Ministry of Agriculture
of the Republic of Tajikistan

The Republic of Tajikistan

Tajikistan Data Collection Survey on the Condition of Small Size Agricultural Machinery

Final Report

March 2025

Japan International Cooperation Agency (JICA)

Overseas Merchandise Inspection Co., Ltd. (OMIC)

Asia Engineering Consultant Co., Ltd. (AEC)

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List of Abbreviations

日本語	Abbreviation	Term in full
アジア開発銀行	ADB	Asian Development Bank
デフカン農業協会	ADF	Association of Dehkan Farms
日・アフリカ農業イノベーションセンター	AFICAT	Japan-Africa Agricultural Innovation Center for Agricultural Technology
アハガーン財団	AKF	Aga Khan Foundation
土地開拓灌漑庁	ALRI	Agency for Land Reclamation and Irrigation under the Government of the Republic of Tajikistan
アグロテクサービス	ATS	AgroTechService
独立国家共同体	CIS	Commonwealth of Independent States
デフカン農場	DF	Dehkan Farm
ユーラシア経済同盟	EAEU	Eurasian Economic Union
ユーロアジア標準化評議会	EASC	Euro-Asian Council for Standardization, Metrology and Certification
欧州復興開発銀行	EBRD	European Bank for Reconstruction and Development
欧州連合	EU	European Union
国連食糧農業機関	FAO	Food and Agriculture Organization of the United Nations
地図情報システム	GIS	Geographic Information System
地盤レベル	GL	Ground Level
灌漑排水	I&D	Irrigation and Drainage
情報通信技術	ICT	Information and Communication Technology
国際農業開発基金	IFAD	International Fund for Agricultural Development
国際通貨基金	IMF	International Monetary Fund
総合的病害虫管理	IPM	Integrated Pest Management
イスラム開発銀行	IsDB	Islamic Development Bank
農業協同組合	JA	Japanese Agricultural Cooperatives
国際協力機構	JICA	Japan International Cooperation Agency
ゴルノ・バグフシャン自治州	GBAO	Gorno-Badakhshan Autonomous Province
農業省	MoA	Ministry of Agriculture of the Republic of Tajikistan
農業機械技術センター	MTC	Machinery Technical Service Center
タジク国立機械試験所	MTS	Tajik State Institute of Machine Testing Station
アメリカ合衆国農務省国家農業統計サービス局	NASS	USDA National Agricultural Statistics Service
政府開発援助	ODA	Official Development Assistance
有機物	OM	Organic Matter
タジクアグロリーシング	TAL	TajikAgroLeasing
国際連合貿易開発会議	UNCTAD	United Nations Conference on Trade and Development
国際連合開発計画	UNDP	United Nations Development Programme

日本語	Abbreviation	Term in full
アメリカ合衆国国際開発庁	USAID	United States Agency for International Development
付加価値税	VAT	Value Added Tax
世界銀行	WB	World Bank
国連世界食糧計画	WFP	United Nations World Food Programme
水利組合	WUA	Water Users Association
水利用者グループ	WUG	Water Users Group

Definitions

Jamoat	ジャモアート　（郡の中にある行政区画）
Region	州　　（行政区画）
District	郡　　（州の中にある行政区画）
Cooperative	協働組合
Dangara	ダンガラ (営農試験を実施した地域名）
Fayzobod	ファイザーボォド (営農試験を実施した地域名）
Farming test	営農試験
Implement	作業機械
Dehkan Farm	デフカン農場（DF法に基づく、集団農場解体後の農家世帯の集団）
Sovkhoz	ソフホーズ（国営農場）
Kolkhoz	コルホーズ（集団農場）

Weights and measures:
Metric system

Currency exchange rate as of November 2024
(Source: JICA)
USD 1.00 = 153.2340 JPY
TJS 1.00 = 14.55890 JPY
(TJS: Tajikistani Somoni)

Chapter 1 Background Purpose, and Process of Survey

Chapter 1 Background, Purpose, and Process of Survey

1.1 Background

The Republic of Tajikistan (hereinafter referred to as "Tajikistan") has the lowest GDP per capita among post-Soviet states at USD 859 (World Bank, 2019) - a status which is attributed to a lack of energy resources such as oil and natural gas, as well as the civil war that followed the country's declaration of independence from the former Soviet Union. Also, 73% of Tajikistan's population lives in rural areas (World Bank, 2018), with more than 60% of its labor force engaged in agriculture. With agriculture being vital not only for Tajikistan's economic growth but also for the country's food security, improving farming productivity has long been an important issue, but this has remained at a low level compared to neighboring countries (ADB, 2023). In addition, the temporary suspension of imports due to border closures during the COVID-19 pandemic from early 2020, as well as global food shortages related to the situation in Ukraine, have caused marked shortages of agricultural produce such as potatoes - a staple food in Tajikistan - and the need to increase agricultural output to maintain the country's food security is becoming an even more urgent issue.

The main reason for low agricultural productivity in Tajikistan is that agricultural mechanization has not sufficiently advanced. According to Tajikistan's Ministry of Agriculture (MoA), demand for work by tractors and harvesters is not being met, and most smallholder farmers involve the entire family, including women and children, in manual farm labor. This is mainly attributed to the total number of agricultural machinery, of which there was significant uptake during the Soviet era, having been adopted on a large scale post-1991 when Tajikistan declared its independence. In 1991, the total number of agricultural machinery was estimated at 37,000 units; by 2006, this number had fallen to 19,000. Adding to this, another major issue is that most of the machines currently owned in the country are remnants of the Soviet era, having exceeded their useful service life and deteriorated in condition, so only about 70% of these machines are in operable condition.

Another major obstacle to agricultural mechanization in Tajikistan is the subdivision of cultivated land. As 93% of the country is mountainous, cultivated land comprised a small percentage of total land area to begin with, but in the process of transitioning to a market economy after the collapse of the former Soviet Union, collective farms (kolkhozes) and state farms (sovkhozes) were dismantled and most were reorganized into Dehkan farm units[1] operated by multiple families (typically relatives) under state registration. Individual and single-family operations have come to make up the bulk of these, and according to the MoA, the average cultivated area is about 0.5 ha per farmer household. Such a tiny scale makes access to agricultural machinery extremely difficult for farmers. At the same time, intercropping and greenhouse cultivation in orchards have been on the rise, but such small-scale cultivation

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1 Initially, out of more than 670 state/collective farms from the Soviet era, roughly 100 were retained, with the rest being subdivided into a total of around 53,000 Dehkan farms (DFs) (at the time). Registration of DFs was legislated through Tajikistan's Law On Dehkan Farms in May 2002; this has since been revised in 2009 and 2016, with cooperatives being positioned as groups of DFs able to share profits. Subdivision has proceeded to the point that there are now approximately 176,000 DFs (MoA, 2023).

is difficult to handle with the large, Belarusian-made machines of the Soviet era, which account for the majority of Tajikistan's agricultural machinery today. From this, we can observe a latent demand for small, easily maneuverable agricultural machinery that is relatively inexpensive.

This survey was carried out with a view to collecting and confirming information on the adaptability of Tajikistan's farmers' agricultural machinery and points for improvement in small-sized Japanese agricultural machinery in order to introduce said Japanese agricultural machinery, in particular, through a grant aid project.

1.2 Purpose of the Survey

The survey team under this survey, with a view to establishing a grant aid project for introducing small-size Japanese agricultural machinery in Tajikistan,

(1) Identifies and organizes issues related to the possibility of their application, improvements needed in the country's cultivation and farming methods, establishing a system to promote uptake, and refining Japanese agricultural machinery for use in Tajikistan;

(2) Considers the purpose and contents of potential future grant aid projects, outlining the optimal project contents and scale through which collaborative results can be obtained after analyzing the human, technological and economic necessity and validity; and

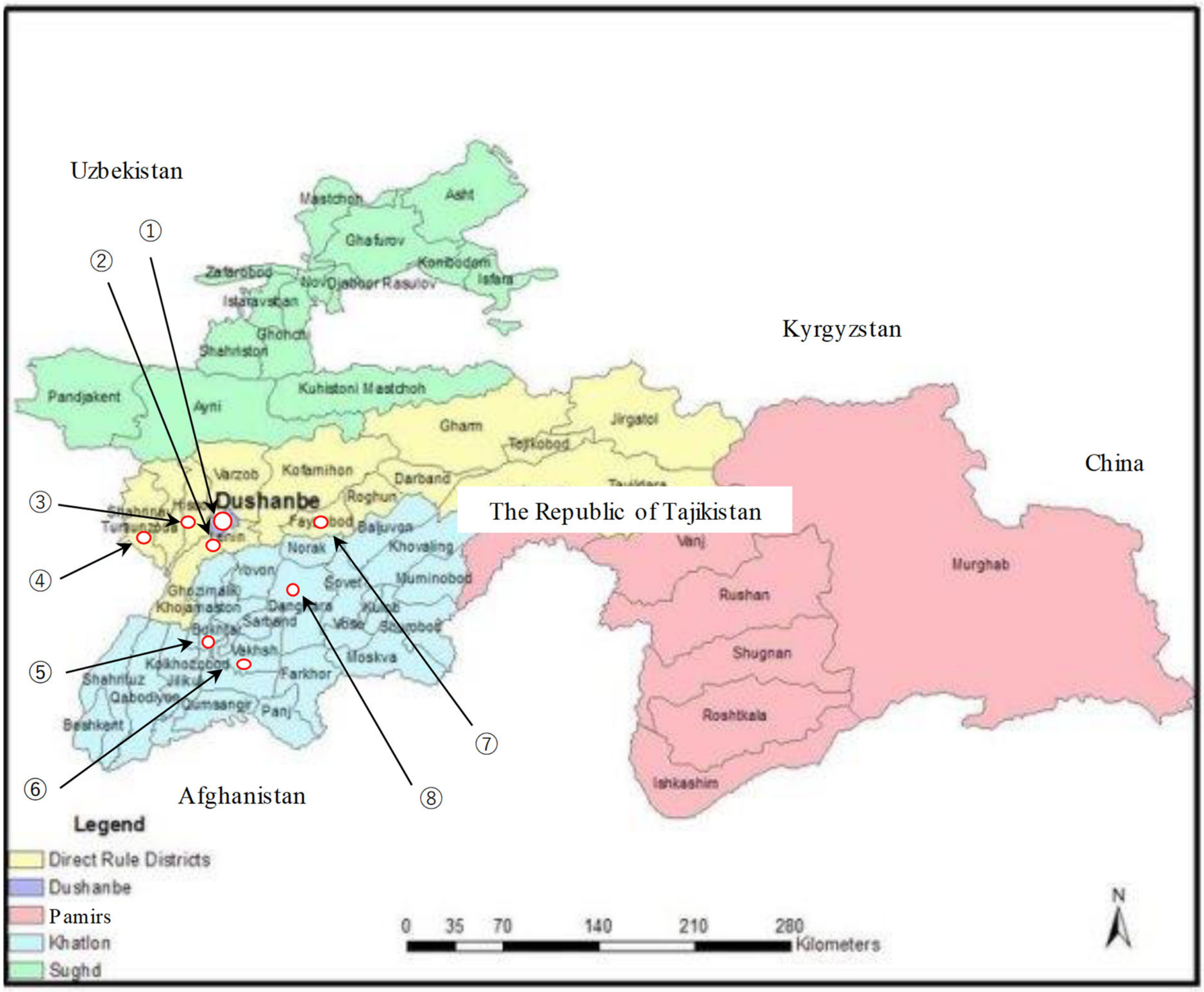
(3) Proposes essential considerations regarding the contents, implementation plan, administration and maintenance, etc. of an agricultural mechanization model project on the Tajikistan side to achieve project outcomes and targets.

1.3 Survey Period

March 2023 to December 2024

1.4 Main Areas for Survey and Farming Test Sites

Figure 1.1 shows the mains areas covered by this survey along with farming test sites.



Main survey area	
① Dushanbe	⑤ Bokhtar
② Rudaki	⑥ Vakhsh
③ Hisor	⑦ Fayzobod (Farming test site)
④ Tursunzoda	⑧ Dangara (Farming test site)

Source: Survey Team

Figure 1.1: Map of Main Areas for Survey and Farming Test Sites

1.5 Process of Survey

1.5.1 Overall Structure and Process of Survey

In light of the contents described in "1.1 Background," the structure and process required to achieve "1.2 Purpose of the Survey" are stated as follows:

(1) Understand the current state of agricultural mechanization and the overall condition of agriculture in Tajikistan, including market trends for agricultural produce, farming conditions, logistics and taxation systems, related organizations, various donor activities, and environmental/social considerations.

(2) Conduct farming tests tailored to the current conditions of farmers in Tajikistan

(3) Make the following considerations and proposals based on the results of the farming tests

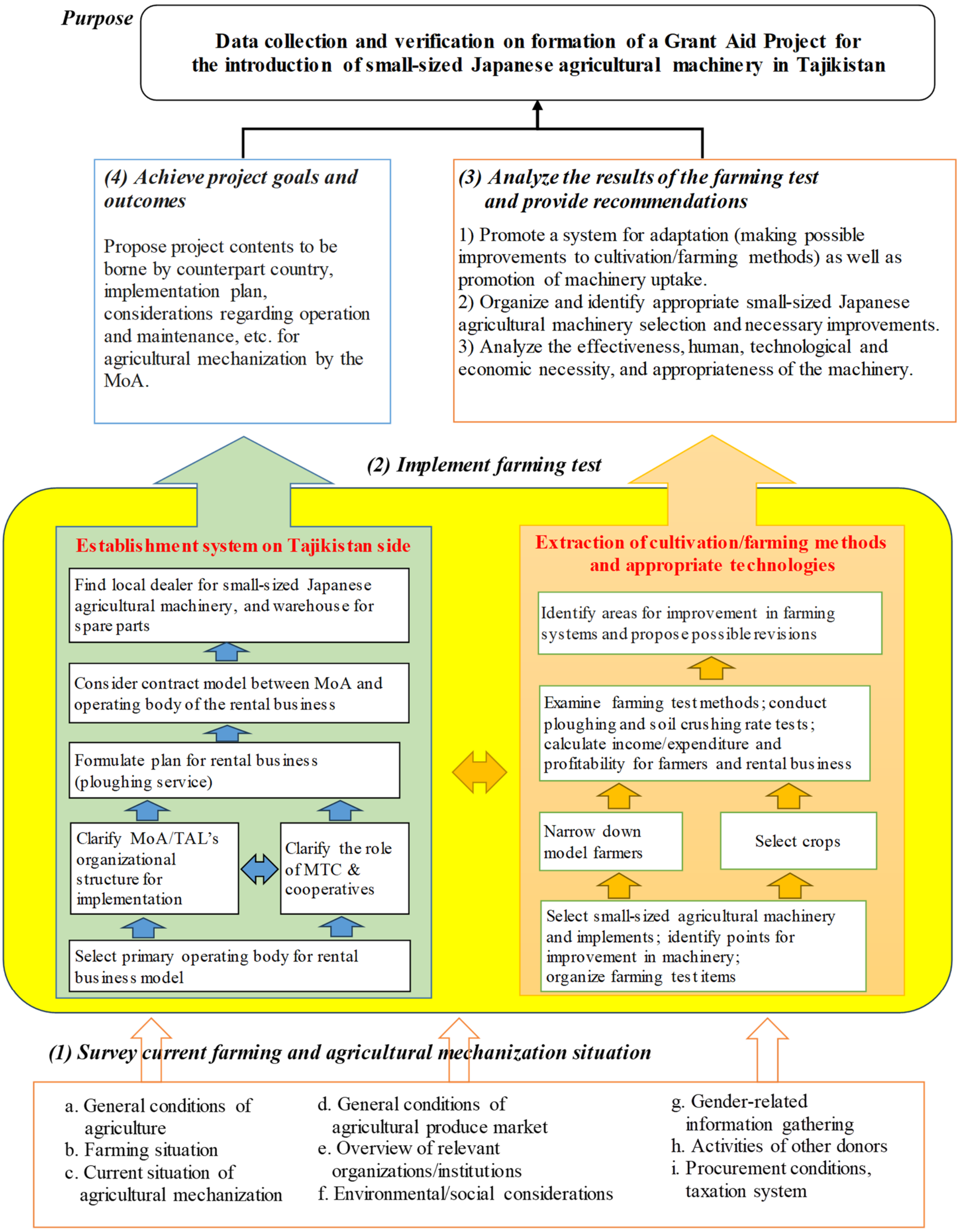
1) Proposal of systems to be established for ensuring the adaptability of small-sized Japanese agricultural machinery in Tajikistan (improvement of cultivation/farming methods, development of appropriate technologies) and promoting their introduction.

2) Agricultural machinery selection and refinement concerning specific small-sized Japanese agricultural machinery.

3) Analysis of the predicted effect, human/ technological/ economic necessity, and appropriateness of introducing small-sized Japanese machinery in Tajikistan.

(4) Propose contents, an implementation plan, and essential considerations regarding administration and maintenance for the MoA's agricultural mechanization program as preconditions for procurement through grant aid.

The relationship between the purpose of the survey and the composition of each item in the overall structure is summarized in Figure 1.2 below.



Source: Survey Team

Figure 1.2: Implementation Policy and Points to Keep in Mind for Accomplishing Survey Purpose

1.5.2 Establishment of the Survey Working Group

In conducting this survey, the contents of the inception report were explained to the MoA along with the state-run TajikAgroLeasing (TAL), the main body responsible for agricultural mechanization in Tajikistan. Both organizations subsequently requested the formation of a Survey Working Group (hereinafter referred to as "Survey WG"), with the Japan and Tajikistan sides discussing the TOR, including the schedule, personnel, and survey assignments related to the Survey WG.

Tajikistan side members of the Survey WG were assigned questionnaires and tasks, the data/information obtained from which was re-analyzed and scrutinized within the Survey WG. Discussions were held at each stage of the survey to examine the farming test methodology and results, as well as to consider the formulation of an implementation plan for the MoA's agricultural mechanization model, among other items. At each stage of the survey, the approval of the Minister of Agriculture was obtained before moving on to the next activity item.

The first WG was held in June 2023. At this time, the contents of the inception report and the TOR of the Survey WG were finalized, and the Tajikistan side's signed agreement was obtained from the Survey WG Supervisor, the Deputy Minister of Agriculture in charge of the survey (See Appendices 1, 2 and 3 (1) MoA/TAL 1) to 8)).

The Survey WG confirmed with the Tajikistan side their wishes for test items to be included in the farming tests, which were reflected in the implementation guidelines for these. Throughout the survey, cooperation was sought upon explaining that the Supervisor had already approved the matter in the Survey WG so as to obtain official MoA or on-site cooperation. When obtaining the questionnaires, data, and other information to be provided as per the inception report and the TOR of the Survey WG, the importance of these to the Survey WG was explained to the Tajikistan side in an ongoing manner so as to seek understanding.

1.6 Composition of the Survey Team

The survey was conducted by members in the six distinct fields outlined below.

Field of Survey	Full Name	Affiliation
(Project Manager) Agricultural mechanization	KANAMOTO Masakazu	Overseas Merchandise Inspection Co., Ltd. (OMIC)
Farming techniques	ARAKI Yasunori	Overseas Merchandise Inspection Co., Ltd. (OMIC)
Small size agricultural machinery	AKUTSU Takao	Overseas Merchandise Inspection Co., Ltd. (OMIC)
Marketing	SUEMITSU Kenji	Asia Engineering Consultant Co., Ltd. (AEC)
Organizational structure, operational management	HAMROEV Aslam	Asia Engineering Consultant Co., Ltd. (AEC)
Procurement conditions	SAITO Takashi	Asia Engineering Consultant Co., Ltd. (AEC)

Chapter 2　Current Situation of Farming and Agricultural Mechanization in Tajikisutan

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2.1 General Conditions of Agriculture in Tajikistan

2.1.1 General Conditions of Agriculture

Agriculture accounts for approximately 24% of Tajikistan's GDP, and creates 60% of the country's working population, making it an important industry sector (World Bank, 2019). Tajikistan's climate is classified as continental; temperatures drop to sub-zero on the plains in January, but exceed 36℃ from July to August. In addition, the temperature difference between the night and day is generally significant, which makes for a very suitable climate for crop cultivation. Topographically, however, most of the country is covered by mountains, and arable land is very limited at 960,000 ha (about 7% of the country's total land area) (JICA, 2013). Its administrative divisions are comprised of four regions, and the main agricultural products of each are shown in Table 2.1.

Table 2.1: Overview of Regions of Tajikistan and Major Agricultural Products

Name of region	Major agricultural produce	Remarks
Sughd Province	Cotton, cereal grains, garden plants (potatoes, etc.), tree fruits (berries, grapes, apples, apricots), tobacco, livestock	Cultivation is possible on flat fields and various scales of the Dehkan farms.
Republican Subordination	Cotton, cereal grains, garden plants (potatoes, etc.), livestock	
Khatlon Province	Cotton, cereal grains, garden plants (watermelon, melon, pumpkin, etc.), tree fruits (berries, grapes), livestock	
Gorno-Badakhshan Autonomous Oblast	Livestock, cropping in river valleys (potatoes, highland vegetables, berries)	Crops are cultivated in limited sections of mountainous and river valley areas.

Source: Survey Team

As for the main farm products in Tajikistan, there are: 1) cotton growing by the irrigation maintained during the former Soviet Union era; 2) grains such as rice, wheat, and barley; 3) garden plants such as potato, tomato, cucumber, carrot, onion, watermelon, melon, and pumpkins; and 4) tree fruits including grapes, apples, apricots, berries. As for crop cultivation, this is undertaken by farmers 2 to 3 times per year for grain and garden plants within the rainy season (September to May, including the snowfall season), and the dry season (late May/June to August/mid-September) (Tajik-SHEP survey, 2022). The main issues to be solved include insufficient fertilization and reduction of yield due to continuouse cropping injury.

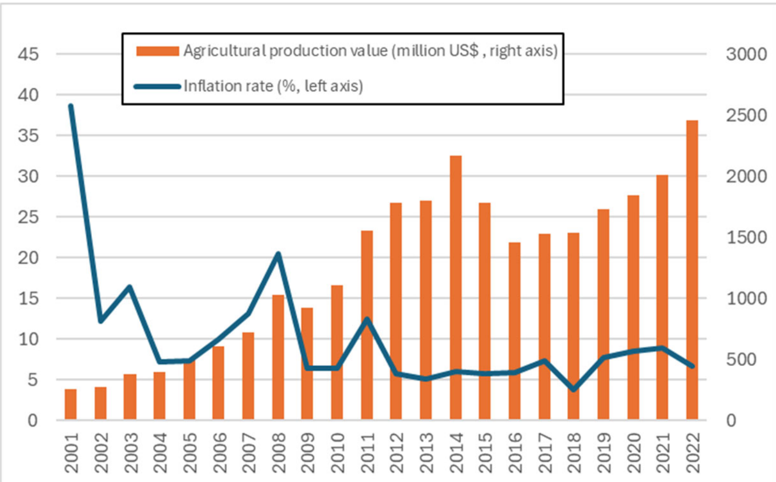
The subdivision and privatization of state and collective farms was pushed forward in Tajikistan through land reform following the collapse of the former Soviet Union, and small and medium-sized Dehkan farms (farm households) became the norm. Dehkan farms are the smallest unit of farming enterprise, and come in a variety of constitutions (1 to 100 or more farm households) and scales (less than 1 ha to 20 ha or more). However, most of them are small-scale operations, and because geographical constraints make it difficult to expect an expansion of cultivated land, the challenge is how to improve the agricultural productivity and profitability of Dehkan farms operating with limited plots.

2.1.2 Agricultural Production and Import/Export Trends in Tajikistan

Detailed production and trade statistics by crop were not available fromthe Ministry of Agriculture for this survey, but we analyzed the trends in agricultural production and import/export in Tajikistan based on the international statistics (2023) prepared by the World Bank (WB) and otkers [1](the most recent data and other information for each statistic may be estimates; refer to the respective websites of the UN agencies for details).

(1) Agricultural production value

According to international statistics from the World Bank (2023), the value of agricultural production in Tajikistan has increased nearly tenfold over the last 20 years, as shown in Figure 2.1. On the other hand, the increase in arable land during the same period was less than 20% (from 883,000 ha in 2001 to 1,042,000 ha in 2021; FAO, 2023), and the average inflation rate during the same period was 10.1% per year, relatively stable for a developing country. It can be inferred that the background to the large increase in agricultural production value is the introduction of new, more profitable crops (vegetables, etc.) as well as improvements in productivity, attributed to Tajikistan's transformation after independence from a collective farming system based on a planned economy centered on kolkhozes (collective farms) and sovkhozes (state farms), to an agricultural system based on a market economy centered on Dehkan farms.



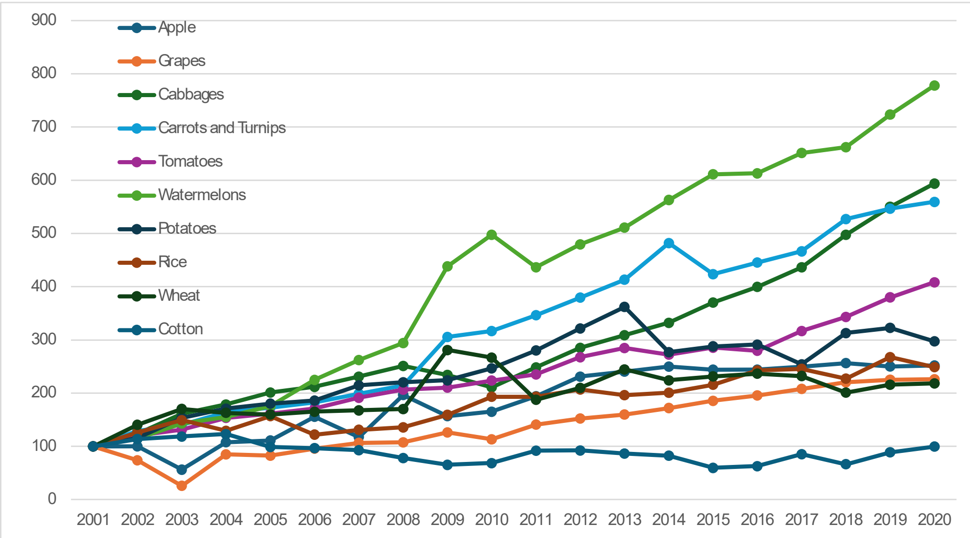
Source: Prepared by the Survey Team based on WB and IMF data.

Figure 2.1: Trends in Agricultural Production and Inflation in Tajikistan (2001-2022)

[1]World Bank (WB); https://data.worldbank.org/
United Nations Conference on Trade and Development (UNCTAD); https://unctadstat.unctad.org/EN/
Food and Agriculture Organization of the United Nations (FAO); https://www.fao.org/faostat/en/
International Monetary Fund (IMF); https://www.imf.org/en/Data

(2) Production volume by product category

Figure 2.2 depicts the relative changes in production volume by crop from 2001 to 2020 (with each crop's production in 2001 represented as '100'). Vegetables such as watermelon, cabbage, carrots, and turnips, as well as tomatoes, increased in the range of 4 to 8 times, while grains such as rice and wheat, and fruits such as apples, more than doubled. Only cotton showed a slight decrease.



Note: Data for 2001 to 2020, with each crop production in 2001 as 100.

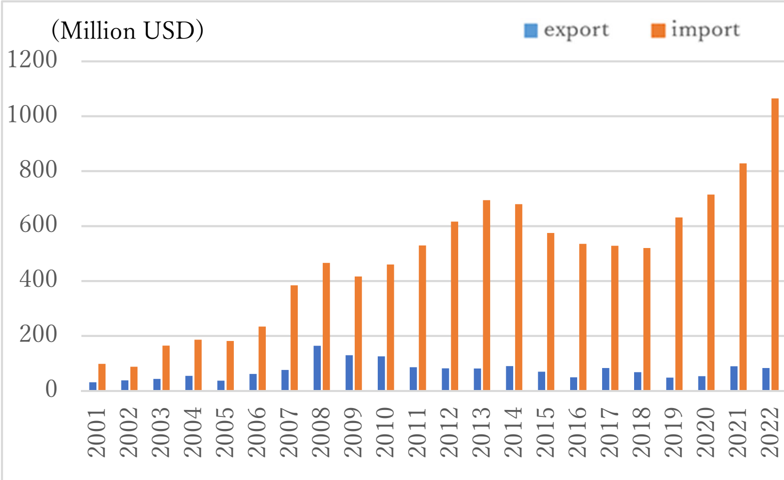
Source: Survey Team, based on FAO data.

Figure 2.2: Trends in Production by Crop in Tajikistan

(3) Import and export of agricultural products and foodstuffs

While Tajikistan's domestic agricultural production is growing in both value and volume, the country's population has increased from 6.41 million in 2001 to 9.95 million in 2022. [2]This has resulted in a significant trade deficit in relation to agricultural products and foodstuffs (Figure 2.3), which has become a major national financial challenge in recent years. According to the MoA, the main export destinations are Kazakhstan, Kyrgyzstan, Uzbekistan, and Russia, but exports are not growing due to insufficient processing, conditioning, packaging, and other pre-export logistic facilities. Therefore, technologies and facilities to handle these processes need to be expanded.

[2] UN statistics; https://population.un.org/dataportal/



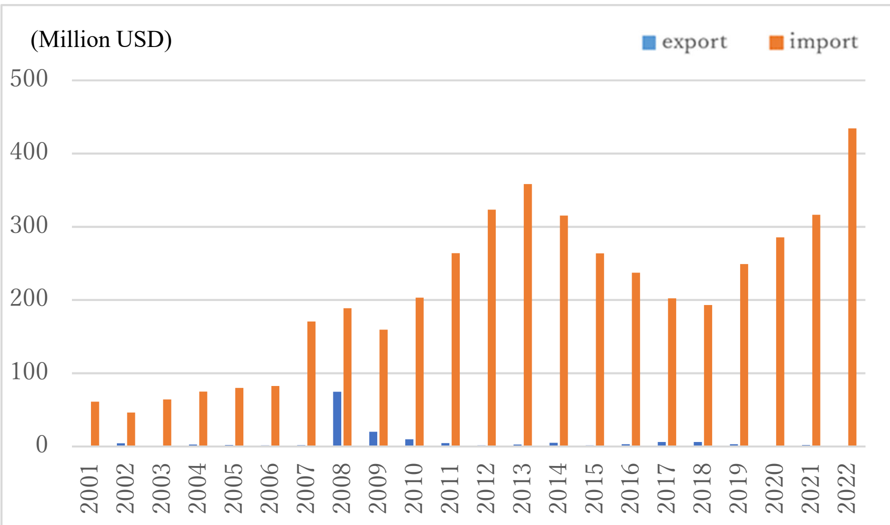
Source: UNCTAD

Figure 2.3: Trends in Import and Export of Agricultural Products and Foodstuffs in Tajikistan (2001-2022)

(4) Import and export of grains

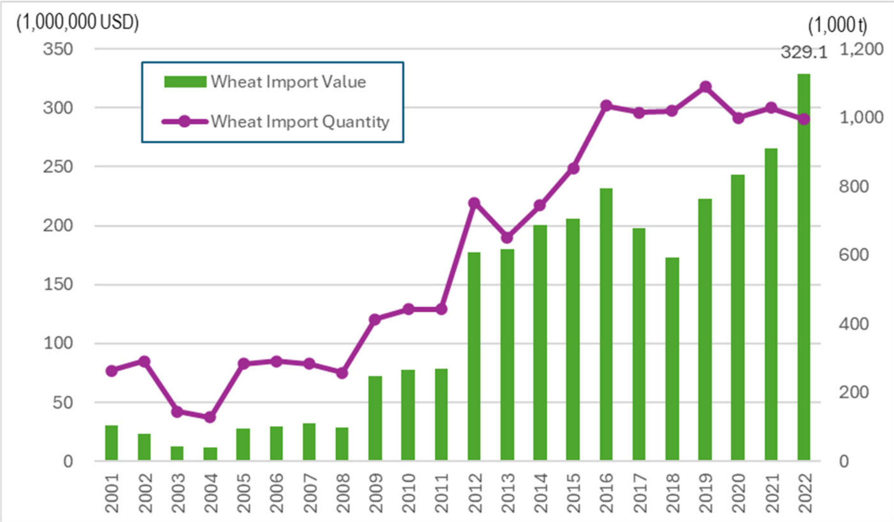
Regarding the trade deficit surrounding imports and exports of agricultural products and foodstuffs, a breakdown shows that about 40% of this is generated by grain imports (Figure 2.4 and Figure 2.5). Since the 2009 agrarian reform, Tajikistan has officially stopped forcing producers to produce certain crops. However, substantial production quotas are still in place for cotton, potatoes, and wheat through government authorities and Jamoats (administrative wards within districts), and the MoA is encouraging increased production of those major crops, but this is not keeping up with demand.

Figure 2.5 shows the trends in the quantity and value of wheat imports. Most of Tajikistan's grain import deficit (around 80%) is caused by the import of wheat, which amounts to about 1 million tons per year. Therefore, increasing wheat production is an urgent issue for Tajikistan, both for ensuring food security and to reduce the deficit.



Source: UNCTAD

Figure 2.4: Trends in Tajikistan's Grain Imports and Exports (2001-2022)

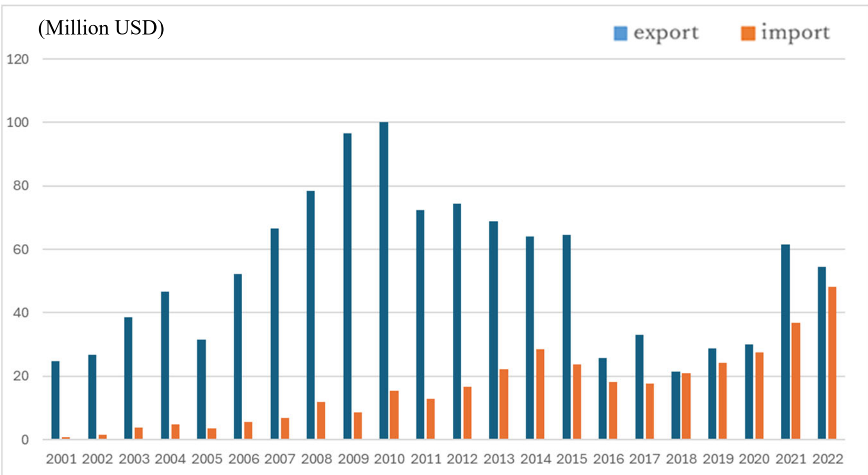


Source: FAO

Figure 2.5: Trends in Quantity and Value of Tajikistan's Wheat Imports (2001-2022)

(5) Import and export of vegetables and fruits

With regard to the imports and exports of vegetables and fruits, until 2015 there was a large export surplus, but in recent years this has shrunk significantly, partly due to an increase in imports (Figure 2.6). According to the MoA, about 260,000 ha of farmland is used for horticultural crops in Tajikistan, and the fruits produced are exported to Iran, China, Russia, and other countries, but the lack of processing technologies and facilities is an issue. Therefore, various measures are required to secure a surplus, such as diversification of varieties grown domestically, the spread of greenhouse cultivation, and an increase in cold storage facilities.

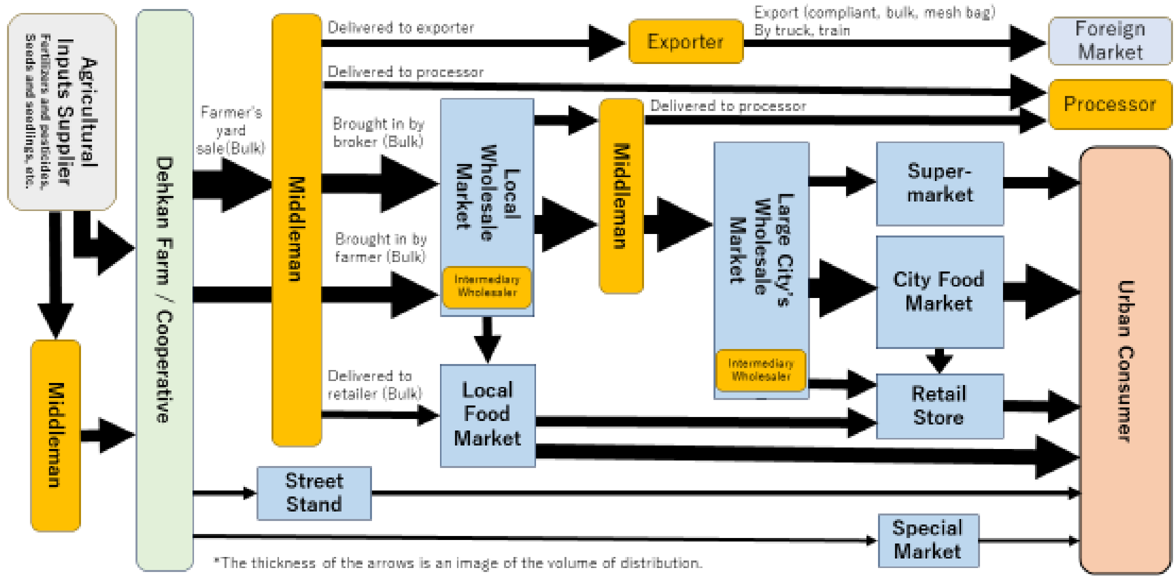


Source: UNCTAD

Figure 2.6: Trends in Tajikistan's Vegetable and Fruit Imports and Exports (2001-2022)

2.1.3 Major Distribution Channels for Agricultural Products in Tajikistan

The major distribution channels for agricultural products in Tajikistan are summarized in Figure 2.7.



Source: Survey Team

Figure 2.7: Major Distribution Channels for Agricultural Products in Tajikistan

(1) Brokers

The distribution of agricultural products in Tajikistan is dependent on private middlemen (brokers), as there are few producer organizations holding power to the degree of, for example, Japanese Agricultural Cooperatives (JA). These middlemen include those who work closely with specific Dehkan farms or cooperatives to sell their products at local wholesale markets, those who visit many Dehkan farms to collect specific products at the request of processors or intermediate wholesalers, and those who transport cheaper products from local wholesale markets to wholesale markets in large cities or foreign markets in large volumes by truck or train. Some not only buy the agricultural products produced, but also sell or provide postpaid fertilizers, pesticides, seeds, and other materials necessary for production to the producers. They have become an integral part of the current distribution of agricultural products in Tajikistan, which has transformed from the collective production system of the former Soviet Union into an individual, private-sector production system.

Usually, brokers are familiar with market prices and demand. Based on this knowledge, they offer transaction (purchase) prices to producers, and if producers are satisfied, the transaction is concluded. Figure 2.8 illustrates the factors used by brokers to determine the purchase price based on the interviews in this survey. Essentially, the purchase price is linked to the wholesale market price, and brokers consider the forecast of future market arrivals, calculate their profits, and deduct transportation and sales expenses from the anticipated wholesale market price. The remaining amount is then presented to producers as the yard sale price. Unlike market transactions, there is no mechanism for the government to control the profit margin of the middlemen, and each is left to their discretion (differences between yard prices and wholesale market prices are described further in 2.4.1).

Source: Survey Team

Figure 2.8: Factors in Determining Producer's Yard Price by Brokers

(2) Dehkan farms and cooperatives

Rural "producers" such as Dehkan farms and cooperatives sell their produce face-to-face to brokers, mainly in their yards, but there are also many producers that bring their products directly to wholesale markets to sell, notably those near markets or those with the means of transportation. In rural areas along major roads, there are also cases where producers sell their products to tourists and other visitors in the form of roadside stands. Even in urban areas, temporary sales stands are set up on certain days of the week in the form of "special markets", where nearby producers sell their products directly to urban consumers.

(3) Agricultural produce markets

There are two types of agricultural produce markets in Tajikistan: public markets under the jurisdiction of local governments, and privately operated markets[3]. However, wholesale markets in Tajikistan do not possess an equivalent of the "wholesalers" in Japanese public markets, who take on all agricultural products brought into the market and sell them on behalf of the producers or middlemen for a commission.

There is also no "auction" nor any other clear price formation system, which poses a challenge in terms of offering fair prices. Under these circumstances, it often takes time for producers to make transactions when trying to sell on favorable terms, and it is difficult for buyers to expand into large-lot transactions because most sales are settled immediately in cash.

The MoA, through the market administrative department of local government, conducts weekly surveys on the prices of agricultural products in public markets. To prevent retail prices of major agricultural products from deviating significantly from wholesale market prices, or to prevent extreme price hikes, certain controls are in place, such as requiring retailers to post and observe the maximum retail prices for major agricultural products. On the other hand, the main roles of the market administrative department of the local government are to develop and maintain market facilities and to monitor the price gap between intermediate wholesalers and retailers (in cooperation with the Anti-Monopoly Bureau). For example, in the Dehqon Market in Dushanbe, prices for 48 major commodities are surveyed and recorded daily. However, this data is not made available to the public via the Internet or other means. The department also does not monitor the number of market visitors, total sales, or volumes of each item handled in the market. Overall, it must be said that the digitalization of market

[3] To avoid confusion with Japanese wholesalers, in this report, the term "intermediate wholesalers" will be used to refer to those who buy products brought in by producers and middlemen and sell them to retailers and/or bulk buyers.

functions in Tajikistan has only just begun.

During the peak season of agricultural product shipments, too much produce arrives at the market relative to demand, causing prices to plummet. Conversely, depending on the season and the status of exports to other countries, the number of deliveries can be extremely low. Under such circumstances, intermediate wholesalers forecast daily demand and supply and determine the prices to offer to producers and middlemen who bring products to the market. The market administrative department does not intervene in this process.

When visiting the site, we saw that many ordinary consumers visit retail markets to purchase daily foodstuffs, and all markets are very busy from early morning until late in the evening. Wholesale markets, on the other hand, are usually open at night, attracting many middlemen and growers' trucks, which are used for active trading. In addition, in some local wholesale markets, such as Bokhotar, small-scale producers come to the market in the daytime, their cars loaded with produce, and the market is as busy as it is at night.

(4) Cold chain

The administrative departments at each market visited recognized an urgent need to expand refrigeration facilities to maintain the quality of the produce being handled. In some markets, large parts of the wholesale section were not equipped with roofs, and there were concerns about sanitation and losses due to food damage during the summer months.

Few producers have refrigeration facilities to store their harvests, and few brokers have refrigerated trucks. Therefore, a large portion of the vegetables and fruits produced in Tajikistan are delivered to markets at room temperature immediately after harvest. There is also a considerable lack of refrigeration facilities at markets, and even supermarkets often have insufficient refrigerated racks for vegetables. In Tajikistan, the formation of a cold chain is a challenge that remains to be addressed. Currently, vegetables and fruits are damaged quickly during the summer period, which drives up distribution costs.

(5) Urban consumers and where they buy produce

Urban consumers purchase agricultural products from market retailers, general retailers in town, large retailers (supermarkets), and some at special markets. These special markets are also important for controlling the high prices of agricultural products in urban areas. They are sometimes held at the request of the MoA during certain times of the year when prices are likely to be high.

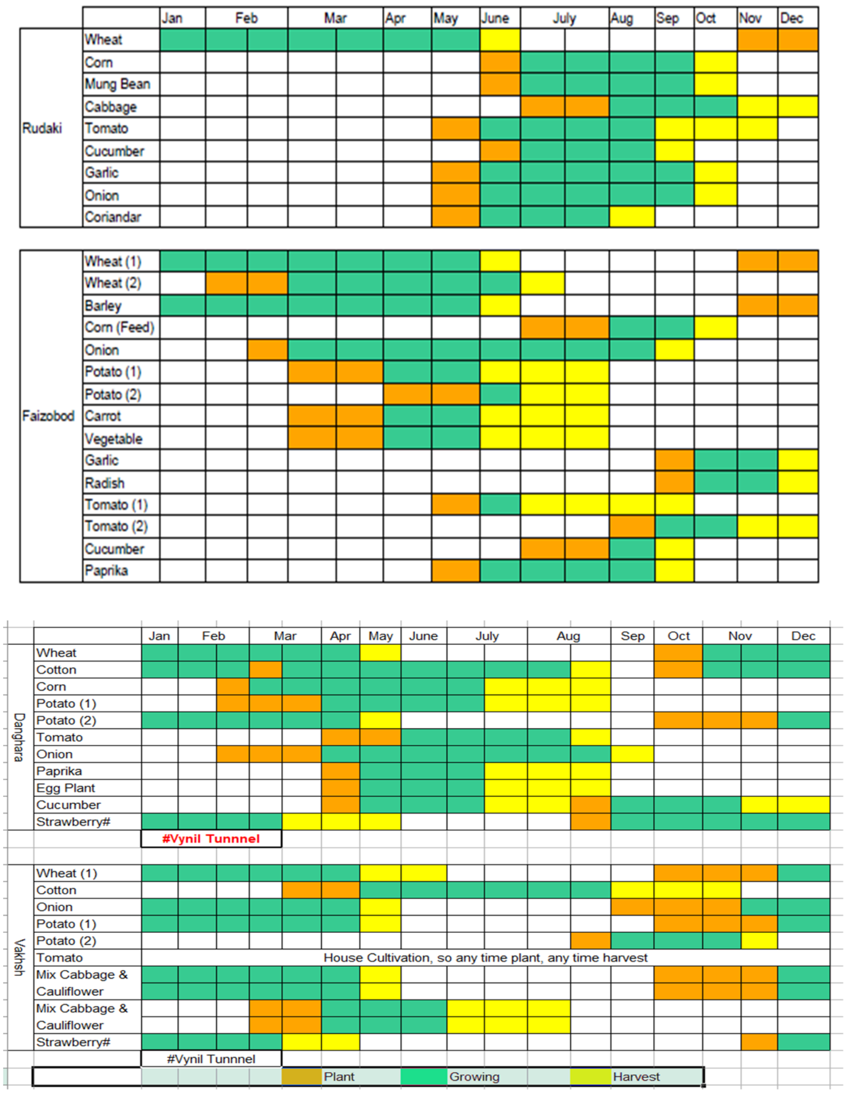
Dushanbe's supermarkets currently purchase produce in good condition from the city's public markets and other sources. We were unable to identify any examples of sales that dealt directly with independent producers and posted the name of the producer and place of production. In addition, except for some fragile fruits, few fruits and vegetables were in packaged form even at supermarkets, generally being sold by weight in unclassified and unpackaged condition. As far as we could ascertain, there were no stores specializing in organic products or organic produce sections in supermarkets in Dushanbe. The value chain for high-end agricultural products based on "safety and reliability" is still underdeveloped.

2.2 Farming Situation

2.2.1 Reasonable Cropping System According to Water Conditions

Faced with limited irrigation area and constraints on water supply, farmers are attempting to maximize profits by combining many kinds of crops and utilizing rainwater, or irrigation water if available, with crop rotation and intercropping being implemented to some extent. Specifically, farmers have established a reasonable farming system by preparing for planting in February and March, assuming full use of rainwater in April and May. The respondents have a good knowledge of crop rotation, and while they have little knowledge of how to deal with pests and diseases, they are proactive in planting, for example, mixing rice and legume crops. Even farmers on irrigated land mostly rely on pump irrigation and have a strong desire to save water and minimize irrigation pump use in order to economise on electricity bills. The resulting system is reflected in the cultivation calendar provided in Table 2.2, which covers the Republican Subordinations of Rudaki and Favzobod districts in the governorate, Danghara district in Khatlon Province, and Vakhsh district in the southern part of the same Province.

Table 2.2: Cultivation Calendar



Source: Survey Team

2.2.2 Characteristics of Farmers' Conventional Cultivation and Farming Techniques

In the survey, whilst planting and harvesting times for each product were able to be confirmed with the above-mentioned cultivation calendar, information on the cultivation and harvesting work for most kinds of crops was limited to a small variety, namely cabbage. Also, it was confirmed that potatoes were hilled up to prevent them from turning green. In addition, farmers established a rational crop rotation system by considering the crop selection system that suited their fields for each crop, and no farmers were repeatedly cultivating the same few crops.

Table 2.3 below shows the results of soil analysis conducted in July 2023.

Table 2.3: Results of Soil Analysis (July 21 to Aug 1, 2023)

Plot No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Standard**
Location	Rudaki		Rudaki House	Fayzobod		Dangara		Vakhsh		Upland in Japan
Soil type	**Alluvial soil**			**Immature soil**		**Immature soil**		**Alluvial soil**		**Immature soil**
GPS coordinates	**38.460431, 68.790641**			**38.530090, 69.300232**		**38.07285, 69.34746**		**37.70772, 68.83658**		
Sampling date	July 21	July 21	July 21	July 25	July 25	July 27	July 27	Aug 1	Aug 1	
Depth from surface	Topsoil	Subsoil	Topsoil	Topsoil	Subsoil	Topsoil	Subsoil	Topsoil	Subsoil	
Soil texture	Silt-Loam	Silt	Silt	Silt	Silt	Clay	Clay	Clay	Clay	
Crop before sampling	Corn	Corn	Flower	Fallow	Fallow	Wheat	Wheat	Cotton	Cotton	Upland crops
EC (mS/cm)	0.258	0.117	0.213	0.373	0.203	0.350	0.282	**2.20***	0.686	0.3
pH	6.97(7.9)	7.92(8.0)	7.73(7.9)	7.24(8.0)	7.73(8.1)	7.25(8.0)	7.628(8.1)	7.62(8.1)	7.54(8.2)	6.0-6.5
Bulk density (g/ml)	1.115	1.098	-	1.23	1.148	1.137	1.191	1.08	1.034	1.0
OM (humus) %	1.79	1.12	3.14	1.46	1.20	1.87	1.28	1.72	1.1	2.0
NO_3 (mg/100g)	3.56	0.784	1.59	6.12	0.902	0.686	0.294	7.08	5.98	5-15
NH_4 (mg/100g)	1.85	0.597	3.85	1.52	1.16	1.19	0.597	8.00	0.776	
P_2O_5 (mg/100g)	4.28	3.03	4.81	3.43	1.87	2.05	0.875	4.54	3.48	10-75
K_2O (mg/100g)	30.2	28.0	33.2	28.4	19.6	20.0	13.6	32.0	27.6	20-30
Mineral nitrogen (mg/kg)	22.4	6.42	33.6	25.6	11.1	18.4	5.32	78.3	19.5	
Soil hardness (mm) d = 10cm						25		23		22
20cm	18			14		32		24		22
30cm	24			26		20		20		22
40cm	25			29		33		24		22
50cm	25			30				24		22
60cm								22		22
Soil layer										

- EC was analyzed using a HORIBA LAQUAtwin EC-33B, and pH with a HORIBA LAQUAtwin pH-22B.
- Soil hardness was analyzed using a Yamanaka-type Soil Hardness Tester.
  When this value exceeds 20mm, most plants cannot extend their roots further.
- Values shown for OM (humus), NO_3, NH_4, P_2O_5, K_2O, and mineral nitrogen items were analyzed by the Institute of Soil Science and Agrochemistry, Academy of Agricultural Sciences of Tajikistan.

- Values shown in brackets for pH are data analyzed by the Institute of Soil Science and Agrochemistry, Academy of Agricultural Sciences of Tajikistan.
- *The high EC value of the * mark may be due to the fact that a large amount of compost or chemical fertilizer remained in the soil. Also see the soil analysis in 3.1.2 Procedures for the Farming Test, (3) Preparing plots for the farming test.

Source: Survey Team

From the preceding soil analysis results (soil hardness by depth), the depth of cultivated soil was confirmed to be quite shallow, often less than 20 cm, and in some places just over 10 cm. All open fields other than the horticultural greenhouses had little organic matter (humus), which was not being applied very often. In Fayzobod, there was an organic matter (mainly chicken manure) collection site on the outskirts of the city, depicted in the photo (right), and vegetable farmers made use of this, applying approximately 20 t/ha once per year. However, as the humus content was low at 1.4-1.7% in the cultivated soil layer (surface of soil) and 0.7-1.3% in the deeper layers (subsoil) respectively, it is thought that the amount being applied was not sufficient. In addition, the nitrogen (N), phosphorus (P), and potassium (K) contents were all low, suggesting that cultivation had been conducted on unfertile soil.

In conventional cultivation, the low yield (10 t/ha for cabbage, one-quarter of Japan's yield) is attributed to an insufficient supply of irrigation water. This is because, even in irrigated areas, the operating hours of electric pumps are limited to save on electricity bills. Rainfall is extremely scarce, so the amount of water is inevitably insufficient. Also, the physical properties of the soil (shallow and hard topsoil) are poor, resulting in low water retention capacity, so that even if water is irrigated, it quickly disappears from the soil layer and does not reach the crops, or only reaches them for a short time. As this is an arid region with annual precipitation of several hundred millimeters, water volume being a major factor limiting production for rain-fed areas is to be expected, but such has also been confirmed in irrigated areas where water comes from upstream glaciers.

In terms of managing the cultivation of individual crops (tomatoes, cucumbers, vegetables, potatoes, etc.), no thinning was done at all. Also, there was almost no staking, with cucumbers and melons being grown on the ground, as well as tomatoes in a bush-type cultivation method. Even with ground cultivation, no farmers were mulching with straw laid underneath. Although this comprises an extensive form of cultivation management, this extensive management is also a factor in the low yield.

2.2.3 Farm Management Details

As shown in Tables 2.4 to 2.6, interviews were conducted with a total of 12 farm households—six at each of the two farming test sites—regarding the details of their farming, agricultural management costs, and so on.

Table 2.4: Farmers Interviewed

	Fayzobod District		Dangara District	
	Name of farmer	Area	Name of farmer	Area
Farm 1	Mr. Muminou Mauaddullo	0.5 ha	Mr. Abdukodir Shirin	84 ha
Farm 2	Mr. Abdulledu Fazliddin	0.6 ha	Mr. Murodov Sanzaali	20 ha
Farm 3	Mr. Gulou Himoiddin	1.0 ha	Mr. Sharipou Hokimgon	30 ha
Farm 4	Mr. Nozirou Najmiddin	1.0 ha	Mr. Nazarou, Uroq Sayfiddirouvich	12 ha
Farm 5	Mr. Sayfyelloeu Bahodur	40 ha	Mr. Najmidinev Zalon	10 ha
Farm 6	Mr. Kamolov Mirzorajab	1.1 ha	Mr. Isomatov Davlat	18 ha

Source: Survey Team

Table 2.5: Crops Planted by Fayzobod District Farmers

	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5	Farm 6
Wheat	✓		✓	✓		✓
Potato	✓	✓	✓	✓	✓	✓
Corn	✓	✓	✓		✓	
Onion	✓					
Red Bean	✓					✓
Tomato	✓	✓	✓	✓	✓	✓
Alfalfa		✓			✓	✓
Paprica				✓	✓	✓
Chili					✓	
Beat						✓
Cucumber				✓	✓	
Radish						✓

Source: Survey Team

Table 2.6: Crops Planted by Dangara District Farmers

	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5	Farm 6
Wheat	✓	✓	✓	✓		✓
Barley	✓	✓	✓	✓		
Potato	✓					
Corn	✓					
Onion					✓	✓
Tomato				✓		
Alfalfa		✓		✓		
Paprika						
Watermelon					✓	✓
Cucumber				✓		
Cauliflower						
Groundnuts				✓		
Cotton				✓		

Source: Survey Team

The farmers in Fayzobod district, with the exception of one large farmer, are small, with a scale of operation of around 1ha, and mainly grow wheat and potatoes, but also gravitate towards crops such as tomatoes which have a long continuous period and can provide a certain amount of cash income on an ongoing basis. These crops are also profitable. Some farmers also grow peppers and cucumbers, which are expected to be profitable, similar to tomatoes. On the other hand, the farmers in Dangara district are large-scale, and except for Farm 4, do not grow labor-intensive vegetables such as tomatoes, but rather focus on large-scale cultivation of wheat, barley, etc. The following table shows obtained from these farmers regarding their farm operating income and expenditure, and the cultivation and costs of each crop.

Table 2.7: Farm Operating Income and Expenditure (2023)

DF / Product	Fayzobod						Dangara					
	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5	Farm 6	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5	Farm 6
Farm Land (ha)	0.50	0.60	1.00	1.00	40.00	1.10	84.00	20.00	30.00	12.00	10.00	18.00
Wheat (Grain)	4,050		10,500	8,500		7,650	592,800	96,000	100,000	12,000		60,000
Wheat (Cube)	550		1,600	1,000		2,400	135,200	37,440	39,600	3,960		21,600
Barley (Grain)							136,800	81,000	162,000	9,000		
Barley (Cube)							39,520	25,920	72,000	3,600		
Corn	1,225	3,150	1,225		8,750							
Corn Leaf	1,525	1,500	1,000		700							
Oil Seed										18,225		
Cotton										66,000		
Watermelon											149,625	240,000
Groundnuts										2,625		
Onion	24,000										525,000	180,000
Potato	4,950	10,500	11,250	16,071	40,000	35,000	6,400					
Tomato	4,000	17,500	19,250	28,000	240,000					16,000		
Paprika				4,200	10,500	6,000						
Chili					5,250							
Cucumber				11,000	2,700					16,000		
Bean	525				1,120							
Alfalfa		6,000			262,500			183,600		18,000		
Beat						6,000						
Total annual crop income	40,825	38,650	44,825	68,771	571,520	57,050	910,720	423,960	373,600	165,410	674,625	501,600
Machinery	1,155	1,450	2,575	1,800	18,795	4,560	171,192	76,180	81,300	27,450	14,000	37,420
Input	3,295	3,215	10,064	11,145	23,053	3,295	254,434	35,795	70,700	29,212	49,150	91,660
Labor	8,680	11,840	15,203	31,110	60,902	8,680	26,775	2,700	0	24,300	26,775	178,200
Water	50	150	120	1,000	10,000	1,500	80	6,375	0	1,840	2,600	4,680
Tax	120	87	240	240	2,950	240	21,853	4,570	7,800	1,738	2,600	4,680
Total annual farm expenses	13,300	16,742	28,202	45,295	115,700	18,275	474,334	125,620	159,800	84,540	95,125	316,640
Annual profit	27,525	21,908	16,623	23,476	455,820	38,775	436,386	298,340	213,800	80,870	579,500	184,960
USD conversion [=10.93 tjs]	2,518	2,004	1,521	2,148	41,704	3,548	39,926	27,296	19,561	7,399	53,019	16,922
Profitability (ratio)	67.4%	56.7%	37.1%	34.1%	79.8%	68.0%	47.9%	70.4%	57.2%	48.9%	85.9%	36.9%

(Note: Revenue generated by each crop is based on the 2023 performance report.)

Source: Survey Team

According to Table 2.7, farmers are making the most of their limited management resources, selecting crops that fit the scope (size and labor) of their farms, and rationally structuring their farming systems to somehow turn a profit. Among the data on expenses, labor costs are expected to be underestimated. This is because, while farmers record wages paid, they do not record family labor, as they do not consider it to be an expense. Therefore, it is necessary to find out how many people and how much time was spent on each task during the cultivation of each crop, but with this being a desk-based interview rather than a survey at the actual cultivation site, data on tasks that the surveyor did not anticipate (e.g. control work to avoid late frost damage, flood prevention work) might not have been included.

A notable trend in the data obtained is the use of cubed/baled wheat and other crop residues as feed, which accounts for more than 20% of the profits from grain use and constitutes an important source of income. However, such activity is counterproductive in terms of returning crop residues to the fields and promoting soil fertility, and as a result, the organic matter content of the soil is low, as evidenced by the soil analysis in Table 2.3 and the later Tables 3.3 and 3.4, and this is something that will need to be addressed in the future. This point should be addressed by taking into account the farmers' balance of cultivation, including sales of residuals, and by straining residues and weeds into the soil to improve soil fertility.

Looking at farm income, there are also farms that are making more than USD 20,000 a year, and some farms have the capacity to update their agricultural machinery, but there are also many farms that make less than USD 10,000 a year, and it is thought that small-scale farms across the country are managed in a similar manner.

Table 2.8: Crop Production Cost and Income (2023)

Cost -	Unit production cost [TJS/ha]						Yield [kg/ha]	Unit seles price [TJS/kg]	Production unit cost [TJS/kg] (Ratio of cost %)	Unit income [TJS/ha] (A)	Unit profit [TJS/ha] (B) (Ratio of profit %)
	Machinery	Inputs	Labor	Water	Tax	Total cost [TJS/ha]					
Wheat (FB)	2,643	5,603	2,478	867	193	11,784	3,538	4.38	3.33	15,496	3,712
	22.4%	47.5%	21.0%	7.4%	1.6%	100.0%			76.0%		B/A=24.0%
Wheat (Dga)	2,559	2,505	160	318	212	5,754	2,770	3.64	2.08	10,083	4,329
	44.5%	43.5%	2.8%	5.5%	3.7%	100.0%			57.1%		B/A=42.9%
Potato (All Ave.)	2,688	18,816	21,478	1,043	243	44,268	31,000	4.14	1.43	128,340	84,072
	6.1%	42.5%	48.5%	2.4%	0.5%	100.0%			34.5%		B/A=65.5%
Onion (FB)	1,583	4,933	34,400	300	240	41,456	37,300	3.30	1.11	123,090	81,634
	3.8%	11.9%	83.0%	0.7%	0.6%	100.0%			33.7%		B/A=66.3%
Onion (Dga)	1,300	5,085	28,450	260	260	35,355	19,000	3.00	1.86	57,000	21,645
	3.7%	14.4%	80.5%	0.7%	0.7%	100.0%			62.0%		B/A=38.0%
Corn (All Ave.)	4,951	5,075	16,439	348	281	27,094	8,295	4.08	3.27	33,844	6,750
	18.3%	18.7%	60.7%	1.3%	1.0%	100.0%			80.1%		B/A=19.9%
Red Bean	720	2,125	13,750	1,050	240	17,885	2,150	14.50	8.32	31,175	13,290
(Faizobod, Ave.)	4.0%	11.9%	76.9%	5.9%	1.3%	100.0%			57.4%		B/A=42.6%
Watermelon	1,488	5,068	10,940	307	961	18,764	30,000	3.00	0.63	90,000	71,236
(Dangara Ave.)	7.9%	27.0%	58.3%	1.6%	5.1%	100.0%			20.8%		B/A=79.2%
Melon (Dga)	2,650	1,100	1,667	5,333	1,662	12,412	90,000	2.50	0.14	225,000	212,588
	21.4%	8.9%	13.4%	43.0%	13.4%	100.0%			5.5%		B/A=94.5%
Cotton (1 case)	2,750	3,640	2,600	260	260	9,510	2,200	7.50	4.32	16,500	6,990
(Dangara)	28.9%	38.3%	27.3%	2.7%	2.7%	100.0%			57.6%		B/A=42.4%
Groundnuts	1,200	2,470	1,200	0	24	4,894	500	10.50	9.79	5,250	356
(Daa, 1 case)	24.5%	50.5%	24.5%	0.0%	0.5%	100.0%			93.2%		B/A=6.8%
Beat (1 case)	3,500	5,250	12,000	1,500	240	22,490	30,000	2.00	0.75	60,000	37,510
(Faizobod)	15.6%	23.3%	53.4%	6.7%	1.1%	100.0%			37.5%		B/A=62.5%
Oil Seed (1 case)	1,200	1,447	800	0	24	3,471	300	13.50	11.57	4,050	579
(Dangara)	34.6%	41.7%	23.0%	0.0%	0.7%	100.0%			85.7%		B/A=14.3%
Tomato	1,915	12,670	64,225	840	240	79,890	45,000	3.80	1.78	171,000	91,110
(Faizobod, Ave.)	2.4%	15.9%	80.4%	1.1%	0.3%	100.0%			46.7%		B/A=53.3%
Tomato (GH)	18,333	36,667	266,667	26,667	260	348,594	133,000	8.20	2.62	1,090,600	742,006
(Dga, 1 case)	5.3%	10.5%	76.5%	7.6%	0.1%	100.0%			32.0%		B/A=68.0%
Paprika	720	11,319	29,300	1,500	240	43,079	12,000	5.00	3.59	60,000	16,921
(Faizobod, Ave.)	1.7%	26.3%	68.0%	3.5%	0.6%	100.0%			71.8%		B/A=28.2%
Cucumber	720	10,325	40,920	1,500	240	53,705	41,000	4.30	1.31	176,300	122,595
(Faizobod, Ave.)	1.3%	19.2%	76.2%	2.8%	0.4%	100.0%			30.5%		B/A=69.5%
Cucumber (GH)	18,333	22,667	266,667	26,667	260	334,594	133,000	8.00	2.52	1,064,000	729,406
(Dga, 1 case)	5.5%	6.8%	79.7%	8.0%	0.1%	100.0%			31.4%		B/A=68.6%
Cabbage	2,800	6,000	15,400	2,266	463	26,929	10,000	12.00	2.69	120,000	93,071
(Rudaki, 1 case)	10.4%	22.3%	57.2%	8.4%	1.7%	100.0%			22.4%		B/A= 77.6%

(Note: "FB" stands for Fayzobod and "Dga" for Dangara. The data is for 2023. Unit price is Farm Gate Price.)

Source: Survey Team

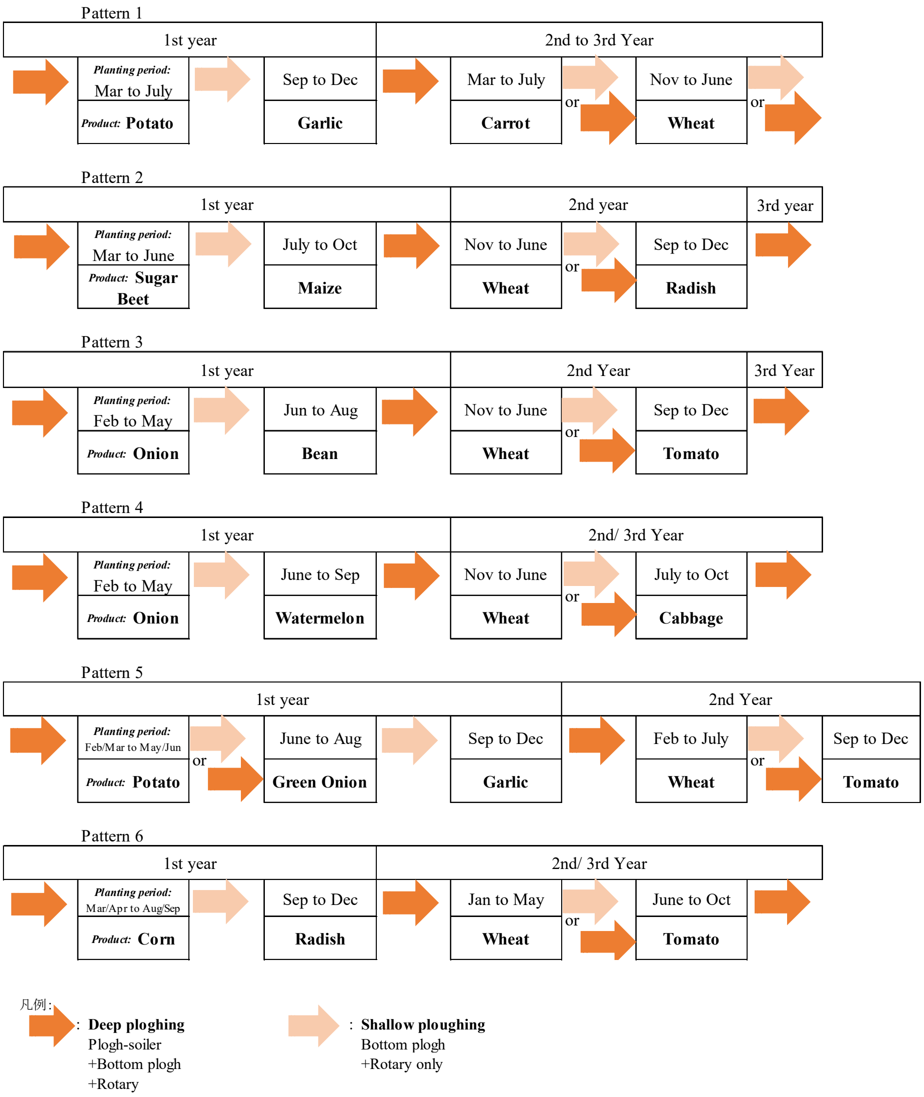
Production costs and profits related to each crop in Table 2.8 are based on single-year data, and this data cannot be used to determine which crops are more profitable, but it does show that there were crops that were profitable even in a year like 2023, wherein a cold wave occurred around January. The costs in Table 2.8 are the same as the cost data in Table 2.7, so farmers' own labor costs cannot be accurately presented in many cases, and it can be seen that costs are underestimated. Therefore, since the underestimated costs are the basis for the calculation, Table 2.8’s Profitability (%) (Unit Price/Income) data should be considered overstated. In 2023, the relatively high market prices were reflected in the Farm Gate Price, which led to higher sales and a certain degree of profit, but the results for 2024 are expected to change significantly. For example, on January 26, 2024, Fresh Plaza reported that the wholesale price of onions in Tajikistan had plummeted to USD 0.09/kg[4], and it is assumed that the crop income and expenditure balance of onions has shifted accordingly. Farmers have already taken such fluctuations into account, and do not adopt a strategy of switching to a crop that was profitable one year and relying heavily on it the next year. Instead, as shown above, they keep in mind the soil, water, and labor situations of their farms, combine various crops as mentioned above, and build a rational crop rotation system to stabilize their management and expand profits.

2.2.4 Appropriate Crop Rotation System for Both Areas Envisaged from Farm Management, Cultivation Calendar, and Farming Test Results

(1) Appropriate Crop Rotation System Envisaged for Fayzobod District

The crop rotation system in Figure 2.9 is envisaged for the Fayzobod district. The area is somewhat cold in the Fayzobod district, and it is difficult to introduce beans around March like Dangara, so the first crop in early spring is potatoes, onions, and beets. Corn is planted a little later in April. When looking at the crop profits mentioned above, beans are not particularly profitable, but if included somewhere in the crop system to improve soil fertility, productivity throughout the entire crop system will improve. If tomatoes are added throughout the entire process, profitability will improve slightly. Carrying out deep ploughing (using a plough-soiler, etc.) will make it possible to include deep-rooted crops such as radishes and carrots in the crop system.

4 https://www.freshplaza.com/asia/article/9595728/tajikistan-onion-prices-are-down-to-9-us-cents-per-kg/

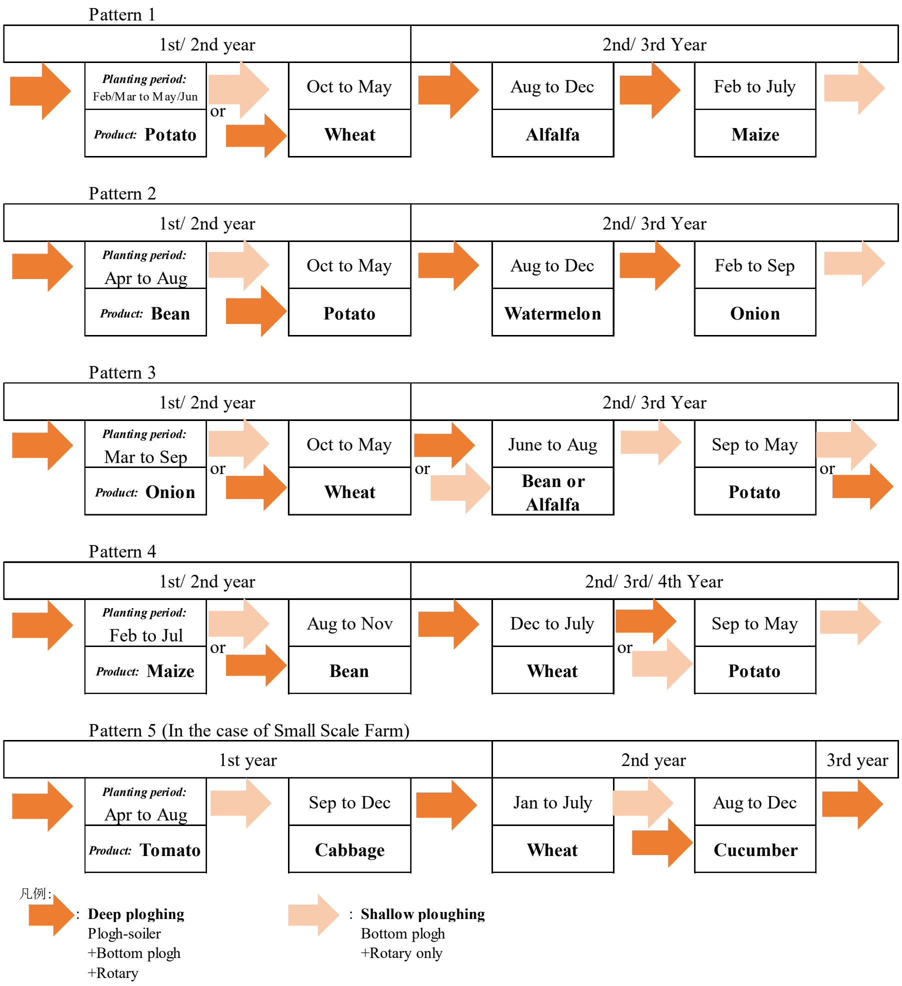


Source: Survey Team

Figure 2.9: Appropriate Crop Rotation System Envisaged for Fayzobod District (example)

(2) Appropriate Crop Rotation System Envisaged for Dangara District

Dangara district requires a large-area crop rotation, in which it is difficult to incorporate labor-intensive vegetables. Therefore, a crop rotation centered on wheat and potatoes, the processes for which are highly mechanized, with beans interspersed, is envisaged. For small-scale crop rotation, tomatoes and other vegetables can be included to improve profitability (Figure 2.10).



Source: Survey Team

Figure 2.10: Appropriate Crop Rotation System Envisaged for Dangara District (example)

2.2.5 Use of Agricultural Machinery

Generally, small-scale farmers only own power tillers, and in most cases, hire private tractor-operated farming services for ploughing work (ploughing service) at the beginning of planting. However, the cost associated with this has risen sharply in recent years, putting pressure on farm management. Adding to this, the agricultural machinery they own is typically old, and small-scale farmers are unable to renew machinery due to a lack of agricultural financing options.

There are not many cases where tractors are used to plough compact dry soil, and in most cases, the soil is watered before ploughing, loosened, and then the machinery is used. Therefore, machine use and irrigation are inseparable. (In areas without irrigation facilities, machinery is thought to be utilized when there is rainwater.) However, in many areas, the cultivated soil is shallow, and at a depth of 20 cm or more, the soil hardness is 20 mm or more (Yamanaka-type Soil Hardness Tester), making it impossible for roots to grow.

The survey did not cover any other plots that were ploughed by cattle, nor did it touch on plots where stones remain in the soil.

2.2.6 Seed Supply Situation and Farmer Support System

There are 90 farms supervised by the Ministry of Agriculture (MoA) throughout Tajikistan, and it was confirmed that the seeds produced by the farmers there are provided to other farmers throughout the country, with suitable varieties allocated to each place. Since these seeds are produced by the farmers themselves, they are not F1 seeds. (The vegetable seeds used by the farmers the surveyor visited in Rudaki were all Chinese-produced F1 seeds.) Non-supervised farmers are not able to sell their self-grown seeds.

The Fayzobod Agricultural Cooperative is commissioned to produce seeds, including tomatoes (Bull's Heart variety, large), onions (white variety, red variety), peppers, potatoes, and wheat. However, the vegetables that farmers in this region actually plant are F1, so it seems that most of them do not use many seeds from the seed farms supervised by the MoA.

There are 1-2 agronomists (in charge of farming) at the district agricultural office to support farmers. Although they provide guidance on soil management, cultivation, and pest control, none of the farmers have been trained in Integrated Pest Management (IPM). The district offices do not have soil analysis instruments, so it is hard to say that accurate guidance can be provided on soil management.

Furthermore, there are about 10 Jamoats in each district, and each Jamoat has at least one agronomist and one statistician. Some of these agronomists are technically reliable, so it seems that they are able to carry out extension activities to a certain extent. However, statisticians are responsible for collecting taxes from Dehkan farm (DF) farmers based on the cultivated area. For this reason, from the farmers' perspective, the Jamoat office is a tax collection office, meaning farmers will not agree to disclose details or consult regarding their farming operations with them.

As such, it is considered difficult for the Jamoat to take on the role of a core extension work in terms of building trust with farmers.

2.3 Current Situation of Agricultural Mechanization in Tajikistan

2.3.1 Current Situation and Issues Regarding Agricultural Machinery

It is said that the primary reason for poor agricultural productivity in Tajikistan is the lack of advancement in agricultural mechanization. According to the Ministry of Agriculture (MoA), only 70% of the number of tractors required by the country are available, and combined, the currently functioning agricultural machinery meets only 39% of demand. Adding to this, most of the machines currently owned are remnants of the Soviet era, with only about 70% being in operable condition. Most agricultural machinery in the country has exceeded its useful service life and is deteriorating in condition. After gaining independence from the Soviet Union, the roughly 670 state and collective farms were subdivided significantly, with there now being about 176,000 Dehkan farms (MoA, 2023). With 93% of the country being classified as mountainous, the average area under cultivation for a single farm household has accordingly shrunk to around 0.5 ha. This limited scale makes access to agricultural machinery very challenging for individual farms. The MoA released a document in 2020 titled "Problems and Possibilities in Agricultural Mechanization Development," which outlines the current state of agricultural mechanization, identifies issues, and suggests potential solutions.

Demand for agricultural mechanization services:

(1) Machinery Technical Service Center (hereinafter referred to as “MTC”) facilities with a fleet of more than 400 TAL-affiliated agricultural machines are required to offer repair and agro-mechanized service for farming.

(2) There are more than 170,000 Dehkan farms (DFs) and individual farms engaged in agriculture in the country.

(3) Only a few are on the 100–200 ha scale; most farmers have no more than 0.5–20 ha of cultivated land, and the majority lack the economic leeway to purchase agricultural machinery.

(4) Even Dehkan farms owning agricultural machinery lack access to workshops where machinery can be repaired skillfully and properly.

(5) Dealers should introduce GPS to monitor agricultural machines during the warranty period and perform regular maintenance and repair of this machinery through the MTC in each domestic area.

(6) An MTC manual is being made available that provides instructions regarding rental services, rental, and operation of agricultural machinery.

Mechanization service companies:

(1) The lineup of tractors and other machinery is maintained by 85 MTC and Machinery Technical Service Enterprise (MTE) facilities providing repair services.

(2) Of these 85 MTCs and MTEs, 60 are under the jurisdiction of the state unitary enterprise “TajikAgroLeasing” (TAL), and the remaining 25 are private or government enterprises. All of the machines and diagnostic tools in the service centers are outdated, and do not need the requirements to provide quality repairs to agricultural machinery.

(3) The service centers provide low salaries to employees, resulting in a lack of skilled professionals and low-quality repair service.

(4) The service centers possess more than 786 tractors, about 30 grain harvesting machines, and 2,228 mounted/towing implements, but there are outdated machines that are over 20 years old, which require a large amount of expenditure to keep running.

(5) Replacement parts for repair are, poor quality because they are not genuine parts and are procured from the domestic market without a manufacturer's certificate of quality.

Industry-wide Problems:

(1) The current fleet of agricultural machinery has become obsolete.

(2) Local maintenance companies and MTCs are underdeveloped regarding agricultural machinery and technical expertise.

(3) A lack of permanent engineers and technical staff has resulted in insufficient professional development, and the work of such professionals is poorly remunerated.

(4) Farmers’ knowledge of capital management and newer energy-efficient agricultural technologies is insufficient to enable their introduction.

(5) Cultivation technologies for improving land management and crop quality are lacking in the

provision of agricultural mechanization services (rental, etc.).

(6) There is a lack of opportunities for experts to be involved in consulting on and disseminating technology for cultivation, taking into account the topography, soil, and climatic conditions.

(7) Banks do not provide financial support to farmers on preferential terms.

(8) New imported agricultural machinery is not being tested upon arrival by Tajikistan’s national testing institute.

Proposal for sustainable agricultural mechanization development:

(1) Tajikistan’s "Program for Sustainable Development of the Agriculture Mechanization of the Republic of Tajikistan for 2021-2030" has been devised, with "Program for the Development of Innovative Mechanization of Agriculture Farms of the Republic of Tajikistan for 2025-2029" following in 2024.

(2) Appropriate agricultural machinery should be selected and procured based on relevant cultivation technologies and in consideration of the topography and climatic conditions of the farmland.

(3) Emphasis should be placed on the promotion of mechanization for small-scale farmers.

(4) Investment should be attracted from foreign nations to establish high-standard, certified MTCs in all domestic regions.

(5) Technical staff should provide training for farmers on new technologies for crop cultivation and the proper use of high-tech agricultural machinery.

(6) Effort should be made to reduce the prices of agricultural machinery and parts through market competition, and to cap the costs of repair services.

2.3.2 Situation Regarding the Introduction of Agricultural Machinery

The number of agricultural machines available in Tajikistan is extremely insufficient compared to the country’s needs. A major reason for this situation is that renewal is not keeping pace with the deterioration of existing machines due to poor levels of investment in the agricultural sector. In rural areas, a large portion of the young generation goes away to work in Russia and other neighboring countries, and many farmers have to make use of rental services provided by MTCs and/or private sector services for their farming.

Table 2.9 shows official data on supply and demand for agricultural machinery, provided by the MoA in June of 2024.

Table 2.9: Supply and Demand Situation for Agricultural Machines

The current situation at the agro machines in Tajikistan (2024) Draft As of the end of 2023

	List of agricultural machinery and units	Co-efficiency*1: Requirement per 1,000 ha (units/ 1,000 ha) ①	Target area of cultivated land (ha) ②	Required quantity according to the area of cultivated land (units) ③ = ① * ② /1,000	Existing quantity (units) ④	Demarcation of available quantity ④ State farms (units) ⑤	Private farms (units) ⑥	Available quantity to use (units) ⑦	Ratio of available quantity to use (%) ⑦'=100*⑦/④	Balance [-: deficit] [+: surplus] (units) ⑧ = ⑦ - ③	Ratio of operational quantity (%) ⑨ =100* ⑦ / ③	Ratio of deficit quantity (%) ⑩ =100* ⑧ / ③
1	Tractor, from 80 to 110 hp.	44	660,054	29,042	24,922	6,541	18,381	19,148	76.8	-9,894	65.9	-34.1
1-1	Plow	24	660,054	15,841	10,941	3,133	7,808	9,556	87.3	-6,285	60.3	-39.7
1-2	Seeder (seeding machine) grain	8	382,463	3,059	324	102	222	198	61.1	-2,858	6.5	-93.4
1-3	Tractor trailer	25	660,054	16,501	8,437	3,291	5,146	6,623	78.5	-9,878	40.1	-59.9
1-4	Lawnmower	20	110,874	2,217	1,613	751	862	1,416	87.8	-801	63.9	-36.1
1-5	Cotton seeder	15	186,000	2,790	1,881	1,347	534	1,693	90.0	-1,097	60.7	-39.3
1-6	Potato harvester	32	41,620	1,332	495	234	261	407	82.2	-925	30.6	-69.4
1-7	Potato planting machine	26	41,620	1,082	221	166	55	210	95.0	-872	19.4	-80.6
1-8	Inter-row cultivator	17	233,696	3,973	3,486	1,999	1,487	2,946	84.5	-1,027	74.2	-25.8
1-9	Cotton sprayer OVH-600	5	186,000	930	231	113	118	173	74.9	-757	18.6	-81.4
2	Harvester, 140 HP corn	8	382,463	3,060	1,123	320	803	903	80.4	-2,157	29.5	-70.5
3	Hay mower, 100 hp	19	110,874	2,107	-	-	-	0	-	-2,107	0.0	-100.0
4	Grass harvester, 100 HP	15	110,874	1,663	125	74	51	82	65.6	-1,581	4.9	-95.1
5	Mini tractor, 40 hp class*2	24	450,000	10,800	2,769	727	2,042	2,128	76.9	-8,672	19.7	-80.3
5-1	Garden Pesticide Sprayer	6	250,000	1,500	142	42	100	139	97.9	-1,361	9.3	-90.7
5-2	Milling cultivator	15	660,054	9,901	260	96	164	220	84.6	-9,681	2.2	-97.8

Source: The Ministry of Agriculture, the Republic of Tajikistan

Note:

*1: The Ministry of Agriculture uses a standard co-efficiency (relief, soil, time for harvesting) in the cultivating based on data of the Agriculture Sience Acadamy [1980s, based on the standard of the Union of Soviet Socialist Republics].

*2: The standard of demand of small size agricultural machinery is included approximately 450,000ha of intercropping field and green house area etc. in 660,054ha.

Approximately 24% of the existing agro-machinary [engine power machine: toractor etc.] is out of order; deterioration, short duration and discontinuation of spareparts.

Mini-tractor 40HP for 450,000 ha would be required approximately 10,800units [= 450,000/1,000 x co-efficiancy24]. So 10,800 - 2,128 = 8,672units is to be deficit of mini tractors in Tajikistan by the opinion of the MoA.

Source: Ministry of Agriculture of the Republic of Tajikistan (MoA), TAL (Tajik Agro Leasing)

The following is a summary of the details found in Table 2.9.

1) For large-sized tractors of 80-110 HP

- The total area under cultivation for the country as a whole is 660,054 ha.
- What can be seen from the table is that for large-sized tractors with 80 to 110 hp, the required number is 29,042 units, while only 19,148 tractors are operational, resulting in a shortage of 9,894 units, or a shortage rate of 34.1%. (The coefficient is set at 44 units per 1,000 ha for a target cultivated area of 660,054 ha by large-sized tractors.)
- There is a 93.4% shortage of grass seeders for large-sized tractors and a 69.4% shortage of potato harvesters.

2) For small tractors of 40 HP

- The target cultivated area is set at 450,000 ha (Note: of the 660,054 ha, the area assumed to be capable of utilizing small-sized agricultural machinery).
- The required number of units is 10,800, with 2,128 available, meaning a shortage of 8,672 units, or a shortage rate of 80.3%.

It is explained that this coefficient is based on figures from the Soviet Union in the 1980s, which take into account factors such as the terrain, soil, and harvest timing of farmland, and it will be necessary to recalculate this based on modern conditions. However, it is necessary to re-establish the coefficients in accordance with the current situation.

As a reference, an analysis of the rental business indicates that, according to MTC and agricultural cooperatives in Dangara, one set can manage 60 to 70 ha; when assuming each set of small-sized agricultural machinery can manage 60 ha, the resulting coefficient would be 16.7 units, which would produce a shortage of 5,400 units.

In any case, even if around 100 sets of small-sized agricultural machinery were to be introduced through a grant aid project, the input rate would amount to only 1.1% to 1.3% of the required number.

The key issue is whether this could serve as a catalyst for agricultural mechanization. Most agricultural machinery purchases by farm households are funded by personal savings, utilizing private bank loans, or TAL's financing system. However, the interest rates are extremely high. Generally, private bank loan interest rates are 23% annually. TAL provides loans with an annual interest rate of 12% and a five-year repayment period, but its annual budget is only TJS 30 million (approximately USD 2.7 million), which can only cover the purchase of about 100 tractors. Farmers who do not own agricultural machinery use rental services, but the rental prices vary greatly depending on the region, MTC, and private businesses. There is no particular trend among regions, but private businesses are typically higher.

On the other hand, problems with farming land include soil compaction (stab-hardening) caused by large-sized agricultural machines (the Tajikistan side repeatedly stated that "the soil of the Tajikistan farming land is very hard"). Soil hardness hinders the extension of roots (at hardness of more than 2 MPa). In addition, there are many cases of the crushed soil ratio being below 40% (a higher crushed soil ratio meaning fewer clods in the soil) for farms, even after ploughing, mainly attributed to design problems with existing machinery and ploughing at excessively high speeds. This situation negatively affects quality and yield, and indicates that appropriate cultivation techniques surrounding agricultural machinery are not currently being employed.

Discussions were held with WB and FAO's Tajikistan office on the state of agriculture and agricultural machinery in general, current problems with agricultural machinery, whether there is a need for deep ploughing, and market trends for small-sized agricultural machinery. The following perceptions were held. (See Appendix 3: Meeting Minutes (2) WB 1), 2) and (3) FOA 1), 2))

- Farmers need agricultural machinery, but even with the use of current ploughing services, ploughing is ineffective, and the soil is hard even after ploughing. There is also the issue of how the ploughing service is structured.
- It would be best if deep ploughing could be facilitated.
- The establishment of a maintenance system is an issue, and we feel that there is a need to monitor the progress of the current support.
- There is demand for small-sized agricultural machinery because of the small ploughing area per field and low initial investment.

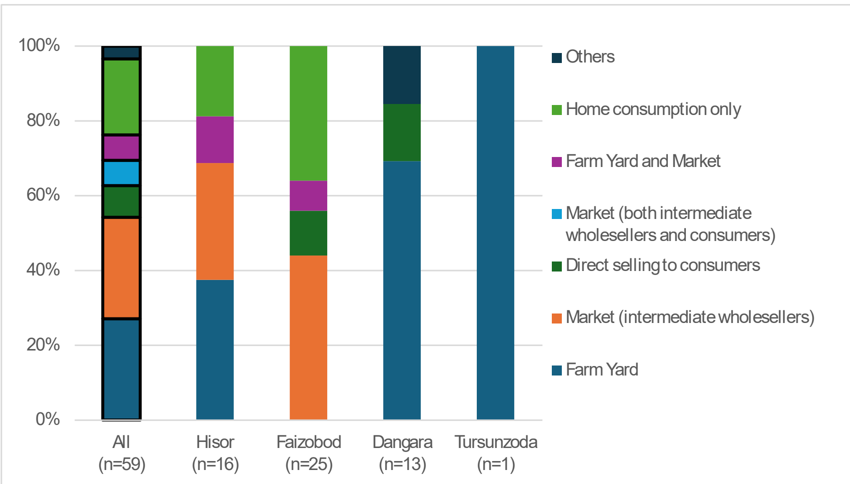
The key point is to improve the profitability of cultivation by establishing a maintenance system in line with the awareness of the Survey Team, utilizing small-sized agricultural machinery, and combining it with appropriate cultivation technologies.

2.4 General Conditions of the Agricultural Produce Market

2.4.1 Sales Status and Sales Prices of Producers' Agricultural Products

Sales prices of producers of various agricultural products, such as vegetables, are an essential metric for estimating the effects of introducing agricultural machinery, but in Tajikistan, no surveys on these transaction prices have been conducted by the MoA or by other public agencies. Therefore, in October 2023, we conducted a survey on the actual transaction prices of the main products for the past year. Information was collected from 15 Dehkan farms and brokers in the 5 districts of Fayzobod, Dangara, Hisor, Bokhtar, and Tursunzoda for a total of 59 cases for 19 commodities. Since transaction prices fluctuate from time to time, respondents in many cases gave a wide range of values. For the purposes of this estimation, the intermediate value of the range of their sales prices was used for such cases. The largest number of samples per commodity was 11 (wheat), but 12 commodities had less than 3 samples, and such cases of limited sample size were excluded from the analysis of average transaction prices. It should be noted that the sample size for the seven commodities analyzed was also limited and does not necessarily provide a statistically accurate representation of the past transaction prices for that commodity.

As mentioned earlier, the main methods by which producers sell their agricultural products are to a middleman in their yards or to intermediate wholesalers at a wholesale market or similar. Figure 2.11 shows the percentage of total transactions for each method of produce transaction by survey location. No respondents in the Dangara district traded at the market, which is attributable to none of them being focused on vegetable farming. For Tursunzoda, a visit was made to interview rice farmers, but time was limited, and only one respondent was available.



Source: Survey Team

Figure 2.11: Percentage of Produce Transaction Method by Survey Location

First, regarding the differences in average prices due to differences in trading methods, we investigated the case of wheat, which is less susceptible to quality factors such as size and appearance (Table 2.10). Although these figures should be used for reference only, due to the limited number of samples and survey sites in this study, it is possible to sell wheat at a price several tens of percent higher when it is brought to the wholesale market for sale compared to when it is sold at the yard to a middleman. This price difference is considered to be equivalent to the transportation and sales costs, plus the profits of the middlemen, as described in Table 2.10. However, many producers in the survey answered that they would prefer to sell their produce at a yard sale, considering transportation and the time required to bring produce to the wholesale market and negotiate with buyers. The profit level set by middlemen in Tajikistan, 15 years having passed since the agricultural reform in 2009, is the result of a compromise between producers and middlemen based on market principles at a level that is acceptable to both parties.

Table 2.10: Wheat Price Differences by Transaction Method

Transaction methods	Price (TJS/kg)	Harvest (month)	Note
At farm yard, to middlemen	2.94	6-7	Cases of Dangara (n=4) Sales to a specific middleman
At market, to intermediate wholesellers	4.13	6-8	Cases of Hisor (n=2) Sales to intermediate wholesellers in Hisor market

Source: Based on interviews (October 2023)

Next, Table 2.11 summarizes the average transaction prices for each crop. As previously mentioned, the values in the table are for reference only, being affected by the balance of supply and demand at the time of sale, the quality of the produce, and the distance to market, as well as the extremely limited number of samples.

Compared to the price of Japanese agricultural products, most unit prices for Tajikistan are extremely low, at a fraction of the price of Japanese produce (assuming 7.5 TJS = 100 JPY), and exports to neighboring countries are limited in this landlocked country. To realize profitable agriculture, comprehensive efforts will be required, including production and shipment targeting high unit price periods through greenhouse cultivation, introduction of new varieties, or use of preservation facilities, processing, and exporting to developed countries.

Table 2.11: Producer Transaction Prices by Crop

Crop	Cases	Price (TJS/kg)
Wheat	11	3.43
Potato	8	3.67
Onion	7	3.45
Tomato	6	3.92
Bell pepper	3	4.33
Corn	3	3.53
Water melon*	3	15.00

*Price per unit for watermelon only is TJS/piece

Source: Based on interviews (October 2023)

In many cases, producers obtain market prices by asking reliable brokers or by doing their own research beforehand. Although most producers are currently unaware, some organizations that aim to revitalize agricultural markets publish weekly surveys on the market prices of major agricultural products for major cities in Tajikistan on the Internet.[5] This allows producers and market participants to obtain information free of charge (see the next section).

Figure 2.12: Website on Market Prices of Agricultural Products in Tajikistan Provided by EastFruit

	
Producers' vehicles loaded with produce to sell to intermediate wholesalers or directly to consumers at the wholesale market (Bokhotar, June 26, 2023)	Intermediate wholesalers at Bokhotar wholesale market (Bokhotar, June 26, 2023)

2.4.2 Market Price Trends for Agricultural Products

(1) Wholesale market price

The website of EastFruit[6], an organization supported by the FAO, the European Bank for

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5 East Fruit https://east-fruit.com/en
United Nations World Food Programme (WFP) https://reliefweb.int/country/tjk

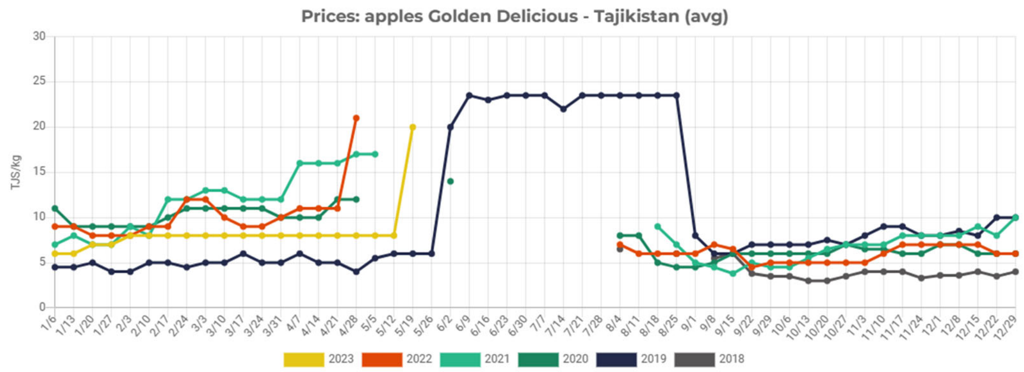
6 EastFruit offers services in English (https://east-fruit.com/en/) as well as Russian, Ukrainian, and Uzbek.

Reconstruction and Development (EBRD), and the EU4Business Initiative, provides free information on fruit and vegetable prices in Tajikistan, the CIS, and Eastern European countries. The site also provides news and other information on produce from the region. EastFruit's market price survey methodology follows the USDA's price monitoring methodology[7]. The survey is based on sampling surveys of distributors (intermediate wholesalers), selecting survey targets based on market share, and continuously obtaining and analyzing information from these targets.

This study analyzed wholesale market prices in Tajikistan based on data available as of July 2023 for the years from 2018. Comparing data from year to year, despite an average inflation rate of 7.16%[8] over the five-year period starting in 2018, which caused price hikes in other commodities, no specific trend could be observed with respect to food products. Food product prices are not increasing, but farmers' actual income may be in a state of continual decline due to general inflation.

1) Apples

Figure 2.13 shows the price trends for apples (Golden Delicious variety) from 2018 to 2023. Prices had lowered in 2023 compared to recent years. As of June 2023, the market was still flooded with apples, but these were either early varieties or imports. Generally, April through August is the off-season for Golden Delicious and Gala varieties. The site lists prices for several varieties in addition to the aforementioned varieties and early varieties, indicating the importance of apples to agriculture in Tajikistan. If profitable farming is the goal, the combination of varieties needs to be considered.



Source: EastFruit

Figure 2.13: Price Changes of Apples (Golden Delicious Variety) from 2018 to 2023

2) Carrots

Except for 2021, when prices remained very high during the summer months, prices were at their highest in the last five years at the time of the 2023 survey. Once shipments gain momentum, prices are expected to fall. Figure 2.14 shows the current year's crop prices, and Figure 2.15 shows the previous year's crop prices. Carrots from the previous year's crop that had been stored in cool storage were sold at the vegetable wholesale market in Dushanbe during the survey in June 2023. According to market officials in Dushanbe, most carrot imports come from Russia.

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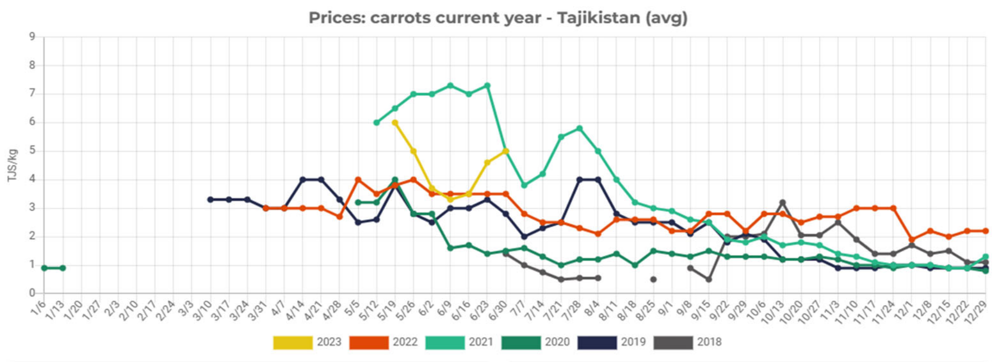
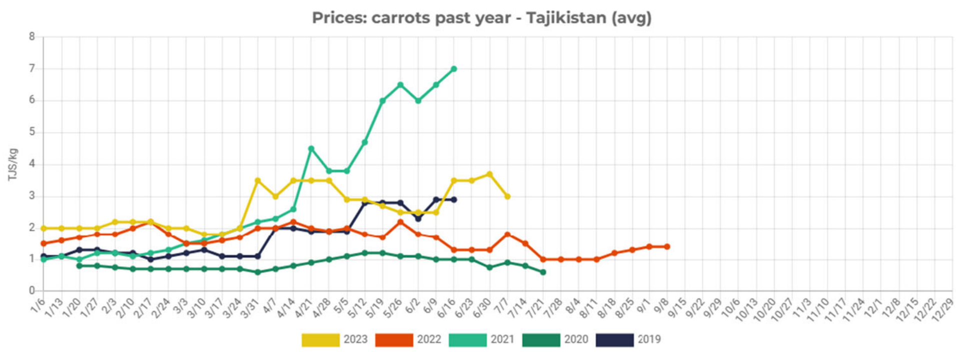
7 Detailed survey methodology is available on the USDA's National Agricultural Statistics Service (NASS) website (https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Prices/).

8 IMF - World Economic Outlook Databases (https://www.imf.org/en/Publications/SPROLLS/world-economic-outlook-databases)



Source: EastFruit

Figure 2.14: Price Changes of Carrots (Current Year's Crop) from 2018 to 2023

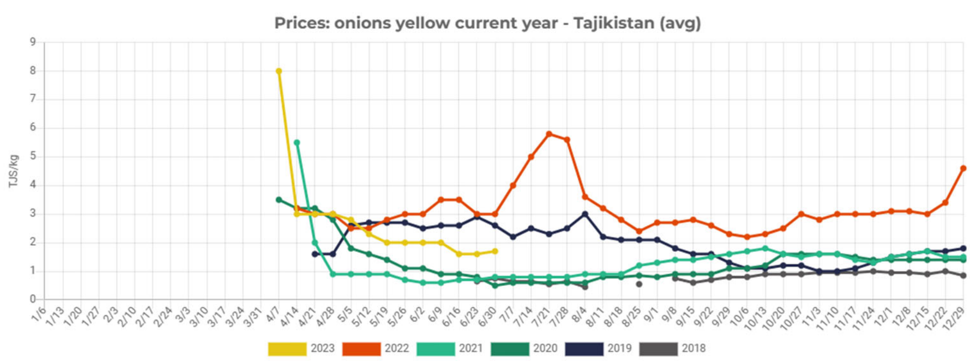


Source: EastFruit

Figure 2.15: Price Changes of Carrots (Previous Year's Crop) from 2018 to 2023

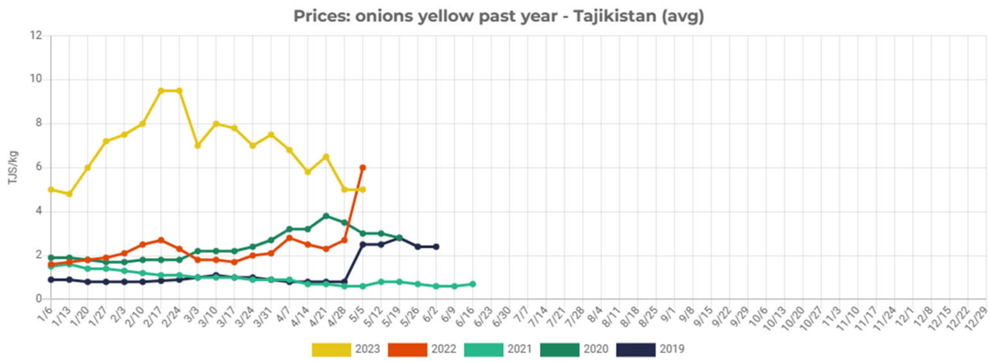
3) Onion

While farmers' motivation for onion production was high in 2022 with high market prices, these have been falling since May 2023. Nevertheless, prices still remain about twice as high as they were in 2020 and 2021. Prices are largely influenced by the crop production and export/import policies of neighboring countries. Figure 2.16 shows onion prices for the current year's crop, and Figure 2.17 for the previous year's crop. According to a market source in Dushanbe, onions are imported from Kyrgyzstan in large quantities during periods when domestic onions are in short supply. The main export destination is Russia, and when exporting to Russia, it is necessary to separate the onions into standards (S, M, and L, with S size being preferred).



Source: EastFruit

Figure 2.16: Price Changes of Onions (Current Year's Crop) from 2018 to 2023

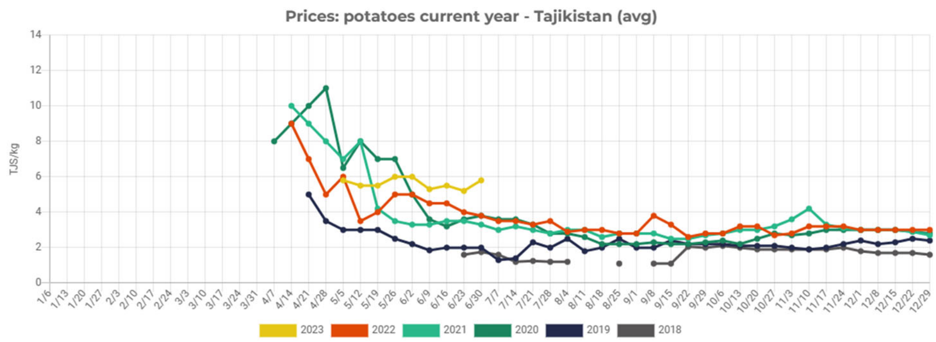


Source: EastFruit

Figure 2.17: Price Changes of Onions (Previous Year's Crop) from 2018 to 2023

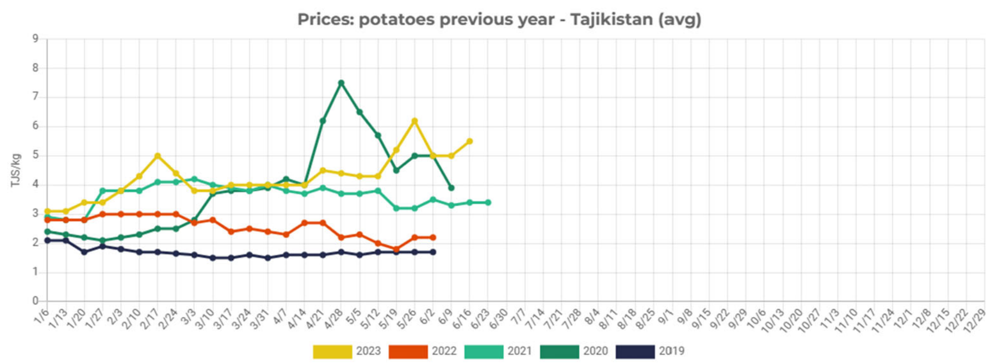
4) Potato

Potato prices remained stable at just under 6 TJS/kg in 2023, marking the highest June price in recent years. There are many possible explanations for this, but it is possible that many farmers increased onion planting and reduced potato planting due to the impact of the 2022 onion price spike. Figure 2.18 shows potato prices for the current year's crop, and Figure 2.19 shows those of the previous year's crop. According to a market source in Dushanbe, most potatoes are imported from Pakistan, Uzbekistan, and Russia.



Source: EastFruit

Figure 2.18: Price Changes of Potatoes (Current Year's Crop) from 2018 to 2023



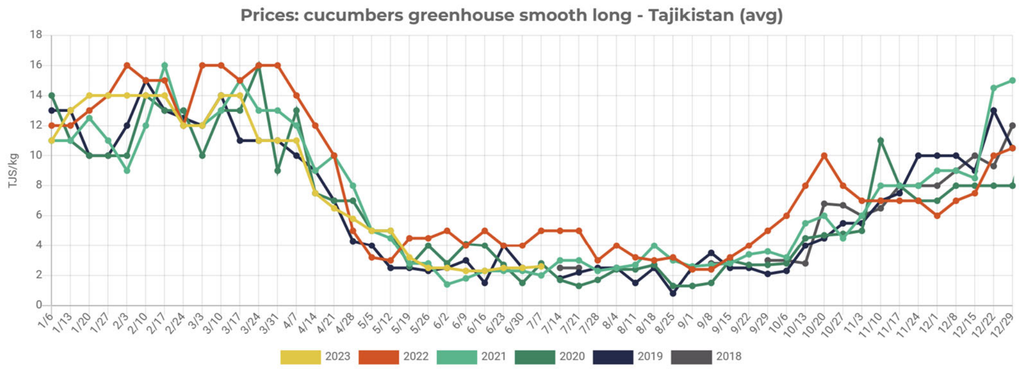
Source: EastFruit

Figure 2.19: Price Changes of Potatoes (Previous Year's Crop) from 2018 to 2023

5) Cucumber

Cucumber (greenhouse, smooth, long) prices, which remained relatively high in 2022, returned to about the same level as in previous years (Figure 2.20) from November 2022 until the time of the June

2023 survey. Prices are above 10 TJS/kg during the winter months when produce is in short supply, but fall to around 2 TJS/kg during the summer months, when shipments are concentrated, and producers may not be able to adequately secure their profits. According to an agricultural official in Tursunzoda, a border region with Uzbekistan, cucumbers are often imported from neighboring Uzbekistan and Turkmenistan.

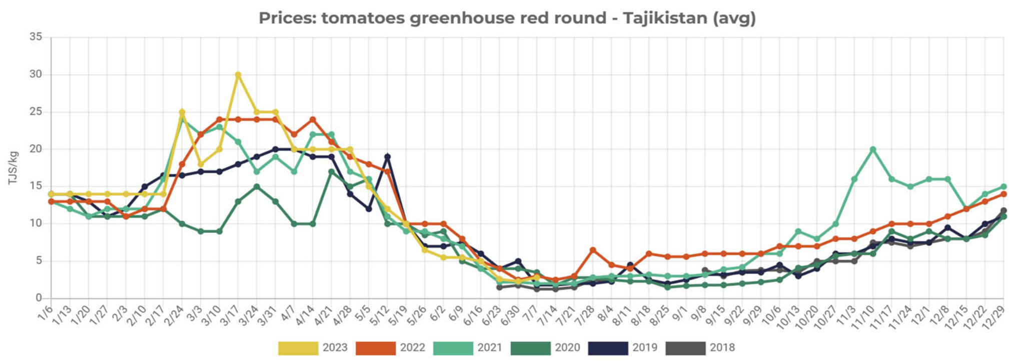


Source: EastFruit

Figure 2.20: Price Changes of Cucumbers from 2018 to 2023

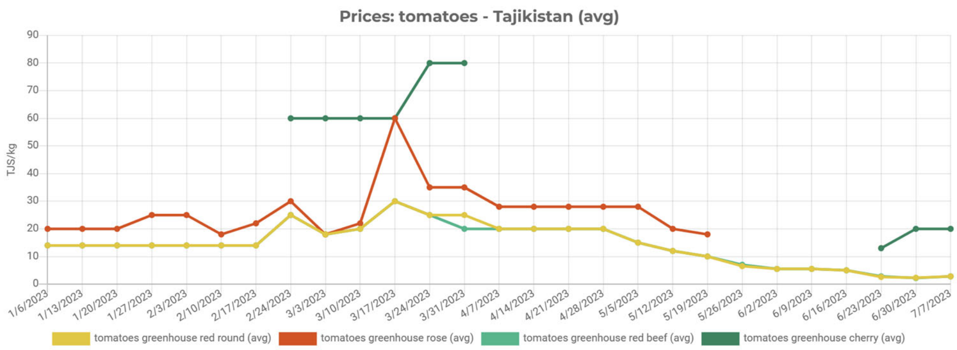
6) Tomatoes

Tomato prices (greenhouse, red, round) in 2023 were relatively high from January to April, but have been inexpensive since May, even compared to previous years (Figure 2.21). Looking at the types of tomato, “greenhouse, cherry” and “greenhouse, rose” are relatively expensive compared to the standard “greenhouse, red, round” and “greenhouse, red, beefsteak” varieties (Figure 2.22). As with cucumbers, tomatoes are often imported from Uzbekistan and Turkmenistan during times of scarcity, according to the agricultural officer in Tursunzoda, which lies close to the border with Uzbekistan. The challenge for tomatoes is lower prices in the summer. The interviewed greenhouse tomato producer in Tursunzoda was trying to ship his products as early as possible and finish growing them in July, when full-fledged tomato shipments begin, by pinching the top shoots in the spring.



Source: EastFruit

Figure 2.21: Price Changes of Tomatoes (Greenhouse, Red, Round) from 2018 to 2023

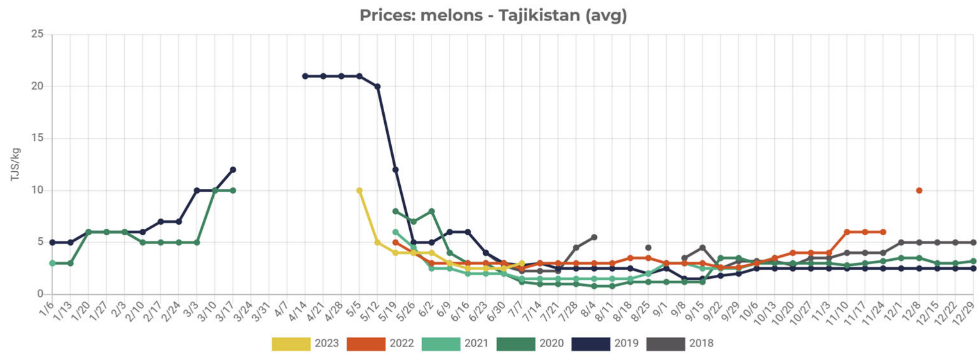


Source: EastFruit

Figure 2.22: Price Changes of Four Tomato Varieties in the First Half of 2023

7) Melon

Prices for melons in 2023 remained largely the same as in previous years (Figure 2.23). In some years, there are price records for winter, while in other years there are none, and the reason for this is unknown. For off-season cultivation using greenhouses, relatively high prices can be expected based on 2019 and 2020 figures, but profitability must be thoroughly checked, partly due to the high fuel costs in recent years.



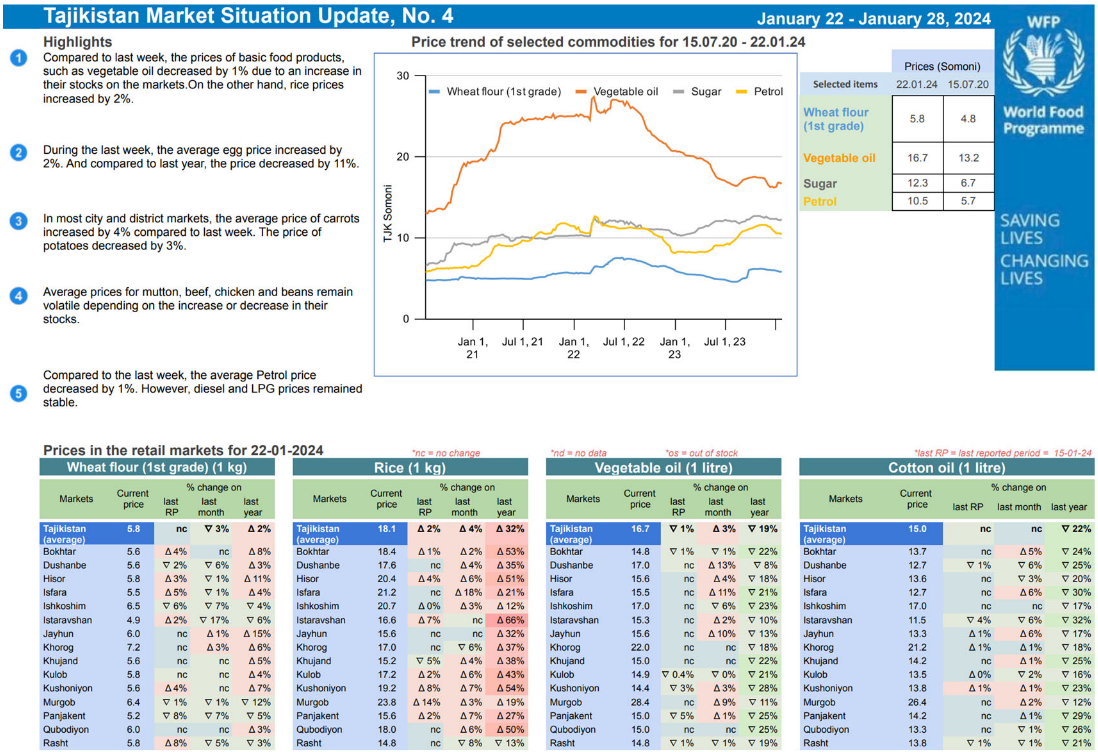
Source: EastFruit

Figure 2.23: Price Changes of Melons from 2018 to 2023

(2) Nationwide retail market price

While EastFruit provides wholesale prices in Tajikistan, the WFP, in cooperation with Neksigol Mushovir, a local agricultural consulting firm, compiles retail food market price information for a total of 15 markets throughout Tajikistan, including Dushanbe. This is available on the Internet[9] in the form of weekly reports (Figure 2.24) (the same information is also provided as a privately based service of Neksigol). Weekly reports (Dehkan farm version) are available for free download, covering the past two years or more. The 16 agricultural products listed are: wheat flour, rice, vegetable oil, cottonseed oil, sugar, milk, eggs, beef, lamb, chicken, chickpeas, haricot beans, potatoes, onions, carrots, and cabbage.

[9] https://reliefweb.int/country/tjk



Tajikistan Market Situation Update, No. 4 — January 22 - January 28, 2024

Highlights

1. Compared to last week, the prices of basic food products, such as vegetable oil decreased by 1% due to an increase in their stocks on the markets.On the other hand, rice prices increased by 2%.
2. During the last week, the average egg price increased by 2%. And compared to last year, the price decreased by 11%.
3. In most city and district markets, the average price of carrots increased by 4% compared to last week. The price of potatoes decreased by 3%.
4. Average prices for mutton, beef, chicken and beans remain volatile depending on the increase or decrease in their stocks.
5. Compared to the last week, the average Petrol price decreased by 1%. However, diesel and LPG prices remained stable.

Price trend of selected commodities for 15.07.20 - 22.01.24

Selected items	Prices (Somoni) 22.01.24	15.07.20
Wheat flour (1st grade)	5.8	4.8
Vegetable oil	16.7	13.2
Sugar	12.3	6.7
Petrol	10.5	5.7

Prices in the retail markets for 22-01-2024

*nc = no change   *nd = no data   *os = out of stock   *last RP = last reported period = 15-01-24

Wheat flour (1st grade) (1 kg)

Markets	Current price	% change on last RP	last month	last year
Tajikistan (average)	**5.8**	**nc**	**∇ 3%**	**Δ 2%**
Bokhtar	5.6	Δ 4%	nc	Δ 8%
Dushanbe	5.6	∇ 2%	∇ 6%	Δ 3%
Hisor	5.8	Δ 3%	∇ 1%	Δ 11%
Isfara	5.5	Δ 5%	∇ 1%	Δ 4%
Ishkoshim	6.5	∇ 6%	∇ 7%	∇ 4%
Istaravshan	4.9	Δ 2%	∇ 17%	∇ 6%
Jayhun	6.0	nc	Δ 1%	Δ 15%
Khorog	7.2	nc	Δ 3%	Δ 6%
Khujand	5.6	nc	nc	Δ 5%
Kulob	5.8	nc	nc	Δ 4%
Kushoniyon	5.6	Δ 4%	nc	Δ 7%
Murgob	6.4	∇ 1%	∇ 1%	∇ 12%
Panjakent	5.2	∇ 8%	∇ 7%	∇ 5%
Qubodiyon	6.0	nc	nc	Δ 3%
Rasht	5.8	Δ 8%	∇ 5%	∇ 3%

Rice (1 kg)

Markets	Current price	% change on last RP	last month	last year
Tajikistan (average)	**18.1**	**Δ 2%**	**Δ 4%**	**Δ 32%**
Bokhtar	18.4	Δ 1%	Δ 2%	Δ 53%
Dushanbe	17.6	nc	Δ 4%	Δ 35%
Hisor	20.4	Δ 4%	Δ 6%	Δ 51%
Isfara	21.2	nc	Δ 18%	Δ 21%
Ishkoshim	20.7	Δ 0%	Δ 3%	Δ 12%
Istaravshan	16.6	Δ 7%	nc	Δ 66%
Jayhun	15.6	nc	nc	Δ 32%
Khorog	17.0	nc	∇ 6%	Δ 37%
Khujand	15.2	∇ 5%	Δ 4%	Δ 38%
Kulob	17.2	Δ 2%	Δ 6%	Δ 43%
Kushoniyon	19.2	Δ 8%	Δ 7%	Δ 54%
Murgob	23.8	Δ 14%	Δ 3%	Δ 19%
Panjakent	15.6	Δ 2%	Δ 7%	Δ 27%
Qubodiyon	18.0	nc	Δ 6%	Δ 50%
Rasht	14.8	nc	∇ 8%	∇ 13%

Vegetable oil (1 litre)

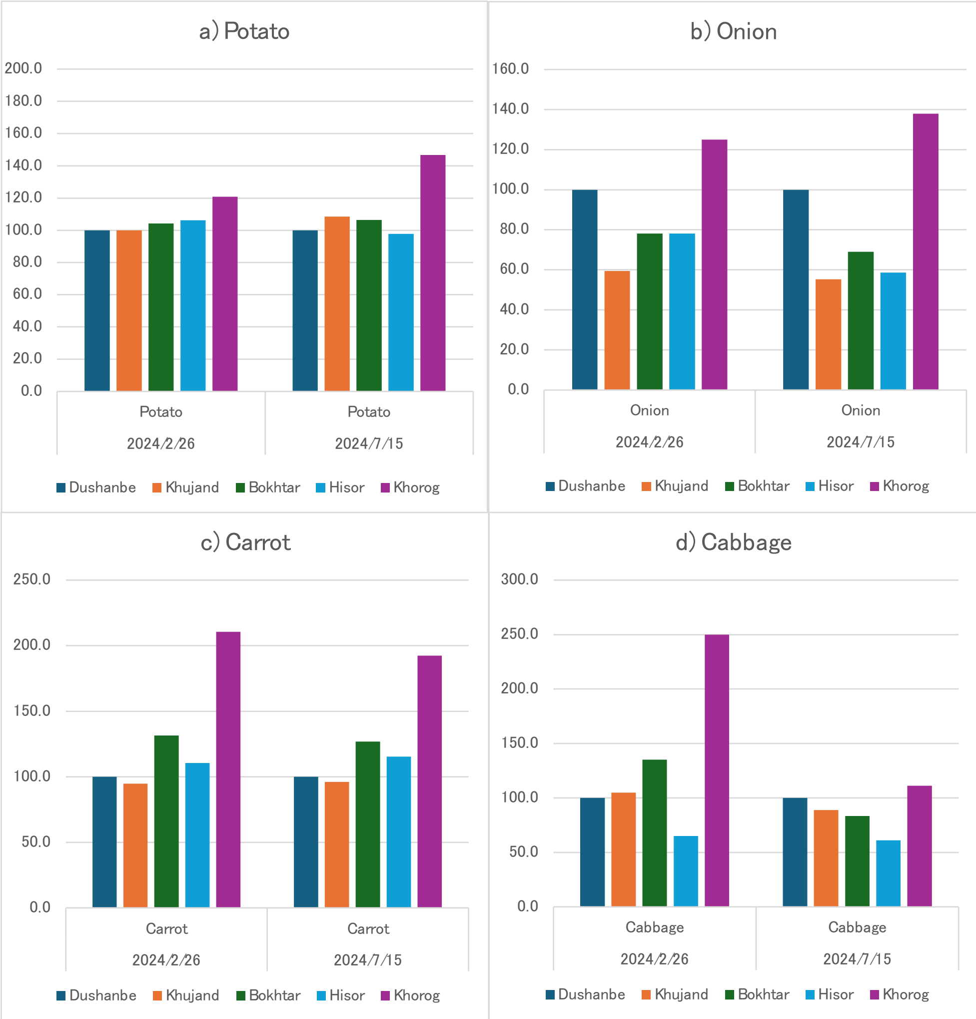
Markets	Current price	% change on last RP	last month	last year
Tajikistan (average)	**16.7**	**∇ 1%**	**Δ 3%**	**∇ 19%**
Bokhtar	14.8	∇ 1%	∇ 1%	∇ 22%
Dushanbe	17.0	nc	Δ 13%	∇ 8%
Hisor	15.6	nc	Δ 4%	∇ 18%
Isfara	15.5	nc	Δ 11%	∇ 21%
Ishkoshim	17.0	nc	∇ 6%	∇ 23%
Istaravshan	15.3	nc	Δ 2%	∇ 10%
Jayhun	15.6	nc	Δ 10%	∇ 13%
Khorog	22.0	nc	nc	∇ 18%
Khujand	15.0	nc	nc	∇ 22%
Kulob	14.9	∇ 0.4%	∇ 0%	∇ 21%
Kushoniyon	14.4	∇ 3%	Δ 3%	∇ 28%
Murgob	28.4	nc	Δ 9%	∇ 11%
Panjakent	15.0	∇ 5%	Δ 1%	∇ 25%
Qubodiyon	15.0	nc	nc	∇ 25%
Rasht	14.8	∇ 1%	∇ 1%	∇ 19%

Cotton oil (1 litre)

Markets	Current price	% change on last RP	last month	last year
Tajikistan (average)	**15.0**	**nc**	**nc**	**∇ 22%**
Bokhtar	13.7	nc	Δ 5%	∇ 24%
Dushanbe	12.7	∇ 1%	∇ 6%	∇ 25%
Hisor	13.6	nc	∇ 3%	∇ 20%
Isfara	12.7	nc	Δ 6%	∇ 30%
Ishkoshim	17.0	nc	nc	∇ 17%
Istaravshan	11.5	∇ 4%	∇ 6%	∇ 32%
Jayhun	13.3	Δ 1%	Δ 6%	∇ 17%
Khorog	21.2	Δ 1%	Δ 1%	∇ 18%
Khujand	14.2	nc	Δ 1%	∇ 25%
Kulob	13.5	Δ 0%	∇ 2%	∇ 16%
Kushoniyon	13.8	Δ 1%	Δ 1%	∇ 23%
Murgob	26.4	nc	Δ 2%	∇ 12%
Panjakent	14.2	nc	Δ 1%	∇ 29%
Qubodiyon	13.3	nc	∇ 1%	∇ 26%
Rasht	13.8	∇ 1%	∇ 1%	∇ 21%

Figure 2.24: Weekly Report on Tajikistan's Retail Market Prices Provided by WFP and Neksigol

Looking at prices by region (market), there are large price differences between markets for many crops, with price differences of several times between the cheapest and most expensive markets frequently observed. As an example, we compared prices in the main markets in February and July for four vegetables (Figure 2.25). Although the situation varies from vegetable to vegetable and from season to season, prices in Khorog are particularly high due to its mountainous location and high transportation costs. Prices at markets in Hisor and Bokhtar, which have better roads to and from Dushanbe, also differed by several tens of percent for onions, carrots, and cabbage. This is thought to be because the prices in local markets close to production areas tend to plummet during the harvest and shipping season, and when imports and other products flow to local markets via the wholesale market in Dushanbe, the transportation costs are reflected in local market prices. It also indicates that although more than 20 years have passed since Tajikistan transitioned from a planned economy to a market economy, there is still much room for development in the domestic distribution system for agricultural products. As a countermeasure, the MoA should first inform producers and middlemen about how to obtain the market price information provided by EastFruit and WFP/Neksigol, so that they can ship their products to markets with higher demand.



Note: A vertical axis value of 100 represents the Dushanbe market price on the survey date.

Source: Survey Team, based on WFP data.

Figure 2.25: Retail Price Differences for Vegetables in Five Major Markets in Tajikistan

2.4.3 Processing and Value-added Agriculture

(1) Shipping preparation and sorting

Most of the interviewed producers sold their products as harvested, with little or no sorting by size or packing into boxes or bags, which could increase the unit sales price. Due to the slow diffusion of sorting machines, it is not the producers who sort the size of the produce, but rather middlemen and intermediate wholesalers at or after the time of purchase, not by the producers.

(2) Processing by cooperatives

Case 1: Sharif Shirin Cooperative (Dangara District)

The Sharif Shirin Cooperative, which conducted the farming trials, purchases apricots and plums from its member growers during the peak shipping season when prices are low and processes them into dried fruits for sale (see photo). This is mainly conducted outdoors in the sun, which poses some challenges in terms of sanitary management and the like.

Case 2: Behbudi Cooperative (Kushoniyon District, Khatlon Province)

This cooperative was established in 2010, and at the time of the May 2024 survey, it had 60 Dehkan farms growing cotton, wheat, vegetables, and fruit trees. The cooperative has dozens of 4 to 5-ton trucks, and is responsible for transporting and selling the crops from each Dehkan farm at the market. Since 2013, the cooperative has been processing apples, apricots, pears, and other fruits into dried fruit, and in 2023, it produced about 20 tons of processed apple products. The cooperative has processing machines for washing, seed removal, drying, weighing, and packaging, as well as a factory where these machines are installed, and has sufficient production capacity. Therefore, Behbudi Cooperative is positioned as a model cooperative for the processing business. Nevertheless, such production is essentially conducted on a made-to-order basis, with production volumes fluctuating each year, and its weak sales force means that it is unable to fully utilize its production capacity.

(3) Associations of Agro-processing Companies and Entrepreneurs

Case 1: Sitarb Agro Company (Durbad Jamoat, Hisor District)

The company has cold storage and processing facilities, and several Dehkan farms inside and outside Durbad Jamoat contract with this company to sell their products.

Case 2: Khatlon Entrepreneurs' Association

The Association, formed by 10 companies in Khatlon Region, was established in 2020. Member companies own and operate cooling facilities, small-scale canning and bottling plants, juice manufacturing plants, etc., and conduct processing operations by procuring agricultural products grown by the producers. The Association provides support services to member companies to apply for HACCP and other certifications, as well as human resource development training and more, in cooperation with donors. The agricultural produce and processed products of the member companies are destined for the domestic market and have not yet been exported to foreign countries (although future exports are being targeted). The newest company in the association is a cooling storage service company established 5-6 years ago.

The canning and bottling factory run by the association president is a small factory built in the former Soviet Union era. The canning facility is hardly in operation, as the processing machinery is very old and not HACCP compliant. The factory is equipped with a Chinese-made carrot washer, which is used only for the items to be shipped to Dushanbe, as well as the cooling facility. The company is having difficulty finding customers to ship to, and selling prices are low and not generating sufficient profit.

	
Dried plums and dried apricots in a storage house (Dangara; June 25, 2023)	Pickled local vegetables are sold in a supermarket (Dushanbe; June 22, 2023)

2.4.4 Improvements in Farming Management Associated with the Introduction of Small-Sized Agricultural Machinery from a Market Perspective

(1) Increased wheat productivity

For crops such as wheat, for which substantial government allocations are made, it is difficult to switch to a crop with a higher unit price, and management efforts are needed to address productivity improvement. As mentioned in section 2.1.2, reducing the trade deficit caused by imports of wheat, the staple food of Tajikistan, is an urgent issue from the perspective of food security. As the large-sized Belarusian tractors introduced in the Soviet era are reaching the end of their service life, it is desirable to introduce new farm machinery and improve cultivation techniques to improve yields and quality henceforth.

(2) Multi-crop cultivation

As mentioned in section 2.4.2, there is no specific crop that can generate stable profits because of the large annual fluctuations in the prices of vegetables and fruits. Therefore, it is desirable to diversify risks by, for example, employing small, maneuverable agricultural machinery to cultivate multiple crops utilizing the space between rows in the orchard. It is also necessary to carefully combine crops and coordinate their planting times from the perspective of improving the operational efficiency of the small-sized agricultural machinery to be introduced and avoiding competition for limited labor.

(3) Off-season cultivation through the introduction of greenhouses, large plastic tunnels, etc.

In the same section 2.4.2, it was also shown that the seasonal fluctuation of wholesale market prices of vegetables and fruits is considerable. With normal open-field cultivation, the market is flooded with the same crops at harvest time, resulting in very low selling prices. As a countermeasure, it is expected that introducing facilities such as greenhouses or large plastic tunnels, aiming for shipment during periods when market prices are relatively high (i.e., products are in short supply), will be very effective from the perspective of profitability improvement. Large-sized agricultural machinery is not suitable for work in such facilities, and so the introduction of smaller machinery is desirable.

(4) Dual cropping of wheat and rice through paddy field development

In this study, we also surveyed rice cultivation areas in Tursunzoda. From a longer-term perspective, increasing rice production should be considered, taking advantage of the abundant irrigation water and high summer temperatures through paddy field development and increasing food self-sufficiency through double cropping in combination with winter wheat. Japan has implemented many technical cooperation projects related to rice cultivation in Southeast Asia and Africa, and the Japan-Africa Agricultural Innovation Center for Agricultural Technology (AFICAT) project is promoting the introduction of Japanese agricultural machinery and advanced agricultural technology through public-private partnerships. Its knowledge and experiences can also be utilized for Tajikistan.

2.4.5 Agriculture-Related Information and Communication Technology Business

In Japan and other developed countries, agriculture-related information and communication technology (ICT) projects and smart agriculture that makes use of such ICT are making progress. As a concrete example, we investigated the activities of Neksigol Mushovir, an agricultural consulting firm based in the Sughd Region (with operations covering the entire country).

Neksigol also operates technical and matching services for Dehkan farms and middlemen, as well as several impressive projects to support Dehkan farms in the production and export of organic agricultural products to European countries (see its website[10] for details). Although the company is not yet well known among Dehkan farms in general, the services provided are very promising for the future expansion of production and distribution of agricultural products in Tajikistan, and its development is expected to continue. The company is aware that the agricultural extension system in Tajikistan is weak and can cooperate with donors through its group's non-profit organization and other means to play a critical role in technical cooperation projects. The following is a list of the company's major ICT projects in the agricultural sector, based on the results of interviews and information gathered from the company's website.

(1) Market Price Monitoring and Analysis System[11]

This provides access to a database of price data for more than 100 commodities, including foodstuffs, agricultural produce, input materials, and non-food items (fuel, unskilled and skilled wage labor rates, etc.) in 15 cities/districts in Tajikistan, plus 60 agricultural commodities in five cities in Kyrgyzstan. Since the Sughd Region, north of Tajikistan, has an active trade with Kyrgyzstan, the company's ability to provide price information for both countries in one service is a strong point.

The system used for this service was developed under a United Nations Development Programme (UNDP) project and has been managed by Neksigol since 2016. As mentioned in section 2.4.2, weekly reports (Dehkan farm version) are currently produced and published in cooperation with the WFP. Researchers in each market use the KoboToolbox platform to efficiently collect information, which is immediately shared with headquarters. Web-based and Android app-based access to the database is completely free. Services that use more extensive SMS updates, for example, are offered on a

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[10] http://neksigol.tj/
[11] https://prices.agroinform.asia

subscription basis, the cost of which depends on the number of products selected, region, frequency of access, and subscription period.

(2) e-Agri-Map[12] (Agricultural Geographic Information System)

e-Agri-Map is a geographic information system (GIS) created to fill critical data gaps in the analysis of key agricultural economic indicators, land degradation, food security, agricultural research systems, soil fertility, and climate change impacts in Tajikistan. Through this service, it is possible to collect, accumulate, store, analyze, and provide data on crop production, sown area, crop yields, soil fertility indicators, agricultural enterprises, importers and exporters, etc.

Access to e-Agri-Map via the Internet or Android application basis is completely free. While we believe that the system is very useful, a large portion of the map data currently accumulated is not up to date, and there are limitations to what private companies can do with it at this time. In addition, as is true for the market price monitoring and analysis system, Internet access is still limited in rural areas in Tajikistan, and the level of digital literacy on the part of producers is low. Therefore, it will take time and multifaceted support to enable Tajik producers to widely use these services for decision-making purposes.

(3) Agricultural Trade and Matching

Neksigol has cooperated with donors through its group's non-profit organization and other means to promote exports, including support for obtaining export licenses, certifications, and branding. In addition to projects supported by donors, the company has also brokered exports as a private company for certain producer organizations for a fee. For example, an Isfara company in the Sughd Region shipped dried fruits to the US and Europe. Neksigol has also assisted domestic Dehkan farms and cooperatives in exporting their products to Afghanistan, China, and other countries.

2.5 Overview and Organizational Structure of Relevant Organizations and Institutions

This section reports the survey results regarding organizations essential for the implementation of grant aid projects, from the perspective of organizational structures. (Please also refer to Section 3.1.7, "Roles of TAL, MTC, and ATS in Farming Test" which reports from the perspective of agricultural machinery.)

2.5.1 Ministry of Agriculture of the Republic of Tajikistan (MoA)

The MoA is the central executive body in the field of agriculture, which formulates and implements a unified national policy. It performs the following tasks:

- Formulating and implementing a unified national policy in the field of agriculture, including plant breeding, livestock, and other agricultural production areas
- Developing programs and production forecasts for the effective utilization of the country's

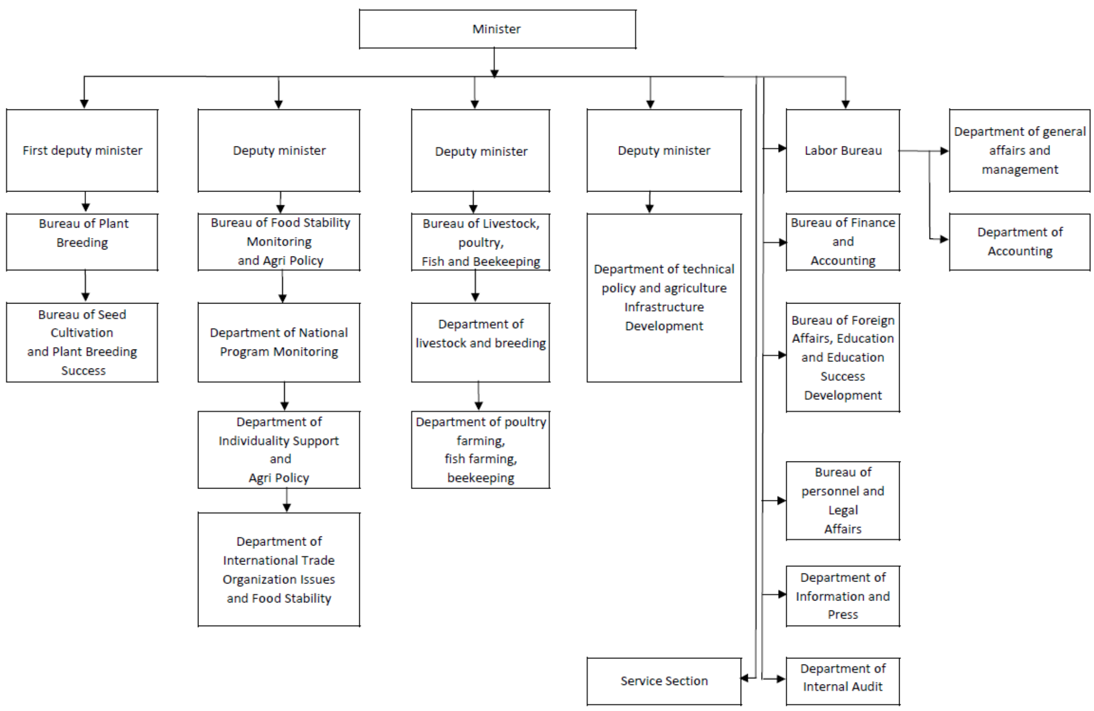
[12] https://maps.agroinform.asia

agricultural production resources

- Organization for monitoring the output and profitability of agricultural production, and determining development trends
- Drafting legislative acts and other normative legal acts, standards, regulations, directives, and necessary norms on agricultural issues
- Monitoring compliance with standards, regulations, directives, and norms, and analyzing statistical indicators of agricultural production
- Controlling the import, export, production, and use of agricultural products
- Development of breeding techniques, seed propagation in the fields of plant breeding and animal husbandry, fisheries and beekeeping, plant protection, control of the use of pesticides and other toxic chemicals in agricultural pest control, recommendations for promoting agricultural mechanization, improvement of agricultural production, including cotton, and development of agricultural infrastructure
- Supporting agricultural producers, comprehensively assessing and forecasting the agricultural situation, and providing relevant information to businesses, institutions, and residents
- Coordinating and ensuring the fulfillment of the obligations of the Republic of Tajikistan through understanding of and participation in international agreements and conventions
- Support for attracting investment to the agricultural sector

The MoA has four deputy ministers under the Minister (Hakimzoda Qurbon), one of whom specifically oversees agricultural mechanization.

The organizational chart of the MoA is shown in Figure 2.26.



Source: Ministry of Agriculture Website

Figure 2.26: MoA Organizational Chart

The Ministry has a Department of Technology Policy and Agricultural Infrastructure Development, which is the contact point for this survey. Additionally, they also provide policy supervision and support to external related organizations such as TAL, Tajik State Machine Testing Station, and the State Inspectorate for Technical Supervision of Agro Machines. MoA will be required to establish a responsible management system for the donated agricultural machinery. Specifically, it is considered essential to assign a dedicated person to the Technology Policy and Agricultural Infrastructure Development Department or to set up a new department to supervise and monitor TAL, MTCs, Cooperatives, and other organizations that use donor-provided machinery, and to make it easier to maintain agricultural machinery usage records.

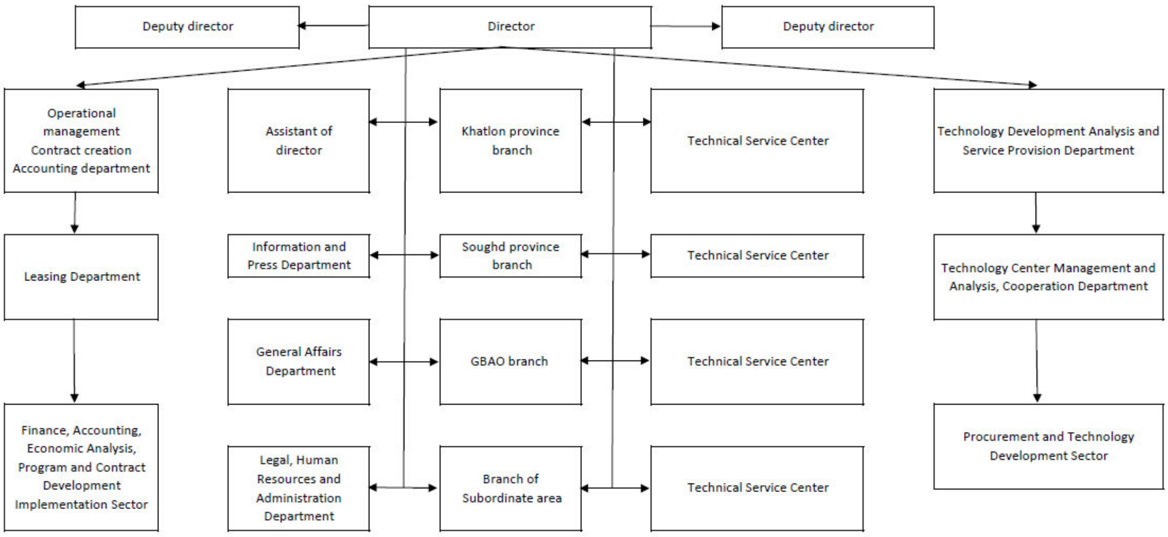
Ministry of Agriculture Building

2.5.2 State Unitary Enterprise "TajikAgroLeasing" (TAL)

State Unitary Enterprise "TajikAgroLeasing" (hereinafter referred to as "TAL") was established on November 30, 2007, by Tajikistan Government Decree No.597, as the "TajikAgroLeasing" state unitary enterprise. It provides agricultural machinery sales and farming services through its subsidiary MTC. The number of employees as of January 2023 is as follows. Headquarters: 42, full-time employees at each regional branch: 13, MTC directors and operators: 60, contract operators: 158, for a total of 273 public employees (including contract employees). An overview of the MTCs in each district and city is as follows.

The organizational chart of TAL is shown in Figure 2.27.

TAL Headquarters



Source: TajikAgroLeasing Website

Figure 2.27: TAL Organizational Chart

(1) Overview of Machinery Technical Service Center (MTC)

TAL has established 61 MTCs in districts, cities, villages, etc. across the country: Khatlon Province: 25 locations, Sughd Province: 14 locations, GBAO: 8 locations, directly under the jurisdiction of the government: 14 locations. After the establishment of MTC, the government donated 130 large-sized tractors and 130 attachments. Each MTC branch uses the donated large-sized tractors (2-3 units) to provide farming services to Dehkan farms and other organizations in the area under its jurisdiction.

Regarding agricultural machinery leasing, the company currently (as of April 2023) has signed leasing contracts with 11,030 Dehkan farms (amounting to TJS 113 million) and is providing leasing services for 2,137 tractors on 3 to 5-year terms, 54 harvesters on 6-year terms, and 3,347 other agricultural machinery on for 1.5 to 3-year terms.

Table 2.12 shows the number of MTC staff, facilities, and machinery in each region.

Table 2.12: Number of MTC Staff, Facilities, Machinery (FY2024)

№	District・City	Agricultural production area (ha)	Number of MTC employees (person)	Machines and implements of MTC		Cost of constructing the MTC facility (in TJS)	Number of workshops (part)
				Machinery (tractors and harvesters) (q/y)	Implement (q/y)		
1	Dangara	28,758	9	10	95	8,069,293	5
2	Vose	21,086	5	16	154	512,350	3
3	Kulob	7,147	4	1	32	1,697,743	3
4	Sh. Shohin	8,246	2	1	7		
5	Farkhor	24,274	2	1	30		
6	Baljuvon	3,498	2		60	1,532,021	4
7	Muminobod	10,742	1		30		
8	Hamadoni	13,086	3	2	30		
9	Khovaling	5,600	1	1	35		
10	Temurmalik	12,291	2		49	974,419	4
Total in Kulob Region		**134,728**	**31**	**32**	**522**	**12,785,826**	**19**
11	Shahritus	7,679	1		5		
12	Panj	14,140	1		33		
13	Dusti	13,257	7	3	55	900,565	5
14	N. Khusrav	6,656	1	2	9		
15	Qubodiyon	12,023	1		4		
16	Jaykhun	15,903	6		34	311,063	5
17	J. Balkhi	15,375	4	3	9		
18	Vakhsh	15,255	7	4	70	431,773	4
19	Kushoniyon	14,664	1	1	2		
20	Yovon	21,859	1		21		
21	A. Jomi	15,051	7	3	117	1,044,314	4
22	Khurson	11,124	4	2	33	1,195,316	
23	Levakant	1,547	1	1	5		
24	Norak	516			8		
25	Khuroson shop			4	50		
Total in Bokhtar region		**165,049**	**42**	**23**	**455**	**3,883,031**	**18**
Total in Khatlon province		**299,777**	**73**	**55**	**977**	**16,668,857**	**37**
26	Ayni	1,500					
27	Devashtich	36,815	7		35	961,184	5
28	Konibodom	8,751	7	1	35	320,993	4
29	Isfara	3,709	1		7		
30	Mastchoh	23,321	1		1		
31	Mastchohi kuhi	2,410	6	2	18	221,513	4
32	Asht	10,255	1		4		
33	Zafarobod	29,053	1		10		
34	B. Gafurov	24,280	2	2	44		
35	J. Rasulov	13,822	1		2		
36	Shahriston	13,328	1		7	192,143	
37	Panjakent	18,012	3	3	29		
38	Spitamen	15,707	1		10		
39	Istaravshan	24,204	8	3	29	818,701	5
Total in Soughd region		**225,167**	**40**	**11**	**231**	**2,514,534**	**18**
40	Vahdat	13,930	1		8		
41	Fayzobod	6,286	1	1	24		
42	Rudaki	17,640	7	5	66	780,000	
43	Rogun	2,114	2	1	12	980,854	
44	Tursunzoda	13,416	2	1	5		
45	Hisor	12,321	1		12		
46	Shahrinav	8,062	2	1	4		
47	Tojikobod	3,020	7	2	55	632,348	5
48	Laksh	6,270	7	4	75	996,044	5
49	Sangvor	2,114	1	1	7		
50	Rasht	4,649	8	6	121	1,927,111	5
51	Nurobod	3,185	1	2	29		
52	Varzob	2,547	1				
53	Dushanbe	1,957					
Region of Republican Subordination		**97,511**	**41**	**24**	**418**	**5,316,357**	**15**
54	Darvoz	1,472	5	4	32		
55	Vanj	1,493	7	7	28		
56	Ishkoshim	2,512	9	9	49		
57	Rushon	1,588	7	7	35		
58	Roshtqala	1,249	6	5	24		
59	Murgob		1	1			
60	Khorug		6	5	22		
61	Shugnon	1,994	9	9	41	1,387,436	4
GBAO		**10,308**	**50**	**47**	**231**	**1,387,436**	**4**
Total in Republic		632,763	204	137	1,857	25,887,184	74

Source: Ministry of Agriculture of the Republic of Tajikistan (MoA), TAL

As shown in the preceding table, 9 districts in Khatlon Region have workshops, while the remaining 16 do not. Also, 9 districts have attachments but no tractors. Of the Sughd Region's 14 districts, only four have workshops, and 8 have attachment-only shops. In the Districts of Republican Subordination, only 3 out of 13 districts have workshops, and 2 have attachment-only shops. In the GBAO, only 1 in 8 districts has a workshop. The workshop is a facility for repairing machines and attachments and is used by specialists employed by MTC on a contract basis.

In total, 19 MTCs had attachments but no tractors, accounting for 31.1% of the total. This denotes a significant shortage of tractors, which is one of the reasons why MoA strongly advocated the provision of large-sized tractors at the beginning of this survey. If there are no tractors, MTC cannot provide farming services in the area, and Dehkan farms are likely forced to either lease or purchase farm machinery on their own, or farm by hand.

In recent years, the number of specialists has been reduced, and TAL intends to accept students from vocational schools in each region under the Committee on Primary and Secondary Vocational Education under the Government of the Republic of Tajikistan in the form of internships, etc., in order to develop human resources and contribute to the future development of MTCs.

On the other hand, the fact that the business plans for each of TAL's MTCs have not been made public raises doubts as to whether the plans are realistic.

The total number of employees at MTC is 204. They are employed as either full-time or contract employees. MTC employees are general employees of a branch office of a state-owned enterprise under the jurisdiction of TAL, but cannot be considered civil servants.

Table 2.12, which was obtained from TAL, has blank columns for agricultural production area, and there are assumed discrepancies from the actual situation with regard to, e.g., counties with large amounts of MTC facility construction costs recorded but zero repair shops. In selecting a recipient, it is important to narrow down the area to a certain extent, visit the site, and as shown in the next section, confirm whether there are facilities for storing and managing the agricultural machinery to be provided, the availability of sufficient operators and other human resources to provide services in the area, and the service track record.

(2) MTC Branch in Fayzobod District

Fayzobod and Dangara districts were selected as targets for the farming tests included in this survey. Fayzobod district MTC has only three staff members: One director and two operators. There is no office, the warehouse is located along the road, and security is very low. Since agricultural machinery is stored outdoors without a roof, it is impossible to protect it from rain, dust, etc. There is a particular need for tractor parking, as well as a warehouse for parts and implements.

Fayzobod MTC Warehouse

On the other hand, interviews with farmers reveal that MTC, as an organization, provides leasing services that satisfy farmers. The Fayzobod district Agriculture Department has built close relationships with each Jamoat and responds promptly to leasing requests from Dehkan farms. The situation is similar not only in Fayzobod district but also in Dangara and Rudaki districts, which were surveyed by this survey team. There are no organizational or financial problems, but there is a lack of technical capacity. Therefore, for the future development of MTCs in each district, it is necessary to strengthen human resource development and training of employees in order to improve their technical capabilities.

(3) Cooperation with domestic companies

TAL is implementing financial collaboration projects related to agricultural machinery sales with state-owned enterprises SUE Korgohi Moshinsozi, LCC Avtorezm, SAOZT TojIron, OAOZ Nouselmash, and AOZ Somon-Kulobtajhizot. The company also imports agricultural machinery with SUE Madad, JSC Madadi Tursunzoda, JSC Agrotechservice, and Avtomashradiator of the Kyrgyz Republic. At present, TAL is not conducting collaborative projects with specific companies that specialize in small-sized agricultural machinery.

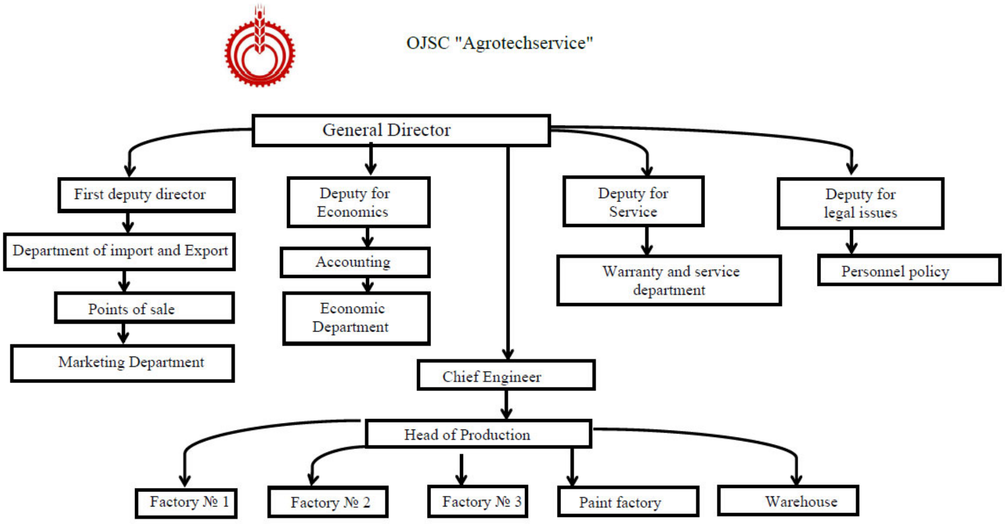
2.5.3 AgroTechService (ATS)

ATS was established on February 25, 2003, and its main business is the import, assembly, and domestic production of agricultural machinery and related implements, as well as sales both domestically and to foreign countries. It also offers warranty and after-sales service after the warranty period expires. Currently, the company is a dealer for a number of large-sized Belarusian brands, including OJSC MTZ, OJSC Bobruiskagromash, and OJSC Gomselmash. The company has the capacity to assemble up to 700 units of tractors and other agricultural machinery of various brands annually (160 tractors, 100 trailers, 30 balers, around 60 ploughs, etc.) in response to the needs of Dehkan farms and farmers.

ATS Facility

In addition, from 2020 to 2022, the company exported 22 locally assembled Belarusian tractors and 24 domestically produced trailers to Uzbekistan, 10 Belarusian tractors to Afghanistan, as well as 30 domestically produced trailers and 4 balers to Kazakhstan. All agricultural machines manufactured at the factory are inspected by the Tajik State Machine Testing Station of the MoA to ensure compliance with national standards.

In order to achieve the strategic goals set out by the MoA, ATS is implementing activities in line with the Food Security Program and supplying the Tajik market with modern combine harvesters from OJSC Gomselmash to support efficient and timely harvesting of grains (10 combine harvesters were sold to farmers in the country in 2020 alone). OJSC has been exempt from paying value-added tax and customs duties since 2019 in accordance with the Law on the State Budget and decisions of the Intergovernmental Commission of Tajikistan and Belarus.



Source: AgroTechService

Figure 2.28: ATS Organizational Chart

2.5.4 Status of Farmer-Related Entities

The current bearers of agriculture in Tajikistan are State-registered Dehkan farms operated by a single family or several families (mainly relatives), but there are also commercial cooperatives (hereinafter referred to as "cooperatives") in which several Dehkan farms come together for agricultural purposes. In some cases, simple processing and sales of products are conducted through the cooperative. Advantages of forming cooperatives include more efficient investment in and use of agricultural machinery, storage facilities, and processing facilities, as well as greater ability to negotiate prices when selling.

However, there are also concerns about ensuing financial troubles, and growth in the number of Dehkan farms cooperatives is still limited. Many Dehkan farms and cooperatives face operational and financial challenges, so in order to streamline farming operations and improve their finances, many are in need of, for example, low interest rates for agricultural machinery rental and leasing, as well as government subsidies.

(1) Number of farming entities and organizations

Table 2.13 shows the number of groups and organizations related to agriculture in Tajikistan. We can see that the main players in agriculture in Tajikistan are “collective Dehkan farms and cooperatives” and “Dehkan farms and individual farmers,” and so an appropriate strategy is needed for how to provide agricultural machinery-related services to these diverse demographics.

Table 2.13: Number of Agricultural Entities and Organizations in Tajikistan (FY2023)

Name	State farms	Association of farmers and water users	Farmers and cooperatives	LLCs and joint-stock companies	Assisted farms	Individual agricultural farmers	Individual entrepreneur	Total
Republic of Tajikistan	158	59	3,641	414	598	176,524	50	181,444
Pamir (Gorniy-Badahshan)	15	0	255	0		3,423		3,693
Darvoz	2		144			504		650
Vanj	1		10			1,636		1,647
Rushon	1		56			1,057		1,114
Shugnon	1		3			121		125
Roshtkala	3		34			27		64
Murghob	3		6			0		9
Ishkoshim	3		0			75		78
Horug	1		2			3		6
Sughd Region	32	59	944	159	285	67,294	50	68,823
Asht	5		10	18	12	5,717		5,762
Ayni	3		42	1	11	1,146		1,203
Devashtich	1		55	4	6	2,549	2	2,617
Zafarobod		34	62	3	20	4,634	2	4,755
Isfara			21	1	24	12,382	4	12,432
Konibodom			18	7	4	8,322	5	8,356
Mastchokh			180	12	5	4,804		5,001
Spitamen	1	8	296		14	1,404		1,723
Jabbor Rasulov		17	95	13	24	2,830		2,979
Panjakent	8		83	8	11	4,325	1	4,436
Istaravshan	2			17	72	8,865	1	8,957
B.Gafurov	6		27	55	67	6,767	29	6,951
Shahristan	5		39	9	15	2,393		2,461
Mastchokh mountains	1		16			1,154		1,171
Hujand				2		1		3
Gulistan				8			1	9
Buston				1		1	5	7
Khatlon Region	72	0	2,177	95	189	70,085		72,618
Kulob	2		60	4	21	2,206		2,293
Baljuvon	3		7		1	456		467
Vose	2		78	3	11	3,988		4,082
Muminobad	1		28	1	2	4,800		4,832
Hamadoni	3		174		33	4,632		4,842
Farkhor	2		524	4		5,542		6,072
Hovaling	1		18	1		2,252		2,272
Temurmalik	12		24		1	984		1,021
Dangara	5		32	2	2	1,922		1,963
Sh. Shahin	2		36	1		2,543		2,582
Khorasan	3		3	4		1,462		1,472
Jomi	2		185	3	6	2,878		3,075
Kushoniyon	10		265	3	5	2,155		2,438
Vakhsh	5		80	5		6,080		6,170
Levakanth	1		5	4	2	125		137
Dusti			7	5	16	2,946		2,974
Balhi	5		389	8	7	2,876		3,285
Jayhun			29	4	10	4,297		4,340
Pyanj	3		5	2	2	5,576		5,588
Shahritus	2		22	3	22	2,582		2,631
Kubodiyon	3		150	4	35	2,867		3,059
N. Husrav	1		10	3		1,825		1,839
Yovon	1		38	27	8	4,819		4,893
Norak	2		1	3	1	242		249
Bokhtar	1		6	1	4	30		42
Dushanbe				11		698		709
Districts under Republic Subordination	39		265	149	124	35,024	0	35,601
Tursunzoda	4		171	16	7	2,361		2,559
Hisar	5		4	25	46	4,199		4,279
Shahrinav	3		46	38	6	1,789		1,882
Rudaki	3			12	39	4,409		4,463
Varzob	1		10	6		600		617
Vahdat	5		14	13	8	9,089		9,129
Faizabad	2		7	5	6	3,918		3,938
Nurabad	1			10		876		887
Sangvor	2				3	596		601
Rasht	2			18		2,830		2,850
Tajikabad	5		10	3	3	1,484		1,505
Lakhsh	5				5	1,793		1,803
Rogun	1		3	3	1	1,080		1,088

Source: Ministry of Agriculture of the Republic of Tajikistan (MoA)

The types of organizations in Tajikistan are defined below (Dehkan farms and cooperatives are described in detail in separate sections).

- State farms
  These farms are under the jurisdiction of the Ministry of Agriculture and the Academy of Agricultural Sciences. Basically, they are used for research and testing.
- Agrofarms
  These carry out agriculture-related business and are similar to JSCs.
- Corporations
  Corporations are general private businesses that carry out agriculture-related business.
- Assisted farms
  These are operated by the personal labor of citizens and their families for the purpose of producing agricultural products to meet their food needs, etc.
- LLC
  Limited Liability Company refers to the corporate form known as Godo Kaisha in Japan.
- JSC
  Joint-stock company (similar to a limited partnership).

It is thought that the most suitable implementing agencies for a future rental project under grant aid will be the MTCs as counterparties in each region if conducted through TAL, however, cooperatives would be most appropriate if conducted through private agricultural entities. On the other hand, a full investigation of both institutions should be conducted during the selection phase.

(2) Dehkan farms

Dehkan farms are registered entities engaged in agricultural production, storage, processing, sale, and other land-related activities of an individual (one farmer) or a joint group (several farmers). Based on Article 142 (3) of the Law on Dehkan Farms[13], authority is held by Dehkan farm associations made up of 1 to 50 Tajik nationals aged 18 or over. Dehkan farms are mainly agricultural business entities formed after independence when large collective farms such as kolkhozes and sovkhozes were dismantled. Since they own a certain amount of farmland, they are suitable targets for supporting agricultural mechanization. In addition to Dehkan farms, there are an increasing number of cases of people who have been allocated small plots of land adjacent to their homes as “personal land,” which are being farmed as vegetable patch gardens. However, because these are not registered or organized, their inclusion in the scope of agricultural mechanization would not be appropriate at this time.

The Mavlavi Dehkan farm in Fayzobod district, where the farming experiment will be carried out, is made up of 16 farm households, with 70% to 80% of its members being women, and the average farm size is 4.5 ha. Dehkan farms in each district and city are under the jurisdiction of Jamoats, which decide the selection and number of crops (especially potatoes) to be cultivated each year.

[13] National Legislative Center Under the President of the Republic of Tajikistan

Legally, Dehkan farms should be free to decide what crops to cultivate. Still, for some crops, planting allocations are handed out semi-compulsory, and farmers have little room for discretion regarding their allocation, including the varieties to be cultivated.

(3) Cooperatives

A cooperative is a formally registered, individual membership-based or independent association established for the purpose of meeting economic, social, cultural, or other common needs, the common provision of property, or personal aspirations. Cooperatives are regulated by Law No. 7-519 of 2013 and are divided into non-profit and for-profit cooperatives. A commercial cooperative is a profit-making organization based on articles of incorporation that generally provides a service (such as the sale of agricultural products) to third parties. The net profits of a commercial cooperative may be distributed among its members in the order prescribed by the abovementioned Law and the articles of association of the cooperative. All cooperatives carrying out agricultural activities are classified as commercial cooperatives.

Sharif Shirin Cooperative Wheat Field

The farming tests for this survey were carried out in two districts, Fayzobod and Dangara. In Dangara, Sharif Shirin Cooperative was selected as the target for the farming test, as it was deemed to have sufficient organizational strength based on the survey, assuming that the cooperative would manage agricultural machinery.

Structure of Sharif Shirin Cooperative

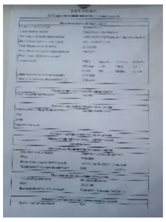
- Number of members: 12 Dehkan farms, 3 of which are female-headed
- Agricultural land area: 396 ha, of which 2 ha are used for vegetable cultivation
- Water situation: Irrigation is available from April to November
- Warehouse: No. 1: 16 x 18 m, No. 2: 6 x 6 m
- Agricultural machinery: Belarusian-made large-sized tractor (1 unit), harvester, various attachments
- Cooperation with TAL/MTC: None

When we asked the Chairman of Sharif Shirin why they did not have any cooperation with TAL/MTC, he replied, “TAL does not lease agricultural machinery, it sells it on loan. In addition, farmers are unlikely to purchase the machines because they are sold at 12% above the cost of the agricultural machines. It is much less expensive to purchase from the manufacturer (distributor) than from TAL. TAL's free maintenance period is around six months, and there is no support after that, so when I purchased through them previously, I ended up returning the agricultural machines midway through.”

On the other hand, some other Dehkan farms and cooperatives maintain close relationships with TAL/MTC and work together in farming. This difference is thought to be influenced by the presence or absence of capital to purchase agricultural machinery on the part of those who use it, as well as the organizational strength to operate and manage it efficiently.

The farming tests showed that a cooperative with a well-organized structure like Sharif Shirin's can use small-sized agricultural machinery without any problems, and as long as there is a system in place to supply spare parts, the cooperative can perform normal maintenance work on its own. If the operation of small-sized agricultural machinery provided in future grant aid projects is to be entrusted to cooperatives, it will be necessary to accurately evaluate in advance the intended management and operation system for the agricultural machinery.

Table 2.14: Sharif Shirin Cooperative Business License

Certificate	Photo	Issued by	Date of expiry
Trade Cooperative Society Sharif Shirin National Registration Certificate		Taxation Committee	Unlimited
Registration	 	Taxation Committee	Unlimited
Land Acquisition Certificate		Dangara district, Khatlon Province	Unlimited

Source: Sharif Shirin Coop.

(4) Dehkan farms and cooperatives in the Fayzobod district

Fayzobod district, which is mainly agricultural, is a Republican Subordination region with 3,870 Dehkan farms and only one cooperative. The number of registered agricultural machines is 297, including 212 MTZ82s (large-sized tractors made in Belarus), 47 combine harvesters, 33 harvesters, and 5 mowers. 60% of these 297 machines are outdated. In recent years, the presence of Chinese manufacturers has increased domestically. Other products made in Belarus, by TajIron, and in Iran are also seen. Some are also made in Ukraine.

The farming tests for this study will be conducted at the farm of Mr. Kamolov, the head of MTC. This MTC has one combine harvester and one MTZ82 tractor made in Belarus. Both are second-hand and still in good condition.

(5) Dehkan farms and cooperatives in Dangara district

In the Dangara district, there are 12 cooperatives and 1,938 Dehkan farms. The number of agricultural machines is as follows: Belarus-made large-sized tractors (MTZ82): 453 units, seeders: 36 units, continuous track tractors: 26 units (12 of which are outdated), and Belarus-made (MTZ82) three-wheeled tractors: 71 units (61 of which are outdated).

2.5.5 Academy of Agricultural Sciences of Tajikistan

(1) Overview of the Academy of Agricultural Sciences of Tajikistan

The Academy of Agricultural Sciences of Tajikistan was established in 1991 and is under the MoA. Its staff numbers are as shown in Table 2.15. Its main missions are to promote the development of agricultural science, put scientific results to practical use, develop human resources, develop agricultural machinery, and conduct research to improve the effectiveness of research activities. There are 11 research institutes under the Academy, each having its own research center.

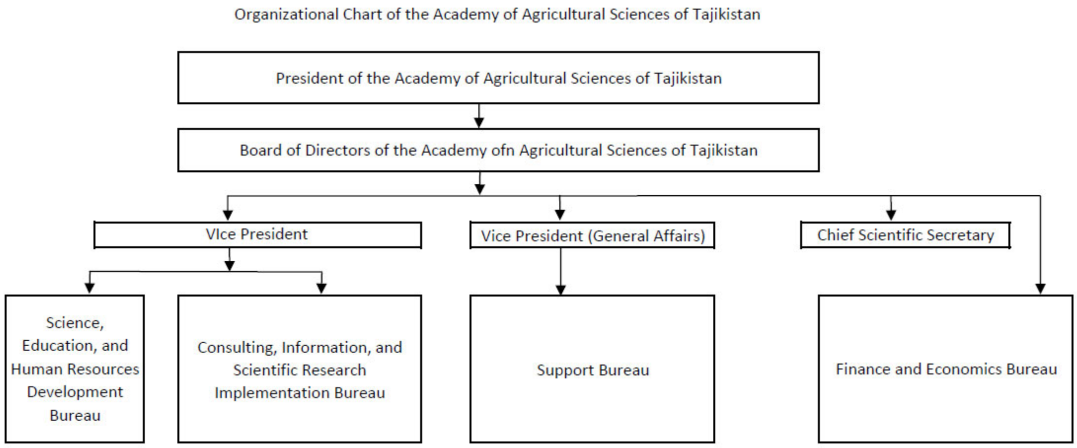
Table 2.15: Organization, Staff and Researcher Numbers of the Academy of Agricultural Sciences of Tajikistan

No.	Name of related organizations	Number of employees	Number of researchers	Number of qualified persons, etc.				
				Academy Members	Supporting Members	Foreign Members	Doctor of Science	Degree -seekers
	Headquarters of the Academy of Agricultural	33	13	2	4	2	3	6
1	Crop Research Institute	196	116	2	1		10	16
	Sughd region branch	36	18					4
	Khatlon region branch	69	23				1	3
	Subtotal	302	157	2	1		11	23
2	Horticultural Vegetable Research Institute	85.5	51	1			4	13
	Sughd region branch	54	25.5				1	10
	Subtotal	139	76.5	1			5	23
3	Soil Science and Agrochemistry Institute	113	48	1			3	12
	Vakhsh Soil Science and Reclamation	20	9					1
	Sughd Soil Science and Reclamation	24	10				1	5
	Subtotal	158	67	1			4	18
4	Animal Husbandry and Farm Research Institute	106	60.5				10	21
	Livestock Biotechnology Center	20	7					2
	Sughd region branch	20	10					2
	Subtotal	146	77.5				10	25
5	Veterinary Research Institute	89	42				6	11
6	Economic and Agricultural Development	56	31	1			2	16
7	Biosafety and Biotechnology Institute	83	39	1	1		5	12
8	National Genetic Resource Center	37	20					5

No.	Name of related organizations	Number of employees	Number of researchers	Number of qualified persons, etc.				
				Academy Members	Supporting Members	Foreign Members	Doctor of Science	Degree -seekers
9	National Center for Innovation and Agricultural	26	14					4
10	National Cocoon Science Research Center	25	13				1	4
11	Pamir Agricultural Science Research Center	23	15				2	3
	Total	**1.118**	**565**	**8**	**6**	**2**	**49**	**150**

Note: Part-time staff are recorded as 0.5.

Source: Academy of Agricultural Sciences of Tajikistan



Source: Academy of Agricultural Sciences of Tajikistan

Figure 2.29: Organizational Chart of the Academy of Agricultural Sciences of Tajikistan

(2) Activities of affiliated organizations

- Crop Research Institute

The institute has 302 employees, 11 departments, 4 agricultural experiment stations, and 8 district offices. Crop breeding and research (29 research projects in 2023) are being carried out, mainly on wheat, cotton, beans, and corn.

- Horticultural Vegetable Research Institute

In addition to this institute, it has a branch in Sughd region and employs a total of 139 people. Research, mainly on fruit trees (8 projects in 2023), is being carried out at research institutes as well as on farms in Hisor, Fayzobod, Muminobod, Vakhsh, and Khuroson districts.

- Soil Science and Agrochemistry Institute

Details are given in a separate section.

- Animal Husbandry and Farm Research Institute

There is a Republic Livestock Biotechnology Center in the Hisor district with a branch in the Sughd region. Hisor district sheep are the most popular in the country, and the district is focused on sheep research. The institute employs 146 people.

- Veterinary Research Institute

  The institute, which also has a biotechnology center and branches, has 148 employees. Research concerns cattle, small animals, birds, fisheries, and bees. In recent years, research has also begun into domestically produced vaccines for animals.

- Economic and Agricultural Development Institute

  This institute has 56 employees and one testing center. It conducts research focusing on socio-economic mechanisms in the agricultural sector and agriculture-related industries and aims to promote government investment in the agricultural sector.

- Biosafety and Biotechnology Institute

  The institute, which has 83 employees, conducts livestock research in the districts of Vahdat, Shahrinav, Fayzobod, Rudaki, J. Balkhi, Farkhor, and Hamadoni.

- National Genetic Resource Center

  The center has 37 employees. It was established in 2006 for the purpose of government regulation, conservation, and research of genetic resources. In 2023, research is being conducted on four genetic themes.

- National Center for Innovation and Agricultural Mechanization

  The center has 26 staff members, and research titled "Introduction of small agricultural machinery in Dehkan farm from 2021 to 2025" has been carried out in 2023. As of June 2024, 10 reports have been published regarding this research, and four small tillers have been developed, of which patent applications for three were submitted to the National Patent Information Center (MMPI (Markazi millii patentivu ittiloot)) on November 17, 2023. Certificates of use have been issued by the State Inspectorate for Technical Supervision of Agricultural Machinery under the MoA for the testing of the four small tillers developed in 2023.

  - Small tiller KRM-1, No. 12-2023 (111)
  - Small tiller KPM-1, No. 13-2023 (112)
  - Small tiller KKY-1, No. 14-2023 (113)
  - Implement KM-4 for corn seeds, No. 15-2023 (114)

  As of May 2024, the specific policies of the MoA and the Tajikistan government in response to this study's results have not been made public.

- National Cocoon Science Research Center

  The center has 25 employees. In 2023, it conducted scientific research focusing on 23 experimental varieties, including those collected from China, Korea, Turkey, Iran, Vietnam, and Japan, to select species for cultivation.

- Pamir Agricultural Science Research Center

  The number of employees at the center is 23. The main research carried out is on cultivation methods for plants, vegetables, and fruits suitable for high altitudes. Trials are being conducted on farms in Rushon, Shugnon, and Murgob districts, focusing primarily on potatoes. In 2022, research on ox farming is being carried out within the framework of a program with the University of Central Asia, located in Khorug, the city center of Gorno-Badakhshan Autonomous Province (GBAO).

2.5.6 Institute of Soil Science and Agricultural Chemistry, Academy of Agricultural Sciences of Tajikistan

The Institute of Soil Science and Agrochemistry of the Academy of Agricultural Sciences of Tajikistan provides the following services in accordance with the Institute Regulations:

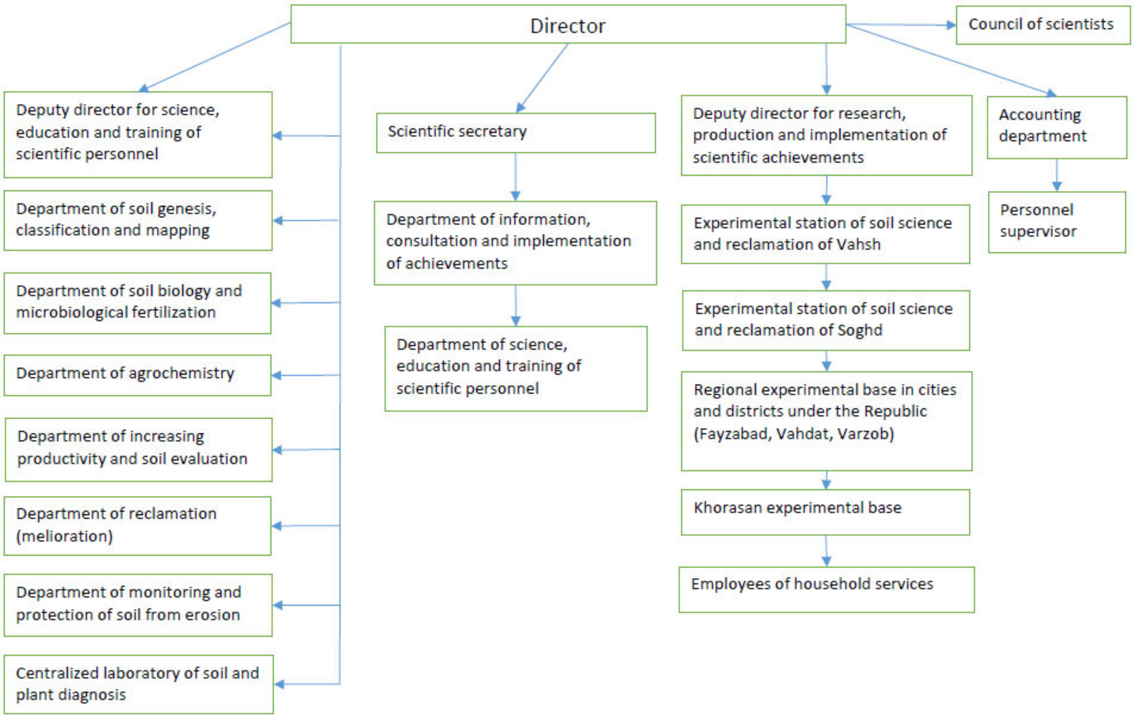
- Testing for pesticides, and testing of soil for physical, physicochemical, biological, climatic, and other characteristics.
- Conducting educational activities and training of highly qualified personnel in the fields of agricultural chemistry and soil science.
- Acceptance of and research support for doctoral and master's degree applicants in related fields.
- Improving scientific and technological processes in the fields of soil science, agricultural chemistry, and agro-climatology; formulating measures to increase crop productivity; examining measures for the comprehensive utilization of water and soil resources; researching and developing systems for the economization of natural resource use in the agricultural sector. Research into priority issues in the agricultural sector in order to realize the government's agricultural policies.
- Studies and proposals on the principle of rational use of land; improvement of methods of maintaining soil moisture in light of climate change.
- Provision of activities for research and instruction in cultivation techniques, subject to the terms and conditions of the activity in accordance with the Institute's cost criteria.

In addition to the main tasks mentioned above, the Institute is also commissioned with the following:

- Promoting scientific, technical, and educational activities; economic forecasting and planning of programs for the efficient use of soil and land resources in irrigated areas; promoting the use of dry lands, improving soil quality, and the productivity of pastures.
- Providing scientific and systematic advice on soil surveys and soil quality assessments to combat soil degradation.
- Conducting outreach activities and seminars on effective and rational land use, soil cultivation, and the effective use of organic and mineral fertilizers.
- Intellectual property rights management for the introduction of new technologies.
- Participation in scientific research activities conducted based on mutual agreements with foreign scientific research institutions.

When conducting this survey, soil tests for farming test fields and other locations were carried out at this institute.

On the other hand, Dehkan farms and cooperatives, etc., barely use the Institute. The reason for this is that farmers alone cannot use the analysis of soil test results for their farming activities. Another barrier to farmers using the Institute for soil testing is that the soil needs to be transported to a laboratory in Dushanbe for analysis. For farmers to make better use of the soil research laboratory, the Institute will need to provide farmers in each Jamoat with information sessions and outreach activities on how to use the results of soil tests in the field based on their analysis.



Source: Soil Science and Agrochemistry Institute website

Figure 2.30: Institute of Soil Science and Agrochemistry Organizational Chart

2.5.7 Tajik Agrarian University

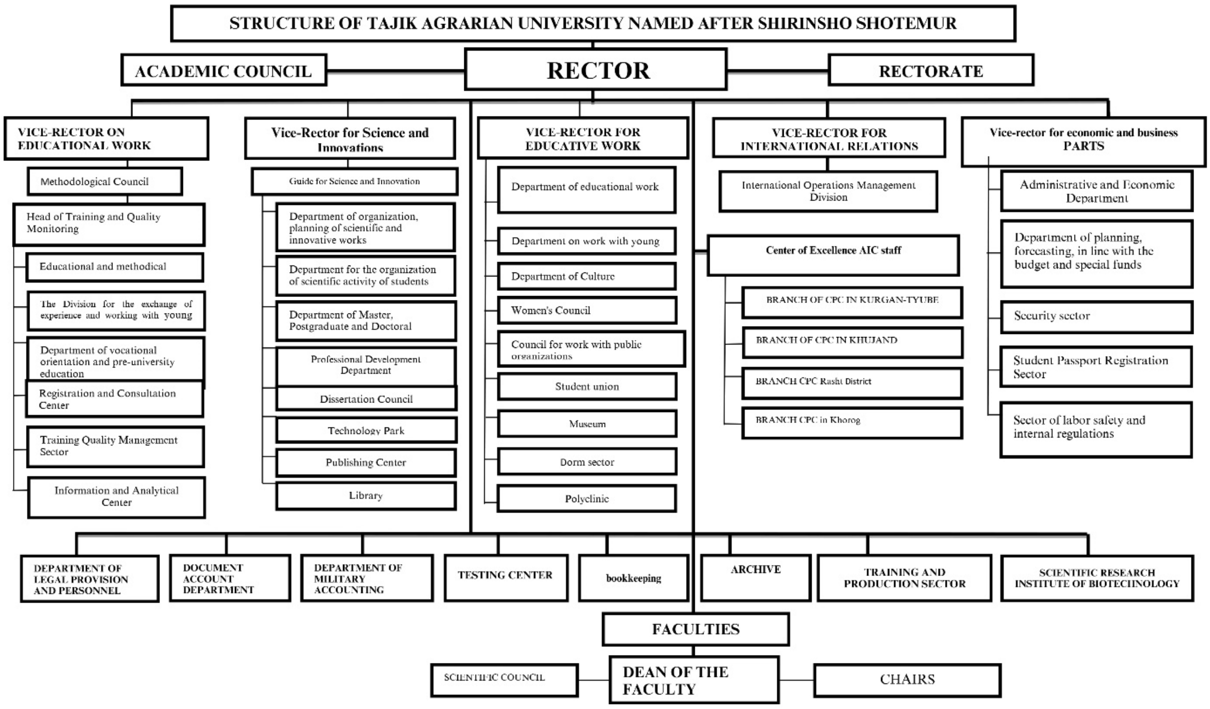
(1) University Outline

Tajik Agrarian University [14]was founded in 1992 as the successor of the Tajik Agricultural Institute and, as of May 2024, consists of the following 10 faculties.

- Faculty of Agronomy
- Faculty of Agrobusiness
- Faculty of Accounting and Finance
- Faculty of Horticulture and Agricultural Biotechnology
- Faculty of Hydromelioration
- Faculty of Zoo Engineering
- Faculty of Land Management
- Faculty of Economics
- Faculty of Mechanization of Agriculture
- Faculty of Veterinary Sciences

[14] Formal name: Донишгоҳи аграрии Тоҷикистон ба номи Ш. Шотемур (Tajik Agrarian University Shirinsho Shotemur)

The university's organizational chart is shown in Figure 2.31.



Source: Tajik Agrarian University

Figure 2.31: Tajik Agrarian University Organizational Chart

Currently, the university has 378 faculty members (Table 2.16) and 4,418 students (Table 2.17), and research is conducted on a total of 956 topics (Table 2.18) across all faculties in the academic year. Of the students, 28 are studying abroad, mainly at Irkutsk Agricultural University in Russia and agricultural universities in China.

While the number of faculty members and research studies changed only slightly between 2022-2023 and 2023-2024, the number of students showed a significant decrease of 17.2%. One possible factor behind this is the improvement in employment opportunities for students after emerging from the COVID-19 pandemic, but there has been a trend of decline in the number of students majoring in agriculture in recent years.

Table 2.16: Number of Teachers by Faculty at Tajik Agrarian University

No.	Faculty	Number of members	
		2022-2023	2023-2024
1	Faculty of Agronomy	51	48
2	Faculty of Agrobusiness	54	50
3	Faculty of Accounting and Finance	60	50
4	Faculty of Horticulture and Agricultural Biotechnology	27	26
5	Faculty of Hydromelioration	20	18
6	Faculty of Zoo Engineering	35	34
7	Faculty of Land Management	29	28

No.	Faculty	Number of members	
		2022-2023	2023-2024
8	Faculty of Economics	48	49
9	Faculty of Mechanization of Agriculture	45	45
10	Faculty of Veterinary Sciences	29	30
Total		398	378

Source: Tajik Agrarian University

Table 2.17: Number of Students by Faculty at Tajik Agrarian University

No.	Faculty	Number of students	
		2022-2023	2023-2024
1	Faculty of Agronomy	596	456
2	Faculty of Agrobusiness	552	446
3	Faculty of Accounting and Finance	460	366
4	Faculty of Horticulture and Agricultural Biotechnology	420	353
5	Faculty of Hydromelioration	507	432
6	Faculty of Zoo Engineering	419	349
7	Faculty of Land Management	469	417
8	Faculty of Economics	380	275
9	Faculty of Mechanization of Agriculture	760	550
10	Faculty of Veterinary Sciences	774	774
Total		5,337	4,418

Source: Tajik Agrarian University

Table 2.18: Number of Research Studies by Faculty at Tajik Agrarian University

No.	Faculty	Number of studies	
		2022-2023	2023-2024
1	Faculty of Agronomy	168	197
2	Faculty of Agrobusiness	74	66
3	Faculty of Accounting and Finance	130	140
4	Faculty of Horticulture and Agricultural Biotechnology	97	102
5	Faculty of Hydromelioration	30	40
6	Faculty of Zoo Engineering	79	54
7	Faculty of Land Management	50	35
8	Faculty of Economics	110	123
9	Faculty of Mechanization of Agriculture	160	128
10	Faculty of Veterinary Sciences	63	71
Total		961	956

Source: Tajik Agrarian University

(2) Collaboration and cooperation with aid agencies and other countries

As of July 2024, the only donor support is the Strengthening Resilience of the Agriculture Sector Project in Tajikistan[15], implemented by the World Bank. Within the framework of this project, plans are

15 https://www.worldbank.org/en/news/press-release/2021/06/18/world-bank-invests-in-tajikistans-agriculture-sector

underway to renovate the university's aging facilities and improve research instruments, but as of April 2024, construction has yet to begin. In recent years, the following greenhouse research projects have been carried out in cooperation with both South Korea and Turkey, and these greenhouses are currently being used for research by university teachers and students.

	
Korean Government Greenhouse Project	Turkish Government Greenhouse Project

(3) Relationship with government agencies and Dehkan farms

Regarding the relationship with Dehkan farms, university students (3rd and 4th-year students) from the Faculty of Hydromelioration, the Faculty of Land Management, and the Faculty of Agronomy are conducting internships mainly at Somonjon Dehkan farm in Dangara district. Other internships are also conducted at Barakati Hisor Dehkan farm in Hisor district from February to March and October to November. The internship program involves providing assistance to farmers with agricultural work. In Dushanbe, the university actively participates in the subbotnik (Saturday work) program, which has been carried out by the Dushanbe city government since the Soviet era.

The university has a soil laboratory that performs soil analysis similar to that performed by the Institute of Soil Science under the Academy of Agricultural Sciences. However, this laboratory is for the purpose of research by students and faculty, and cannot be utilized by external Dehkan farms, cooperatives, etc. (However, cooperation in analysis is possible if the project is carried out through the university).

In addition, agricultural universities have summer vacations (from June to August), which makes it impossible to conduct soil analysis during this period. On the other hand, the Academy of Agricultural Sciences does not have such vacations, and is able to conduct soil analysis all year round.

However, as farmers are not adequately making use of soil analysis, it is essential that agricultural universities, alongside the MoA and the Academy of Agricultural Sciences, assist in educating farmers about the need for regular soil analysis.

	
Front facade of the Tajik Agrarian University	Tomato cultivation test (greenhouse) conducted by a university teacher

2.6 Gender Conditions in Other Donor Assistance in the Agricultural Sector

Tajikistan is a country where a diverse range of cultural influences can be seen, including traditional Islamic cultural values as a base, as well as communist values cultivated during the Soviet Union era and, among the younger generation, Western cultural values. However, it is necessary to carry out the analysis with particular regard to the recent situation in rural areas. The following analysis covers the gender perspectives necessary to incorporate when providing small-sized agricultural machinery, based on interviews with local stakeholders, as well as the FAO report "National Gender Profile of Agriculture and Rural Livelihoods - Tajikistan"[16] compiled in 2016, and the ADB report "Tajikistan Country Gender Assessment"[17] also compiled in 2016.

2.6.1 Gender-Related Legislation, Policies, and Guidelines in the Agricultural Sector

(1) Legal system

The Constitution of Tajikistan proclaims equal rights for men and women (Article 17), and the principle of non-discrimination is also clearly stated in family law, labor law, land law, criminal law, education law, and public health law. Also in 2005, the country adopted the Law on the State Guarantees of Equal Rights and Opportunities for Men and Women (hereinafter referred to as the Gender Equality Law), prohibiting discrimination based on gender and reaffirming the guarantee of equal rights in public institutions, civil service, education, and labor. However, according to the ADB report, the Gender Equality Law is largely declarative, lacking provisions on "how to ensure equality or how to address cases of discrimination," and clear remedies for violations.[18]

According to the FAO, the decline in the number of adult men in rural areas after independence due to deaths in civil war, as well as emigration for work, led to an increase in the number of farming families run by women. However, this led to impoverishment for female farmers, as they were not able to receive land allotments if there were no male laborers in the farm household when collective farms such as

16 FAO (2016): National Gender Profile of Agricultural and Rural Livelihoods – Tajikistan
17 ADB (2016): Tajikistan Country Gender Assessment
18 ADB (2016): p.8

kolkhozes and sovkhozes were dissolved, and they were also disadvantaged when individual shares in the former collective farms were distributed because they were “not full-time regular members.” In fact, data on agricultural assets from 2007 show that male-headed farm households are more likely to own land than female-headed farm households (70% vs. 52%) and tend to own larger plots of land.

(2) Organizational structure, policies, guidelines, etc.

Due to the lack of a legal framework requiring each ministry to take specific gender-related initiatives, the MoA has no department or person in charge of gender issues, and no specific policies or guidelines regarding gender in the agricultural sector have been compiled. Specific efforts in the area of gender are being undertaken by the Committee on Women and the Family (Women's Committee), established in 1991 and strengthened in 2006 to become the central body for implementing national policies on protecting women's interests and rights. The Women's Committee runs a central office in Dushanbe and parallel regional offices, as well as regional information and consultation centers and crisis management centers throughout the country. The activities of the Women's Committee are wide-ranging, encompassing investigations and reviewing citizens’ complaints, promoting women's rights through the media, monitoring compliance with international standards, coordinating government and non-governmental gender equality activities, training, and more. However, due to budgetary limitations, many concrete initiatives are carried out in cooperation with donors. When providing agricultural machinery, it will be necessary to liaise with the Women's Committee and the women's councils of each Jamoat to address gender issues.

2.6.2 Gender Perspective in Other Donor Assistance in the Agricultural Sector

(1) FAO “Support to Improved Agricultural Mechanization Services” Project[19]

This project, which aims to popularize small agricultural machinery (such as tillers) in mountainous areas, has prepared a “Project Implementation Manual” to ensure awareness among stakeholders, and by including specific gender-sensitive procedures therein, is working to promote gender equality in all areas of the project. In addition, it is expected that the machinery services provided through the project will reduce women’s workload in the long term, and the project's approach can serve as a benchmark for JICA's provision of small-sized agricultural machinery.

(2) IFAD “Livestock and Pasture Development Project II”[20]

This project, which ran from 2015 to 2021 in the mountainous region of southern Tajikistan, clearly defined its target group not simply as “small-scale livestock farmers” but also as “female-headed farm households and women in poor farm households.” This enabled the project to reach economically

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[19] https://openknowledge.fao.org/server/api/core/bitstreams/56589f47-8957-4edd-8c1a-0934865a279a/content

[20] https://www.ifad.org/documents/38714170/47956623/asap-tajikistan-lpdp2.pdf/5be9a529-fed3-0960-13c5-7c675826510e?t=1698308282685

vulnerable women directly. This approach can be said to serve as a reference if any technical cooperation projects are implemented in conjunction with the provision of small-sized agricultural machinery.

(3) ADB "Climate- and Disaster-Resilient Irrigation and Drainage Modernization in the Vakhsh River Basin Project"[21]

The abovementioned ADB report lists the characteristics of female agricultural work in Tajikistan as "low pay and job insecurity, back-breaking conditions, lack of access to and control over productive resources, limited presence as managers, and low technical and specialized knowledge." [22]With this in mind, ADB has agreed to provide a grant of USD 30 million for the project mentioned above, which is Tajikistan's first gender-themed irrigation and drainage (I&D) investment, to mainstream gender interests and efforts in Tajikistan, and is scheduled to implement the project from 2022 to 2027.

The project noted that "Despite women's important role in agriculture and as major water users, they have unequal access to knowledge and inputs to improve agricultural productivity. Furthermore, their low representation in water user associations limits their role in decision-making on water management." After clarifying gender issues, the report positions "adopting gender equality policies and strategies to strengthen women's participation in land and water management" as one of its three areas of activity. The project goal is also written with female farmers in mind, stating "The project will enhance climate resilience, water productivity, and the income of female and male farmers." This is an initiative that should be taken as a reference for JICA's Grant Aid projects.

2.6.3 Gender Indicators in Dehkan Farms

The number of female-led Dehkan farms in 2022 increased nationwide compared to 2017 (Table 2.19). Moreover, as shown in the graphs comprising Figure 2.32, the national average proportion of female Dehkan farm heads increased by 4.3% over the same five-year period. This increase is especially concentrated in GBAO, Varzob, Nurobod, Sangvor, Rasht, and Lakhsh regions. This is thought to be because even in regions where Islamic traditions are strong and there has been a strong aversion to registering women as Dehakn farm heads, factors such as an increase in men migrating to other areas for work have resulted in a higher proportion of Dehkan farms with only female employees remaining, with the proportion of female Dehkan farm heads thus increasing accordingly.

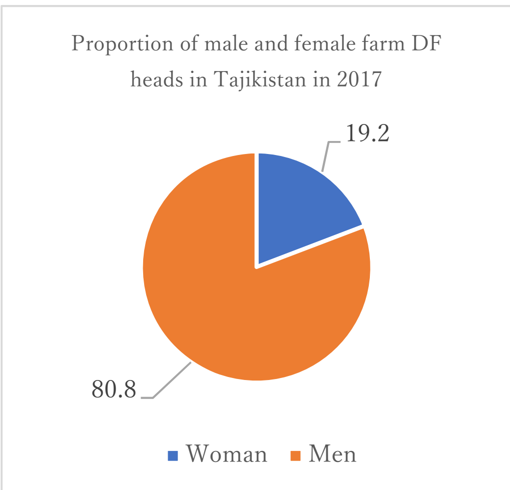
[21] https://www.adb.org/projects/53109-001/main

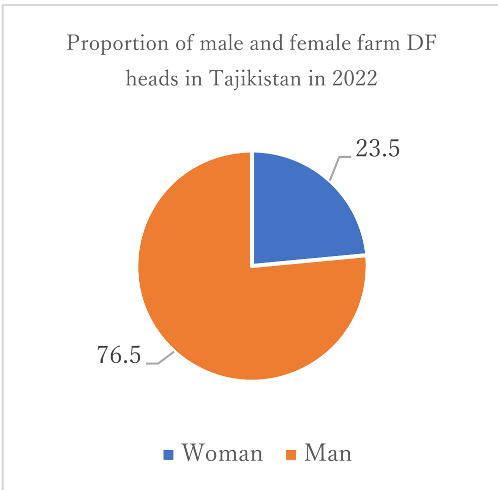
[22] ADB (2016): p.xx

Table 2.19: Gender Indicators for Tajikistan's Agricultural Sector in 2017 and 2022

Number of DF in each region of Tajikistan in 2017 and 2022											
		Total DF		Of these, Chief of DF				When set to %			
№		2017 year	2022 year	Man 2017 year	Man 2022 year	Woman 2017 year	Woman 2022 year	Man 2017 year	Man 2022 year	Woman 2017 year	Woman 2022 year
1	Republic of Tajikistan	164,631	172,107	133,016	133,617	31,615	38,490	80.8	77.6	19.2	22.4
2	GBAO	15,471	2,256	15,446	1,921	25	335	99.8	85.2	0.2	14.8
3	Soughd region	61,591	66,603	45,421	47,217	16,170	19,386	73.7	70.9	26.3	29.1
4	Khatlon region	57,609	68,090	47,612	55,973	9,997	12,117	82.6	82.2	17.4	17.8
5	Region of Repub lican Subordination	29,960	34,461	24,537	27,914	5,423	6,547	81.9	81	18.1	19
6	Tursunzoda	1,786	2,316	1,358	1,731	428	585	76	74.7	24	25.3
7	Hisor	3,914	4,140	3,021	3,113	893	1027	77.2	75.2	22.8	24.8
8	Shahrinav	881	1,752	683	1334	198	418	77.5	76.1	22.5	23.9
9	Rudaki	4,402	4,359	3,806	3,730	596	629	86.5	85.6	13.5	14.4
10	Varzob	662	599	647	485	15	114	97.7	81	2.3	19
11	Vahdat	6,681	8,964	4,404	6,723	2,277	2,241	65.9	75	34.1	25
12	Faizobod	3,519	3,862	2,903	3,156	616	706	82.5	81.7	17.5	18.3
13	Nurobod	910	850	885	803	25	47	97.3	94.5	2.7	5.5
14	Sangvor	557	575	530	516	27	59	95.2	89.7	4.8	10.3
15	Rasht	2,613	2,791	2,572	2,597	41	194	98.4	93	1.6	7
16	Tojikobod	1,315	1,401	1,102	1,130	213	271	83.8	80.7	16.2	19.3
17	Lakhsh	1,650	1,778	1,581	1,554	69	224	95.8	87.4	4.2	12.6
18	Rogun	1,070	1,074	1,045	1,042	25	32	97.7	97	2.3	3

Source: Agency on Statistics under the President of the Republic of Tajikistan





Source: Agency on Statistics under the President of the Republic of Tajikistan

Figure 2.32: Proportion of Male and Female Agricultural Sector Workers in Tajikistan in 2017 and 2022

2.7 Activities of Other Donors

2.7.1 World Bank (WB)

The WB has been conducting a wide range of support initiatives in Tajikistan. In the agricultural sector, the WB implemented the Second Public Employment for Sustainable Agriculture and Water Resources

Project with a total budget of USD 45.9 million from 2013 to 2020. Additionally, the WB and the European Union (EU) jointly implemented the Zarafshon Irrigation Rehabilitation and Management Improvement Project between 2018 and 2021, with a budget of USD 16.6 million.

The latest initiative is the Strengthening Resilience of the Agriculture Sector Project[23], which commenced in December 2022. Through this project, the WB supports activities focused on strengthening food and nutrition security and building resilience in the agricultural sector, as well as providing emergency assistance to vulnerable farmers in the form of seeds, fertilizers, and small farm machinery.

Specifically regarding agricultural machinery, the WB is implementing a project that supplies small tractors and implements to targeted farmer groups at approximately 30% of the market price. This project is being carried out directly by the WB without the involvement of the Ministry of Agriculture. The WB also plans to use 30% of the recovered machinery costs to establish repair workshops and inventory/storage systems for spare parts.

Furthermore, the WB is preparing to implement a USD 7 million grant project that provides implements such as tractors and rotary tillers as a set. However, specific information regarding the method of equipment distribution to farmers could not be obtained. Given the relevance of this initiative as a potential reference for JICA's grant aid projects involving small-scale agricultural machinery, it is necessary to continue gathering relevant information.

2.7.2 Food and Agriculture Organization of the United Nations (FAO)

Since January 2020, the FAO has been working on the dissemination of small agricultural machinery (e.g., tillers) in mountainous areas through the Support to Improved Agricultural Mechanization Services Project[24]. The FAO is also jointly implementing the Empowerment of Families Left Behind for Improved Migration Outcomes in Khatlon, Tajikistan Project with other donor agencies, focusing on agricultural extension services. The former project involves the distribution of small agricultural machinery to farmer groups and transferring technical know-how, including maintenance and operation skills. In light of the geographic characteristics of the target areas located in mountainous regions, the project specifically promotes small-scale machinery. Although there was a delay in its implementation due to the impact of COVID-19, the 2021 evaluation report stated that “Access to agricultural mechanization services has improved in at least 27 rural villages. Applications were submitted by trained farming communities to establish a total of 58 Agricultural Machinery Service Centers. In addition, three applications for machinery repair facilities are under evaluation. We will continue following up on these initiatives.” The latter project adopts a Farmer Field School (FFS) approach, targeting families left behind in rural areas due to the recent increase in labor migration. The project focuses on supporting groups with limited agricultural experience, such as women and school-aged youth, who face challenges managing farming activities. An article on the FAO website[25] in March 2024 reported that twenty women’s groups consisting of more than 500 women joined training in the FFS for Women initiative and that 50 junior FFS have been established in cooperation with schools in two districts of

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23 https://projects.worldbank.org/en/projects-operations/project-detail/P179851
24 https://openknowledge.fao.org/bitstreams/56589f47-8957-4edd-8c1a-0934865a279a/download
25 https://www.fao.org/europe/news/detail/tajikistan-s-rural-women-and-youth-increase-resiliency-against-gaps-left-by-labour-migration/en

Tajikistan to disseminate natural irrigation and various vegetable cultivation methods in school farms, including greenhouses.

In Tajikistan, where the agricultural extension system is not yet in place, the efforts of international aid organizations to cooperatively provide financial support and disseminate farming technology through project-based approaches represent a practical and effective solution to existing challenges.

2.7.3 Asian Development Bank (ADB)

ADB has partnered with Tajikistan since 1998, supporting many sectors and themes, including strategic road and energy infrastructure, health, skills development, agriculture, food security, and finance.

Recent projects in the agriculture sector include:

- “Water Resources Management in the Pyanj River Basin Project (Second Additional Financing)” from 2017 to 2024 with a budget of USD 45 million, and “Water Resources Management in the Pyanj River Basin Project (Additional Financing Hydromet)” from 2019 to 2023 with a budget of USD 11.5 million.
- Climate- and Disaster-Resilient Irrigation and Drainage Modernization in the Vakhsh River Basin Project
  In parallel with the modernization policy of agriculture in this project, water sector reforms are also underway, and irrigation development is being achieved by introducing river basin management techniques. As a result, the current water management situation in Tajikistan is as follows.
  (1) Many facilities were constructed during the Soviet Union era and are now dilapidated (these are being updated through this project).
  (2) AGENCY FOR LAND RECLAMATION AND IRRIGATION UNDER THE GOVERNMENT OF THE REPUBLIC OF TAJIKISTAN (ALRI) will guide Water Users Associations (WUAs) to implement irrigation projects.
  (3) Currently, there are 400 WUAs managing irrigation facilities, and their role is becoming increasingly important.
  (4) At the beginning of each planting season, WUAs are responsible for calculating the water requirements within their jurisdiction based on the production plans (area and planting period) for each crop in the beneficiary areas and formulating water supply plans. In addition, based on the water supply plan, they supply water to the main and secondary canals, open and close gates, and operate and maintain facilities such as pumps.

2.7.4 International Fund for Agricultural Development (IFAD)

IFAD invests in Tajikistan's rural poor, strengthening local institutions and grassroots organizations, and increasing access to land, productive technologies, and resources. Its main activities include natural resource management, implementing land reform, and strengthening local institutions and grassroots organizations.

The following projects are currently ongoing:

- Community-based Agricultural Support Project (CASP) (2017-24), CASP 'plus' (2021-28)

- For IFAD's gender-related initiatives, see "2.6.2 Gender Perspective in Other Donor Assistance in the Agricultural Sector."

2.7.5 Other Institutions and Organizations

- Aga Khan Foundation (AKF) plans to conduct its own SHEP training in Gorno-Badakhshan Autonomous Province.
- USAID's "Feed the Future" program is ongoing until July 2025. As a Family Farming Program, it is working to expand water access in cooperation with water user associations.
- Previously, from 2010 to 2014, the initial Family Farming Program was implemented with a budget of USD 20 million.
- IsDB implemented the Dangara Valley Irrigation Network Project from 2002 to 2020 with a budget of USD 33 million.

2.8 Survey for Procurement and Taxation, Registration for Agricultural Machinery, and Agricultural Activity Costs

2.8.1 Procurement of Agricultural Machinery

(1) Japanese agricultural machinery manufacturers and export trading companies

1) Agricultural machinery manufacturers

Japanese agricultural machinery has high performance, but in order to fully utilize its capabilities, it must be designed and set up to suit the farmland. Because overseas markets require settings appropriate for the country of use, many agricultural machinery manufacturers have been reluctant to expand into Central Asia, and Yanmar Co. was the only manufacturer currently capable of handling the market (Mitsubishi Mahindra may enter the market in the future). Table 2.20 shows details of the main Japanese agricultural machinery manufacturers.

Table 2.20: Japanese Manufacturers' Initiatives in Central Asia

Manufacturer	Strategy for Central Asia
Yanmar Co., Ltd.	**The Tajikistan market can be supplied via Yanmar Turkey** Tractors are made/assembled in Thailand, and tillers in Indonesia. Some implements/attachments are made/assembled in India, but those for this project would be made by Sugano Farm Machinery Manufacturing Co., Ltd. in Japan.
Kubota Corporation	No current inroads to Central Asia, but have experience through the "2KR" assistance project in the 2010s. A possible supply route is via local sales companies in Turkey, but they are very busy with business in Turkey, with **no capacity to expand into the Central Asia market.** Tractors for the African market are made domestically, but are planned to be made/assembled in India in future. Combine harvesters for overseas markets are made/assembled in Thailand.
Iseki & Co., Ltd.	Although they have branches in Europe, Southeast Asia, and China, they are focused on the domestic market, and **scaling down overseas business.**
Mitsubishi Mahindra Agricultural Machinery Co., Ltd.	Manufactures various agricultural machinery including tractors (main factory is in Shimane Prefecture, Japan). Mainly focused on the African market, with no experience in the Central Asia market. **They have expressed the intention to expand their business into Central Asia in the future.**

Source: Survey Team

2) Export trading companies

Interviews were conducted with trading companies that may handle Japanese agricultural machinery exports. As indicated in 1), Yanmar is the only agricultural machinery manufacturer that can currently handle exports, and the trading companies interviewed here were Toyota Tsusho, Tech International, and Nishizawa. Table 2.21 shows the status of each company's response.

Table 2.21: Japanese Trading Companies' Business in Tajikistan

Trading Company	Business in Tajikistan / Possibility of dealing with agricultural machinery
Toyota Tsusho Corp.	They have four departments in charge of ODA: 1) Automotive Dept, 2) Plant Dept, 3) Africa Dept, 4) Construction Machinery & Technology Dept - ODA Group. Agricultural machinery is handled by 4) ODA Group, which has experience in Bhutan, Armenia, and **has also delivered large-sized Belarusian agricultural machinery to Tajikistan via the 2KR project. They also joined the JICA Tajik Agricultural Machinery Survey in 2018, and have connections with MoA, TAL, and MTCs in Tajikistan.**
Tec International Inc.	**They have experience in Tajikistan, including the Dushanbe Airport and Roads Project,** and it is possible to contact their local cooperating agents. They would be handling Yanmar products, as they know that other manufacturers are reluctant to enter the CIS area for agricultural machinery.
Ogawa Seiki Co., Ltd.	They have an office in Uzbekistan and **manage the Tajikistan business from Tashkent. They have contact with Mitsubishi Mahindra for expanding overseas business**, and are open to considering possibilities in the Tajikistan market through this project.
Nishizawa Ltd.	**They have experience in handling agricultural machinery for the Africa market**, and are available to supply to Tajikistan. The only potential manufacturer for them is Yanmar, and it would be difficult to deal with other manufacturers.
Mitsubishi Corp.	ODA Dept. scaled down and abolished in 2023. In Central Asia, they are only dealing with gas turbine (GT) projects in Uzbekistan, which is set wind down in the near future. **It will be difficult for them to handle agricultural machinery in Central Asia.**
Itochu Corp.	Tajikistan is under the area of their Kazakhstan office. **At present, they are not handling agricultural machinery in Central Asia.** In the Agricultural sector, they deal with Uzbekistan's fertilizer production, and import this to Japan. Uzbekistan's fertilizers include urea, ammonium sulfate, potassium chloride and NPK, which are also exported to Tajikistan, with Tajikistan exporting little fertilizer.
Sumitomo Corp.	They are involved in the sale of Toyota motor vehicles in Tajikistan with Tajik Motor, a local conglomerate that handles sales and maintenance. Tajik Motor has **no experience with agricultural machinery, and would need to establish a new structure for agricultural machinery business.**

Source: Survey Team

(2) Country risk where shipments pass

Figure 2.33 shows the 2024 Country Risk Map by Nippon Export and Investment Insurance (NEXI), an organization under the Japanese government. Although the risk assessment of trade insurance is not directly linked to that of the transport route, it will be a reference for selecting the transport route. Based on this map, the most suitable transport route looks to be (China > Kazakhstan > Uzbekistan >) or (Turkey/Georgia > Azerbaijan > Caspian Sea >).

Source: Dehkan farms detailed at https://www.nexi.go.jp/service/

Figure 2.33: Country Risk Map

(3) Transport route and costs

Transporting agricultural machinery from Japan to Tajikistan requires a combination of sea and land routes (railroad and/or truck transport). On the other hand, many Japanese manufacturers produce various parts of their agricultural machinery catalog overseas; for example, Company A might produce tractors in Thailand, tillers in Indonesia, and implements in India or domestically, while Company B might produce tractors in India, and combine harvesters in Thailand. For this reason, multiple transportation routes shall be considered, taking into account the shipping location.

The information collected in the survey pertaining to transportation can be summarized below.

1) When using the Trans-Siberian Railway and railways in China, 40ft containers are preferable to avoid handling issues. The cost difference between 40ft and 20ft containers is only in the range of 5~10%, so considering the cargo handling priority by transit countries, 20ft containers should be avoided. In addition, since transporting to Tajikistan involves long distances and containers of transport companies are assumed to be returned, the method of container disposal, whether by purchasing containers second-hand and donating to the recipient country free of charge, or selling them, must be determined in advance as a contract condition and included in miscellaneous expenses.
2) Export costs include the cost of packaging equipment and domestic transportation to the shipping port, in addition to customs clearance fees, with each cost varying depending on the conditions (various expenses for Japanese domestic exports in this survey were approximately 250,000 yen).
3) Local costs at destination, in addition to incidental costs upon customs clearance, vary depending on the conditions of the transportation and delivery work to the final delivery destination after customs clearance, distance from customs to final destination, the method of disposal of the container, etc. (local expenses in this survey were approximately 10,000 USD).

4) In this survey, there was no significant difference in cost between shipping ports (in Japan, Thailand, and Indonesia), but the number of days required for sea transport will influence the cost. For example, the sea transport this time was via the Suez Canal to Turkey, but if the route via the Cape of Good Hope, Strait of Gibraltar, and the Mediterranean Sea were forced instead, the cost would have increased significantly due to the greater number of sea transport days. Therefore, moving forward, it will be necessary to consider any potential logistical impacts of the Israeli-Palestinian conflict.

Table 22 summarizes the transport routes and estimated transportation costs.

Table 2.22: Transport Routes to Tajikistan and Estimated Cost

	No.	Shipping Port	Method	Stopover 1	Method	Stopover 2	Method	Stopover 3	Method	Destination	Remarks
Packing by 40ft or 20ft container (20ft container recommended for non-railway land shipping)	1	Japan (Japan Sea or Pacific side port)	Mari-time	Nakhodka or Vladivostok/Far East	Rail	Kazakhstan	Rail	Uzbekistan	Rail	⇒Dushanbe Station II	Route via Russia (Trans-Siberian Railway) All railways 1520mm gauge
		Export costs for shipping	Transport cost: Approx. USD 20,000 per 40ft container							Customs fees and costs	Unavailable route Cost estimates based on 2023 figures
	2	Yokohama, Japan	Mari-time	China, Lianyungang	Rail	Kazafstan, Kolgos (Altynkol)	Rail	Uzbekistan	Rail	⇒Dushanbe Station II	Gauge: China 1435mm ⇒ CIS1520mm Requires transshipment
		Export costs for shipping Approx. JPY 150,000	Transport cost Approx. USD 17,000 per 40ft container							Customs fees and costs Approx. USD 5,000	April 2023 estimate Transport period: 3 months (including wait at Lianyungang)
	3	Yokohama, Japan	Mari-time	China, Lianyungang	Truck	Kazakhstan, Kolgos (Altynkol)	Truck	Uzbekistan	Truck	⇒Dushanbe Truck terminal	Result for 2022 SATREPS project China, Lianyungang > Truck transport
		Export costs for shipping	Transport cost 20ft container; No estimate							Customs fees and costs	Luggage stuck in Lianyungang for 4 months
	4	Yokohama, Japan	Mari-time	Georgia, Poti Port	Rail	Azerbaijan, Baku Port	Caspian Sea	Turkmenistan Uzbekistan	Rail	⇒Dushanbe Station II	Standard route via Black Sea Currently unavailable
		Export costs for shipping	Transport cost No estimate							Customs fees and costs	No shipping company estimate
	5	Yokohama, Japan	Mari-time	Iran, Bandar Abbas Port	Truck	Turkmenistan	Truck	Uzbekistan	Truck	⇒ Dushanbe truck terminal	Route currently unavailable
		Export costs for shipping	Transport cost Approx. USD 12,000 per 40ft container; Approx. USD 11,000 per 20ft container							Customs fees and costs	Estimated in July 2023 by local trading company in Tajikistan
	6	Yokohama, Japan	Mari-time	Turkey, Mersin Port	Truck	Iran	Truck	Turkmenistan Uzbekistan	Truck	⇒ Dushanbe truck terminal	Route currently unavailable; transport costs likely to be higher than No. 5 above
		Export costs for shipping	Transport cost No estimate							Customs fees and costs	No shipping company estimate
	Actual results for this Project 7	Yokohama, Japan	Mari-time	Turkey, Mersin Port	Truck	Azerbaijan, Baku Port	Caspian Sea	Turkmenistan, Turkmenbashi Port	Truck	⇒ Dushanbe truck terminal	Attachments/ Implements Sugano Farm Machinery MFG
		Export costs ~ JPY 250,000	Transport cost (unloaded at Mersin Port) Approx. USD 17,000 per 20ft container							Customs fees and costs **	Truck transport from Mersin Port
		Laem Chabang Thailand	Mari-time	Turkey, Mersin Port	Truck	Azerbaijan, Baku Port	Caspian Sea	Turkmenistan, Turkmenbashi Port	Truck	⇒ Dushanbe truck terminal	Tractor (Yanmar)
		– – –	Transport cost (unloaded at Mersin Port)* Approx. USD 18,000 per 40ft container							Customs fees and costs **	* 20ft & 40ft cargo transported together by truck from Mersin Port
		Surabaya Indonesia	Mari-time	Turkey, Mersin Port	Truck	Azerbaijan, Baku Port	Caspian Sea	Turkmenistan, Turkmenbashi Port	Truck	⇒ Dushanbe truck terminal	Tiller (Yanmar)
		– – –	Transport cost (unloaded at Mersin Port)* Approx USD 17,000 per 20ft container							Customs fees and costs **	* 20ft & 40ft cargo transported together by truck from Mersin Port

Export costs for shipping: Various costs (packaging, etc.) and customs duties for export shipping
Customs fees and costs: Customs clearance fees, customs incidental fees, local delivery fees, etc. (depends on delivery location)
** Actual customs fees and cost for this project: Approx. USD 10,000 (sum total for 3 containers)

Source: Survey Team

An explanation of the above table is as follows.

1) via Trans-Siberian Railway; Far East loading (No. 1 in Table 2.22)

Involves maritime shipping from Japan to Nakhodka or Vladivostok, containers moved to trains, and then transported by the Trans-Siberian Railway. This route does not require the transfer of freight car trains, making it an inexpensive route that would likely be used under normal social circumstances. However, this is no longer viable due to the situation in Ukraine.

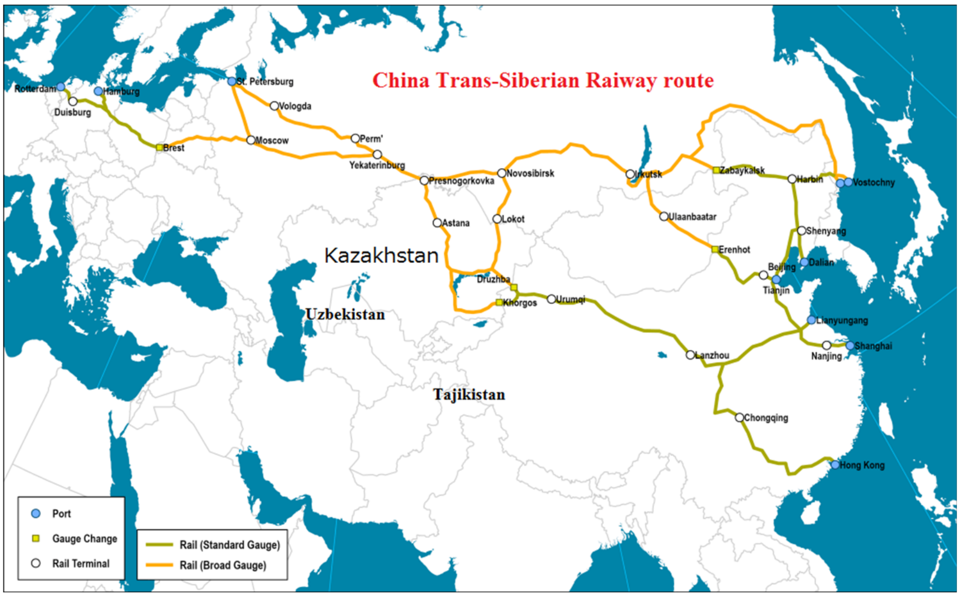
Currently, most shipping companies decline to provide estimates for the cost of this transportation route, but with the cooperation of one trading company, we were able to provide an approximate cost based on 2023 performance. The presumed transportation cost for a 40ft container came to approximately USD 20 thousand.

2) via China (No. 2 in Table 2.22)

As an alternative route to the above item 1), there is a transport route from Lianyungang, China via Khorgos (Altynkol), Kazakhstan, which does not pass through Russia. When transporting via rail on this route, the railway gauge in Kazakhstan is the broad gauge 1,520 mm of the former Soviet Union, which is different from the 1,435 mm standard gauge of China, so freight cars must be changed at the Kazakhstan border station. The estimated transportation cost (2023-2024) for a 40 ft container came to approximately USD 17 thousand by several shipping companies.

However, Russian imports via China have increased since the invasion of Ukraine, and coupled with the impact of the COVID-19 pandemic, transportation time via China was about three months. In the actual case at the end of 2022, there was a 4-month cargo backlog at Lianyungang (No. 3 in Table 2.22). Currently, the effects of COVID-19 have subsided and the transportation period is estimated at just over two months.

Figure 2.34 shows a portion of the railway routes via the Trans-Siberian Railway and via China described in the above 1) and 2) respectively. The route takes the train from Kazakhstan to Tajikistan via Uzbekistan's railway line, and the railway gauge is the broad gauge of the former Soviet Union, meaning no freight car change will need to be conducted beyond Kazakhstan to reach Tajikistan, even for routes via China.



Source: https://transportgeography.org/contents/chapter7/transborder-crossborder-transportation/aurasian-landbridge/

Figure 2.34: Trans-Siberian and Chinese Railway Routes to Kazakhstan

3) via the Black Sea

If utilizing sea transport as the main method, the ideal route would be to unload the goods at Poti port in Georgia and use the former Soviet Union's broad-gauge rail transport network, which would not require the transfer of freight cars. But this route would require passing through the Black Sea, and the Ukraine-Russia situation currently makes this route impossible. So, all shipping companies are declining to estimate this transportation cost.

4) via Iran (No. 5 in Table 2.22)

Due to UN sanctions against Iran, transport via Iran is essentially impossible. Even if the sanctions are lifted, rail transport introduces the same railway gauge problem as via China, necessitating transshipment. It would be more advantageous to utilize truck transport from the port, but land transport is expensive.

Regarding transportation costs, Japanese companies declined to estimate, so we obtained a rough estimation from a local trading company in Tajikistan. According to the obtained estimation, the transportation cost by 40 ft container is approximately USD 12 thousand, or USD 11 thousand by 20 ft container, with only a USD 1 thousand difference.

5) via Turkey (No. 7 in Table 2.22; route used in this survey)

For this survey, truck transportation was chosen as the transport method after maritime unloading. Cargo was shipped to Mersin Port, Turkey, where this was unloaded and transferred to a truck. The truck transport route was then ⇒ Georgia ⇒ Azerbaijan ⇒ Caspian Sea ⇒ Turkmenistan ⇒ Uzbekistan ⇒ Tajikistan. In the case of routes via Turkey, it would be possible to pass through Iran by rail after unloading at Mersin, but the route would require changing freight cars caused by the railway gauge, and also for the same reasons as in item 4), the route which passes through Iran would not be viable.

The transportation carried out in this survey has three shipping ports of origin, so transportation costs were calculated in three parts. However, regardless of the shipping port (Yokohama, Thailand, or Indonesia), the costs were approximately USD 17 thousand for 20 ft and approximately USD 18 thousand for 40 ft containers.

6) via Cape of Good Hope

Due to the Israeli-Palestinian conflict, transport via the Suez Canal is currently problematic. Trading companies speculate that alternate transport costs via the Cape of Good Hope would be 30% higher or more compared to via the Suez Canal.

A comparison of transportation costs for the four routes above for which estimates could be obtained, excluding export expenses before shipping and local charges at the destination, is as follows.

(a) via Trans-Siberian Railway; Far East loading (No. 1)
Approx. USD 20 thousand per 40 ft container (estimate by one Japanese company)

(b) via China Railway; Lianyungang loading (No. 2)
Approx. USD 17 thousand per 40 ft container (estimated by several Japanese companies)

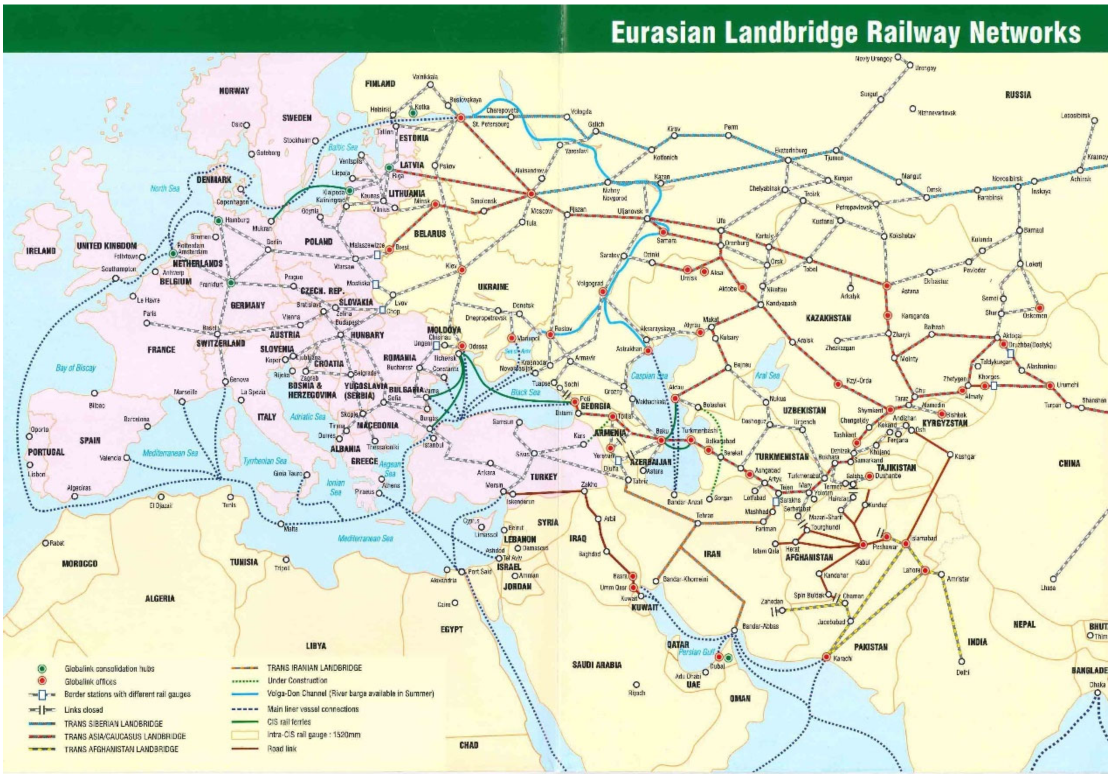
(c) via Iran (No. 5)
Approx. USD 12 thousand and USD 11 thousand for 40 ft and 20 ft containers, respectively (estimate by Tajikistan local trading company)

(d) via Turkey; by truck (No. 7) (route and cost for this project)
Approx. USD 18 thousand and USD 17 thousand for 40 ft and 20 ft containers, respectively; this route is very long, and costs are estimated to be higher compared to other routes.
However, it was forecast that transportation expenses would increase drastically due to the Suez Canal becoming unusable due to the Israel-Palestine conflict, in which case a route via the Cape of Good Hope would be required.

It was thought that costs would vary noticeably depending on the transportation route, but in this comparison, the difference was not large, except for via Iran. When providing equipment assistance in the future, it will be necessary to consider routes based on up-to-date estimates, risk factors, and the expected number of days for transportation.

(4) Transport approach route to Tajikistan

Figure 2.35 details the approach route into Tajikistan described in the above item (3).



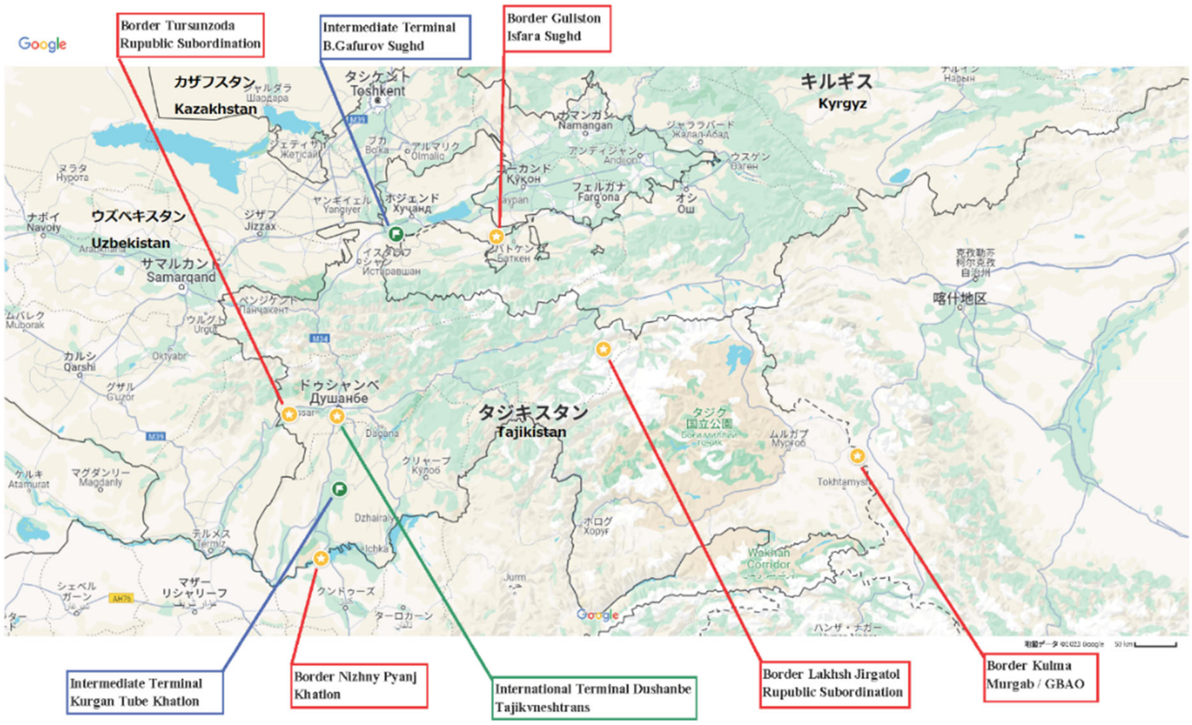
Source: Obtained from Japanese trading company

Figure 2.35: Transport Route to Tajikistan

(5) Location of the Tajikistan border customs

Tajikistan has six border customs offices: one at the border with China, two at the border with Kyrgyzstan, one at the border with Afghanistan, one at the border with Uzbekistan, and one in the capital, Dushanbe. In the capital, there are rail and truck customs terminals, and customs clearance for air cargo is also handled at Dushanbe. The Kulma border crossing at the Chinese border exists as an overland route for customs clearance, but it is in a remote location and goes through a mountain pass at an altitude of nearly 4,000 m, so the road conditions are poor. As such, it is rarely chosen as a transportation route when importing equipment from Japan, and transportation companies do not recommend its use. Therefore, the route through Tursunzoda customs on the Uzbekistan border is that which is typically used when importing from Japan.

Figure 2.36 shows the location of Tajikistan customs office-related facilities.



Source: Prepared by the Study Team using Google Maps data

Figure 2.36: Location of Customs Offices in Tajikistan

(6) Type inspection and registration of agricultural machinery

1) Type inspection of agricultural machinery

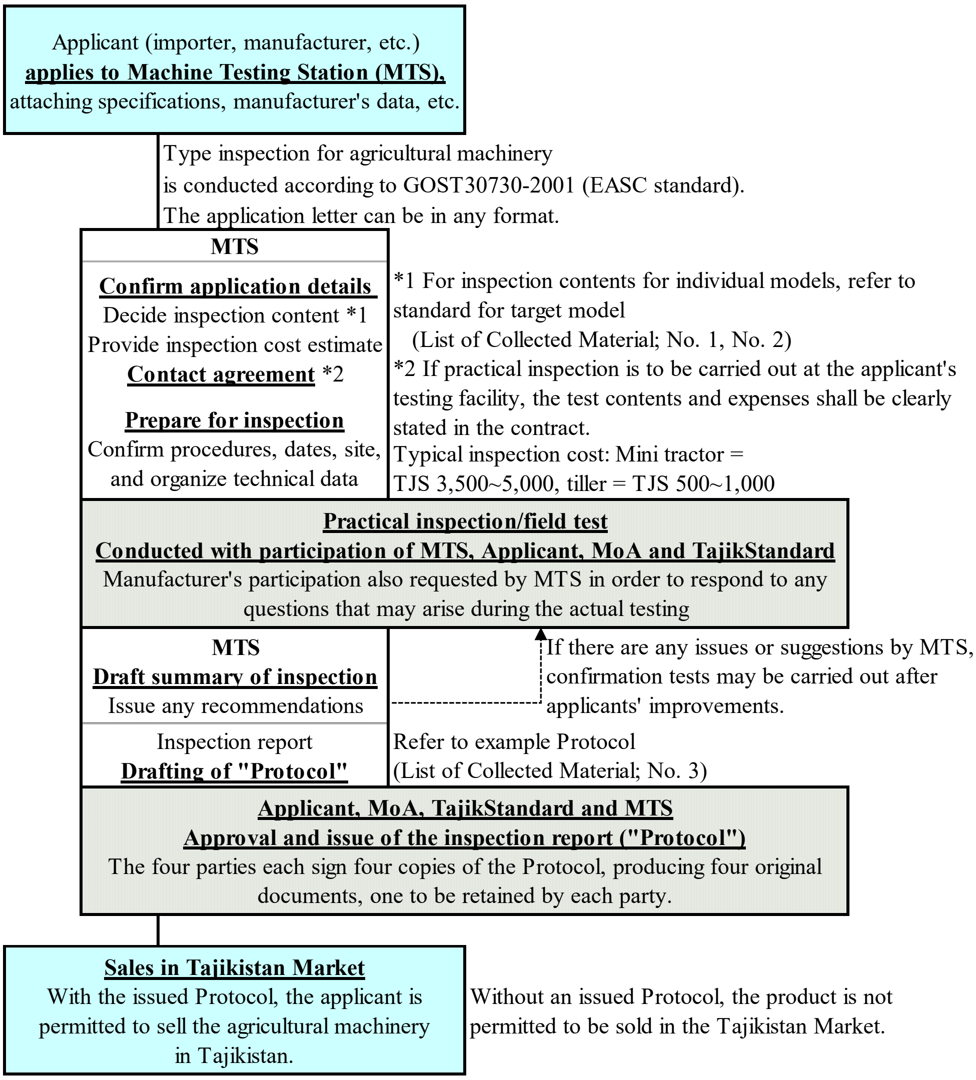
To distribute agricultural machinery in Tajikistan, it must first pass a type inspection conducted by a national testing institution certified by TajikStandard[26]. For agricultural machinery, the certified agency is the Tajik State Institute of Machine Testing Station (MTS) under the MoA. TajikStandard: Agency of Standardization, Metrology, Certification and Trade Inspection under the Government of TajikistanThe inspection regulations for agricultural machinery are based on the "Tractors and farm implements certification procedure; GOST30730-2001" (refer to Appendix 5: List of Collected Material, No. 1), standard established by the Euro-Asian Council for Standardization, Metrology and Certification (Euro-Asian Standard Council: EASC), which has members comprising 11 CIS countries and adapts operations to the circumstances of each. In Tajikistan, inspection methods have been determined by a model. (Refer to Appendix 5: List of Collected Material, No. 2 for the agricultural machinery standards list)

For type inspections, applicants such as manufacturers or import trading companies submit an inspection application letter in any format to MTS. After checking the application, MTS issues an inspection cost estimate and exchanges contract documents with the applicant before starting the inspection. If MTS identifies any issues or suggests improvements based on the result of the inspection, applicants should make improvements to the machinery for the identified issues. Depending on the report on improvements by the applicant, MTS judges whether to re-inspect for confirmation or check

[26] TajikStandard: Agency of Standardization, Metrology, Certification and Trade Inspection under the Government of Tajikistan

the report only. Upon such confirmation, MTS prepares the test report (Protocol). The Protocol is prepared in four to be signed by the MoA, TajikStandard, MTS, and the applicant. The four signed documents then become the official inspection result report, with each of the four parties retaining an original copy. Agricultural machinery and related parts can be sold in Tajikistan only after the Protocol has been issued. (Refer to Appendix 5: List of Collected Material, No. 3 for Protocol example)

The flow of type inspection is shown in Figure 2.37.



Source: Survey Team

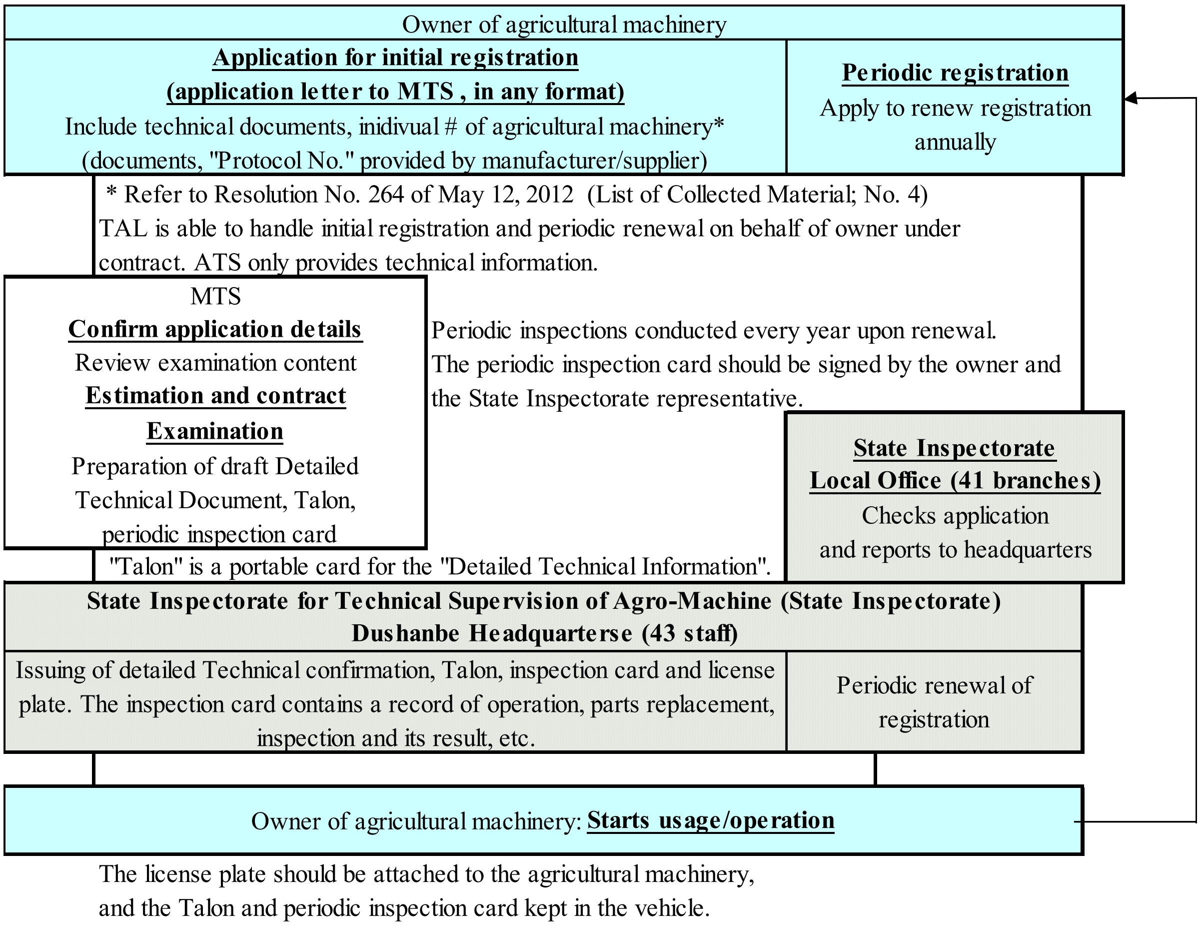
Figure 2.37: Flow of Type Inspection

2) Registration of Agricultural Machinery

When using agricultural machinery, the owner should complete vehicle registration procedures for each machine in accordance with the Agricultural Machinery Registration Regulations before starting use. (Refer to Appendix 5: List of Collected Material, No. 4) For initial registration, the owner should submit the application form for each machine to MTS, which then conducts a technical review and reports the results to the "State Inspectorate for Technical Supervision of Agro-Machine" (hereinafter

"State Inspectorate"). The State Inspectorate issues the License Plate, Detailed Technical Information, "Talon" (portable card simplifying Detailed Technical Information), and Regular Inspection Record Card. Owners should display and carry on their agricultural machinery all of these documents issued to them, except the Detailed Technical Information. This application system is very similar to Japan's automobile registration system. Owners have to renew their agricultural machinery registration every year with the State Inspectorate. On the Regular Inspection Record Card, inspection results are recorded, as well as machinery parts replacement, etc., so with this it is possible to confirm that proper maintenance is being carried out.

The flow of registration and periodic inspection for agricultural machinery is shown in Figure 2.38.



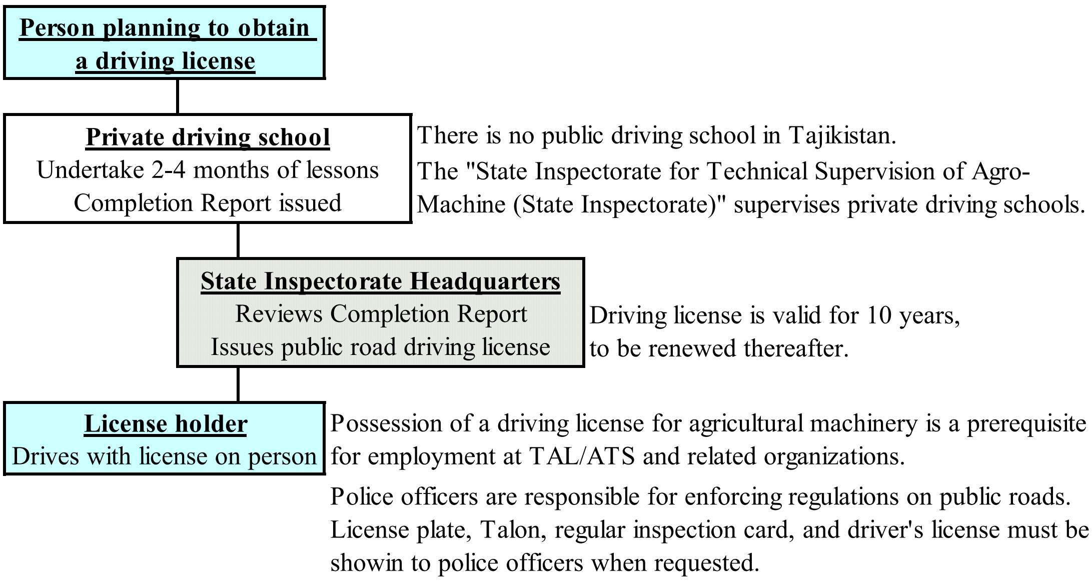
Source: Survey Team

Figure 2.38: Flow of Registration and Periodic Inspection for Agricultural Machinery

3) Public road driving license for agricultural machinery

When operating agricultural machinery only within private areas or farmland, a driving license is not required, and even minors are able to operate it. However, when driving Agricultural machinery on public roads, a driving license for agricultural machinery is required, the same as a car driving license. Those who wish to obtain such a license must complete lectures, exams, and practical training at a private driving school, in order to obtain a driving license from the State Inspectorate. The driver should carry the license on their person at all times when driving agricultural machinery. Driving licenses must be renewed every 10 years. When a police officer conducts a check of the vehicle and driver, they will request and confirm this license along with the License Plate, Talon, and Periodic Inspection Card described in item (2).

The flow for obtaining an agricultural machinery driving license is shown in Figure 2.39.



Source: Survey Team

Figure 2.39: Flow of Obtaining a Driving License for Agricultural Machinery

(7) Local importers and dealers of agricultural machinery

As described in item (6), in order to sell agricultural machinery in Tajikistan, it is necessary to comply with the procedures for type inspection and individual vehicle registration. There are three major trading companies and dealers of agricultural machinery in Tajikistan: ATS, TAJ-Iran, and JSC Madadi Tursunzoda. The survey team has enjoyed some form of contract with, or support from each, and recognizes that all three possess a high degree of technical ability.

ATS has a technical partnership with a Belarusian manufacturer of agricultural machinery, manufacturing trailers and other implements domestically, and also deals in Chinese agricultural machinery. TAJ-Iran is a joint venture with an Iranian manufacturer of agricultural machinery offering manufacturer support. Madadi Tursunzoda also deals mainly in Belarusian agricultural machinery and is presumably supported by the manufacturers under warranty, although this has not been confirmed. All three agricultural machinery companies have high capabilities in applying for type inspection and registration procedures for agricultural machinery, and so TAL, under the MoA, procures agricultural machinery only from these three companies. There were no other major dealers identified in Tajikistan within the scope of the survey.

The barrier to market entry for Japanese manufacturers in Tajikistan is very high on account of the need for an agency that is technically capable of applying for type inspections and registration procedures, etc. One effective market entry method for Japanese companies would be to establish a local branch, or contract with one of the above-mentioned agricultural machinery companies, excluding the Iranian joint venture TAJ-Iran, and make a system for dealing with type inspections, etc.

2.8.2 Taxes and Farming Costs in Tajikistan

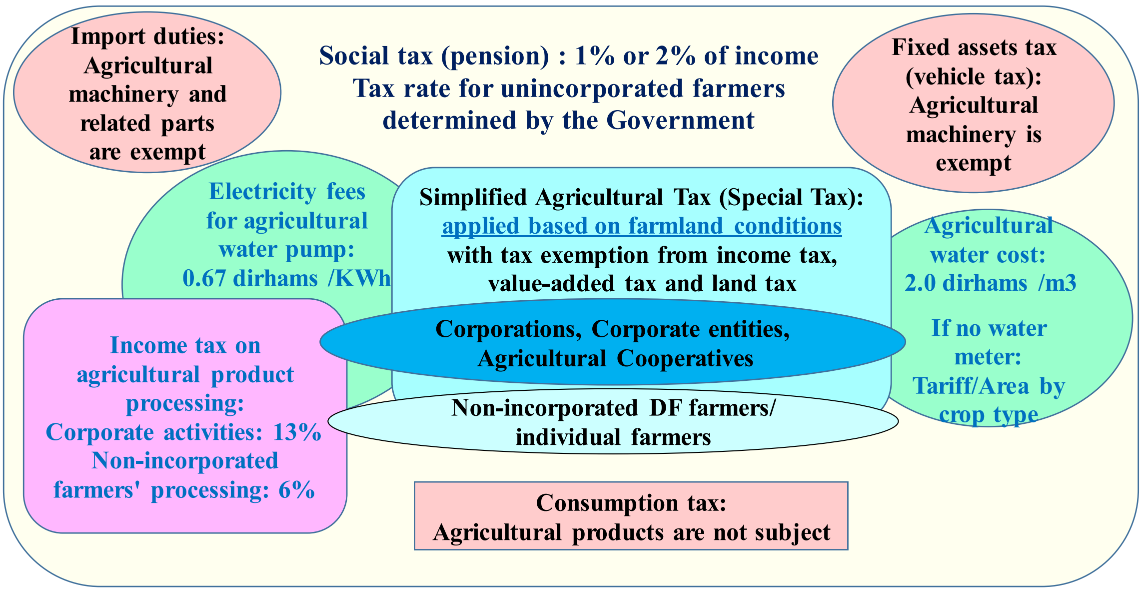
Tajikistan's taxes consist of custom duties levied at the time of import, and the following domestic taxes: 1) income tax, 2) Value Added Tax (VAT), 3) consumption tax, 4) natural resource tax, 5) social tax (pension), 6) consumption tax on primary aluminum, 7) fixed assets tax, and 8) special tax. VAT and consumption tax are collected at the same time as customs duties upon import, and later deducted from domestic payments or refunded. Table 2.23 shows a list of taxes in Tajikistan.

Table 2.23: Domestic Taxes in Tajikistan

	Classification Type	Outline (contents relating to agriculture)
	Customs duty (Customs Code) Customs duty rate (Resolution No. 399)	Subjects: Agricultural machinery/parts, and seeds of high-quality crops are exempt; fertilizers are taxed. Tax rates by item are 0%-30% (typically ~15%), plus customs clearance fees.
1)	Income tax (Tax Code, Chapters 25~35); Chapter 25, Article 183	Individuals: Residents 12%, Non-residents 20%, Agro-processing 6%, Others 15% Entities: Production activities (inc. agricultural processing) 13%, Others 18-20%
2)	Value Added Tax (VAT) (Tax Code, Chapters 36~43)	Subjects (standard rate 15%): Product imports and domestic sales over an annual income of TJS 1 million (excludes exports).
3)	Consumption tax (Tax Code, Chapter 44)	Subjects: Beverages, tobacco/nicotine products, mineral fuels, transport vehicles, precious metals & jewellery, etc.; agricultural machinery and products not included.
4)	Tax on natural resources (Tax Code, Chapter 45)	Subjects: Includes water use, but agricultural irrigation water fees excluded, being under ALRI jurisdiction.
5)	Social tax (Tax Code, Chapter 46)	Pension: 1% to 2% of income; for non-incorporated individual/DF farmers, tax rate is decided separately by the Government.
6)	Sales tax (Tax Code, Chapter 47)	Subject: Primary aluminum
7)	Fixed assets tax (Tax Code, Chapter 48)	Subject: Real estate tax, land tax, vehicle tax; agricultural machinery inc. tractors, grain harvest combines and cotton harvesting machinery exempt from vehicle tax; depreciation at fixed rate of 9% p.a.
8)	Special tax (Tax Code, Chapters 49~56)	Categories: Free economic zone tax, securities market tax, patent tax, small and medium-sized entities tax, unified agricultural tax.

Source: Survey Team

Figure 2.40 shows a conceptual diagram of taxes and costs related to farming overall. Each component will be explained subsequently.



Source: Survey Team

Figure 2.40: Conceptual Diagram of Taxes and Costs Related to Farming

Regarding the collection of tax information for Tajikistan by Japanese companies, we were informed by JICA that "OCAJI (Overseas Construction Association of Japan) doesn't have sufficient tax information for the agricultural sphere in Tajikistan." Accordingly, the Study Team implemented a data collection survey in detail, through on-site survey information as well as sourcing data online, and compiled the latest tax-related information as follows.

(1) Customs duty

This includes "customs duties" and "incidental fees" which comprise the (a) customs clearance fee, (b) customs escort fee, (c) warehouse charge, and (d) issuance charge for the customs qualification certificate. In Customs Tariff Decree No. 399 Annex No. 1, tariffs are classified into 97 groups, and rates are set for each sub-category under that group (see Appendix 5, List of Collected Materials No. 5 (Customs Act) and No. 6 (Import Tariff Provisions)).

Table 2.24 shows the fees for import customs clearance based on Decree No. 137 (see Appendix 5: List of Collected Material, No. 7 (Customs Clearance Fee Regulations)).

Table 2.24: Fees for Import Customs Clearance to Tajikistan

Incidental fees for customs clearance

Fee Type	Tariff (USD)
Customs clearance fees	See Table on right
Customs escort fees (per 10km)	2
Warehouse charge*	
Each vehicle (per day)	0.5
Each 50kg of goods (per day)	0.01
Issuance charge for customs qualification certificate	50

* Warehouse charge to be paid to warehouse owner

Customs clearance fee table

Value of Goods (USD)	Tariff (USD)
5,001 or less	10
5,001 ~ 10,001	20
10,001 ~ 50,001	70
50,001 ~ 100,001	150
100,001 or more	450

Government Order No. 137, revised on March 3, 2011

Source: Customs Clearance Fee Regulations (Appendix 5: List of Collected Material, No. 7)

1) Tax on exported goods

For export goods, domestic taxes (VAT, Consumption tax) are either exempted or refunded if they have already been paid domestically (see Chapter 19, Article 166 of the Customs Act; Chapter 44, Article 286 of the Taxation Law (Appendix 5: List of Collected Material, No. 8)).

2) Tax on agricultural machinery imports

Generally, for imported goods, customs duties and incidental fees are incurred. In addition, VAT and Consumption tax are also collected when passing through customs (Customs Code, Chapter 1, Article 10).

However, grant aid and agricultural machinery on the government's approved list are exempt from customs duties (Customs Code, Chapter 41, Article 345). In addition, agricultural machinery is exempt from VAT, and also not subject to consumption tax (Tax Code, Chapter 39 Article 251, and Chapter 44 Article 282). Therefore, if the agricultural machinery is of a type registered as per the procedures in the above-mentioned item 2.8.1(6) 1), it will not be subject to customs duty or VAT/consumption tax.

3) Tax on crop seeds and fertilizers

Imports of premium crop seeds and their first crop production will be exempt from customs duties, and VAT reduced by half (Chapter 11 Article 15 in "State Budget Program 2024"; refer to Appendix 5: List of Collected Material, No. 9). On the other hand, there are no tax exemptions for imported fertilizer.

4) Customs clearance and delivery procedures

The consignee should prepare the necessary documents for customs clearance and apply as per the following steps:

(a) Obtain documents concerning the imported equipment (packing list, equipment manuals, etc.), from the contractor, i.e. manufacturer and/or import trading company.

(b) Attach the contract documents with the contractor, and evidence of aid assistance (GA, Exchange of Notes (EoN), approval letter by the Tajikistan Government, etc.) with the above documents in (a), and apply via letter to the Customs Service. However, in the case of GA, etc., the letter should be submitted to the Customs Service via the competent ministry/authority (MoA in the case of this survey). To facilitate smooth customs clearance, application forms and attachments must be prepared in Russian as well as English.

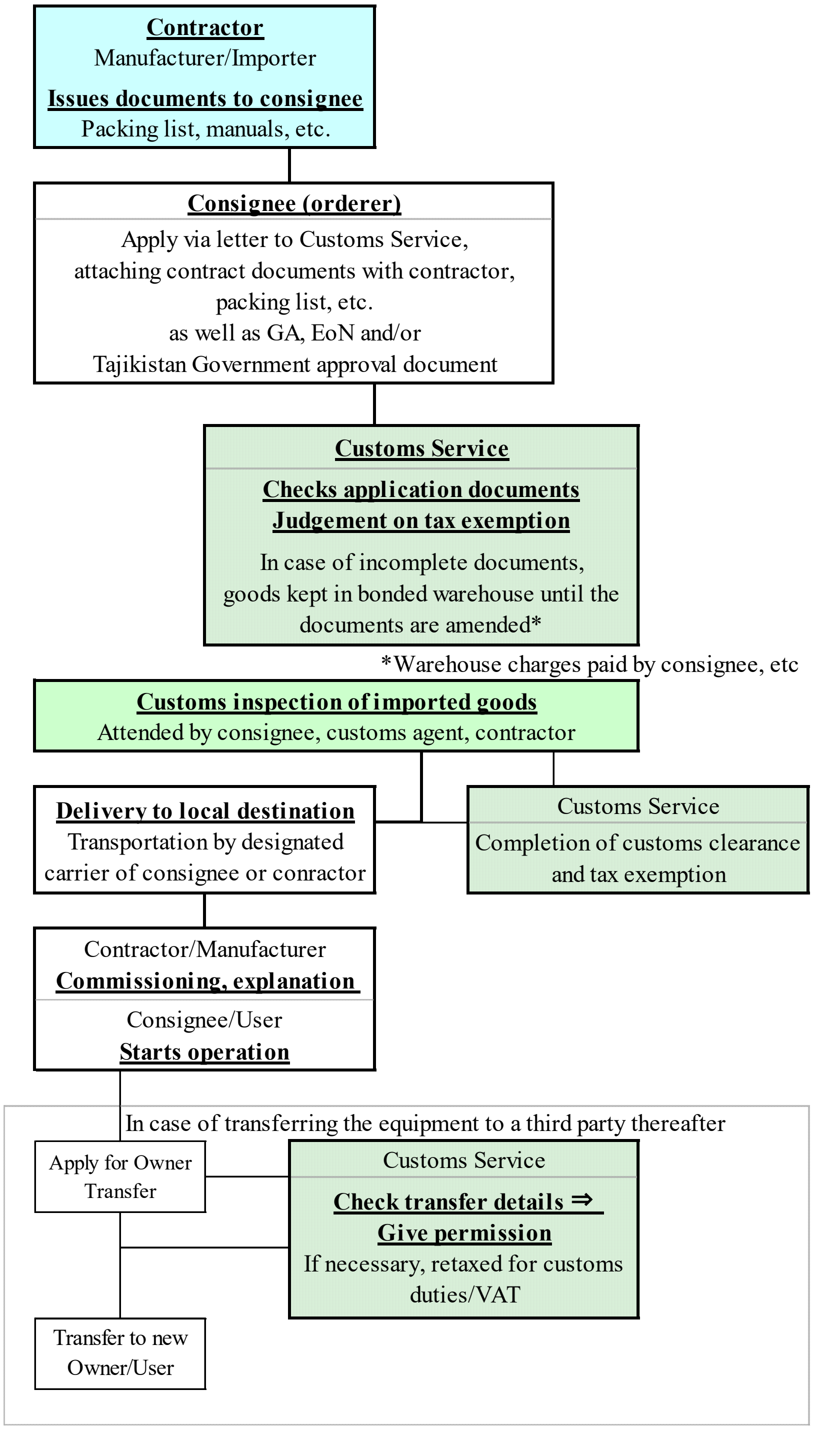
(c) In the case of incomplete documents, the imported goods will be stored in a customs warehouse until the documents are completed, with the additional warehouse costs borne by the consignee or contractor. (This will happen if inconsistencies are found in Russian-language documents.)

(d) Customs inspection is conducted by customs officials, attended by the consignee or a customs clearance agency representative. If necessary, the contractor/manufacturer will also be requested to attend.

(e) Delivery: After the carrier delivers the equipment to the designated final destination, the contractor will provide a briefing on how to operate the equipment.

(f) When the owner's or user's usage is terminated and the equipment is transferred to a third party, the owner should notify the Customs Service of this fact and pay the necessary taxes requested.

Figure 2.41 shows the flow of customs clearance procedures.



Source: Survey Team

Figure 2.41: Customs Clearance Procedures

(2) Special tax for farming (Tax Code Chapter 53; Simplified Agricultural Tax)

Agricultural producers who do not process their agricultural products will be subject to the Simplified Agricultural Tax, regardless of their organizational status (Dehkan farm, agricultural cooperative, corporation, etc.). Farmers subject to the Simplified Agricultural Tax are exempt from domestic taxes such as income tax, VAT, and fixed asset tax (property tax) (Tax Code, Chapter 53 Article 382). The amount of Simplified Agricultural Tax is determined according to the farming area and the tax rate. The tax rate is revised every five years by the State Committee of Land Management and Geodesy, which proposes a land register that takes into account agricultural land conditions and crops cultivated, and then discusses and determines the tax rate with the Tax Committee (see Tax Code, Chapter 53 Article 386; for 2024 land tax rate, refer to Appendix 5: List of Collected Material, No. 10).

Most farmers do not process agricultural products, and so they pay only special taxes (Simplified Agricultural Tax) and social taxes (pensions). If they implement both agricultural production and its processing, income from agricultural processing is taxed separately from the Simplified Agricultural Tax. Income from agricultural processing is subject to an income tax rate of 6% for non-corporations (Tax Code, Chapter 52, Article 380(1)), such as individual Dehkan farm farmers, and 13% for corporations (Chapter 25, Article 183(4-1)). As such, the cost of agricultural product processing must be recorded and reported separately from the simplified agricultural account to clarify the processing income.

Agricultural product processing is defined as work that requires equipment, such as making juice, canned goods, or cooking. Simple work done by farmers themselves, such as production of dried fruit, is not considered agricultural product processing.

(3) VAT on agricultural machinery

Generally, a 15% VAT is levied on imported goods (Tax Code, Chapter 41, Article 264). However, there is a VAT exemption on the import of agricultural machinery and its parts and components, as well as on domestically manufactured agricultural machinery and implements. At the same time, there is also VAT exemption on grant aid and loan projects approved by the Tajikistan Government (Tax Code, Chapter 39 Article 251(4,5); Customs Code, Chapter 41 Article 345(6,15)). However, if income from agricultural product processing exceeds 1 million TJS, 15% value-added tax will be applied to that income (it is expected that there are very few processing businesses whose income from agricultural product processing exceeds 1 million TJS).

(4) Vehicle tax and depreciation for agricultural machinery

Automobile taxes (vehicle taxes) are typically levied on vehicles according to engine power; however, tractors, grain harvesters, special combines, cotton harvesters, etc., are exempt from these (Tax Code, Chapter 48, Articles 360-361). In addition, depreciation for Agricultural machinery is set at a fixed rate of 9% (Tax Code, Chapter 29, Article 198).

(5) Social tax (Social insurance and pensions)

The insurance tax rate for employees of corporations is 2% of their income after deductions (or 1% for employees of state agencies). For members of individual Dehkan farms that are not incorporated, the government sets a minimum social tax rate separately, but this is generally around 1% or more (Tax Code, Chapter 46 Article 332(3,4)).

(6) Farming-related expenses

1) Agricultural water costs

The Agency for Land Reclamation and Irrigation (ALRI) manages water intake from pumping stations and rivers, and supplies water for use. Farmers pay irrigation water fees to ALRI at 2.0 dirams[27] per cubic meter. If there is no water meter, water will be taken from a river or other source, in which case, the farmer will pay ALRI according to an annual tariff rate for the standard area for each crop type. Even after collecting these fees, ALRI still runs at a deficit and is covered by an annual government subsidy of approximately TJS 40 million. Irrigation water tariffs are shown in Table 2.25.

Table 2.25: Irrigation and Agricultural Water Fee Table

r/t	Users	Unit	Amount of Payment (including VAT)
	In areas equipped with water meters:		
1	For farmland irrigation (agricultural farms, regardless of the form of ownership) per 1 m3	Diram	2.0
2	For aquaculture ponds (Decision of State Committee, March 2001 No. 123) per 1 m3	Diram	0.01
3	For non-irrigation users (those not belonging to 1 or 2 above) per 1 m3	Diram	3.33
	In areas where water meters are not/cannot provided:		
	AVERAGE TAX RATE BY AGRICULTURAL CROP		
1	Cotton (standard of 10,000 m3 water per 1 ha)	TJS	200.00
2	Autumn crops (wheat, rye, etc.; standard of 2,200 m3 water per 1 ha ~)	TJS	44.00
3	Corn for grain, 1st harvest (standard of 9,000 m3 water per 1 ha ~)	TJS	180.00
4	Corn for grain, 2nd harvest (standard of 7,800 m3 water per 1 ha ~)	TJS	156.00
5	Corn for silage, 2nd harvest (standard of 3,500 m3 water per 1 ha ~)	TJS	70.00
6	Rice (standard of 3,700 m3 water per 1 ha)	TJS	740.00
7	Vegetables (standard of 12,000 m3 water per 1 ha)	TJS	240.00
8	Clover (feed plants; standard of 12,500 m3 water per 1 ha)	TJS	250.00
9	Fruit trees (standard of 9,500 m3 water per 1 ha ~)	TJS	190.00
10	Potatoes (standard of 6,500m3 water per 1 ha)	TJS	130.00
11	Melons and other multi-seeded fruits (standard of 5,000 m3 water per 1 ha)	TJS	10.00
12	Tobacco, citrus, and livestock produce (standard of 5,000 m3 water per 1 ha ~)	TJS	110.00

Source: Government Antimonopoly Service Decree No. 62 (Appendix 5: List of Collected Material, No. 11 "Irrigation Water Fee Schedule")

2) Electricity tariffs

The electricity required for farming is used for pumps for agricultural water irrigation, but as mentioned in 1), ALRI basically manages the irrigation pumps, and crop producers do not directly pay for this electricity. However, as much as 60% of the total water intake area comes from areas that are not recorded by water meters, and there are cases where water cannot be naturally drawn from rivers or other sources, or where crop growers must prepare their own pumps to pump water for agricultural use due to water shortages. In such cases, farmers have to pay electricity fees directly to the power company, according to electricity tariff item 4) (10.67 diram/kWh) in Table 2.26.

[27] 1 diram = 1/100 TJS

Table 2.26: Electricity Tariffs

	Category	Tariff / KWh	Notes
1)	Industrial sector	70.35 Diram	
2)	General public	30.75 Diram	
3)	Irrigation pumps: during April to September	10.67 Diram	Pumping stations and repair workshops of ALRI
	Irrigation pumps: during October to March	30.75 Diram	
4)	Reclamation pumps/stations	10.67 Diram	Reclamation pumps mainly used by farmers

Farmer do not need to pay electricity costs for 3) irrigation pumps of ALRI.

Source: Government Antimonopoly Service Decree No. 546 (Appendix 5: List of Collected Material, No. 12 “2024 Electricity Tariffs”)

Chapter 3　Farming Test Implimentation and Results

Chapter 3 Farming Test Implementation and Results

3.1 Implementation Process for Farming Test

3.1.1 Outline of Farming Test

Regarding the farming test activity formed by the Survey WG, the Japanese side promoted agreement with the Tajikistan side regarding details on site selection, activity items, and implementation procedures, as per the Survey WG's TOR, to ensure a smooth farming test. The Survey WG confirmed with the Tajikistan side their wishes for test items to be included in the farming tests, which were reflected in the implementation guidelines for these.

An overview of the farming test particulars agreed with the Tajikistan side is provided below:

(1) The purpose of the farming test is to:

- Confirm the durability and ploughing effectiveness of small-sized Japanese agricultural machinery in Tajikistan's farms.
- Confirm the possibility of a rental business in the operation.
- Confirm the profitability of the rental business and the benefit to its users (farmers).

Based on the above confirmation, the contents of a future business model are deliberated. The Tajikistan side also agreed to this (refer to Appendix 3: Meeting Minutes (1) MoA/TAL 9)).

(2) Farming test sites

Sites to host the farming test were decided based on two management cases – the MTC and the cooperative – that perform the real business of ploughing services for farmhouses constituting Dehkan farms. It was communicated that the location does not have to be the same as that selected for a future Grant Aid project. Given the limited testing budget and term, the MoA and TAL were asked to present candidate sites that had good access from Dushanbe and where the rental business (ploughing service) was in operation. As a result, the MoA recommended two sites, MTC Fayzobod in the Direct Rule Districts region and Sharif Shirin Cooperative in Dangara district, Khatlon region. Upon examination, it was decided to adopt these sites for the farming test due to their close distance to Dushanbe, and after inspecting the sites, their field conditions, farm scale, planted crops, the status of rental business, etc.

(3) Contents of the farming test

Test plots and control fields were selected at farms on both sites. The survey team explained that three types of tests would be carried out through the rental business – existing farming practice, a ploughing test with chemical fertilizer applied, and a ploughing test without chemical fertilizer applied – and the Survey WG approved this (refer to Appendix 4 Agreement with Tajikistan Side on Implementation of Farming Test).

(4) Terms for the farming test (ploughing test at the plots of the farming test sites) (as of January 2024)

1st time: 7-10 days each during the period from late February to early March 2024

2nd time: 2-3 days each from the end of June to early July 2024

(5) Procedure of Farming Test

The farming test will verify the feasibility of using small-sized Japanese agricultural machinery in Tajikistan's fields, as well as the proper use of machinery for ploughing work (soil preparation). Therein, the survey team will also identify issues with current soil conditions and farmwork content using conventional farming methods, and make recommendations on appropriate cultivation. In verifying the profitability of the rental business for its operators and users (farmers), the survey team will also calculate the appropriate utilization area for each variety of agricultural machine/implement.

3.1.2 Procedures for the Farming Test (Standards for Plots and Cultivated Product Preparation)

The process leading up to the implementation of the farming tests after selecting the test plots for Fayzobod (MTC) and Dangara (cooperative) district sites was as follows.

(1) Consideration of plots and agricultural products for each plot

Fayzobod and Dangara district sites were each divided into 5-6 plots, considering irrigation methods and other factors. Since November 2023, there were some changes due to delays in the arrival of agricultural machines sets at the site and inclement weather at the site, so fine-tuning was carried out to determine the plots and products to be grown at both sites (see Tables 3.1 and 3.2).

Unlike the cold weather of the previous crop season, warm weather continued in 2023, delaying ploughing operations from fall onward. Furthermore, from the beginning of 2024, due to the worsening situations in Ukraine and Israel, there were delays in the transportation of agricultural machines sets procured in Japan, and missing or damaged parts had to be replaced when they arrived in the area. We reported to the MoA as needed, and after repeated discussions and readjustments with the cooperative farmers (Dangara district) and MTC (Fayzobod district), the products were decided as shown in Tables 3.1 and 3.2., and the target farmers prepared the seeds for the test.

Table 3.1: Products Planned for Cultivation in Each Farming Test Plots (Fayzobod District)

Plot No. / Control field	Product [crop]	Ploughing pattern Refer to Figure 2	Applying Natural fertilizer	Applying Chemical. Fertilizer [C/F].
Plot 1	Potato/forage crops	The pattern to plough is chosen by the field situation based on the ploughing pattern [Figure 3.1].	No ploughing because of continuous rain in December 2023	Without C/F
				With C/F
Plot 2	Red bean			Without C/F
				With C/F
Half of Plot 3	Tomato			Without C/F
				With C/F
Plot 4	Watermelon			Without C/F
				With C/F
Plot 5	Nil			
Plot 6	Corn			Without C/F
				With C/F
Plot 7 (3 rows)	Green onion, xx, xx, Cucumber			Without C/F
				With C/F
Control field 1	Watermelon	As usual		Without C/F
Control field 2	Corn			Without C/F

Source: Survey Team

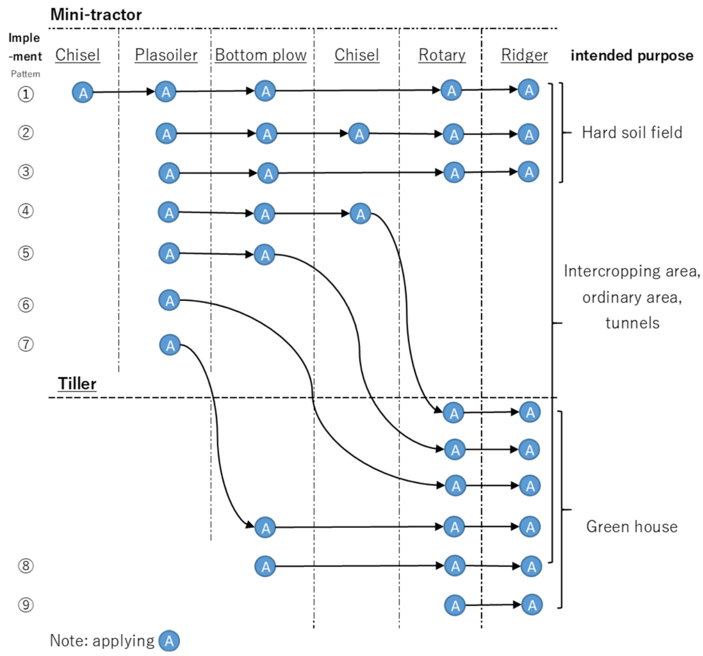
Table 3.2: Products Planned for Cultivation in Each Farming Test Plots (Dangara District)

Plot No. / Control field	Product [crop]	Ploughing pattern Refer to Figure 2	Applying Natural Fertilizer	Applying Chemical Fertilizer [C/F]
Plot 1	Potato/groundnut	The pattern to plough is chosen by the field situation based on the ploughing pattern [Figure 3.1].	Ploughing & application of N/ fertilizer as usual	Without C/F
				With C/F
Plot 2	Potato/groundnut			Without C/F
				With C/F
Plot 3	Red bean			Without C/F
				With C/F
Plot 4	White bean			Without C/F
				With C/F
Plot 5	Corn			Without C/F
				With C/F
Plot 6 (greenhouse)	Tomato, Cucumber			Without C/F
				With C/F
Control field 1		As usual		Without C/F
Control field 2				Without C/F

Source: Survey Team

(2) Consideration of ploughing pattern

We selected from among the ploughing patterns shown in Figure 3.1 for use in the farming test.

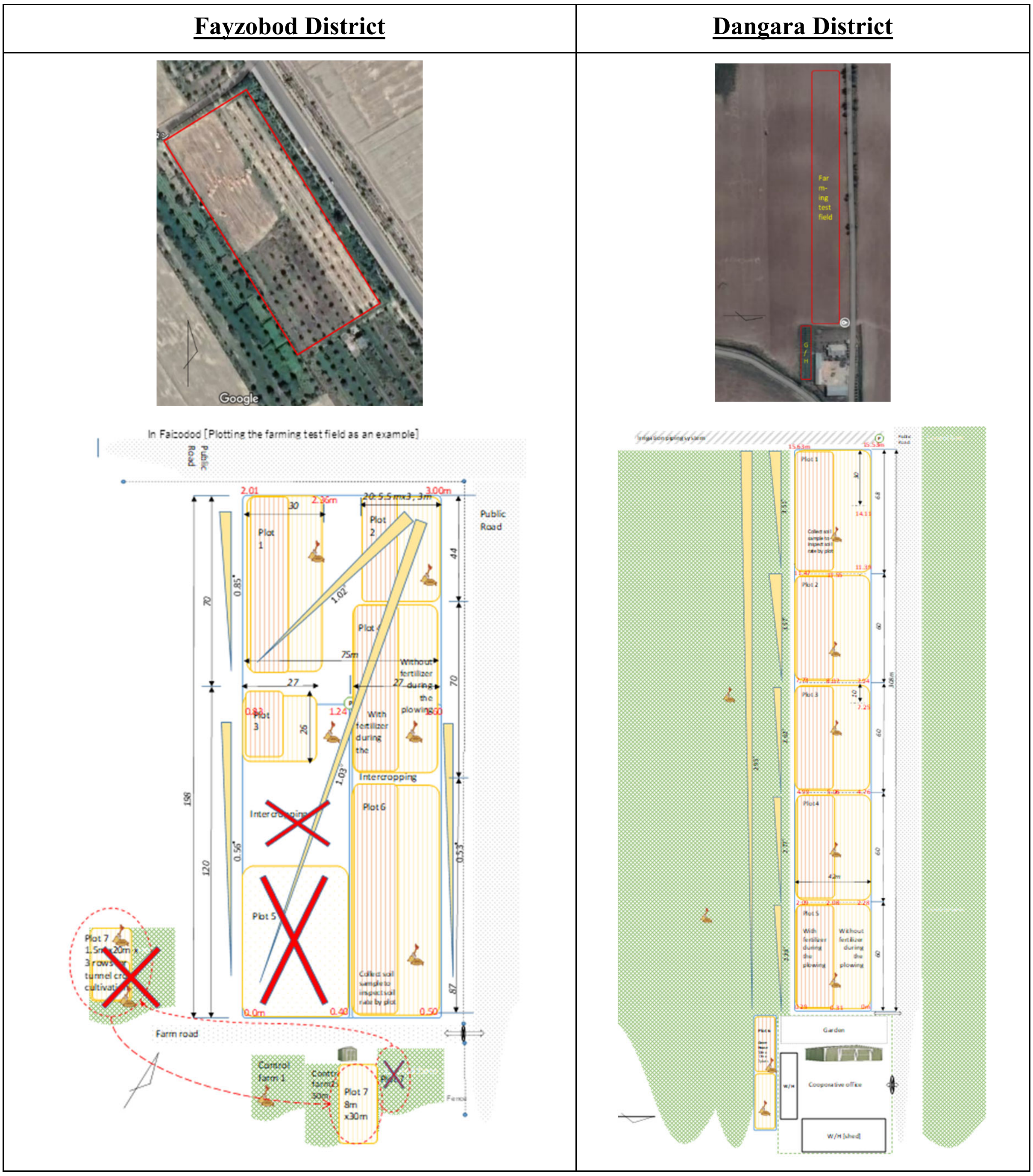


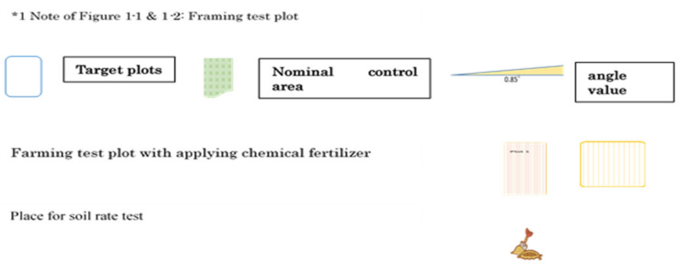
Source: Survey Team

Figure 3.1: Ploughing Patterns

(3) Preparing plots for the farming test

Discussions were held with both sites regarding the establishment of fields (hereafter referred to as "plots") for verifying ploughing performance (ploughing tests) and cultivation productivity (growing tests) in the farming test and control fields (where ploughing and cultivation are carried out using the same cultivation methods as before, and where comparisons are made with the plots; hereafter referred to as "control fields"). This was reported to the Tajikistan side in the Survey WG, and approval was obtained. The plots for both sites were divided based on the slope angles of the land measured from the level and plane survey of the plots in question. Figure 3.2 shows the plot allocations.





Source: Survey Team

Figure 3.2: Plotting of Farming Test Sites

For performing soil crushing rate and hardness tests, approximately two control plots along with one site on each plot are defined. Concerning sampling, the plan was to focus on two or three sites from the plots or control fields for soil analysis.

For soil analysis, we decided to utilize the soil department of the Tajik Agricultural Academy of Agricultural Sciences, thereby confirming the analytical capability of this institution alongside confirmation of the state of ploughing by the organic (humus) content of the soil.

Tables 3.3 and 3.4 show the results of soil analysis conducted in two farming test sites in February 2024.

Table 3.3: Results of Soil Analysis (Feb 13-25, 2024) in Fayzobod District Site (Analyzed by the JICA Survey Team and the Academy of Agricultural Sciences of Tajikistan)

Plot No.		1		6		7	
Soil Group		**Immature Soil**					
Sampling Date		Feb 15	Feb 15	Feb 15	Feb 15	Feb 15	Feb 15
Depth from surface		Topsoil	Subsoil	Topsoil	Subsoil	Topsoil	Subsoil
Soil texture		Silt	Silt	Silt-Clay	Silt-Clay	Clay	Clay
Crop before sampling		Carrot	Carrot	Onion	Onion	Wheat	Wheat
EC (mS/cm)		0.252	0.213			0.189	0.287
pH		7.75, 7.8	7.77(7.9)	7.9	80.0	7.67(8.3)	7.78(8.2)
Bulk density (g/ml)		0.905	0.965			0.933	0.968
OM (humus) %		1.58	1.34	1.55	0.74	1.71	1.11
NO_3 (mg/100g)		1.24	1.00	5.74	1.30	0.80	0.60
NH_4 (mg/100g)		1.38	1.16	1.78	1.31	1.14	1.00
P_2O_5 (mg/100g)		4.68	4.00	4.20	1.82	3.18	2.13
K_2O (mg/100g)		30.0	28.0	27.2	19.6	23.6	20.8
Measuring instrument		Yamanaka [mm]	MPa	Yamanaka [mm]	MPa	Yamanaka [mm]	MPa
Soil hardness (Yamanaka)	10cm	13	2.3	18	1.0	14	1.0
	20cm	15	1.8	18	0.7	14	0.5
	30cm	18	1.8	19	1.3	21	0.6
	40cm	18	2.0	20	1.5	23	1.5
	50cm	20	1.7	22	1.5	23	2.4
	60cm		2.0		1.5		2.7
Soil moisture (%)	10cm	38.4		40.9		41.7	
	20cm	45.1		44.2		38.4	
	30cm	45.0		44.5		45.0	
	40cm	42.5		44.8		45.0	
	50cm	46.8		43.0		43.1	
	60cm						

- EC (electrical conductivity, which indicates fertilizer concentration) was analyzed using a HORIBA LAQUAtwin EC-33B, and pH with a HORIBA LAQUAtwin pH-22B.
- Soil hardness was analyzed using a Yamanaka-type Soil Hardness Tester.
  When this value exceeds 20mm, most plants cannot extend their roots further.
- Values shown for OM (humus), NO_3, NH_4, P_2O_5, K_2O, and mineral nitrogen items were analyzed by the Institute of Soil Science and Agrochemistry, Academy of Agricultural Sciences of Tajikistan.
- Values shown in brackets for pH are data analyzed by the Institute of Soil Science and Agrochemistry, Academy of Agricultural Sciences of Tajikistan.
  Source: Survey Team

Table 3.4: Results of Soil Analysis (Feb 13-25, 2024) in Dangara District (Analyzed by the JICA Survey Team and the Academy of Agricultural Sciences of Tajikistan)

<u>Five (5) plots in open fields</u>

Plot No.		1		3		5	
Soil type		**Alluvial soil**					
Sampling Date		Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13
Depth from surface		Topsoil	Subsoil	Topsoil	Subsoil	Topsoil	Subsoil
Soil texture		Clay	Clay	Clay	Clay	Clay	Clay
Crop before sampling		Wheat	Wheat	Wheat	Wheat	Wheat	Wheat
EC (mS/cm)		0.176	0.188			0.171	**0.746****
pH		7.67 (8.2)	7.78 (8.3)	(8.1)	(8.2)	8.02 (8.3)	7.69 (8.2)
Bulk density (g/ml)		1.014	1.01			1.009	0.99
OM (humus) %		1.40	1.14	1.37	0.62	1.47	0.90
OM (humus) % after deep ploughing on Feb 27		**2.04**	**1.69**				
NO_3 (mg/100g)		1.50	0.58	1.18	1.10	1.04	0.70
NH_4 (mg/100g)		1.47	1.301	1.10	0.94	1.00	0.843
P_2O_5 (mg/100g)		0.97	0.34	1.70	0.61	1.00	0.32
K_2O (mg/100g)		18.0	14.8	20.0	15.2	18.4	14.4
Measuring instrument		Yamanaka [mm]	MPa	Yamanaka [mm]	MPa	Yamanaka [mm]	MPa
Soil hardness (Yamanaka)	10cm	13	1.0 (15cm)	18	1.0 (15cm)	13	1.6
	20cm	12		16	2.0	17	2.5
	30cm	27	2.4	22	2.5	24	2.5
	40cm	27	2.8	18		23	
	50cm	18		18		17	2.8 (45cm)
	60cm						
Soil moisture (%)	10cm	36.0		33.7		33.1	
	20cm	31.1		36.3		34.2	
	30cm	22.7		34.1		39.9	
	40cm	26.2		39.1		34.8	
	50cm	20.7		28.0		32.7	
	60cm						

Source: Survey Team

Two (2) of five (5) plots in greenhouse

Plot No.		6		6 (No Roof)	
Soil type		**Alluvial soil**			
Sampling date		Feb 14	Feb 14	Feb 14	Feb 14
Depth from surface		Topsoil	Subsoil	Topsoil	Subsoil
Soil texture		Clay	Clay	Clay	Clay
Crop before sampling		Beans	Beans	Beans	Beans
EC (mS/cm)		**1.554****	**0.867****		
pH		7.34 (8.1)	7.67 (8.0)	(8.2)	(8.1)
Bulk density (g/ml)		0.98	0.986		
OM (humus) %		2.56	1.14	2.28	1.01
NO_3 (mg/100g)		3.16	1.90	1.40	0.68
NH_4 (mg/100g)		1.63	0.91	1.10	0.843
P_2O_5 (mg/100g)		4.93	4.66	1.70	4.57
K_2O (mg/100g)		31.4	27.6	32.6	25.2
Measuring instrument		Yamanaka [mm]	MPa	Yamanaka [mm]	MPa
Soil hardness (Yamanaka)	10cm	9	1.5	10	0.6
	20cm	15	1.5	12	0.8
	30cm	23	2.1	23	0.8
	40cm	13	1.1	17	2.5 (-35cm)
	50cm	18	2.7 (-45cm)	13	
	60cm				
Soil moisture (%)	10cm	39.4		36.3	
	20cm	37.6		30.8	
	30cm	37.4		41.7	
	40cm	36.7		41.8	
	50cm	43.9		43.1	
	60cm				

Source: Survey Team

In addition, the EC (electrical conductivity) values marked with “**” in Table 3.4 were extremely high, raising concerns about salt damage, although in reality there was no significant impact observed on crop growth. Plot 6 on the Dangara district site is a vinyl greenhouse and was thought to be in an environment prone to salt damage, but there was no particular disruption to cucumber production between April and May of 2024. The plot showed a value of 1.5 mS/cm at one point, but when another point was measured, it was 0.74 mS/cm, so the first point was likely measured where there happened to be a lot of chemical fertilizer remaining. The soil in the vinyl greenhouse showed higher values for humus, N, P, and K than in the open field, and it is believed that more organic matter is added to the greenhouse than in the open field. The reason why the EC value is higher than in the open field is that water from an irrigation channel is used in the greenhouse, and this irrigation water already has a high EC value (0.6 mS/cm or more), so it is thought that this has been accumulating in the greenhouse soil. For outdoor cultivation, rainwater is used instead of irrigation water, but the EC value of Plot 5 (close to Plot 6) in the open field of the Dangara district site is also high, and it is believed that the irrigation water is affecting this. The irrigation beneficiary area, having the Nurek Dam and Vaksh River as its water source, spans over several hundred thousand hectares, but because it is supplied with water with a high EC value, it always poses the risk of salt damage. As shown in Tables 3.2 and 3.25 from the farming test, it is thought that in cucumber cultivation, environmental adaptation has occurred such that a slightly high EC value does not inhibit crop growth. Irrigation water is not used in the open field.

3.1.3 Procurement for Japanese Machines and Implements

(1) Small-sized Japanese agricultural machinery

In order to verify whether Japanese agricultural machinery can perform ploughing work in Tajikistan through the farming test at the two selected sites, the minimum necessary array of ploughing implements was selected (see Appendix 6 for a list of the procured implements).

The agricultural machinery for procurement constitutes a 40 hp tractor, a 10 hp tiller, and various (ancillary work) implements (plough-soiler, chisel, bottom plough[1], rotary tiller, ridger and trailer). The specifications, summaries, and working speed of each implement are as follows.

Implements for a 40 hp tractor

Implement	Specifications and summary	Working speed (km/h)
Mini chisel 	3-blade type Breaks or crushes soil that is very hard or many clods that are hard/large. Increases the efficiency of rotary ploughing in the subsequent process.	8.0 to 12.0
Plough-soiler 	2-blade type: Ploughing depth 300-450 mm Improves the physical properties (permeability/ drainage/ aeration) of subsoil, breaking up soil to around GL-40 cm and bringing some of it to the surface.	4.0 to 6.0
Bottom plough 	14 in moldboard, 2-board type: Ploughing depth 200-300 mm Moldboards invert the soil and aid in agitation to achieve uniformity of organic matter in the soil. It should be used after the plough-soiler and before rotary ploughing.	3.0 to 6.0
Rotary tiller 	48-blade type: Ploughing depth 50-100 mm Mixes soil while crushing soil clods near the surface and cutting residues and weeds. Soil clods, large residues, and weeds become finer, making ridging easier and increasing the amount of soil that can be used for cultivation.	1.5 to 4.0
Disk-type ridger	24 in, 2-board type Ridges are used to increase irrigation efficiency and to enhance the rooting of produce.	3.0 to 5.0

Implements for 11 hp tiller

Implement	Specifications and summary	Working speed (km/h)
Bottom plough	Moldboard, single-board type: Ploughing depth 100-200 mm Moldboards invert the soil and aid in agitation to achieve	3.0 to 5.0

[1] Bottom plough: Also referred to as a "mold board plough".

Implement	Specifications and summary	Working speed (km/h)
	uniformity of organic matter in the soil. Should be used before rotary ploughing.	
Rotary tiller 	48-blade type: Ploughing depth 50-100 mm Mixes soil while crushing soil clods near the surface and cutting residues and weeds. Soil clods and large residues and weeds become finer, making ridging easier and increasing the amount of soil that can be used for cultivation.	2.0 to 4.0
Ridger	Single-ridge type Ridges to increase irrigation efficiency and to enhance the rooting of produce. Easy to use to create mulching ridges.	4.0 to 6.0

(2) Manufacturers of the procured agricultural machinery

The agricultural machinery manufacturers selected were Yanmar Agribusiness Co., Ltd. for tractors, along with Sugano Farm Machinery Mfg. Co., Ltd. and Matsuyama Mfg. Co., Ltd. (hereinafter referred to as "Niplo") for implements.

(3) Transportation route for procured agricultural machines sets

Due to the deteriorating situation in Ukraine following Russia's invasion, the Russian transportation route had become unavailable. In addition, with transportation using the railway through China taking more than 6 months, and agricultural machines sets potentially being held up at intermediate transshipment points and a borders with Central Asia for more than 2 months each way, it would be difficult to predict the timing of those arrival at the destination. As such, the Caspian Sea route was used, with the agricultural machines sets unloaded at the port of Mersin in southern Turkey to be transported overland to Central Asia.

(4) Developments in procurement and transport (Caspian Sea route usage record)

The local arrival of agricultural machines sets for use of the Caspian Sea route was set at November 30, 2023, but the subsequent outbreak of the Israel-Hamas conflict and the capture and attack of merchant ships in the Red Sea caused delays and confusion in container transshipment operations at various ports. This led to delays of approximately one month or more in sea transportation and land transportation along the Caspian Sea route.

Also, on January 19, 2024, the agricultural machines sets shipped from Thailand and Indonesia arrived in Dushanbe, customs inspection was cleared, and unloading was completed in the TAL warehouse near Dushanbe. The Yokohama port shipment arrived in Dushanbe on February 4 and was immediately customs-cleared and put through receiving inspection. Inspection work and test run verification were conducted with three engineers from Yanmar Turkey, who were dispatched by Yanmar. For shipments from Japan, two engineers from Sugano Farm Machinery Mfg. Co., Ltd., the manufacturer, traveled from Japan to inspect the agricultural machines sets and provide operational guidance.

The tiller produced by Yanmar Agribusiness Co., Ltd., Indonesia was not a finished product, with the cultivator unit itself and the diesel engine being shipped separately. Tiller assembly was performed on-site by the manufacturer's engineers. Inspection work and trial operation checks were conducted, as well as operational training sessions for operators at the farming test sites. After delivery, inspections and defect checks produced the following results:

1) Missing parts
   a) There were missing parts for the Yanmar tractor (balance weights; 3 pcs x 2 units). They were airlifted from Yanmar Thailand and brought to the site to confirm installation on the tractor.
   b) Of the 2 sets of spare V-belts for the cultivator, 1 set (2 belts) was missing. Yanmar Indonesia sent them by DHL. We were able to obtain them on February 26 via the JICA office.
2) Defective parts
   a) Both rubber wheels for the rotary tiller of Yanmar’s YZC-DL cultivator were worn out. This may have been due to friction caused by horizontal shaking in the container during transportation. We requested a replacement with non-defective items from Yanmar Turkey and were able to obtain them on February 26 via the JICA office.
   b) Paint was peeling off one of the V-belt cover units on the Yanmar cultivator YZC-DL. We instructed Yanmar to send touch-up paint, but since paint cannot be sent by airmail, Yanmar decided to replace the complete set of cover components for this part with new ones. They were later sent to the JICA office by DHL mail from Yanmar Indonesia.
   c) The mounting parts of the Niplo Japan bottom plough (16 mm in diameter) and Yanmar power tiller (19 mm in diameter) were unmatched, with the mounting bolt size differing. As an immediate measure, we asked ATS to lathe the hole diameter of Niplo's mounting bracket to 19 mm in diameter so that it would be compatible for use. Genuine parts for two units were sent from Niplo Japan to the JICA Tajikistan office, and these arrived on March 20. After the Survey Team members personally installed these parts and tested them at the farming test sites during the field survey, they confirmed the workability after replacement and completed the inspection process for the Yanmar products, after which a notice of inspection passage was issued at the end of July.
   d) All other machines and spare parts delivered by Yanmar and Nippon were in good condition, with no missing or defective parts.

3.1.4 Trial Operation of Machines and Training Program

Yanmar engineers from Turkey conducted practical training on attaching and detaching the work machine to the tractor and also provided driving instruction. in the TAL warehouse. The training participants were three from the Sharif Shirin Cooperative in Dangara District and three from the MTC in Fayzobod District. Each operator was accustomed to driving tractors, so there was a quick learning curve.

Photos: Procured machines and implements

		
Yanmar 40 hp tractor (2 units delivered)	Rotary tiller for tractor (2 sets)	Power tiller, main body (diesel engine was packed separately, necessitating assembly)
		
Training program for tractor operation	Training for the installation and detachment of the rotary tiller	Training for the operation of the cultivator and the installation and detachment of the rotary

3.1.5 Transportation of Machinery to Farming Test Sites

With the support of MoA (TAL), an 8-ton truck with a crane was made available from TAL, and all machinery and spare parts were able to be transported successfully to the farming test sites.

On February 8, all machines and spare parts were stored in the locked warehouse of the compound of MTC Fayzobod; and on February 9, all machines and spare parts were stored in the warehouse on-premises at Sharif Shirin Cooperative (Dangara).

3.1.6 Operation Trials at the Farming Test Sites

Two (2) engineers from Sugano Farm Machinery Mfg. Co., Ltd. conducted the inspection of all implements and spare parts, trial operation, and directly gave operational training to local operators.

(1) On February 19 and 20,

A trial operation for the tractor, bottom plough, rotary tiller, ridger, and plough-soiler was conducted outside of farming test plot 5 of Dangara Cooperative. An additional trial for the power tiller with bottom plough and rotary tiller was also carried out inside the greenhouse. Many farmers attended the trial operation to observe, and they were very impressed with the performance of these machines. After the trial operation, operational training was given to local operators, and it was confirmed that they were able to use all machines and implements without difficulty.

(2) On February 21,

A machine operation check and training on how to operate work machinery was arranged for MTC Fayzobod at the farming test site. Under the condition of about 5 cm of snow covering farming plot 1, the plough-soiler was able to perform 40 cm deep ploughing, and the bottom plough made it to

25 cm, with perfect turn-over of the field. The farmers who observed acknowledged their excellent performance. After the trial operation, operational training was given to local operators, and it was confirmed that they were able to use all machines and implements without difficulty.

Photos: Trial operation and training

		
(Dangara) Demonstration and training on the bottom plough were conducted adjacent to the test site.	(Dangara) Operation of rotary tiller. There were no troubles despite 5 cm of snow cover.	(Dangara) Power tiller operated inside the greenhouse. Operators were not familiar with power tillers.
		
(Fayzobod) Plough-soiler trial operation and training for local operators who were able to use the new implement without difficulty.	(Fayzobod) Trial operation of a bottom plough. The farming site was covered by 5 cm of snow, but no troubles were found for this use.	(Fayzobod) The bottom plough can achieve a 180-degree turnover of soil. Farmers watching this operation were very impressed with the performance.

3.1.7 Roles of TAL, MTC, and ATS in Farming Test

(1) Main activities of TAL and MTC

TAL's major activities comprise promotion and financing management for installment sales of agricultural machinery with low-interest loans. In addition, TAL also utilizes its affiliated MTC for the promotion and execution of rental business, including machinery operators. There are significant differences in activities among MTC branches, and rental business (ploughing service) fees also differ by area (see Table 3.5). Some farmers who use MTC's loans and rental business (ploughing services) complain that maintenance and repair of machines takes too much time, rental fees are too high, or that the ploughing conducted is ineffective.

Table 3.5: Unit Prices for Rental Business (Ploughing Service) by Work Type (Unit: TJS/ha)

Rental business (ploughing service)	MTC, Fayzobod District	Private service provider in Fayzobod District	MTC, Dangara District	Private service provider in Dangara District
Bottom plough work	800-1,000	1,100	400	700
Rotary tiller	1,500-2,000	1,500	400	300
Chisel soil crushing	N/A	400-500	400	N/A
Potato harvester	N/A	N/A	500	N/A
Wheat combine harvesting	N/A	N/A	400	560
Compost spreading	N/A	N/A	N/A	60
Grass reaping	500	600	N/A	N/A

Source: Interviews conducted by the Survey Team.

(2) Current MTC activities

The following activities were observed during this survey in 3 MTCs:

1) MTC Rudaki District

The number of staff is 10 in total, with 5 employed by MTC Rudaki and 5 employed by the chief of MTC as private staff. For troubleshooting of machines, MTC staff can manage repair works, but they do not have the necessary spare parts for repairs in stock. MTC purchases necessary spare parts in a parts shop in the town; if the shop does not have the required parts in stock, MTC asks the shop to source them, including the arrangement of importing. The main rental business (ploughing services) of MTC Rudaki is ploughing, clod breaking, sowing (by seeding machine), and making forage cubes, mainly provided to cotton farmers. The chief of MTC Rudaki explained that a farmer typically pays about 75 to 80 USD/ha for such rental business (ploughing services) every year.

Photos: Large-sized agricultural machines owned by MTC Rudaki

		
3-wheel 80 hp tractor, mainly used on cotton farms.	Many implements are stored in the compound with no roof overhead. The MTC office is at the back.	75 hp 4WD tractor and 3-row bottom plough. The plough shape differs from the Japanese model, and it cannot turn over the soil.

2) MTC, Fayzobod District

The total staff is 3 persons, with a chief and two operators only. This MTC has no roofed warehouse, and most implements are stored in the open space of the compound, which is located at the roadside and thus vulnerable to security threats. MTC has one 82 hp large tractor and one combined harvester for wheat, as well as several implements. They provide rental business (ploughing services) for ploughing, clod breaking, sowing (by seeding machine), and making forage cubes. As shown in Table 3.5, their rental business (ploughing service) fees are high compared to other areas, but many farmers have come to rely on their rental business with timely execution and careful work. Fayzobod District explained that they have not recorded any machine sales in recent years.

Photos: Implements stored outside and storage at MTC Fayzobod District

		
MTC has several implements. Small-sized machines and spare parts are kept in the storerooms at the back.	Machine store. The roof is low, meaning large-sized machines cannot be stored, but spare parts can be stocked here and inventory made.	Tractor storage, with a roof but no entrance door.

3) MTC, Dangara District

The number of staff is 8 persons, who work as operators. MTC Dangara was able to construct a new office, machine warehouse, and repair workshop through a grant aid project provided by IFAD, and conducted the opening ceremony in March 2024. Their workshop boasts a concrete pit for tractor repairs, a lathe, a milling machine, and blacksmithing equipment. However, the arrangement for machine operators has not been fulfilled as yet, and not all machine tools are yet in use (as of August 2024).

Photos: New office building and warehouse, machines of MTC Dangara

		
New office building and display area for implements	Tractors and implements for display and storage	As yet unused concrete pit for tractor repair and maintenance.
		
Lathe machine in workshop. Not in operation as of yet.	Milling machine in workshop. Not in operation as of yet.	Blacksmithing machine. Ridging plates for tractors processed from steel bars are often used locally.

MTC Dangara works hard for the installment sales of large tractors with a low-interest rate scheme. The chief of MTC Dangara explained that they were able to sell 15 units of a Belarus-made 82 hp tractor across 2022 and 2023, and also display a small-sized 24 hp Chinese tractor in their compound, for which they are working towards sales.

MTC Dangara owns two 80 hp and four 82 hp tractors, as well as various implements, comprising their rental business (ploughing service). They provide services for ploughing, clod breaking, cutting grasses, and making cubes/bales for forage, as well as transportation services for agricultural produce. Since cotton cultivation is typical in the area, they also provide services for cotton combine harvesting.

(3) AgroTechService (ATS)

ATS Corporation was established in 2003 and is a private company engaged mainly in importing agricultural machinery and some local assembly work for distribution. ATS exports some machines to Uzbekistan and Afghanistan as well. They have an assembly line of tractors from Belarus in their factory, on which they can manufacture 500 units of different types per year. 80 hp tractors are the best-selling models, followed by 40-50 hp varieties. Assembly and sales of small-sized (25-30 hp) tractors are also conducted. The maximum number of tractors they can manufacture per year is 1,500 units, using a daily 2-shift system. The assembly line uses chassis, engines, and transmission portions from Belarus, rubber tires from Turkey, and cab-related parts subcontracted for manufacturing domestically. They manufacture bottom ploughs, chisel ploughs, and several models of trailers as their products for sale. ATS explains that they can reduce the product cost by 50% compared to importing complete units through knock-down manufacturing.

As for facilities in the factory, they are equipped with the assembly line for tractors, overhead traveling cranes, a laser cutter for making several parts, a large bender and cutters, automatic welding machines, a paint application line, and tool sets. The factory is kept clean and is well organized. The basic sales route is through TAL and through installment sales to Dehkan Farms or farmers. The usual payment terms are a 30% down payment and the remaining 70% paid by the farmer using his own funds or with a loan from TAL or a commercial bank.

The basic sales route is direct sales. There are no intermediate distributors. Margin collection by intermediaries is not allowed. They also focus on after-sales service, having two traveling cars loaded with spare parts and tool sets.

Photos: ATS

		
Outside view of factory and display space	Assembly line for large tractors from Belarus	Laser cutter from China
		
Auto welding machine	Assembly line for trailers Rubber tires are from Turkey, the hydraulic system from Germany.	Traveling maintenance car: Spare parts and tool set are kept inside.
		
4-row bottom plough made by ATS The design cannot achieve full turn-over of soil, rather shallow scratching of the soil surface.	Storage space (8 m by 50 m, with two 5-ton overhead cranes) for fabricated trailers, which can be used for assembling implements from Japan, if required.	Potato planter from China, procured through a World Bank project. Many rice transplanters are also stored here. Machines from Japan under a Grant Aid program could be stored here as well.

(4) Interrelationship between TAL, MTC, and ATS

In order to study the most effective methods for agricultural mechanization in Tajikistan by providing small-sized agricultural machinery, it is required to grasp the detailed activities being executed by TAL and MTC.

In the 2022 JICA study on "Information Collection and Needs Assessment for Small Agricultural Machinery (Agricultural Mechanization)," it was revealed that TAL focuses primarily on promoting installment sales of agricultural machinery, as well as on debt collection operations, functioning more as a financial institution than an agricultural mechanization promotion agency. It also became clear that TAL plays a weak role as a government agency in planning and promoting agricultural mechanization policies. Therefore, to ensure that the introduced Japanese-made small-sized agricultural machinery adapts to local agriculture and improves the management of farmers who utilize rental business (ploughing services), not only the proper selection of machinery, but the choice of MTC/cooperatives that will use (be loaned) the agricultural machines sets is extremely important. Whether to maintain the current ownership/utilization system involving the MoA, TAL, and MTC, or have the MoA directly lease the machinery to organizations (such as MTC or cooperatives) under certain conditions, is one consideration. However, in any case, the selection of MTCs or cooperatives that will operate the service remains critically important.

Based on TAL's articles of incorporation, the nationwide satellite institutions known as MTC serve as sales offices for agricultural machinery, providing operational guidance, agricultural machinery repair, and rental business (ploughing services). However, the operational content varies significantly between MTCs. For example, MTC Dangara, which has a larger number of staff and machinery, is more active in the machine sales and rental business (ploughing services). In contrast, MTC Fayzobod has only three staff members, and its agricultural machinery consists of one large 82 hp tractor with some implements and one wheat combine, with insufficient warehouse facilities. In addition, the technical cooperation activities between MTCs have not been confirmed.

On the other hand, as mentioned earlier, ATS is well-equipped with the necessary manufacturing machines and instruments. For future development, there is room for knock-down manufacturing of implement kinds to reduce transportation and assembly costs for Japanese-made agricultural machinery and related implements. When an engineer from Sugano Agricultural Machinery Mfg. Co., Ltd. Japan, visited ATS in February 2024, it was confirmed that there was ample space and machinery within the factory to assemble the company’s implements, including plough-soilers, chisels, and bottom ploughs. Since blades and moldboards of high-quality ploughing implement cannot be manufactured locally, these parts need to be exported from Japan. However, transportation expenses can be significantly reduced by packing at one-third or less of the volume of finished products. Assembly costs can also be kept lower than those in Japan. Therefore, in the future, it will be possible to supply TAL-MTC and cooperatives with implements that have been knockdown-assembled in Tajikistan at a lower cost than if they were exported from Japan. In addition, these could be exported and sold to neighboring countries.

(5) Management system for consumable parts

One concern regarding the sustainability of the use and maintenance of Japanese-made agricultural machinery in Tajikistan is the establishment of a system for storing and selling spare parts and consumable parts for repairs.

First, it is necessary to establish selection criteria for the parts to be managed in inventory. For instance, V-belts used in tractors and power tillers can be substituted with commercially available products, so there is no need to manage stock for these. However, oil filters, fuel filters, and air cleaner elements used in various machines have high replacement frequencies and are not interchangeable with other manufacturers, so they require inventory management. Additionally, consumable parts for implements must be kept in stock. For example, rotary tiller blades and the wear-prone parts of plough-soilers and bottom ploughs are special parts that require inventory management. Instead of ordering from the manufacturer each time a part is needed, conducting inventory management once a year and keeping track of the number of shipped parts as well as the shipping package sizes would allow for bulk ordering, such as one full container at a time, which would help reduce transportation costs.

Regarding the management method for these parts, rather than having each MTC handle storage and management separately, it would not be difficult to create a system where all MTCs are connected via an internal information sharing system with TAL headquarters, sharing inventory and stock management tables so that all MTCs can simultaneously confirm the stock status. In this case, it would be necessary to establish a department at TAL responsible for managing the parts of agricultural machinery, including Belarusian-made ones.

Most activities, such as stock possession or the inventory management of organized consumable parts, are not currently performed at TAL and MTC. If TAL does not start managing the above operations in the future, this issue could be resolved if the MoA signs a business outsourcing agreement with ATS to manage the inventory and stock management of consumable parts of Japanese-made agricultural machinery and engage in the sale of parts to users, since many MTCs purchase machinery parts from ATS, which sells agricultural machinery, or from local machinery sales companies.

3.2 Results of Farming Test

3.2.1 Utilization Status of Japanese Agricultural Machinery at Test Sites

(1) Sharif Shirin Cooperative (Dangara District)

1) Agricultural machinery utilization

According to the work report (daily report) of Sharif Shirin Commercial Cooperative (hereafter referred to as “the Cooperative”), the Cooperative began using the agricultural machines sets on February 24, 2024, and conducted ploughing and other operations 39 times over a 4-and-a-half-month period ending July 4, 2024. The total hours worked according to the Working Record was 273.4 hours (the tractor hour meter was 333.0 hours as of August 1, so there must have been 60 hours of trial runs, travel, etc.).

Implement utilization is as follows. Chisel: 0 times, plough-soiler: 9 times (including cultivated test sites; 4 rentals), bottom plough: 7 times (2 rentals), rotary: 23 times (19 rentals), ridger: 0 times, trailer: 2 times. The total cultivated area was 72.05 ha, of which rotaries accounted for 56.55 ha (85%), indicating that demand for this implement was extremely high (Table 3.6).

Table 3.6: Number of Times Used and Area Cultivated by Each Implement (Fayzobod)

Implement	Chisel	Plough-soiler	Bottom plough	Rotary	Ridger	Trailer
Number of times used	0 times	9 times	7 times	23 times	0 times	2 times
Cultivated area	0 ha	11.75 ha	3.75 ha	56.55 ha	0 ha	—

Source: Survey Team

The chisel was delivered for use when the soil was too hard for the bottom plough to cultivate, when it was necessary to remove about 5 cm of the hard soil surface as preparatory work, and to break up clods before breaking up the soil with the rotary if the clods were too large after cultivation with the bottom plough, but the Cooperative did not require such a machine this time. Japanese plough-soilers and bottom ploughs have sharp tips that penetrate the soil easily, so a chisel for hard soils is likely to be unnecessary in many cases. (The farmers who used the chisel in the rental business (ploughing service) of MTC Fayzobod used it to break up clods of soil by pulling the chisel before ploughing with the rotary because when the soil was ploughed in reverse with the bottom plough, there were many soft and large clods left.)

The plough-soiler was used a total of nine times. Five of these times were at the farming test sites (Plots 1-5, totalling 1.25 ha). In the rental business (ploughing service), a total of 10.5 ha was ploughed on four occasions. The bottom plough was used a total of seven times: five times in the Cooperative's cultivation test area and twice in the rental business (ploughing service) (2.5 ha in total). Since Dangara’s farmers are accustomed to using large tractors and 3-4 bottom ploughs, few farmers rented the Japanese bottom ploughs. Japanese bottom ploughs have very good soil inversion (turn-over) performance during ploughing. It will take time to educate MTC and farmers on the need for soil inversion, but this will be an essential activity in the future (see 3.2.4 Tire Tread Pressure and Soil turnover performance tests (2) Bottom plough soil turnover performance test and analysis).

Comparing Japanese rotary tillers with locally used types (most are made in Belarus or Iran, and are called "Frazer" instead of "rotary tiller"), the rotation speed of the blade shaft is about the same at 400 rpm (the rotation speed of the blade shaft of the Yanmar-made rotary tiller is 256 rpm in 1st speed, 367 rpm in 2nd speed, and 2,500 rpm at engine speed), but the shape of the blades is very different. This makes a big difference in the soil crushing performance of these machines compared to Japanese products. The farmers who witnessed the work said that "I was surprised to see the remains (mashed soil) of the Japanese-made rotary tiller after only one ploughing pass. If it was made in Iran, it would have to be used two or three times, but if it was made in China, no matter how many times you use it, you can't get the soil to this state."

As for disk-type ridgers (capable of single-row ridging and adjustable row width), the Cooperative and surrounding farmers use 3-4 row ridgers (often made by ATS or a local blacksmith). There was no demand for the single-row ridger delivered this time. Row width adjustment work is also difficult to determine in relation to the tractor wheel distance. Many requests were received from the Cooperative and the farmers for a tractor-towed, 3-4 row, intermediate weeding-ridger.

Photos: Japanese-made ridger and locally-made 3-row ridger

		
Disk-type single-row ridger; ridging width can be set as desired (120 to 60 cm width).	No need was found for single-row ridging.	Locally made 3-row ridger. After rotary ploughing, trenches are dug to make ridges. Farmers requested this type of implement (for ridging, ploughing, and weeding).

Many farmers of vegetables, watermelons etc. seem to be satisfied with the soil crushing performance of the Japanese-made rotary tiller (in fact, tomatoes, cucumbers, and watermelons planted in the rented plots have shown good root growth and yield is 20-30% higher than in previous years). However, the rotary tiller only breaks and agitates the top 20-25 cm (GL-25 cm) of soil, and it cannot break the soil hardpan that is formed 25-30 cm below the surface, which is common in farmland in Tajikistan. Ploughing to a depth of 40cm (GL-40 cm) with a plough-soiler along with using the bottom plough, which has excellent soil inversion performance, is effective at improving water permeability and soil water retention (by breaking up the hardpan), activating soil microorganisms (by allowing air to penetrate deep into the soil), increasing organic matter in the soil (by deep rooting), and improving soil fertility, along with other benefits. To this end, it is desirable not only to introduce Japanese-made agricultural machinery but also to disseminate the technology for using small tractors and implements through technical diffusion.

The 10 hp cultivator delivered this time was used in a cultivation test in the Cooperative's greenhouse with a single-row plough and rotary tiller, but there was no demand for the rental business (ploughing service). In Tajikistan, cultivators are used for greenhouses (because tractors cannot enter these) and in small-scale horticultural areas in the backyards of farms, but there appears to be little demand for cultivators in the Dangara district. Outdoor cultivation work using oxen and horses is not seen in Tajikistan. It is believed that such practice of walking and carrying out cultivation activities ceased after the introduction of large-sized agricultural machinery during the Soviet era. The construction of large-scale greenhouses has increased in recent years in the suburbs of the capital Dushanbe. If grant aid is to be provided for cultivators, it will be necessary to select districts where greenhouse cultivation is thriving.

2) Machine working speed, fuel consumption

Although the data obtained from the ploughing operation and rental services of this cultivation test site is very limited, what was obtained from the Working Record can be analyzed and summarized as per Table 3.7.

Table 3.7: Ploughing Speed and Fuel Consumption by Each Implement (Fayzobod)

Implement	Plough-soiler	Bottom plough	Rotary tiller
Cultivation speed (h/ha)	3.4 h/ha	4.1 h/ha	3.4 h/ha
Fuel consumption (ℓ/ha)	7.8 ℓ/ha	10.0 ℓ/ha	17.2 ℓ/ha
Fuel consumption per hour (L/h)	2.2 L/h	2.4 L/h	5.0 L/h

Source: Survey Team

3) Income and expenditure of rental business

The unit cost per hectare and income and expenditure for cultivation tests and rental business in 2024 set by the Dangara Cooperative are shown in Table 3.8.

Table 3.8: Rental Rates and Income and Expenditure by Implement

Implement	Plough-soiler	Bottom plough	Rotary tiller	Trailer
Rental rate (per hectare)	300 TJS	650 TJS	550 TJS	200 TJS
Number of operations and cultivated area	9 times 11.75 ha	7 times 3.25 ha	23 times 56.55 ha	1 times
Gross income	3,525 TJS	2,438 TJS	29,865 TJS	200 TJS
Expenditure (fuel + operator fees)	2,036 TJS	1,038 TJS	19,110 TJS	93 TJS
Gross profit	1,489 TJS	1,400 TJS	10,755 TJS	107 TJS

Source: Survey Team

The use of Japanese agricultural machinery in cultivation tests and rental business from February 20 to July 2, 2024, as recorded by the Sharif Shirin Cooperative, is shown in Table 3.9.

Table 3.9: Results of Sharif Shirin Cooperative's Rental Service

Total cultivated area	Income	Expenditure	Gross profit	Gross profit ratio
72.05 ha	36,028 TJS	22,277 TJS	13,751 TJS	38.2%

Source: Survey Team

As previously mentioned, rental service fees in the Dangara area are about half the price of those in other areas. If it is possible to increase the unit cost of rental fees, the profitability of the rental service business will increase.

(2) MTC, Fayzobod District

1) Agricultural machinery utilization

According to the Working Record of MTC Fayzobod (herein abbreviated as “MTC”), MTC began ploughing operations at the cultivation test site on March 19, 2024, and conducted various operations using Japanese agricultural machinery 35 times during a 3-and-a-half-month period ending July 3. Usually, these operations begin in late February, but this year, snowfall in February and heavy rainfall in March caused soil erosion, resulting in a 2- to 3-week delay in the start of spring ploughing operations compared to previous years. The total number of work hours that can be confirmed from the Working Record is 137 (the tractor hour meter was at 330.8 hours as of July 29, and so we are concerned that the Working Record prepared by MTC, Fayzobod District, contains many omissions).

The utilization of implements was as follows: 4 times with chisels, 2 times with plough-soilers, 13 times with bottom ploughs, 19 times with rotary tillers, 1 time with ridgers, and 5 times with trailers, bringing the total frequency of operations to 44. The total cultivated area was 25.3 ha, with an average rental service area of 0.58 ha each time. While the area covered per rental service in the Dangara Cooperative was relatively large, ranging from 1.0 to 5.5 ha, averaging 2.7 ha each time, in MTC, Fayzobod District, the largest area was only 2.0 ha, with smaller areas ranging from 1 to 0.3 ha. This indicates that there was high demand for cultivation in the intercropping of orchards (Table 3.10).

Table 3.10: Number of Times Used and Area Cultivated by Each Implement (Fayzobod)

Implement	Chisel	Plough-soiler	Bottom plough	Rotary	Ridger	Trailer
Number of times used	4 times	2 times	13 times	19 times	1 times	5 times
Cultivated area	2.6 ha	1.3 ha	10.2 ha	11.3 ha	0.6 ha	—

Source: Survey Team

The data shows that there was a high demand for MTC Fayzobod's rental service for cultivation services combining the bottom plough and rotary tiller, but again, only two farmers used the plough-soiler for 40 cm deep ploughing. One farmer commented that rental business usually involved a plough and rotary once each before planting, but that he would have to pay for one more ploughing service if he used a plough-soiler, which he was averse to paying for.

Farmers who used the chisel used it to crush weeds and soften the soil surface before ploughing with the bottom plough. Another farmer explained that he used the plough to break up large clods of soil after ploughing.

The effects of hardpan breakdown and soil improvement by ploughing about 40 cm deep using a plough-soiler should be continued for several years and disseminated through demonstration activities so that the effects can be seen and felt first-hand by farmers.

2) Machine working speed, fuel consumption

The data obtained from the ploughing operation and rental business of the MTC Fayzobod cultivation test site can be summarized as per Table 3.11 when analyzing data obtained from the Working Record.

Table 3.11: Ploughing Speed and Fuel Consumption by Each Implement (Fayzobod)

Implement	Chisel	Plough-soiler	Bottom plough	Rotary tiller
Cultivation speed (h/ha)	4.6 h/ha	4.6 h/ha	6.7 h/ha	7.0 h/ha
Fuel consumption (L/ha)	15.8 ℓ/ha	18.8 ℓ/ha	26.3 ℓ/ha	29.7 ℓ/ha
Fuel consumption per hour (L/h)	3.4 L/h	4.0 L/h	3.9 L/h	4.0 L/h

Source: Survey Team

Compared to the Dangara Cooperative's figures, MTC Fayzobod's ploughing speed per hectare is 1.5 to 2 times faster, and its fuel consumption per hectare is at least 2 times greater. Judging from the unusually rapid wear of the rotary tiller blade used at MTC (detailed in the section on 3.2.4 Wear of Consumable Parts), it is clear that MTC's rental business (ploughing service) was operated over a longer period per job. The remarkably high fuel consumption could be attributed in part to long travel distances between fields, so measures such as reducing unnecessary travel distances by grouping by district farmers who receive rental business (ploughing services) or increasing the speed of ploughing operations by improving efficiency are needed.

Adjusting these figures to the same level as the Dangara Cooperative would result in a significant increase in profits. Note that the Working Record prepared by MTC includes work that lacks a description of hours, so the cultivated area and fuel consumption were extracted from the work columns where work hours were entered.

3) Income/expenditure of rental business (ploughing services) and rental rates

The per-hectare unit cost, income, and expenditure for cultivation tests and rental business in 2024, as set by MTC Fayzobod, are shown in Table 3.12.

Table 3.12: Rental Rates and Income and Expenditure by Implement

Implement	Chisel	Plough-soiler	Bottom plough	Rotary	Ridger
Rental fee (TJS/ha)	400-600	600	800	800	1,000
Number of operations and cultivated area	4 times 2.6 ha	2 times 1.3 ha	13 times 10.2 ha	19 times 11.3 ha	1 times 0.6 ha
Gross income	1,400 TJS	780 TJS	8,160 TJS	9,040 TJS	200 TJS
Expenditure (fuel + operator fees)	722 TJS	419 TJS	4,942 TJS	6,293 TJS	110 TJS
Gross profit	678 TJS	361 TJS	3,218 TJS	2,747 TJS	88 TJS

Source: Survey Team

The table below shows the results of the use of Japanese agricultural machinery in the farming test and rental business from March 19 to July 3, 2024, as recorded by MTC Fayzobod.

Table 3.13: Results of MTC, Fayzobod District's Rental Service

Total work area	Income	Expenditure	Gross profit	Gross profit ratio
26.0 ha	19,580 TJS	12,486 TJS	7,094 TJS	36.2%

Source: Survey Team

The new rental business (ploughing service) using Japanese agricultural machinery is priced lower than the existing rental for large tractors and implements (in particular, the new rental fee for rotary ploughing is set at 800 TJS/ha compared to 1,500 to 2,000 TJS/ha for existing services). When we asked MTC Director Kamorov about the reason for this, he explained that the price was lowered to attract farmers' attention because Japanese agricultural machinery is new and unfamiliar to them. The company is considering raising the price of its rental service from the following year, now that the high performance of the machines has become known. If farmers use the rental service at the existing unit price every year, even if the price is higher than the rate set here, raising rental service unit costs to the same extent would improve profitability.

3.2.2 Farming Techniques to Be Improved Through the Introduction of Small-Sized Agricultural Machinery

Given Tajikistan's farming conditions, crop rotation systems, utilization status of agricultural machinery, and support systems that have been explained so far, it is expected that introducing new agricultural machinery and implements to the country will improve farming conditions. However, in order to make proper use of this machinery, improvements in cultivation techniques will also be necessary, the key points pertaining to which are detailed below.

(1) Raising awareness of the importance of deep ploughing

Many farmers use tractors, but the implements used in Tajikistan up until now (disk ploughs, chisels, etc.) were not capable of ploughing to depths approaching 50 cm below ground, and ploughing was only performed to a depth of 20 cm. In addition, many of the tractors used were large and heavy, being over 80 horsepower (hp), which actually contributed to the increase of well-compacting soil and worsened the physical properties of the soil.

The survey team confirmed the soil hardness immediately after conducting a conventional rental business (ploughing service) on a farm owned by the Mayor of Jamoat in Hisor. The soil hardness measured 2.0 MPa (indicated by the Yamanaka type soil hardness meter, showing 21 mm) at both 5 cm and 10 cm below ground level, with no noticeable improvement from ploughing. The primary goal of the ploughing process seems to have been to achieve a fast service speed in order to complete the ploughing work promptly. One Dehkan farmer in Rudaki ceased using the existing rental business over five years ago, although their soil remained fertile down to a depth of 25 cm. According to the farmer, with the existing rental service using large-sized agricultural machinery, the soil is gradually compacted, leading to a decrease in productivity. After discontinuing the ploughing service, they began using a 3 HP tiller instead. As a result, the farmer has noticed a steady reduction in clod size and an improvement in soil quality over time.

The plough-soiler introduced in the farming test this time can be pulled sufficiently by a small tractor with less than 40 hp, and if operated at the right times, can plough up to 40-50 cm deep. It was confirmed to improve the physical properties of the soil as per Table 3.14.

Table 3.14: Changes in Soil Hardness (Yamanaka-type) in Dangara District

Plot of farming test site	Depth	Before plough (Feb 14)	After plough (Feb 24)
Plot 1 (Open-air)	10 cm	13	1
	20 cm	12	10
	30 cm	27	23
	40 cm	27	20
	50 cm	18	
Plot 6 (Greenhouse)	10 cm	9	15
	20 cm	15	14
	30 cm	23	
	40 cm	13	
	50 cm	18	

(Note: For a hardness index with the Yamanaka-type tester, the unit conversion is approx. 6.3 kg/cm2 (0.62 MPa) at 20.0 mm, approx. 15 kg/cm2 (1.47 MPa) at 25.5 mm, approx. 20 kg/cm2 (1.97 MPa) at 27.0 mm, and approx. 25.5 kg/cm2 (2.50 MPa) at 28.0 mm. These levels will hinder root growth.)

Source: Survey Team

The details of the ploughing work in each of the above plots are as follows.

In Plot 1, a bottom plough towed by an Iranian 120 hp tractor was used once on January 5, 2024, after which, on February 24, a plough-soiler (Sugano "plough-soiler" variety) towed by a Yanmar 40 hp tractor was used to till once each way lengthwise and widthwise, followed by once with a Yanmar rotary.

The soil in the greenhouse was ploughed once with a Niplo plough using a Yanmar power tiller, and then three times with a Yanmar rotary. The soil was quite hard, as it had not been tilled deeply for many years, and the rotary could only reach a depth of about 15 cm. Since it was a rotary for paddy fields, it was attached too low, so a considerable downward force was required for it to penetrate the field soil. Unless further ploughing is done to make the soil more flexible, it will be difficult to till deeply with the current machinery alone.

Although the yield of the potatoes planted in Plot 1 could not be fully evaluated in June 2024, the rate of high-quality (large-sized) potatoes has clearly increased.

Further farming tests need to be conducted in the future to determine how to incorporate plough-soilers and other implements into the operational system and to determine the appropriate number of times to use them. However, as shown in the above crop rotation system, for the time being, it is expected that deep ploughing will have an effect of improving physical properties by using it about once a year. Further farming tests need to be conducted in the future to fully confirm the effects of deep ploughing and to widely educate farmers about its significance and importance.

(2) Increasing the application amount and improving the application method of organic matter

As mentioned above, the soil in Tajikistan has poor physical properties and is infertile, but it is not enough to simply improve the soil's physical properties by introducing a plough-soiler or other implements. It is also necessary to increase the amount of organic matter added, such as by incorporating wheat residue, and to plough deeply once a year at the same time by using a plough-soiler or other implements.

In the farming test, in order to see the movement of organic matter in the soil before and after deep ploughing, the organic matter content of the topsoil and subsoil of Dangara district Plot 1 was measured, and after deep ploughing, the organic matter content of both soil layers increased (Table 3.15). Since this was measured at only one location, it is not possible to draw a definitive conclusion, but it is thought that the soil of Plot 1 originally contained a lot of crop roots and tree fragments, which were crushed and mixed during deep ploughing, converted into soil components, and assimilated, which may be the cause of the increase.

Table 3.15: Organic Matter (Humus) in Dangara District Plot 1 Before and After Deep Plough

Soil layer	Topsoil	Subsoil
OM % on Feb 13 (before deep plough)	1.40%	1.14%
OM % on Feb 27 (after deep plough)	2.04%	1.69%

Source: Survey Team

Deep ploughing as described above is expected to have various effects, and improvements in mechanization-related technologies are also needed to facilitate this. Farmers in the Fayzobod district apply 20 tons of chicken manure-based organic matter per hectare, but the humus (OM) content is low at 1.2-1.7%. This is thought to be due to problems with the method of application. It is likely spread on the surface and left there, in which case it may be washed away by rain before it can penetrate the soil. Essentially, organic matter should be applied across the entire soil layer, not just the surface. Technical support in this regard is also necessary.

(3) Implementing cultivation management that takes into consideration the avoidance of salt damage

The water of large rivers such as the Vakhsh River, which is the source of irrigation channels in Dangara District, already has a high EC value (indicating electrical conductivity and chemical fertilizer concentration), and field crop producers using irrigation water from this water source must always be careful of salt accumulation in the soil. In the case of open fields, water is constantly circulated by rainwater, so salts are thought to be less likely to accumulate, but in greenhouse cultivation, there is no salt runoff by rainwater, and so once salts are brought into the soil, it is thought to be an environment conducive to their accumulation. EC meters (electrical conduction meters) are essential for this type of cultivation management, but the local agricultural offices do not possess EC meters, nor adequately understand the concept of EC values. Technical support for this type of cultivation management is also necessary.

(4) Shift from extensive to intensive vegetable cultivation management

As mentioned above, even in the case of small-scale vegetable farmers, extensive management is practiced, by way of e.g. not thinning out the plants after sowing, not pinching or thinning fruit vegetables, and not using supports for ground cultivation. However, it is clear that this leads to reduced yields and quality, so it is necessary to shift to intensive cultivation management to the degree which the environment allows, that is, at the appropriate density, by pinching and thinning, etc. This will also lead to a reduction in the use of pesticides. Upon conducting a cost survey, pesticides were found not to be used very often, but there were some farmers whose pesticides accounted for more than 10% of their material costs, and for these farmers, the shift to intensive cultivation management will enable a reduction in production cost.

3.2.3 Soil Rate and Dry-Season Ploughing Test

(1) Soil rate survey

The original plan was to investigate soil rates in the same plot in the cultivation test, separately before ploughing, after ploughing with a bottom plough, and after soil crushing and agitation operations with the rotary tiller. We were able to conduct this soil rate survey at Plots 1-2 of the Dangara Cooperative's farming test site (Table 3.16). When small-sized agricultural machinery was used in MTC Fayzobod, guidance and monitoring were conducted remotely from Japan when the survey team members were not present, and the soil crushing ratio was measured after using the rotary tiller in Plots 1-6.

1. Deciding on sample collection sites and preparing for work		

2. Soil sample collection: 20 cm square sample collection box embedded in the soil with a hammer to collect samples		
3. Using a stainless-steel wire mesh with an opening of 19 mm, it is shaken horizontally by hand about 20 times to separate the clods from soil of up to 19 mm, and then each is weighed		
4. Soil moisture was also measured during ploughing with a moisture meter to check the effect on ploughing		

Table 3.16: Results from Soil Rate Measurement

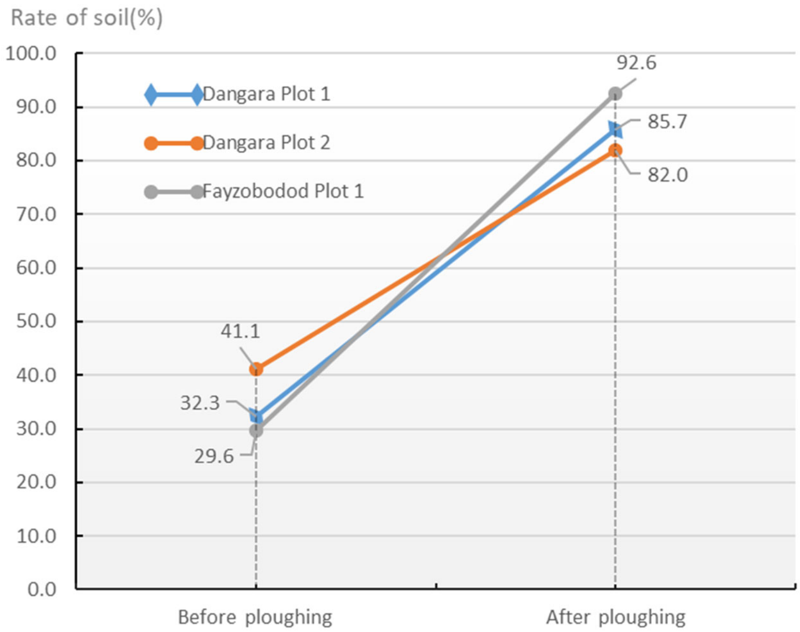
Date	Location	Situation at time of measurement	Soil rate	Soil moisture content
2023/9/26	Dangara district, Plot 1	Untilled cultivated land after the previous wheat harvest. Samples were taken after digging 20 cm of topsoil.	32.3%	36.8%
2024/2/13	Dangara district, Plot 2	Same as above	41.1%	34.1%
Same as above	Dangara district, Plot 5	Same as above	44.3%	36.1%
Same as above	Dangara district, central area of greenhouse	Untilled after harvesting the previous crop of cucumbers.	27.7%	41.0%
Same as above	Dangara district, greenhouse entrance/exit	Same as above	29.7%	39.2%
2024/2/25	Dangara district, Plot 1	Soil rate after one use each of bottom plough and rotary tiller	85.7%	24.1%
Same as above	Dangara district, Plot 2	Same as above	82.0%	20.8%
2024/8/2	Dangara district, control plot (after barley harvest)	Sample measurements after 2 x plough-soiler and 1 x bottom plough for a dry, hard piece of cultivated land after barley harvest	55.5%	14.2%
Same as above	Dangara district, Same as above	Soil rate after crushing and agitating the soil once with a rotary tiller, after ploughing with the bottom plough mentioned above. Jumped from 55.5% to 86.5%.	86.5%	17.5%
2024/2/14	MTC, Fayzobod District	Plot 1, untilled after the previous wheat harvest	29.6%	39.2%

Date	Location	Situation at time of measurement	Soil rate	Soil moisture content
	Cultivation test site			
Same as above	MTC, Fayzobod District	Plot 6, after the previous carrot cultivation	39.2%	39.6%
2024/3/20	MTC, Fayzobod District	Soil rate after ploughing and crushing with one use each of bottom plough and rotary tiller Plot 1	92.55%	Surface: 23.7% -30 cm: 28.8%
Same as above	MTC, Fayzobod District	Same as above, Plot 2	82.2%	Surface: 24.1% -30 cm: 28.9%
Same as above	MTC, Fayzobod District	Same as above, Plot 3	90.5%	Surface: 21.8% -30 cm: 36.1%
Same as above	MTC, Fayzobod District	Same as above, Plot 4	87.3%	Surface: 23.1% -30 cm: 46.1%
Same as above	MTC, Fayzobod District	Same as above, Plot 6	90.2%	Surface: 25.2% -30 cm: 45.0%

Source: Survey Team

Figure 3.3 shows a comparison of the data collected before and after the prescribed ploughing (plough-soiler + bottom plough + rotary tillage) on the same plot in this farming test from Table 3.16.

We were able to examine Plots 1 and 2 of the Dangara site and Plot 1 of the Fayzobod site.



Source: Survey Team

Figure 3.3: Soil Rate Before and After Ploughing

If soil moisture is 16-17% w.b. or higher, deep ploughing can be achieved and the soil rate is likely to be high enough to achieve sufficient ploughing benefits.

At all of the measured cultivation test sites, it was confirmed that the soil coverage was 80% or higher after soil crushing and agitation by the rotary tiller (in Japan, a soil coverage of 70% or higher is targeted as being sufficient in farmland). After using the Japanese-made rotary tiller, the farmers who planted crops were pleased to see better crop rooting and a 20-30% increase in yield. However, as mentioned above, agricultural land in Tajikistan has a stiff hardpan 25-30 cm below the surface. MoA officials and farmers need to understand and respond to the fact that unless this hardpan is broken up at 40 cm below the surface, water retention and drainage, aeration, improved organic content, and farmland fertility will not be achieved. The disruption of hardpan does not require cultivating the entire surface of the agricultural land. The Sugano Farm Machinery Mfg. Co., Ltd. engineer who inspected the site recommended that if the two blades of the newly introduced plough-soiler, which have a width of 120 cm, were used once a year for three years, the soil improvement effect would be significant.

(2) Dry-season ploughing test

Ploughing tests were conducted on dry, hard soils in the dry season, and the following data were obtained (Table 3.17).

A preliminary plough test of the plough-soiler was conducted on a control plot after the barley harvest in June 2024, but the soil was too hard to plough deeper than 30 cm. When attempting to dig deeper than 30 cm, the tractor slipped. When we asked Sugano Farm Machinery Mfg for advice, they replied, "If you make the same furrow twice, or combine the two tines into one (by removing one and attaching only the other to the center of the work machine to increase traction capacity), you should be able to plough 40 cm deep," so we conducted another ploughing test in August.

The plough-soiler was hung twice over the same furrow, which enabled ploughing to a depth of 40 cm. The bottom plough was capable of ploughing 25 cm and returning the topsides to the ground. Subsequent rotary tillage gave a soil rate of 86.5%. Soil moisture was 12.8% at the surface and the penetrating hardness meter showed that soil hardness was Max. 2.5 MPa at a depth of 5 cm and did not penetrate further.

Table 3.17: Ploughing Tests on Dry, Hard Plots

Date and location	August 2, 2024; Sharif-Sharin Cooperative, barley field (after barley harvest)
Plot conditions	Soil hardness: 2.5 MPa (Max.) No penetration beyond 5 cm depth Soil moisture: 12.8% at the surface, 14.2% at 5 cm depth, 17.5% at 25 cm depth
Deep ploughing with plough-soiler	1st time: Tilled to a depth of 30 cm 2nd time: Tilled to a depth of 40 cm
Bottom plough	Ploughing depth: 25 cm, Soil rate after ploughing: 55.0%
Rotary tiller	Tillage depth: 25 cm, Soil rate after tillage: 86.5%
	Operating conditions: Engine rotation 2,500 rpm, PTO speed 1

Source: Survey Team

Photos: Ploughing test

Plough-soiler, top left: 1st run lower right: 2nd run	Bottom plough	Rotary tiller
 	 It can till at 25 cm depth and invert soil 180 degrees.	 Dry yet small clods of soil are also crushed, resulting in a soil rate of 86.5%.

A tractor fuel efficiency survey was also conducted. A fuel consumption study using a plough-soiler (weight: 135 kg) was conducted on farm roads. Fuel consumption of 0.33 L/km was confirmed. Measurements were taken by making three round-trips (330 m x 2 x 3 times = 1,980 m) along the farm road (330 m long) at the Dangara district cultivation test site, consuming 600 milliliters of fuel.

3.2.4 Wear of Consumable Parts

(1) Results of the use of implements for tractors at the Sharif Shirin Cooperative, Dangara district, and wear of consumable parts

Table 3.6, provided earlier, shows the number of machines used, the number of times they were used, and the area cultivated (ploughed) by the Cooperative during the approximately 4-and-a-half-month period from February 24 to July 4, 2024.

The survey team visited the Cooperative on August 2 to check the wear of the consumable parts of each machine. For the plough-soiler and bottom plough, which were used less frequently, and for smaller cultivated areas, we expected less wear on the consumable parts, but the measured dimensions of the parts were almost the same as the originals, and the wear was close to zero. The left-side blade (chisel) of the plough-soiler was reduced by 2 mm to 238 mm. On the right side, the original dimensions are 240 mm, and wear is negligible. The dimensions at both ends of the wing are 260 mm, the same as the original dimensions, with near-zero wear. The manufacturer's instruction manual states that chisels should be replaced when worn to 180 mm, and wing ends should be replaced when they reach 200 mm.

According to the manufacturer's instructions, the bottom plough should be replaced when the gap between the shear and bed falls to 25 mm or less, but measurements on site showed that there was almost no wear. There is no need for replacement of the consumable parts of this plough-soiler and bottom plough in the foreseeable future.

The rotary blade was quite worn. The original part has a width of 55 mm at the tip, and the instruction manual states that it should be replaced when it wears down to 15 mm. The actual measurement of the 48 attached blades showed two rows with a minimum width of 48 mm and six rows with a maximum width of 49 mm. There is approximately 6 mm of wear. Sharif Sharin Cooperative uses a rotary PTO with a single speed of 584 rpm and a blade shaft speed of 256 rpm at low speed. For the time being, it is expected to be usable as-is for another year or so.

Photos: Wear of consumable parts (Dangara District)

		
		
Plough-soiler blades and wings	Bottom plough share	Rotary blades, with 6 mm of wear at the tips

(2) Results of the use of implements for tractors at MTC, Fayzobod District, and wear of consumable parts

The number of times tractor implements at MTC Fayzobod District were used, the size of the cultivated area, and the wear of consumable parts were as per the earlier provided Table 3.10. In contrast, wear of consumable parts was as follows: The test period for MTC's agricultural machines sets was approximately 3-and-a-half months, from March 19 to July 3, 2024.

The survey team visited MTC Fayzobod District on July 27 and 29 to check the wear of the consumable parts of each machine. Wear of the consumable parts of the chisel, plough-soiler, and ridger, which were used infrequently, was close to zero. The bottom plough was used 13 times and the cultivated area was 10.2 ha, but there was almost no wear on the tip.

The wear on the rotary tiller blades was unusually severe. The rotary was used 19 times and cultivated only 11.3 ha (the cooperative in Dangara District used it 23 times and cultivated 56.55 ha), but the blades were very worn out and the remaining width at the tip of the blades was 12 to 13 mm, which meant that the manufacturer's recommended timing for replacement of the blades at the tips (when the blade width at the tip is 15 mm or less) had passed. All 48 blades were replaced with spares.

The reason for the early wear of the rotary tiller blades was that the Fayzobod District is mountainous and sandy, and the PTO was used on the high-speed shift 2 (rotary speed was high at 367 rpm) and the rotary was carefully operated at a ploughing speed of 7 hours/ha, according to the Working Record. (The Dangara Cooperative used a low rotary speed of 256 rpm and a ploughing speed of 3.4 hours/ha.) According to Yanmar's information, the consumable parts for the rotary blades have an export price of USD 800 for a 48-piece set, which is expensive. We instructed MTC Fayzobod District to conduct rental business (ploughing services) at a slower pace in the future, twice as slowly as the current ploughing speed.

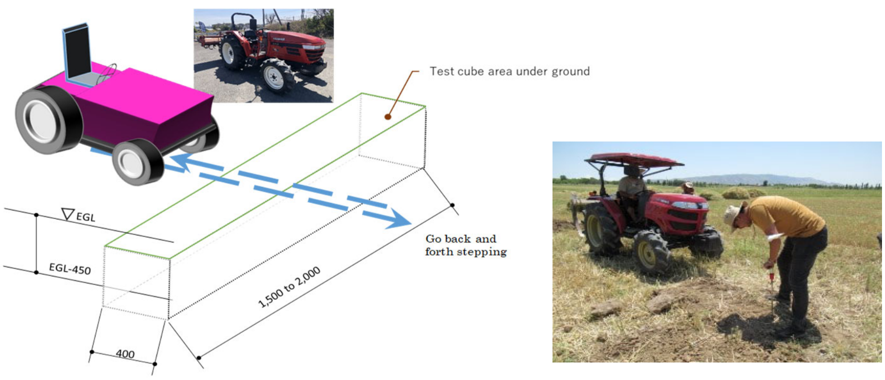
Photos: Wear of consumable parts (MTC Fayzobod)

		
		
Above is the plough-soiler, with black paint still visible. Below is the bottom plough, which has virtually no wear at the tips.	Rotary blades. The photo above shows a worn blade and a new blade for replacement. The tip is worn down 12 mm.	The photo above shows all the blades replaced and installed, and the lower photo shows the worn blades after removal.

3.2.5 Tire Tread Pressure and Soil Turnover Performance Tests

(1) Tire tread pressure testing and analysis

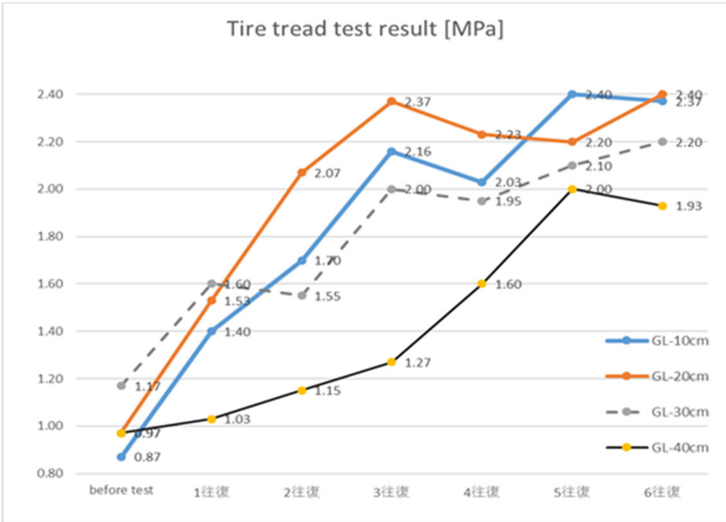
Tire tread pressure tests were conducted in a post-harvest barley field across the road from the farming test plot. The tractor was a 40 hp tractor procured in Japan. As shown in Figure 3.4, a 45-cm-deep trench was dug perpendicular to the tractor's back-and-forth motion, backfilled every 10 cm, and lime was sprinkled each time to facilitate observation of the soil settlement depth. Backfilling was performed six times in total, using a mini-tractor to make one round-trip each time to the backfilled area, with each layer being pushed to -1.0 MPa. Soil hardness (MPa) was measured at the end of each session, every 10 cm from the surface to GL-40 cm, and finally, the cross-section was checked to measure soil sedimentation.



Source: Survey Team

Figure 3.4: Tire Tread Pressure Test (Dangara - June 11, 2024)

Figure 3.5 shows the results of changes in soil hardness (by number of times and depth) in the tire tread pressure test.



Source: Survey Team

Figure 3.5: Changes in Soil Hardness in Tire Tread Pressure Test (by Cycle and Depth)

Before the test, each layer started with a soil hardness of approximately 1.0 MPa, and the same hardness increased with each passing cycle. One feature is that soil hardness increases at an earlier stage per frequency, around GL-20 cm. The next layer, GL-20 cm, shows an increase in soil hardness after one delay. Around GL-10 cm near the surface, soil hardness tended to increase due to lateral shifting of the soil, but the values were not constant. At GL-40 cm, soil hardness began to increase around the fourth time. In each layer, starting from the fifth time, the pressure exceeded 2.0 MPa, and the weight and vibration of the farm machinery hardened the soil, creating a difficult situation for root penetration. Naturally, tractors of 80 hp or more, which are heavier machines, would be expected to reach 2.0 MPa or higher earlier.

The performance here of large-sized machinery currently in use is not poor, but the current shallow ploughing of GL-5 to -10 cm with high-speed movement can only be seen as a "waste of time and money" in farming unless used with greater knowledge of cultivation. Agricultural machinery is pushing down on the soil and shortening the life of the cultivated land. This is very similar to the reality of the use of agricultural machinery for rice cultivation seen in Southeast Asia.

In silty soils such as those in Tajikistan, shallow ploughing can easily lead to poor rooting conditions, resulting in low organic matter content in the deeper layers, which automatically leads to low soil fertility. Ploughing of residues and weeds by deep ploughing is very important for improving irrigation water infiltration and drainage, aeration, and organic content, and the Soils Division of the Tajik Academy of Agricultural Sciences also recommends deep ploughing to compensate for the lack of organic matter.[2]

[2] Soil analysis by the survey team showed a very low organic content of 1.0-1.5%. In interviews, the Tajikistan

One ideal solution is to use small-sized agricultural machinery to promote rooting (in soft soil) through deep ploughing at GL-30 to -40 cm with steady ploughing of organic matter, while reducing soil compaction. Once the importance of deep ploughing is understood, it will become obvious that proper cultivation is not possible without agricultural machinery capable of deep ploughing, and the introduction of small-sized agricultural machinery will lead to the construction of a better farming system.

Therefore, after ploughing, it is best to avoid running over the same area more than 12 times with a 40 hp tractor to avoid any effect on rooting. If each cropping requires only about 6 to 8 treads, then for two to three crops per year, a plough-soiler capable of deep ploughing would only need to be used about once per year. This will be explained to farmers who use agricultural machinery in the future, but it is expected to take a considerable amount of time to communicate phenomena that cannot be visually observed.

Photo: Tire tread pressure testing and soil cross-section

(2) Bottom plough soil turnover performance test and analysis

In the same field, a bottom plough soil inversion test was conducted to confirm its performance in dry (<10% w.b. at the surface), well-compacted soils.

In February-March 2024, ploughing depth was about GL-30 cm, but in areas deeper than GL-20 cm, soil hardness was harder than 2.0 to 2.5 MPa, and no rooting was observed in deeper areas. The ploughing performance was in accordance with the manufacturer's specifications even in dry conditions (<10% w.b.) at running speeds of 3.0 to 4.0 km/h. The inversion performance is at 180°, which does not seem to pose any problem. The next ploughing step, the rotary, is expected to agitate the organic matter evenly. In the farming test plots, deeper ploughing was expected after harvest, and inversion performance was checked after harvest at the end of July or beginning of August 2024.

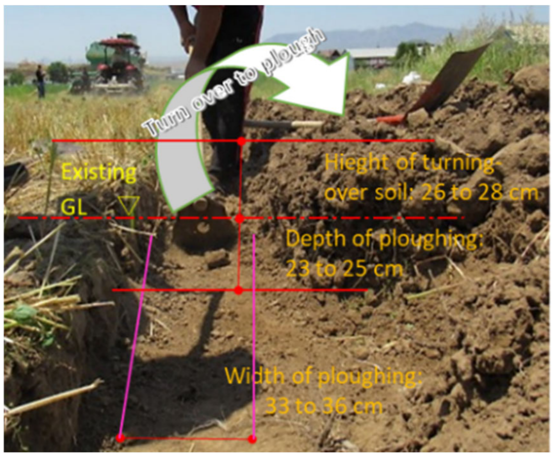


Photo: Soil cross-section in bottom plough soil turnover performance test

Academy of Agricultural Sciences also stated a belief that organic content should be about 3%, and that it is important to plough in organic matter, preferably at a depth of GL-50 cm (although there does not seem to be expenditure at the beginning of the year, and this may be slightly too deep).

3.2.6 Farming Management Patterns, Use of Small Tractors (Implements), and Profitability Targets for Rental Business

(1) Rental service working times

The actual working hours per hectare for each implement during the cultivation test and rental service from March to June 2024 are shown in Table 3.18.

Table 3.18: Cultivation Time per Hectare with Japanese 40 HP Tractor (Actual Test Values)

Farming test sites	Plough-soiler	Bottom plough	Rotary tiller	Total ploughing time
Dangara Cooperative	3.4 h/ha	4.1 h/ha	3.4 h/ha	10.9 hours
MTC, Fayzobod District	4.6 h/ha	6.7 h/ha	7.0 h/ha	18.3 hours

Source: Survey Team

The figures in Table 3.18 are the actual values obtained by aggregating the Working Records of the rental service of Sharif Shirin Agricultural Cooperative (Dangara district) and MTC Fayzobod from February to June 2024. At the Cooperative, it took an average of 3.4 to 4.1 hours for each implement to cultivate 1 ha. Figures for MTC Fayzobod were 1.5 to 2.0 times that of the Sharif Shirin Agricultural Cooperative (Dangara district). The farmland of the Fayzobod district is smaller than that of the Sharif Shirin Agricultural Cooperative (Dangara district), and the cultivation fields are mostly intercropped with orchards, so it is understandable that the ploughing time of each machine is longer, although the rotary tiller takes twice as long. As described in 3.2.1 (2) above, the total work time calculated from the daily work report of MTC Fayzobod was 137 hours. Still, the tractor hour meter indicated 330.8 hours, indicating many omissions from the work daily work report. This matter may be related to the cause of abnormal wear of the rotary tiller of MTC Fayzobod, described in the consumable parts section above.

Based on the standard operating speed specified in the manufacturer's operation manual (according to the manual, plough-soiler: 4-6 km/hr, bottom plough: 3-6 km/hr, rotary tiller: 3-6 km/hr), the average cultivation area per day should set at 3 ha/day for the plough-soiler and rotary tiller and 2 ha/day for the bottom plough.

Note: The plough-soiler and rotary tiller can cultivate 3 ha/day because, whilst the speed is low, the cultivation width is about 1.6 meters; the bottom plough has a much narrower cultivation width of 61 cm, and so it was deemed appropriate to set it at 2 ha/day.

(2) Number of cultivations per implement

Regarding the number of uses of implements per year, the plough-soiler is used for 60-110 days from mid-January to April in the first cropping season of the year (there are some regional differences, but harvest is usually finished by November, and preparation for the next planting begins in December), followed by ploughing, rotary tilling, and seeding. Cultivation in Tajikistan is on a double- or triple-cropping basis, so each implement is used 2 or 3 times. However, plough-soilers are used only once in the middle of the rainy season, when deep ploughing is relatively easy, avoiding the dry season when deep ploughing is difficult due to the time it takes to plough organic matter deep into the soil. Specific cultivation periods for triple cropping are as follows.

1st run: Rainy season plough-soilers late January to early April, bottom plough early February to mid-April, rotary mid-February to mid-April

2nd run Dry season: Bottom plough mid-May to mid-August, rotary mid-May to mid-August

3rd run Dry season: Bottom plough early September to early November, rotary early September to early November

In addition, the demand for inter-tillage weeding work, rental service for chisel ploughs, and transportation work by trailer (transport of seed potatoes, chemical fertilizer, harvest, etc.) adds to the annual work plan. The area for inter-cultivation weeding work by a ridger will be 70% of that for rotary tillage, and the rental service area for chisel ploughs and transportation work will be 30 to 40 ha. In addition, based on the opinions and annual farming patterns of Sharif Shirin Agricultural Cooperative (Dangara district) and MTC Fayzobod, who conducted the farming tests, the target areas for the rental service were set at 60 ha and 70 ha, respectively.

Based on the above understanding, the annual rental service area for each site is calculated as follows:

a) Sharif Shirin Coop. As abundant irrigable agricultural land is available, figures assume 2.5 crops per year.

Plough-soiler: applied once per year; ploughing area is 60 ha, equivalent to 20 days operation.

Bottom plough: applied every cropping; ploughing area is 150 ha (60 ha x 2), equivalent to 75 days operation.

Rotary tiller: applied every cropping; ploughing area is 150 ha (60 ha x 2), equivalent to 50 days operation.

Ridger (inter-cultivation weeding work): 70% of cropping area (150 ha x 0.7 = 100 ha); equivalent to 33 days operation when assuming 3 ha/ hour working speed.

Chisel ploughing and transportation services: equivalent to 30 ha.

b) MTC, Fayzobod District: Calculations based on 2 crops per year.

Plough-soiler: applied once per year; ploughing area is 70 ha (double cropping with small plot areas), equivalent to 23 days operation.

Bottom plough: applied every cropping; ploughing area is 140 ha (70 ha x 2), equivalent to 70 days operation.

Rotary tiller: applied every cropping; ploughing area is 140 ha (70 ha x 2), equivalent to 47 days operation.

Ridger (inter-cultivation weeding work): 70% of cropping area (140 ha x 0.7 = 100 ha); equivalent to 33 days operation when assuming 3 ha/ hour working speed.

Chisel ploughing and transportation services: equivalent to 40 ha.

The above results are summarized in Table 3.19.

Table 3.19: Area That Can Be Used for Rental Business Annually

Farming test sites	Service area (Working days)	Plough-soiler	Bottom plough	Rotary	Ridging-weeding work	Chisel/ transportation service	Total
Sharif Shirin Coop.	Service area (ha)	60	150	150	100	30	490
	(Working days)	20	75	50	33	30	208
MTC, Fayzobod District	Service area (ha)	70	140	140	100	40	490
	(Working days)	23	70	47	33	30	203

Source: Survey Team

(3) Annual service area and income and expenditure forecast for the rental service

Based on the annual rental service area shown in Table 3.19 above, Tables 3.20 and 3.21 show the yearly income and expenditure targets for the next fiscal year and beyond, and the rental service rates by operation for the next fiscal year and beyond were revised as per Tables 3.20 and 3.21 based on feedback from the cooperative in Dangara district and MTC Fayzobod (the aim is to set the price lower than the market price of the surrounding private rental service operators as the first promotional price to expand the market). Since the current rental ploughing services with large-sized agricultural tractors are not very effective and do not necessarily lead to improved productivity, it was determined that there is much room for improvement in the 2024 market price. In addition, the Cooperative reduced its rates by 10%, and MTC by 20%, to attract the interest of users. On the other hand, regarding the demand for rental services, the cooperative in Dangara district has 12 members, and their total field area is 396 ha. In addition, the Cooperative also provides cultivation services to the fields of non-member neighboring farmers. Judging from the total number of farmers in the Dangara district (1,922) and the total field area (28,758 ha), the demand for this 60 ha is deemed to be sufficient. In MTC Fayzobod, all farmers in the district are eligible for cultivation services. Judging from the total number of farmers in the district (3,918) and the total field area (6,286 ha), the demand for rental service covering 70 ha is also deemed sufficient.

In addition, as discussed in Chapter 2, market selling prices for crops are stable thanks to the lack of domestic vegetable production. As such, high-quality crops are expected to fetch higher prices up to a certain delivered volume, with expected profits being equivalent to those described in Section 3.3 even for farmers using rental business. In addition, after interviewing current users of rental ploughing services, we have confirmed that they want to continue using such services even if the fee is set at a rate similar to surrounding agricultural machinery rental business (other than the farming test).

Table 3.20: Income & Expenditure of Rental Service by Sharif Sharin Cooperative/Dangara District (Unit: TJS)

		Plough-soiler	Bottom plough	Rotary	Ridging/ weeding	Other (chisel/transportation service)	Total
Rental fee	(TJS/ha)	700	900	800	650	600	---
Annual service area	(ha/year)	60	150	150	100	30	490
Rental income	(TJS)	42,000	135,000	120,000	65,000	18,000	380,000
Unit area cost	(TJS/ha)	150	290	300	120	120	---
Total expenditure	(TJS)	9,000	43,500	45,000	12,000	3,600	113,100
Gross profit	(TJS)	33,000	91,500	90,000	53,000	14,400	281,900
Gross profit ratio	%	78.6%	67.8%	75%	81.5%	80%	74.2%

Source: Survey Team

Table 3.21: Income & Expenditure of Rental Service by MTC Fayzobod (Unit: TJS)

		Plough-soiler	Bottom plough	Rotary	Ridging/ weeding	Other (chisel/transportation service)	Total
Rental fee	(TJS/ha)	800	1,000	1,000	800	600	---
Annual service area	(ha/year)	70	140	140	100	40	490
Rental income	(TJS)	56,000	140,000	140,000	80,000	24,000	440,000
Unit area cost	(TJS/ha)	250	390	450	200	200	---
Total expenditure	(TJS)	17,500	54,600	63,000	20,000	8,000	163,100
Gross profit	(TJS)	24,500	85,400	77,000	60,000	16,000	263,100
Gross profit ratio	%	43.8%	59.6%	47.5%	69.2%	66.7%	59.8%

Source: Survey Team

It is necessary to add the maintenance cost (cost for various oils, grease, and consumable parts) in addition to the service expenditure of the rental business (fuel cost + operator cost). Maintenance costs for agricultural machinery are typically recorded at 5 to 10% of the machinery price. Generally, these are set at 5% for 3-4 years after the purchase of the machine, and 10% thereafter. This time, it was calculated at 5% of the machinery price (FOB price applied for imported Japanese goods, and factory price for locally purchased goods).

In this regard, the machine price for Japanese and locally made implements is 5,229,000 JPY (as of November 2024), 5% of which comes to 261,450 JPY. Using the exchange rate of 1 USD: 150 JPY : 10.60 TJS, this becomes TJS 18,500. The annual income and expenditure target, including the maintenance cost, can be summarized in Table 3.22.

Table 3.22: Annual Income and Expenditure Targets for 2025 (TJS)

	Dangara Cooperative	MTC, Fayzobod District
① Rental income	380,000	440,000
② Expenditure for rental business	113,100	163,100
③ Maintenance fee (5% of machine cost)	18,500	18,500
④ Profit (①-②-③)	248,400 (USD 23,434)	258,400 (USD 24,370)
⑤ Profitability % (④÷① x 100)	65.4%	58.7%

Note: The exchange rate was calculated at 10.60 TJS/USD.

Source: Survey Team

3.3 Income and Expenditure for Each Product Cultivated on the Farming Test Plots

3.3.1 Income and Expenditure for Each Product Cultivated on the Farming Test Plots (Sharif Shirin Cooperative, Dangara District)

The potato harvest at Dangara District Cooperative's farming test sites, Plots 1 and 2, had been completed as of the end of June 2024. Table 3.23 compares and discusses the results of the three types of farming test plots: fertilized, non-fertilized, and a control field grown last year.

Photos: Potato (Dangara District C**ooperative, 10 June 2024)**

Plot 2: Chemical fertilizer application	Plot 2: No fertilizer	Control field (no chemical fertilizer)
Deep ploughing (approx. GL-40 cm): Plough-soiler + Bottom plough + Rotary tiller	Deep ploughing (approx. GL-40 cm): Plough-soiler + Bottom plough + Rotary tiller	Shallow ploughing (approx. GL-25 cm): Plough-soiler + Bottom plough
		
		
Root length is 42 cm. Up to around GL-35 cm, soft (not exceeding 1.0 MPa), supports rooting.	Root length is 35 cm. The rooting was almost the same as on the left.	The root length is 24 cm, and the fruit is also smaller. At GL-15 to -20 cm, soil hardness is significant at 1.5 MPa or greater, and there is no visible rooting at greater depths.

Table 3.21 shows the post-harvest income/expenditure for the potato crop, together with the results of interviews conducted during the harvest of the crop grown with a large-sized 80 hp Belarusian-made tractor in 2023 with the previous ploughing method (bottom plough + rotary ploughing) and chemical fertilizer application.

Table 3.23: Income/Expenditure for Potato Cultivation (Dangara District Site)

Photo： Hervested potato: from left, Plot1, 2 with chemical fertilizer(C/F)／ Plot1,2 without C/F／Control field without C/F

			2024						2023	
			Plot1, 2: with chemical fertilizer		Plot1, 2: without chemical fertilizer		Control field without chemical fertilizer		Control field with chemical fertiliser + ploughing by Belorussiya tractor80HP	
	Harvest date		2024/6/28		2024/6/28		2024/6/28		the end of May	
	Product		Potato		Potato		Potato		Potato	
	Cultivation area (ha)／ Converted to unit area； per ha		Actual value	Per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha
			0.25	1.00	0.25	1.00	0.03	1.00	0.05	1.00
Cultivation expenses	Number of ploughing (times)		3	3	3	3	1	1	2	2
Cultivation expenses	Ploughing: Deep<GL-35～-40cm, Shallow>GL-25～-30cm、 Implement: Ch.; Chisel, PS; Plough-soiler, BP; Bottom-plough, Ry; Rotary ploughing with Japanese tractor 40HP		Deep: PS + BP + Ry		Deep: PS + BP + Ry		Shallow: Ry		Shallow: (BP + Ry) with Belorussiya tractor 80HP	
Cultivation expenses	Rental fee (TJS)	①	414	1,650	414	1,650	50	550	200	4,000
Cultivation expenses	Amount of planting seed/ nursery	②	600	2,400	600	2,400	30	1,000	150	3,000
Cultivation expenses	(kg or number)		kg	kg	kg	kg	kg	kg	kg	kg
Cultivation expenses	Seed expense (TJS)	③	2,700	10,800	2,700	10,800	135	4,500	699	14,000
Cultivation expenses	Fertilizer levels [amount] (Nutural f.; ton)		0	0	0	0	0	0	0	0
Cultivation expenses	Fertilizer levels [amount] (Urea bag: 50kg/bag)		2.0	8.0	0	0	0	0	1	20
Cultivation expenses	Other expenses: Labor, irregation, applying fertilyzer (TJS)	④	1,525	6,100	1,165	4,660	140	4,667	1,513	30,260
Cultivation expenses	Cultivation expenses	⑤=①+③+④	4,639	18,550	4,279	17,110	325	9,717	2,412	48,260
Tax	(Farmhouse tax)	⑥	65	260	65	260	8	260	13	260
	Total cultivation expenses	⑦=⑤+⑥	**4,704**	**18,810**	**4,344**	**17,370**	**333**	**9,977**	**2,425**	**48,520**
Income	Production (kg)	⑧	8,247	32,988	3,040	12,160	180	6,000	1,600	32,000
Income	Harvest magnification for the unit seed potato quantity (times)	⑨=⑧／②	13.75	13.75	5.07	5.07	6.00	6.00	10.67	10.67
Income	Unit selling price (TJS/kg)	⑩	3.5	3.5	2.6	2.6	2.6	2.6	3.5	3.5
Income	**Income (TJS)**	⑪=⑧x⑩	**28,865**	**115,458**	**7,904**	**31,616**	**468**	**15,600**	**5,600**	**112,000**
Profit	Profit (TJS)	⑫=⑪−⑦	24,161	96,648	3,560	14,246	135	5,623	3,175	63,480
Profit	**Profitability (ratio) (%)**	⑬=100x⑫/⑪	**83.7%**	**83.7%**	**45.0%**	**45.1%**	**28.8%**	**36.0%**	**56.7%**	**56.7%**

Source: Survey Team

Table 3.23 shows the following:

① Comparison of sites where chemical fertilizer was applied and those where no chemical fertilizer was used in Plots 1 and 2 shows differences in yield and quality. Without the use of supplemental chemical fertilizers, even if making improvements with deep ploughing and higher soil rate, soil fertility does not improve although the less fertile lower soil layers are agitated with the surface areas. The need for steady ploughing of organic matter was understood, and complementary chemical fertilizer application will help to increase yield and improve quality. In addition, although not seen before 2023, the intermediate buyers (middlepersons or brokers) in the sale of potatoes on this occasion reflected price differences depending on quality, which had a positive impact on profitability.

② In a comparison of the non-fertilized farms in Plots 1 and 2 and the 2024 crop control farms, the quality was judged to be about the same as the purchase price of the harvest, which was 2.6 TJS/kg for both. The non-fertilized land in Plots 1 and 2 was about 57% [(17,370-11,094)/11,094 ≒ 0.566] more expensive to cultivate, but the yield was about twice as high, and the rate of return was 45.1% compared to 28.8% on the managed farms, indicating the effectiveness of deep ploughing.

③ This is a comparison of the 2024 and 2023 crops in the control field. The research team did not give any advice on cultivation for the 2023 crop before the decision was made to conduct the farming test at the Dangara district site. The Cooperative used a large-sized machine (80 hp) for ploughing, crushing, and ridging with a bottom plough and rotary tiller, and if anything, they were relying on chemical fertilizers to increase yield. The soil rate was also less than 60%, and the ploughing depth was about GL-20 cm. Cultivation was conducted under typical field conditions in Tajikistan. The yield to unit seed potato volume ratio was low at 10.67 times for the 2023 crop, despite the large amount of chemical fertilizer applied, indicating the need for deep ploughing. In 2023, prices were rising due to a poor potato crop and other factors. The profitability was also favorable at 62.1%. This was because the purchase price for farmers was 4.0 TJS/kg, even though the quality was poor. Considering the 2024 crop price, the profitability would be 56.7% for a 3.5 TJS/kg purchase price with good quality, and 41.7% for a 2.6 TJS/kg purchase price [(1,600kg x 2.6TJS/kg) = 4,160TJS, (4,160-2,425TJS)/4,160 ≒ 0.417], which is considered poor quality, which is about the same as if only ploughing was conducted on the non-fertilized land in Plots 1 and 2. A report by the Cooperative president noted the quality of 2023's harvest as intermediate between the non-fertilized and managed fields of the 2024 farming test Plots 1 and 2.

④ Land with chemical fertilizer application in Plots 1 and 2 had a yield-to-unit seed potato volume ratio of 13.75 times. If the amount of chemical fertilizer applied could be reduced by about half with deep ploughing and growth during the growing process could be controlled, the yield to unit seed potato volume ratio could be further increased, which would improve the profitability. It is essential that humus, phosphorus (P), and other nutrients can spread into the subsoil by deep ploughing. Deep ploughing without chemical fertilizer initially takes 1.5 to 3 years to fix humus, particularly phosphorus (P), into the subsoil layer. A chemical fertilizer (NPK) was applied complementarily in this farming test. Then, from the results, it was inspected whether humus and NPK were necessary for the soil to spread fertility and improve organic quality (humus). Confirmed simultaneously was that returning residual substances and weeds, including manure, to the field's soil to save on chemical fertilizer is best. For potatoes, we would like to aim for a yield increase by a ratio of 15 to 20 times (depending on the variety) through deep ploughing, ploughing in organic matter, and proper fertilization.

If deep ploughing is carried out in the rental business (ploughing services), a certain profitability can be secured even if the ploughing is limited to three times.

Next, Table 3.24 shows the income and expenditure for bean (genus: Phaseolus, variety unknown) and corn cultivation. Note that there are no cultivation results for these crops until 2023.

Table 3.24: Income and Expenditure for Bean and Corn Cultivation (Dangara District Site)

			Farming test fields							
		Plot no.	Plot 3 & 4 with C/F (NPK) *1		Plot 3 & 4 without NPK *2		Plot 5 with NPK *3		Plot 5 without NPK *4	
		Harvesting date	2024/8/2		2024/8/2		2024/9/22		2024/9/22	
		Product	Beans		Beans		Corn		Corn	
		Cultivation area (ha)／Converted to unit area ; per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha
			0.25	1.00	0.25	1.00	0.12	1.00	0.12	1.00
Total cultivation cost [expenses]	Cultivation expenses	Number of ploughing (times)	3	3	3	3	3	3	3	3
		Ploughing: Deep<GL-35～-40㎝, Shallow>GL-25～-30㎝、Implement: Ch.; Chisel, PS; Plough-soiler, BP; Bottom-plough, Ry; Rotary ploughing with Japanase tractor 40HP	Deep: PS+BP + Ry		Deep: PS+BP + Ry		Deep: PS+BP + Ry		Deep: PS+BP + Ry	
		Rental fee (TJS) ①	489	1,950	489	1,950	245	2,042	245	2,042
		Amount of planting seed/ nursery (kg or number) ②	25 kg	100 kg	25 kg	100 kg	4.2 kg	35.0 kg	4.2 kg	35.0 kg
		Seed expense (TJS) ③	500	2,000	500	2,000	84	700	84	700
		Fertilizer levels [amount] (Nutural f.; ton)	0	0	0	0	0	0	0	0
		Fertilizer levels [amount] (NPK10-10-10 bag: 50kg/bag)	1.0	4.0	0.0	0.0	1.5	12.5	0.0	0.0
		Other expenses: Labor, irregation, applying fertilyzer (TJS) ④	180	720	1,460	5,840	1,285	10,709	970	8,083
		Cultivation expenses ⑤=①+③+④	1,169	4,670	2,449	9,790	1,614	13,451	1,299	10,825
	Tax	(Farmhouse tax) ⑥	65	260	65	260	31	260	31	260
		Total cultivation expenses ⑦=⑤+⑥	**1,234**	**4,930**	**2,514**	**10,050**	**1,645**	**13,711**	**1,330**	**11,085**
Income & profit	Income	Production (kg) ⑧	352	1,408	189	756	1,182	9,850	467	3,892
		Harvest magnification for the unit seed potato quantity (times) ⑨=⑧／②	14.08	14.08	7.56	7.56	281.43	281.43	111.19	111.20
		Unit selling price (TJS/kg) ⑩	15.0	15.0	15.0	15.0	4.0	4.0	4.0	4.0
		Income (TJS) ⑪=⑧x⑩	**6,030**	**24,120**	**3,285**	**13,140**	**7,828**	**65,233**	**3,268**	**27,235**
	Profit	Profit (TJS) ⑫=⑪−⑦	4,796	19,190	771	3,090	6,183	51,522	1,938	16,150
		Profitability (ratio) (%) ⑬=100x⑫/⑪	**79.5%**	**79.6%**	**23.5%**	**23.5%**	**79.0%**	**79.0%**	**59.3%**	**59.3%**

Note:

*1: As for the income, the amount of residual substance sale is included.(0.25ha) Production 352kg x 15TJS/kg + Residual substance sale 750TJS = 6,029TJS

*2: As for the income, the amount of residual substance sale is included.(0.25ha) Production 189kg x 15TJS/kg + Residual substance sale 450TJS = 3,284TJS

*3: As for the income, the amount of residual substance sale is included.(0.12ha) Production 1,182kg x 4TJS/kg + Residual substance sale 3,100TJS = 7,827TJS

*4: As for the income, the amount of residual substance sale is included.(0.12ha) Production 467kg x 4TJS/kg + Residual substance sale 1,400TJS = 3,067TJS

Source: Survey Team

① Fertilization is effective for growing produce. The difference was more pronounced for beans than for corn. In both cases, too much chemical fertilizer was applied, but this may be due to deep rooting in the case of the corn. When deep ploughing is attempted, the physical properties of the soil may be improved, but nutrients will be in short supply, so supplemental chemical fertilizers and compost should be applied, and the appropriate amount of chemical fertilizer for future cultivation calculated. The yield was different, suggesting that the deep ploughing allowed the effect of chemical fertilizer application to penetrate deeper into the soil.

② We believe that growers (farmers) should experience firsthand the effects of incorporating legumes into their crop rotation system in the course of continuous cultivation. The need for technical cooperation projects can be seen.

③ As with wheat varieties, the residues of both products are easily collected after harvest and are often sold as livestock feed. However, taking residues and weeds out of the field, both during cultivation and after harvest, could also lead to a shortage of phosphorus in the field (i.e. the P in NPK, which is in especially short supply in Tajikistan). The roots will remain in the ground, but consideration will need to be given to the restoration of residues and weeds, including the effective nourishment ingredient from the above-ground portion to the subsoil, even though these constitute a source of income.

Next, Table 3.25 shows the income and expenditure for greenhouse cultivation of cucumbers and melons. Planting was redone by 60-70% from the end of March to April after flood damage occurred in March 2024.

Table 3.25: Income and Expenditure for Greenhouse Cultivation of Cucumbers and Melons (Dangara District Site)

				Farming test fields							
		Plot no.		East of Plot 6 [Greenhouse] with NPK *1		East of Plot 6 [Greenhouse] without NPK *2		West of Plot 6 [Greenhouse] with NPK		West of Plot 6 [Greenhouse] without NPK	
		Harvesting date		2024/9/22		2024/9/22		2024/9/22		2024/9/22	
		Product		Cucumber		Cucumber		Melon		Melon	
		Cultivation area (ha)／ Converted to unit area ; per ha		Actual value	Per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha
				0.018	1.00	0.018	1.00	0.018	1.00	0.018	1.00
Total cultivation cost [expenses]	Cultivation expenses	Number of ploughing (times)		2	2	2	2	2	2	2	2
		Ploughing: Deep<GL-35～-40㎝, Shallow>GL-25～-30㎝、Implement: Ch.; Chisel, PS; Plough-soiler, BP; Bottom-plough, Ry; Rotary ploughing with Japanese tractor 40HP		Shallow: BP + Ry with tiller 11HP		Shallow: BP + Ry with tiller 11HP		Shallow: BP + Ry with tiller 11HP		Shallow: BP + Ry with tiller 11HP	
		Rental fee (TJS)	①	180	10,000	180	10,000	180	10,000	180	10,000
		Amount of planting seed/ nursery (number)	②	750.0 pc	41,667.0 pc	750.0 pc	41,667.0 pc	15.0 g	833.0 g	15.0 g	833.0 g
		Seed expense (TJS)	③	180	10,000	180	10,000	15	833	15	833
		Fertilizer levels [amount] (Nutural f.; ton)		0	0	0	0	0	0	0	0
		Fertilizer levels [amount] (NPK10-10-10 bag: 50kg/bag)		0.030	1.67	0.0	0.0	0.024	1.3	0.0	0.0
		Other expenses: Labor, irregation, applying fertilyzer (TJS)	④	840	46,667	832	46,222	420	23,333	414	23,000
		Cultivation expenses	⑤＝①+③+④	1,200	66,667	1,192	66,222	615	34,166	609	33,833
	Tax	(Farmhouse tax)	⑥	5	260	5	260	5	260	5	260
		Total cultivation expenses	⑦＝⑤+⑥	**1,205**	**66,927**	**1,197**	**66,482**	**620**	**34,426**	**614**	**34,093**
Income & profit	Income	Production (kg for cucumber, pc for melon)	⑧	1,013	56,278	585	32,500	290	16,111	111	6,167
		Harvest magnification for the unit seed potato quantity (times)	⑨＝⑧／②	1.35	1.35	0.78	0.78	19.33	19.34	7.40	7.40
		Unit selling price (TJS/kg)	⑩	4.12	4.12	4.13	4.13	7.0	7.0	7.0	7.0
		Income (TJS)	⑪＝⑧x⑩	**4,174**	**231,865**	**2,416**	**134,225**	**2,030**	**112,777**	**777**	**43,169**
	Profit	Profit (TJS)	⑫＝⑪－⑦	2,969	164,938	1,219	67,743	1,410	78,351	163	9,076
		Profitability (ratio) (%)	⑬＝100x⑫/⑪	**71.1%**	**71.1%**	**50.5%**	**50.5%**	**69.5%**	**69.5%**	**21.0%**	**21.0%**

Note: Expected profittabillity if properly ploughing/ applying fertilizer

Note: *1: As there was a sales price change, I did weighted average during a sale period. Production 1,013kg x 4.12TJS/kg = 4,174TJS

*2: As there was a sales price change, I did weighted average during a sale period. Production 585kg x 4.13TJS/kg = 2,416TJS

Source: Survey Team

① Yields of both products were higher for those fertilized, about 1.75 times higher for cucumbers and 2.7 times higher for melons. Mulch is used for cultivation, and if chemical fertilizer application and irrigation estimates were more limited, yields would increase, and profitability would be further improved.

② As with tomatoes, mass-produced products have a long harvest season. It is also thought that greenhouse cultivation should also be deep-ploughed with a plough-soiler to allow for rooting, as the row height is as low as 10 to 15 cm with mulch. Three ploughings would not reduce the cost-effectiveness of the project, as the yield would likely increase. Considerations such as establishing an opening on the eave or end wall of the greenhouse to allow a 40 hp tractor to access greenhouse fields with a plough-soiler are thus important. This is one of the messages needing to be conveyed to rental business (ploughing service) users.

3.3.2 Income and Expenditure for Each Product Cultivated on the Farming Test Plots (Fayzobod District Site)

The following analysis could be made for potatoes in Fayzobod district.

At both sites, potatoes are harvested from the end of June to mid-July, so excavation was conducted during the standing crop to check rooting and fruit production. The following is a comparison of both sites in three different ways: plots fertilized with chemical fertilizer, non-fertilized plots, and plots ploughed as before (non-fertilized) in the farming test plots.

Photos: Comparison based on potato ploughing method and with/without chemical fertilizer application (Fayzobod district, 7 June 2024)

From left to right, root lengths for Plot 1 with NPK (chemical fertilizer application), without NPK (non-chemical fertilizer application), and control field (previous ploughing and no chemical fertilizer application) were 38 cm, 32 cm, and 26 cm, respectively.

In fields where only shallow ploughing has been used so far, deep ploughing can be applied, and inverting low soil layers that are not fertile (GL-30 to -40 cm) is not expected to have an immediate effect on cultivation and is unlikely to be reflected in growth.

It is essential to improve aeration and water infiltration, plough in roots and post-harvest residues and weeds, and increase the percentage of organic matter (humus) in the soil, so it will likely take 1.5 to 3 years to achieve high productivity.

As the less fertile lower soils are moved to the surface, supplemental chemical fertilizer application is thought to be effective. However, in this case, it seemed that too much chemical fertilizer was applied, and it was not certain whether this would be reflected in fruit production, as the plants were 80 to 100 cm tall and had thick stems.

It is difficult to obtain a uniform fixed amount of chemical fertilizer in a short-term survey. If the chemical fertilizer is, for example, NPK 10:10:10, there is a quality concern, and based on the farmers' level of experience, it is recommended to use around 1 to 3 bags (50 kg/bag)/ha and gradually increase the amount to find the appropriate amount for each field. In conventional cultivation methods, compost is often used, making it difficult to calculate the appropriate amount of chemical fertilizers. If chemical fertilizers are used only as a supplement to cultivation, cultivation costs will not be unnecessarily high.

Next, we will show the income and expenditure for potato cultivation (Table 3.26). The difference with and without chemical fertilizer application was not as apparent as in Dangara district, but as shown in the photo, there was a difference in quality, suggesting that supplementary chemical fertilizer application may be effective. There is a clear need for technical cooperation projects to improve productivity, such as promoting the proper amount of chemical fertilizer application and the effective use of agricultural machinery. The items for technology transfer include: the importance of spreading organic matter (humus) and chemical fertilizer components deep into the soil by deep ploughing; the effect supplementary fertilization in shortening 1.5 to 3 years required for organic matter (humus) and chemical fertilizer components to take hold when deep ploughing only; and, the synergistic and cost reduction effects of ploughing in residues and weeds containing organic matter (humus) and chemical fertilizer components after harvest rather than removing them from the field. We believe that including legumes in the crop rotation system would also be effective.

Table 3.26: Income/Expenditure for Potato Cultivation (Fayzobod District Site)

				Farming test fields			
		Plot no.		Plot1 with NPK		Plot1 without NPK	
		Harvesting date		2024/8/19		2024/8/19	
		Product		Potato		Potato	
		Cultivation area (ha)／Converted to unit area ; per ha		Actual value	Per ha	Actual value	Per ha
				0.15	1.00	0.15	1.00
Total cultivation cost [expenses]	Cultivation expenses	Number of ploughing (times)		3	3	3	3
		Ploughing: Deep<GL-35～-40㎝, Shallow>GL-25～-30㎝、Implement: Ch.; Chisel, PS; Plough-soiler, BP; Bottom-plough, Ry; Rotary ploughing with Japanese tractor 40HP		Deep: PS + BP + Ry		Deep: PS + BP + Ry	
		Rental fee (TJS)	①	350	2,300	350	2,300
		Amount of planting seed/ nursery (kg)	②	400.0 kg	2,667.0 kg	400.0 kg	2,667.0 kg
		Seed expense (TJS)	③	1,600	10,667	1,600	10,667
		Fertilizer levels [amount] (Nutural f.; ton)		0	0	0	0
		Fertilizer levels [amount] (Urea bag: 50kg/bag)		1.000	6.67	0.0	0.0
		Other expenses: Labor, irregation, applying fertilyzer (TJS)	④	930	6,200	630	4,200
		Cultivation expenses	⑤=①+③+④	2,880	19,167	2,580	17,167
	Tax	(Farmhouse tax)	⑥	45	300	45	300
		Total cultivation expenses	⑦=⑤+⑥	**2,925**	**19,467**	**2,625**	**17,467**
Income & profit	Income	Production (kg for potato)	⑧	2,800	18,667	1,600	10,667
		Harvest magnification for the unit seed potato quantity (times)	⑨=⑧／②	7.00	7.00	4.00	4.00
		Unit selling price (TJS/kg)	⑩	3.50	3.50	3.50	3.50
		Income (TJS)	⑪=⑧x⑩	**9,800**	**65,335**	**5,600**	**37,335**
	Profit	Profit (TJS)	⑫=⑪−⑦	6,875	45,868	2,975	19,868
		Profitability (ratio) (%)	⑬=100x⑫/⑪	**70.2%**	**70.2%**	**53.1%**	**53.2%**

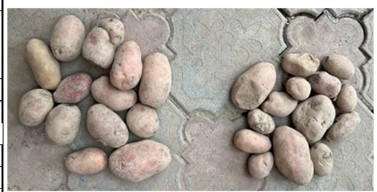


Photo: Ptato production in the farming test field for potato[Fayzobod site]、left; Plot1 with chemical fertilizer (C/F)／ Plot1 without C/F

Source: Survey Team

Next, we will show the income and expenditure for bean (genus: Phaseolus, variety unknown) cultivation (Table 3.27).

Table 3.27: Income/Expenditure for Watermelon and Bean Cultivation (Fayzobod District Site)

			Farming test fields							
		Plot no.	Plot 4 with NPK *1		Plot 4 without NPK *2		Plot 2 x with NPK		Plot 2 without NPK	
		Harvesting date	2024/9/15		2024/9/15		2024/9/24		2024/9/24	
		Product	Watermelon		Watermelon		Beans		Beans	
		Cultivation area (ha)／ Converted to unit area ; per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha
			0.10	1.00	0.10	1.00	0.06	1.00	0.06	1.00
Total cultivation cost [expenses]	Cultivation expenses	Number of ploughing (times)	3	3	3	3	3	3	3	3
		Ploughing: Deep<GL-35～-40㎝, Shallow>GL-25～-30㎝、Implement: Ch.; Chisel, PS; Plough-soiler, BP; Bottom-plough, Ry; Rotary ploughing with Japanese tractor 40HP	Deep: PS + BP + Ry		Deep: PS + BP + Ry		Deep: PS + BP + Ry		Deep: PS + BP + Ry	
		Rental fee (TJS) ①	300	2,300	300	2,300	210	2,300	210	2,300
		Amount of planting seed/ nursery (number) ②	600.0 pc	6,000.0 pc	600.0 pc	6,000.0 pc	2.5 g	41.7 g	2.5 g	41.7 g
		Seed expense (TJS) ③	600	6,000	600	6,000	45	750	45	750
		Fertilizer levels [amount] (Nutural f.; ton)	0	0	0	0	0	0	0	0
		Fertilizer levels [amount] (NPK10-10-10 bag: 50kg/bag)	0.50	5.00	0.0	0.0	0.40	6.67	0.0	0.0
		Other expenses: Labor, irregation, applying fertilyzer (TJS) ④	150	1,500	175	1,750	290	4,829	170	2,829
		Cultivation expenses ⑤＝①+③+④	1,050	9,800	1,075	10,050	545	7,879	425	5,879
	Tax	(Farmhouse tax) ⑥	15	150	15	150	9	150	9	150
		Total cultivation expenses ⑦＝⑤+⑥	**1,065**	**9,950**	**1,090**	**10,200**	**554**	**8,029**	**434**	**6,029**
Income & profit	Income	Production (kg for beans, pc for watermelon) ⑧	650	6,500	380	3,800	160	2,667	90	1,500
		Harvest magnification for the unit seed potato quantity (times) ⑨＝⑧／②	1.08	1.08	0.63	0.63	64.00	63.96	36.00	35.97
		Unit selling price (TJS/kg) ⑩	10.00	10.00	10.00	10.00	18.0	18.0	18.0	18.0
		Income (TJS) ⑪＝⑧x⑩	**6,500**	**65,000**	**3,800**	**38,000**	**2,880**	**48,006**	**1,620**	**27,000**
	Profit	Profit (TJS) ⑫＝⑪－⑦	5,435	55,050	2,710	27,800	2,326	39,977	1,186	20,971
		Profitability (ratio) (%) ⑬＝100x⑫/⑪	**83.6%**	**84.7%**	**71.3%**	**73.2%**	**80.8%**	**83.3%**	**73.2%**	**77.7%**

Source: Survey Team

① With deep ploughing, a profitability of 70-75% or more can be expected even without fertilization.

② Chemical fertilizer application is effective for growing products, but it is only supplementary, and it is thought that the amount of chemical fertilizer applied should start at 1 bag/ha, being adjusted thereafter after observing the situation. If cost savings can be achieved, the profitability will further increase. Profitability of 80-85% or more can be expected for both products if the grower ploughs crop residue and weeds containing organic matter (humus) into the soil instead of removing these.

Next, we will show the income and expenditure for the cultivation of tomatoes and cucumbers (Table 3.28). Planting was redone in April after flood damage occurred in March 2024. For tomatoes, comparisons were made between chemical fertilizer application and non-application of chemical fertilizer, but for cucumbers, there was also flood damage, so the farming test was conducted only under conditions where chemical fertilizer was applied.

Table 3.28: Income/Expenditure for Tomato and Cucumber Cultivation (Fayzobod District Site)

			Farming test fields					
		Plot no.	Plot 3 with NPK		Plot 3 without NPK		A quarter of Plot 6 with NPK	
		Harvesting date	End of Jul to 15 Oct		End of Jul to 15 Oct		End of Jul to 5 Oct	
		Product	Tomato		Tomato		Cucumber	
		Cultivation area (ha)／ Converted to unit area ; per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha
			0.15	1.00	0.15	1.00	0.10	1.00
Total cultivation cost [expenses]	Cultivation expenses	Number of ploughing (times)	3	3	3	3	3	3
		Ploughing : Deep<GL-35～-40㎝, Shallow>GL-25～-30㎝、 Implement: Ch. ; Chisel, PS; Plough-soiler, BP; Bottom-plough, Ry ; Rotary ploughing with Japanese tractor 40HP	Deep: PS + BP + Ry		Deep: PS + BP + Ry		Deep: PS + BP + Ry	
		Rental fee (TJS) ①	350	2,300	350	2,300	350	2,300
		Amount of planting seed/ nursery (number) ②	6,000.0 pc	40,000.0 pc	6,000.0 pc	40,000.0 pc	500.0 g	5,000.0 g
		Seed expense (TJS) ③	900	6,000	900	6,000	500	5,000
		Fertilizer levels [amount] (Natural f.; ton)	0	0	0	0	0	0
		Fertilizer levels [amount] (NPK10-10-10 bag: 50kg/bag)	2.00	13.33	0.0	0.0	1.00	10.00
		Other expenses : Labor, irregation, applying fertilyzer (TJS) ④	1,100	7,333	600	4,000	705	6,650
		Cultivation expenses ⑤＝①+③+④	2,350	15,633	1,850	12,300	1,555	13,950
	Tax	(Farmhouse tax) ⑥	45	300	45	300	40	400
		Total cultivation expenses ⑦＝⑤+⑥	**2,395**	**15,933**	**1,895**	**12,600**	**1,595**	**14,350**
Income & profit	Income	Production (kg) ⑧	5,000	33,333	3,000	20,000	3,000	30,000
		Harvest magnification for the unit seed potato quantity (times) ⑨＝⑧／②	0.83	0.83	0.50	0.50	600.00	600.00
		Unit selling price (TJS/kg) ⑩	4.00	4.00	3.00	3.00	4.0	4.0
		Income (TJS) ⑪＝⑧x⑩	**20,000**	**133,332**	**9,000**	**60,000**	**12,000**	**120,000**
	Profit	Profit (TJS) ⑫＝⑪－⑦	17,605	117,399	7,105	47,400	10,405	105,650
		Profitability (ratio) (%) ⑬＝100x⑫/⑪	**88.0%**	**88.1%**	**78.9%**	**79.0%**	**86.7%**	**88.0%**

Source: Survey Team

① For tomatoes, chemical fertilizer application resulted in higher yields, approximately 1.67 times higher than non-application of chemical fertilizer. In cultivation, applying some amount of chemical fertilizer and deep ploughing so that it reaches the subsoil will likely increase yields and further improve profitability; there is no need to apply copious amounts of chemical fertilizer, and ploughing alone takes a long time to show results, so this method shows relatively immediate effects. In the subsoil, 2-3% organic matter (humus) [currently around 1%], and 10-70 mg/100 g or more of phosphorus (P, P_2O_5) [currently 1-5 mg/100 g], are deemed necessary, and this decreases along with soil depth.

② Collectors are buying tomatoes at 4 TJS/kg instead of the usual price of 3 TJS/kg, leading to improved profitability.

③ In the case of cucumbers, the purchase price was 4 TJS/kg, whereas the usual purchase price was 3-3.3 TJS/kg. These results are effective in fostering motivation among future users of the rental business (ploughing services) (farmers) when it comes to transplanting appropriate cultivation techniques using agricultural machinery.

④ We estimate that retail prices in Dushanbe in mid-to-late October 2024 will be 7-7.5 TJS/kg for high quality in both products, which includes 75-90% (collectors/wholesalers/retailers) expenditure (including transportation/venue cost) and profit on the selling price at which they are purchased from the farmers.

3.4 Farming Income/Expenditure of Rental Business (Ploughing Service) Users Around the Farming Test Sites (Dangara District (Sharif Shirin Cooperative)/ (Fayzobod District))

The continuity of agricultural mechanization cannot be ensured only by the favorable income and expenditure of rental operators, such as MTCs and cooperatives. Profitability is important for farmers, who are the users of the rental business (ploughing services), and users must be convinced of the technical capabilities of Japanese agricultural machinery.

3.4.1 Farming Income/Expenditure of Rental Business (Ploughing Service) Users (Dangara District Site)

This is a trial uniquely for rental business (ploughing service) users, but a comparison is being made between pulling with a small-sized tractor (40 hp) made in Japan and a large-sized tractor (80 hp) made in Belarus. The manufacturer of the implement is matched to that of the tractor. The following analysis could be made.

Table 3.29 shows a comparative study of bottom ploughing with a Belarusian-made 80 hp tractor on pasture (alfalfa). Table 3.29 outlines the results. Note that chemical fertilizers were not applied in any fields.

Table 3.29: Income/Expenditure of Rental Business (Ploughing Service) Users Surrounding Dangara District Test Site (Pasture)

			Ploughing service users fields							
		DF	DF Eshon		DF Fafhsed		DF Ahliddin		DF Yusuf	
		Harvesting date	4times between May and Aug 2024		4times between May and Aug 2024		4times between May and Aug 2024		4times between May and Aug 2024	
		Product	Alpaha-alpha		Alpaha-alpha		Alpaha-alpha		Alpaha-alpha	
		Cultivation area (ha)／ Converted to unit area ; per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha
			0.50	1.00	1.00	1.00	1.00	1.00	2.00	1.00
Total cultivation cost [expenses]	Cultivation expenses	Number of ploughing (times)	3	3	2	2	2	2	3	3
		Ploughing: Deep<GL-35～-40㎝, Shallow>GL-25～-30㎝、 Implement: Ch.; Chisel, PS; Plough-soiler, BP; Bottom-plough, Ry; Rotary ploughing, with mini-toractor 40HP	Deep: PSx2 + Ry		Shallow: BP with Belorussiya tractor 80HP+ Ry		Shallow: BP with Belorussiya tractor 80HP+ Ry		Deep: PS+BP with Belorussiya tractor 80HP+Ry	
		Rental fee (TJS) ①	650	1,300	1,100	1,100	1,250	1,250	4,200	2,100
		Amount of planting seed/ nursery (kg or number) ②	15 kg	30 kg	30 kg	30 kg	30 kg	30 kg	60 kg	30 kg
		Seed expense (TJS) ③	1,200	2,400	2,400	2,400	2,400	2,400	4,800	2,400
		Fertilizer levels [amount] (Nutural f.; ton)	0	0	0	0	0	0	0	0
		Fertilizer levels [amount] (NPK10-10-10 bag: 50kg/bag)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Other expenses: Labor, irregation, applying fertilyzer (TJS) ④	1,480	2,960	2,960	2,960	2,960	2,960	9,920	4,960
		Cultivation expenses ⑤=①+③+④	3,330	6,660	6,460	6,460	6,610	6,610	14,120	7,060
	Tax	(Farmhouse tax) ⑥	130	260	260	260	260	260	520	260
		Total cultivation expenses ⑦=⑤+⑥	**3,460**	**6,920**	**6,720**	**6,720**	**6,870**	**6,870**	**14,640**	**7,320**
Income & profit	Income	Production (Bale) ⑧	365	730	600	600	645	645	1,240	620
		Harvest magnification for the unit seed potato quantity (times) ⑨=⑧／②	24.33	24.33	20.00	20.00	21.50	21.50	20.67	20.67
		Unit selling price (TJS/Bale) ⑩	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
		Income (TJS) ⑪=⑧x⑩	**7,300**	**14,600**	**12,000**	**12,000**	**12,900**	**12,900**	**24,800**	**12,400**
	Profit	Profit (TJS) ⑫=⑪−⑦	3,840	7,680	5,280	5,280	6,030	6,030	10,160	5,080
		Profitability (ratio) (%) ⑬=100x⑫/⑪	**52.6%**	**52.6%**	**44.0%**	**44.0%**	**46.7%**	**46.7%**	**41.0%**	**41.0%**

Source: Survey Team

① All lots were farmed without chemical fertilizer application. The Belarusian-made 80 hp tractor was used primarily to pull the bottom plough, and the Japanese-made 40 hp tractor pulled a rotary plough on all lots. We were fortunate that the selling price was the same for all lots. The deeper the ploughing, the higher the profitability. Alfalfa, in particular, has vigorous rooting, prefers deep ploughing, and because it is a legume, it has a composting effect on the next crop. It is a product that can play a role in crop rotation and is expected to coexist with the livestock industry.

② At DF Yusuf, deep ploughing was performed, but the large (80 hp) tractor used for bottom plough caused soil compaction and prevented rooting. There appears to be a 10% difference in yield, so care should be taken in the use of large-sized agricultural machinery. The farmers are convinced that expenditure will hamper productivity.

③ Note that chemical fertilizers were not applied in any fields concerned. The effect of deep ploughing alone was demonstrated. With deep ploughing and light chemical fertilizer application of 0.2 to 0.3 bags/ha spreading to the subsoil layer, productivity can be improved and a profitability of 60% or more can be expected.

④ Rental business (ploughing service) users are considering future combinations, and so this activity seems to have acted as a good transfer of technology to the farmers.

Table 3.30 shows a comparative study of bottom ploughing with a Belarusian-made 80 hp tractor for corn and watermelon.

Table 3.30: Income/Expenditure of Rental Business (Ploughing Service) Users Surrounding Dangara Test Site (Corn and Watermelon)

			Ploughing service users fields									
		DF	DF Karim *1		DF Iskandal *2		DF Yusuf *3		DF Davlat *4		DF Davlat *5	
		Harvesting date	2024/9/10		2024/8/3 to 9/10		2024/7/28 to 9/13		2024/7/30 to 9/8		2024/7/30 to 9/8	
		Product	Corn		Watermelon		Watermelon		Watermelon		Watermelon	
		Cultivation area (ha)／Converted to unit area ; per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha
			1.40	1.00	2.00	1.00	3.00	1.00	4.70	1.00	0.30	1.00
Total cultivation cost [expenses]	Cultivation expenses	Number of ploughing (times)	2	2	2	2	3	3	2	2	2	2
		Ploughing : Deep<GL-35～-40㎝, Shallow>GL-25～-30㎝、Implement: Ch. ; Chisel, PS; Plough-soiler, BP; Bottom-plough, Ry ; Rotary ploughing with Japanase tractor 40HP	Shallow: BP with Belorussiya tractor 80HP+ Ry		Shallow: BP with Belorussiya tractor 80HP+ Ry		Deep: PS+BP with Belorussiya tractor 80HP+Ry		Shallow: BP with Belorussiya tractor80HP + Ry with Belorussiya tractor80HP		Shallow: BP with Belorussiya tractor80HP + Ry	
		Rental fee (TJS) ①	1,875	1,340	2,500	1,250	5,700	1,900	6,580	1,400	600	2,000
		Amount of planting seed/ nursery (kg or number) ②	35 kg	25 kg	3.00 kg	1.50 kg	4.00 kg	1.33 kg	6.00 kg	1.28 kg	0.367 kg	1.22 kg
		Seed expense (TJS) ③	875	625	2,250	1,125	2,800	700	4,500	957	230	767
		Fertilizer levels [amount] (Nutural f.; ton)	0	0	0	0	0	0	0.0	0.0	0.0	0.0
		Fertilizer levels [amount] (Urea bag: 50kg/bag)	2.1	1.5	7	3.5	4.00	1.33	17.00	3.62	1.00	3.33
		Other expenses : Labor, irregation, applying fertilyzer (TJS) ④	10,500	7,500	8,995	4,497.5	8,550	2,850	14,597	3,106	750	2,500
		Cultivation expenses ⑤＝①+③+④	13,250	9,465	13,745	6,873	17,050	5,450	25,677	5,463	1,580	5,267
	Tax	(Farmhouse tax) ⑥	364	260	520	260	780	260	1222	260	79	260
	Total cultivation expenses	⑦＝⑤+⑥	**13,614**	**9,725**	**14,265**	**7,132.5**	**17,830**	**5,710**	**26,899**	**5,723**	**1,659**	**5,527**
Income & profit	Income	Production (kg for corn, pcs for watermelo ⑧	6,300	4,500	8,100	4,050	11,900	3,967	12,000	2,553	935	3,117
		Harvest magnification for the unit seed potato quantity (times) ⑨＝⑧／②	180.0	180.0	2,700	2,700	2,975.0	2,982.7	2000.0	1994.5	2,547.7	2548.65
		Unit selling price (TJS/kg) ⑩	3.20	3.20	9.27	9.27	8.24	8.24	5.91	5.91	6.32	6.32
		Income (TJS) ⑪＝⑧x⑩	**32,160**	**22,971**	**75,087**	**37,544**	**98,056**	**32,688**	**70,920**	**15,088**	**5,909**	**19,699**
	Profit	Profit (TJS) ⑫＝⑪－⑦	18,546	13,246	60,822	30,411	80,226	26,978	44,021	9,365	4,250	14,172
		Profitability (ratio) (%) ⑬＝100x⑫/⑪	**57.7%**	**57.7%**	**81.0%**	**81.0%**	**81.8%**	**82.5%**	**62.1%**	**62.1%**	**71.9%**	**71.9%**

Note: *1: Income is included with sales amount for cores of cone (1.4ha); 12,000TJS. Production 6,300kg x 3.2TJS/kg + residual substance 12,000TJS = 32,159TJS

*2 to *4: Each watermelon unit selling price did a weighted average between the first & second harvested production.

*3: As for the income, the amount of residual substance sale is included.(0.12ha) Production 6,300kg x 3.2TJS/kg + Residual substance sale 12,000TJS = 32,160TJS

Source: Survey Team

① Likewise, for watermelon cultivation, the amount of chemical fertilizer applied (pre-fertilizer) is also thought to be around 1 bag/ha. If too much expenditure is spent on fertilization, it will be difficult to obtain the benefits of deep ploughing.

② In DF Davlat, within the same field of watermelon cultivation (compared by dividing into 4.7 ha and 0.3 ha), only a large-sized Belarusian-made tractor was used for ploughing with a bottom plough, and a large tractor (80 hp) and a small Japanese tractor (40 hp) were used for rotary ploughing, towing their respective implements for comparison tests. In rotary ploughing, the use of large tractors seems to cause soil compaction and hinder the ploughing effect of the previous process. Profitability were about 10% higher when small tractors were used in rotary ploughing. In the farmers' view, there is no difference in unit sales price, but there is a difference in quality and a larger unit yield, leading to an increase in income. The difference in rooting due to the improved soil physicality resulting from high agitation seems to have been successful. Rotary ploughing with a large-sized tractor seems to have more negative effects on compaction in the subsoil, even though it improves the appearance of the soil at the surface. The effects of the plough-soiler are diminished.

③ If deep ploughing is done with the right amount of chemical fertilizer, yields can be increased and profitability of 85% or more can be expected at the same sales price range. From the farmers' view, a considerable proportion of watermelons were big dimensions, leading to increased profits.

④ For corn (DF; Karim case), it is thought that the quantity of fertilization was 1.5 bags/ha or less, an appropriate amount, and the profitability is also high. Although some expenses were focused on weed removal, it appears that these were not being ploughed into the soil. The yield of 4,500 kg/ha is thought to be high in Tajikistan. Profitability could be further improved through deep ploughing, and the importance of fertilizing an appropriate amount complementarily was also shown. However, care should be taken when fertilizing with shallow ploughing, as this is more likely to be washed outside of the field. This is another point for future technology transfer.

⑤ In corn cultivation, the results are compared between the farming test plots at the Dangara district site and the field of Mr. Karim, a ploughing service user, in Table 3.31.

Table 3.31: Comparison Between Farming Test Plots and Rental Business (Ploughing Service) User Field in Corn Cultivation (Dangara District) (1 ha conversion)

		Farming test fields		Ploughing service user's field
		Plot5 with NPK	Plot5 without NPK	DF Karim
Ploughing method: Deep<GL-35～-40㎝, Shallow>GL-25～-30㎝、Implement: Ch. ; Chisel, PS; Plough-soiler, BP; Bottom-plough, Ry ; Rotary ploughing with Japanese made tractor40㏋		Deep: PS+BP + Ry with tractor40㏋	Deep: PS+BP + Ry with tractor40㏋	Shallow: BP with Belorussiya tractor80㏋ + Ry with tractor40㏋
Cost	①	**13,711**	**11,085**	**9,725**
Production (kg)	②	9,850	3,892	4,500
Selling price for production (TJS)	③	39,400	15,568	14,400
Selling price for residues/sub-production (TJS)	④	25,833	11,667	8,571
Total income	⑤=③+④	**65,233**	**27,235**	**22,971**
Profit (TJS)	⑥=⑤-①	**51,522**	**16,150**	**13,246**
Profitability [for Production+ Residue] %	⑦=(⑥/⑤)x100	**79.0%**	**59.3%**	**57.7%**
Profitability[for Production only] %	⑧=((③-①)/⑤)x100	65.2%	28.8%	32.5%

Source: Survey Team

No significant difference was observed in the profitability of the farming test fields (non-fertilized) and the farmer's shallow-ploughed fields. It is noteworthy that when looking at the profitability for production only (8), that of the fields where complementary fertilization with deep ploughing was employed was highest at about 65%. With such results, it is expected that there will not be any significant opposition from farmers to plough even a portion of the residues into the soil after harvest for the next cultivation, or to creating compost. Furthermore, if concerns about the effective use of residues in cultivation cannot be eliminated, it would be desirable to incorporate livestock feed (pasture grass; particularly *Fabaceae*) into the crop rotation system.

3.4.2 Farming Income/Expenditure of Rental Business (Ploughing Service) Users (Fayzobod District Site)

Table 3.32 shows the income and expenditure for cultivation by users of rental business around the Fayzobod district site.

Table 3.32: Income/Expenditure of Rental Business (Ploughing Service) Users Surrounding Fayzobod District Site (Potatoes, Chickpeas)

			Rental ploughing users' field									
		DF	DF Komil		DF Kamolov		DF Dilshod		DF Abdulloev		DF Kamolov	
		Harvesting date	July 20, 2024		AUG 8, 2024		JUL 25, 2024		AUG 5, 2024		17-Aug	
		Product	Potato		Potato		Potato		Potato		Chick pea	
		Cultivation area (ha)／ Converted to unit area ; per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha
			0.10	1.00	0.10	1.00	0.10	1.00	0.20	1.00	0.50	1.00
Total cultivation cost [expenses]	Cultivation expenses	Number of ploughing (times)	3	3	2	2	3	3	3	3	2	2
		Ploughing: Deep<GL-35～-40㎝, Shallow>GL-25～-30㎝、Implement: Ch.; Chisel, PS; Plough-soiler, BP; Bottom-plough, Ry; Rotary ploughing with Japanese toractor 40HP	Shallow: Ch.+BP+Ry		Shallow: BP+Ry		Shallow: Ch.+BP+Ry		Shallow: Ch.+BP+Ry		Shallow: BP+Ry	
		Rental fee (TJS) ①	275	2,200	200	1,600	275	2,200	500	2,200	900	1,600
		Amount of planting seed/ nursery (kg or number) ②	300 kg	3,000 kg	300 kg	3,000 kg	300 kg	3,000 kg	600 kg	3,000 kg	30 kg	60 kg
		Seed expense (TJS) ③	1,200	12,000	1200	12,000	1,200	12,000	2,400	12,000	450	900
		Fertilizer levels [amount] (Nutural f.; ton)	0	0	0	0	0	0	1.5	7.5	0	0
		Fertilizer levels [amount] (NPK10-10-10 bag: 50kg/bag)	2.0	20.0	1.0	10.0	0.5	2.5	2.0	10.0	1.0	2.0
		Other expenses: Labor, irregation, applying fertilyzer (TJS) ④	1,525	15,250	650	6,500	125	1,250	1,427	6,775	750	1,500
		Cultivation expenses ⑤=①+③+④	3,000	29,450	2,050	20,100	1,600	15,450	4,327	20,975	2,100	4,000
	Tax	(Farmhouse tax) ⑥	30	300	30	300	30	300	60	300	150	300
	Total cultivation expenses	⑦=⑤+⑥	**3,030**	**29,750**	**2,080**	**20,400**	**1,630**	**15,750**	**4,387**	**21,275**	**2,250**	**4,300**
Income & profit	Income	Production (kg) ⑧	2,000	20,000	2,350	23,500	3,000	30,000	3,000	15,000	350	700
		Harvest magnification for the unit seed potato quantity (times) ⑨=⑧／②	6.67	6.67	7.83	7.83	10.00	10.00	5.00	5.00	11.67	11.67
		Unit selling price (TJS/kg) ⑩	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	15.0	15.0
		Income (TJS) ⑪=⑧x⑩	**7,000**	**70,000**	**8,225**	**82,250**	**10,500**	**105,000**	**10,500**	**52,500**	**5,250**	**10,500**
	Profit	Profit (TJS) ⑫=⑪−⑦	3,970	40,250	6,145	61,850	8,870	89,250	6,113	31,225	3,000	6,200
		Profitability (ratio) (%) ⑬=100x⑫/⑪	**56.7%**	**57.5%**	**74.7%**	**75.2%**	**84.5%**	**85.0%**	**58.2%**	**59.5%**	**57.1%**	**59.0%**

Source: Survey Team

① It is reported that there is a hard layer on the surface, so chiselling is used extensively. However, since the plough-soiler's ability to penetrate the soil is equal to or greater than that of the chisel, there seems to be no opportunity to use the chisel except for soil crushing after turning over by the bottom plough (implement manufacturer recommendation).

② In the case of potatoes, a profitability of 85-90% can be expected in the same sales price range if chemical fertilizer application is adjusted at 2-3 bags/ha on top of deep ploughing.

③ For chickpeas as well, deep ploughing appears to be essential, and if cultivated properly, a profittability of about 75% at the same sales price level is considered possible. Thinking about the next crop, beans are considered a prime product for crop rotation system.

④ This data appears to be worthy of farmers' consideration. Even when cultivating with existing 80 hp Belarusian tractors, proper cultivation techniques such as application of chemical fertilizer in a well-controlled amount along with deep ploughing can provide reasonable profitability compared to the present situation; such practical skills are necessary to improve cultivation conditions.

⑤ It is desirable to provide training for farm management to users of the rental business (ploughing services), also.

Table 3.33 shows the income and expenditure for tomato and watermelon cultivation.

Table 3.33: Income/Expenditure of Rental Business (Ploughing Service) Users Surrounding Fayzobod District Site (Tomatoes, Watermelons)

			Rental ploughing users' field											
		DF	DF Komil		DF Kamolov		DF Abdulloev		DF Dilshod		DF Dilshod		DF Zubaydov	
		Harvesting date	from AUG 1 to SEP 15		JUL 25 - SEP 20		AUG 2 - 14 SEP		AUG 03 - SEP 10		AUG 12 - SEP 15		JUL 30 - SEP 5	
		Product	Tomato		Tomato		Tomato		Tomato		Watermelon		Watermelon	
		Cultivation area (ha)／	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha	Actual value	Per ha
		Converted to unit area ; per ha	0.20	1.00	0.20	1.00	0.40	1.00	0.30	1.00	0.10	1.00	1.00	1.00
Total cultivation cost [expenses]	Cultivation expenses	Number of ploughing (times)	3	3	2	2	3	3	3	3	3	3	3	3
		Ploughing : Deep<GL-35～-40㎝, Shallow>GL-25～-30㎝、Implement: Ch. ; Chisel, PS; Plough-soiler, BP; Bottom-plough, Ry ; Rotary ploughing with Japanese toractor 40HP	Shallow: Ch.+BP+ Ry		Shallow: BP+Ry		Shallow: Ch.+BP+ Ry		Shallow: Ch.+BP+ Ry		Shallow: Ch.+BP+ Ry		Deep: PS+BP+ Ry	
		Rental fee (TJS) ①	625	2,200	500	1,600	1,000	2,200	660	2,200	275	2,200	2,200	2,200
		Amount of planting seed/ nursery ② (kg or number)	1,200 nurseries	6,000 nurseries	1,400 nurseries	7,000 nurseries	15,000 nurseries	37,500 nurseries	3,600 nurseries	12,000 nurseries	500 nurseries	5,000 nurseries	5,000 nurseries	5,000 nurseries
		Seed expense (TJS) ③	900	4,500	1,050	5,250	2,250	5,625	1,800	6,000	500	5,000	5,000	5,000
		Fertilizer levels [amount] (Nutural f.; ton)	0	0	0	0	3.0	7.5	0	0	0	0	0	0
		Fertilizer levels [amount] (NPK10-10-10 bag:50kg/bag)	0.5	2.5	0.5	2.5	2.00	5.00	0.30	1.00	0.3	3.0	3.00	3.00
		Other expenses:Labor, irregation, applying fertilyzer (TJS) ④	2,005	10,025	1,150	5,525	1,722	4,305	1,155	3,850	415	4,150	3,370	3,370
		Cultivation expenses ⑤=①+③+④	3,530	16,725	2,700	12,375	4,972	12,130	3,615	12,050	1,190	11,350	10,570	10,570
	Tax	(Farmhouse tax) ⑥	60	300	30	300	120	300	90	300	30	300	300	300
		Total cultivation expenses ⑦=⑤+⑥	**3,590**	**17,025**	**2,730**	**12,675**	**5,092**	**12,430**	**3,705**	**12,350**	**1,220**	**11,650**	**10,870**	**10,870**
Income & profit	Income	Production (kg) ⑧	3,000	15,000	3,800	19,000	13,000	32,500	4,000	13,333	1,150	11,500	7,000	7,000
		Harvest magnification for the unit seed potato quantity (times) ⑨=⑧／②	2.50	2.50	2.71	2.71	0.87	0.87	1.11	1.11	2.30	2.30	1.40	1.40
		Unit selling price (TJS/kg) ⑩	4.5	4.5	4.5	4.5	4.80	4.80	5.5	5.5	12.0	12.0	10.8	10.8
		Income (TJS) ⑪=⑧x⑩	**13,500**	**67,500**	**17,100**	**85,500**	**62,400**	**156,000**	**22,000**	**73,332**	**13,800**	**138,000**	**75,600**	**75,600**
	Profit	Profit (TJS) ⑫=⑪－⑦	9,910	50,475	14,370	72,825	57,308	143,570	18,295	60,982	12,580	126,350	64,730	64,730
		Profitability (ratio) (%) ⑬=100x⑫/⑪	**73.4%**	**74.8%**	**84.0%**	**85.2%**	**91.8%**	**92.0%**	**83.2%**	**83.2%**	**91.2%**	**91.6%**	**85.6%**	**85.6%**

Source: Survey Team

① For tomatoes, the amount of chemical fertilizer applied (primary fertilizer) was considered adequate at less than 1 to 2 bags/ha, resulting in a high profittability. The cost savings and higher yields were better than the profitability of the farming test plots, indicating the importance of supplementary application of the right amount of chemical fertilizer.

② Regarding tomatoes, it would be possible to apply an appropriate amount of urea fertilizer at the time of ploughing and intermediate weeding-ridger, for example.

③ The selling price of watermelons differs, affecting profitability, but these are almost the same when the selling price range is even.

④ Likewise, for watermelon cultivation, the amount of chemical fertilizer applied (pre-fertilizer) is also thought to be around 1 bag/ha. If too much expenditure is spent on fertilization, it will be difficult to obtain the benefits of deep ploughing.

⑤ If deep ploughing is done with the right amount of chemical fertilizer, yields can be increased, and profitability of 85% or more can be expected at the same sales price range. As expected, the farmers' view was that a considerable percentage of big size watermelons led to an increase in profits.

⑥ The farmers have a very positive view of rotary ploughing. While easy ridging and increased soil utilization are important aspects of evaluating the Japanese agricultural machines sets, this is a matter of appearance in the surface layer (GL±0 cm to GL-25 cm), and no thought has been given to improving the physical properties of the deeper layers that promote rooting. It is believed that tying the transfer of related cultivation technology to future projects for the procurement of agricultural machinery will generate synergies.

3.5 Insights and Suggestions from the Farming Tests and Rental Business (Ploughing Services)

As mentioned previously, given that large-sized agricultural machinery has led to problems such as soil compacting and shallow ploughing, Japanese small-sized agricultural machinery that exhibits no technical performance limitations has a good chance of being able to enter the Tajikistan market.

3.5.1 Technological Superiority of Japanese Small-Sized Agricultural Machinery (40 hp Tractor)

1) Fuel consumption is low, in the 7.8 to 17.2 L/ha range (bottom plough: 10.0 L/ha). Interviews indicated that when using a bottom plough, Belarus-made 80 hp tractors consumed 20-25 L/ha (30-35 L/ha for 120 hp tractors), and Chinese-made 80 hp tractors around 20-22 L/ha. Fuel consumption is comparatively high for all tractors when rotary ploughing.
2) The durability of Belarusian and Chinese tractors and implements is low, and while some parts for these can be purchased at local agricultural machinery stores, it takes time to obtain them; replacements have to be sought when a manufacturer goes out of business or when products are discontinued, the rental business will be closed for an extended period until the parts can be obtained. The durability of Belarusian-made products is said to be about twice as high as that of Chinese-made products.
3) In terms of initial investment price, Belarusian and Chinese-made machines are about 1/3 to 1/6 the price of Japanese-made machines, but based on the insights gained from the farming tests, the view at both sites was that the availability of existing machinery was poor, and the service life of consumables was perhaps 1/4 that of those for Japanese-made machines, based on users' (subjective) interview results. Therefore, if the rental business can recover the initial costs within three years, the next set of agricultural machinery can be purchased, even if it is made in Japan, thus enabling self-sustaining agricultural mechanization to become possible. As a result, it is believed that the price issue can be resolved in terms of the advantage of Japanese-made products.

3.5.2 Considerations in Setting Rental Service Rates

Price ranges for rental business were considered at both sites. Currently, we believe that prices are in the promotional phase in order to increase the number of users, ensure that Japanese small-sized agricultural machinery is utilized, and increase productivity in cultivation. However, Japanese-made agricultural machinery, including implements, will have a considerable technological advantage. Fuel consumption is also minimal, with a 40 hp Japanese tractor consuming around 1/2 to 1/5 less fuel than non-Japanese tractors, and a price increase of 20-30% from the promotional price is thought to be possible (still being 10-15% cheaper than existing services). In order to minimize travel to the plots, cost reductions can be planned by devising ways to group user Dehkan farms into small areas.

3.5.3 Insights and Suggestions Obtained From the Farming Test Results

1) According to interviews with Dehkan farmers who participated in the farming test, demand for rental business is strong among small and medium-sized Dehkan farmers who are unable to procure agricultural machinery on their own.

2) Rental service providers are expected to improve their skills in using implements performance enough by forming user groups and other means to provide efficient service.

3) The user should choose the most efficient method (inward ploughing/outward ploughing, inner roll ploughing/outer roll ploughing, etc.) for each field to plough effectively with the bottom plough and plough-soiler before starting the crop, so as to minimize waste in ploughing work.

4) In order to reduce the expenditure of service providers, efforts should be made to establish user groups for rental business in each MTC or cooperative to reduce unnecessary travel distances and the like.

5) It is necessary to promote the performance of small-sized Japanese agricultural machinery and its expected benefits, such as increased income and fertility of farmland, through demonstrations and seminars. There is a belief that the main Belarusian and Chinese-made equipment currently used by farmer-users, although low-cost, has poor ploughing performance and poor durability.

6) From the farming test, it was found that deep ploughing (GL-40 cm) was possible in Tajikistan by introducing Japanese small-sized agricultural machinery, and the soil crushing rate was high, with good root extension. Product quality improved, and the yield increased. The market reaction is positive, and farmers can expect high sales prices by product differentiation with regard to production quality, leading to higher profitability. When the subsoil is brought to a fertile condition by deep ploughing, profitability of 60% or more are thought to be achievable.

7) It is necessary to transfer the technology on the importance of deep ploughing to both the user farmers and operators of the rental business (ploughing service).
   The main points are:
   - Soil that is not fertile to begin with will not immediately become more fertile simply by ploughing, although this can promote root growth. Even if ploughing residual substances and weeds into the soil is conducted post-harvest, it takes 1.5 to 3 years for organic matter (humus) and fertilizer components (particularly phosphorus (P)) to properly take root.
   - Fertilizing only the soil surface layer has minimal benefit and is not cost-effective. Farmers need to understand that if it is desired to improve crop quality and increase the yield per unit area as soon as possible, thoroughly spreading organic matter (humus) and chemical fertilizer into the subsoil by deep ploughing will encourage the root growth that leads to such results.

- Judging from the soil conditions and farm scales in Tajikistan, small agricultural machinery is thought to be appropriate for use in the country. However, existing large-sized agricultural machinery (80 hp tractors) is still the norm, and it is thought that replacement with small-sized agricultural machinery will be difficult. In that case, it is considered possible to transfer technology to increase productivity in the future regarding ploughing methods by inputting only Japanese-made implements (plough-soiler, bottom plough, and rotary) compatible with large-sized agricultural machinery, despite the remaining issue of soil compaction due to the use of large-sized agricultural machinery.
- Even after the introduction of agricultural machinery, productivity does not rise immediately. In addition, ploughing will not necessarily be done well simply because the machinery set was made in Japan; it is vital that the user fully understands how to utilize and operate the cultivation technology, along with service records and bookkeeping.
- If the importance and requirements for deep ploughing are first understood, small-size agricultural machinery can be effectively used for such work that cannot be done by hand, and this will become a cultivation/farm management model (farming model) for utilization of small-sized agricultural machinery (see Appendix 7 for the list of on-site training materials).
- In addition, the establishment of purchasing systems and transportation routes is also an important issue for the introduction of small-sized Japanese agricultural machinery.

8) The annual revenue for the Dangara District site (Sharif Shirin Cooperative) in 2025 can be estimated at 248,400 TJS. MTC Fayzobod District also expects annual revenues of 258,400 TJS. Both are target values, but this amount is equivalent to approximately 25,000 USD. On the other hand, the small-sized Japanese agricultural machinery, similar to the equipment (40 hp mini-tractor, plough-soiler, bottom plough, rotary tiller, trailer; approx. 42,000 USD + 11 hp tiller set; approx. 11,000 USD) delivered this time, will cost roughly 53,000 USD per set (although this is greatly affected by fluctuations in land/sea transport costs). Therefore, even if both sites are operating at 80% capacity, the next equipment purchase can be made within three years (or sooner for a 40 hp tractor set only). If the rental service income is used as a source of funds to continue the project of purchasing the next set and disseminating it to other MTCs (Cooperatives), it is expected that agricultural mechanization using small-sized agricultural machinery in Tajikistan will progress rapidly. The Survey Team WG members have been briefed, and they understand this (see Appendix 3: Meeting Minutes (1) MoA/TAL 10)).

9) It is necessary to establish a parts management system for small-sized Japanese agricultural machinery. It would not be difficult to build an internal information sharing system connecting TAL and MTC/cooperatives under the control of MoA as a system for sharing inventory and stocktaking control charts. TAL's warehouse would be an appropriate stock location for the parts inventory. If TAL is unable to manage such operations, one option is for the MoA to enter into a business contract with a private vendor (e.g., ATS) and delegate the management of parts inventory and parts sales.

10) Regarding cultivation technologies such as chemical fertilizer application techniques and crop

rotation formulation, it is considered essential to implement technical cooperation projects in parallel. At the same time, the transfer to rental business (ploughing service) entities and rental business (ploughing service) users of skills directly related to management, such as operation charts and bookkeeping, may also be included in the scope of this project.

11) From the farming test, there were no suggestions for improvements of implement design deemed necessary by the Tajikistan side, and there is no particular problem with the current designs for each item of machinery.

The MoA should use the many findings and information obtained from the "Information Collection and Verification Survey on the Maintenance of Small-sized Agricultural Machinery" conducted by JICA this time to understand the characteristics of small tractors and implements, and to formulate and disseminate technologies for soil improvement and efficient use of agricultural machinery in field areas.

Chapter 4　Examination of Candidate Programs for Cooperation

Chapter 4 Examination of Candidate Programs for Cooperation

4.1 Development of Agricultural Mechanization Strategy by the Government of Tajikistan

In November 2024, Tajikistan's government formulated the "Program for the Development of Innovative Agricultural Mechanization in the Republic of Tajikistan for 2025-2029". This initiative aligns with Tajikistan's broader Government Decree No. 168 of April 30, 2021 for the "Medium-term Development Program of the Republic of Tajikistan for 2021-2025," as well as Government Decree No. 54 of March 1, 2023 concerning the "Program for the Development of the Agri-Food System and Sustainable Agriculture for the Period Until 2030". The full text is provided in Appendix 8, and the details of this initiative are shown below.

4.1.1 Program for the Development of the Agri-Food System and Sustainable Agriculture for the Period Until 2025-2029

Table 4.1 shows the structure of the Program for the Development of the Agri-Food System and Sustainable Agriculture for the Period Until 2025-2029 (hereinafter referred to as "the Program").

Table 4.1: Program Structure

Chapter	Title
Chapter 1	General Provisions
Chapter 2	Analysis of Current Situation and Main Problems of the Sector
Chapter 3	Priority Sectors
Chapter 4	Program Objectives and Targets
Chapter 5	Staff Development and Professional Retraining
Chapter 6	Program Implementation Funding Mechanisms
Chapter 7	Monitoring and Evaluation
Chapter 8	Other

Source: Ministry of Agriculture of the Republic of Tajikistan (MoA)

Looking specifically at Chapter 1, General Provisions, the program aims to solve agricultural problems by increasing productivity and yield, effectively using and conserving land resources, maintaining and improving soil fertility, improving land, and creating new jobs, with the main objectives of improving the living standards of rural residents and significantly reducing poverty levels.

It is also stated that the rapid development of the agricultural sector is closely linked to the development of appropriate soil cultivation and ploughing technologies, along with the use of agricultural machinery. It further defines agricultural mechanization as the replacement of manual labor with agricultural machinery, thereby improving the quality of agricultural products and reducing costs.

Chapter 2 analyzes the current status and challenges of agricultural mechanization in Tajikistan, including the transition from manual to mechanical operations including soil ploughing and pre-planting soil treatment (soil clod grinding, ploughing, planting, inter-row treatment, weeding, plant protection, etc.) as proposed by the Survey Team. In addition, statistical data shows the number of existing agricultural machines as of October 1, 2024, which is almost identical to the figures in Table 2.9, "Supply and Demand Situation for Agricultural Machinery in Tajikistan," in Chapter 2 of this report.

Chapter 3 contains specifics for agricultural mechanization in the core of this program, and its sub-items are organized as follows.

Sub-items of Chapter 3

1) Improvement of the system of control, testing, registration and training agricultural machinery and equipment
2) Improvement of the state certification and testing systems agricultural machinery and equipment
3) Development of financial leasing relations in the sector
4) Assistance in modernization of agricultural machinery and equipment, the introduction of modern agricultural machinery and equipment
5) Development of a system for servicing agricultural machinery and equipment
6) Development of the machine systems

Overall, the structure is balanced, ranging from legal and institutional frameworks to methods of dissemination and maintenance regimes, but ultimately including the development of agricultural machinery unique to Tajikistan. Of these, 4) is related to the introduction of agricultural machinery. In addition to the financial measures for the acquisition of agricultural machinery by small- and medium-scale farmers, specific measures other than the financial leasing mentioned in 3) include holding exhibitions and seminars, establishing information platforms and databases on the machinery market, providing manuals, and making recommendations to farmers. The points to be considered when introducing these machines include the introduction of agricultural machinery suited to the natural conditions of each piece of farmland, energy conservation, and the social aspect of securing mechanics and qualified personnel. More specific actions include the development of preferential treatment for imports of energy-efficient and environmentally friendly agricultural machinery that uses the latest technology, the development of existing agricultural machinery manufacturers through joint ventures with foreign companies, and the resulting shift to domestic production of components.

Next, 5) demonstrates the nationwide expansion of MTC as a maintenance system for agricultural machinery, while 6) describes the development of agricultural machinery in Tajikistan, where AgroTechService is listed as a private company alongside the Academy of Agricultural Sciences of Tajikistan, The state institution of Tajik Agrarian University, and Tajikistan National Testing Institute as state institutions that develop and manufacture machinery. This would involve the company performing local assembly of the Japanese-made work agricultural machinery proposed in this survey.

Chapter 4 describes the objectives and goals of the program, in which "adaptation of machinery systems to local natural and economic conditions" is mentioned as a relevant statement, an example of which is the introduction of small-sized agricultural machinery, with the note regarding "the use of high-powered machinery/implements with a wide range of working capacity to cope with the workload in large areas and the use of relatively small and convenient machinery in small areas".

Chapter 5 discusses human resource development, with a particular focus on technical cooperation. Of special note is the fact that the respondents mentioned not only machinery technology, but also technical cooperation related to agricultural production processes, including farmers, land improvement, and water management, which is consistent with the proposals in this survey. In addition to universities and other institutions of higher education, the Center for Advanced Human Resources Development in the Agricultural Sector, the Center for Scientific and Technological Innovation under the Academy of Agricultural Science of Tajikistan, and the Center for Agricultural Mechanization are also listed as institutions that provide training.

In Chapter 6, the first phase (2025-2027), the second phase (2028), and the third phase (2029) are set as the program implementation periods, and an action plan is developed for the first phase, which is described in the next section. In addition, a total of 207.9 million Tajikistani TJS (approximately 2.6 billion yen) has been allocated for the implementation of the first phase. Of that amount, 95 million TJS (about 1.2 billion yen) will be procured from the national budget, and 112.9 million TJS (about 1.4 billion yen) will be procured through grant aid from development partners, the private sector, and other sources. This is to be implemented within the framework of a government resolution (based on a report by TajikAgroLeasing) for the development of financial leasing and the establishment and equipping of the MTC.

Finally, in Chapter 8, "Other," further action plans for the second phase of the program (2028-2029).

4.1.2 Details of the First Phase of Action Plan 2025-2027

The first phase of the Action Plan 2025-2027 consists of five of the sub-items 1) to 5) (not including "Development of Machinery (Systems)") listed in Chapter 3 of the above program, and human resource development listed in Chapter 5, for a total of six items, the sixth of which includes not only the staff and experts listed in Chapter 5, but also the technical capacity building of farmers. The Action Plan presents 45 activities across these six items, many of which are consistent with those described in Chapter 3, but as with Chapter 5, they are not entirely consistent and include some activities not described in Chapter 3.

In addition, the duration of the Action Plan and the total budget are in line with the description in Chapter 6 of the Program, which is divided into each year of the first phase (2025-2027) and allocated separately to other financial resources that will be disbursed from the national treasury and borne by donors, but only some of them are budgeted for and many are not. The main activities with budgets are listed in Table 4.2.

Table 4.2: Major Budget Items in the First Action Plan

Chapter 3 Applicable sub-item	Details of major budget items	Budget for 3 years (2025-2027) TJS (converted to JPY)
1)	Establishment of a unified database	TJS 5,000,000 (a little over 60 million yen)
2)	Expansion of the infrastructure and testing machinery of the National Mechanical Testing Institute of Tajikistan	TJS 6,000,000 (a little over 75 million yen)
3)	Development of financial leasing *As an increase in funding from TAL's state budget	TJS 12,000,000 (a little over 150 million yen)
4)	Demand analysis of agricultural machinery by region, city, and district	TJS 30,000,000 (a little over 400 million yen)

Chapter 3 Applicable sub-item	Details of major budget items	Budget for 3 years (2025-2027) TJS (converted to JPY)
5)	Expansion of MTC installation	60,000,000 TJS (a little over 750 million yen)

Source: Ministry of Agriculture of the Republic of Tajikistan (MoA)

The names of development partners are listed for each sub-item, and JICA is listed in many of these items, along with international organizations FAO and UNDP, and bilateral donors GIZ and USAID. Although the criteria and rationale for the selection are not clear, it is possible that recommendations made by the survey to the Ministry of Agriculture and data from the survey results have been considered as part of the activities, since the Action Plan items are not only hard aspects.

4.2 Implementation Planning for Small-Sized Japanese Agricultural Machinery Based on Survey Results

As to planning for the introduction of these 8,672 small-size (40 hp) tractors, we have suggested an agricultural mechanization program utilizing small-sized Japanese agricultural machinery sets with implements, based upon the results of the farming test, as well as discussions with stakeholders, data analysis, and observations to date. So as to demonstrate the convenience of the small-sized Japanese agricultural machinery, target farms representing the 450,000 ha assumed by the MoA in its agricultural mechanization plan should include intercropped areas as well as greenhouses to some extent. However, the use of agricultural machinery on land sloped at more than a 10-degree incline is undesirable from a safety perspective.

4.2.1 Introduction of Small-Sized Japanese Agricultural Machinery

During this survey, a farming test in which Japanese agricultural machinery was introduced was used to evaluate the local performance of Japanese agricultural machinery in Tajikistan, analyze the income/expenditure of the rental business operating this agricultural machinery set and its users (farmers), and verify the sustainability of such agricultural mechanization activities. The capacity of the Tajikistan side to manage the machines was also examined.

Results indicated that Tajikistan’s current problems surrounding agricultural mechanization include the obsolescence of existing machinery being used on farms, a shortfall in the number of machines available, and a lack of personnel and budget for cultivation and agricultural machinery management. Other problems affecting cultivation include hard soil, low soil rate and organic matter (humus) content, as well as poor fertilizing management. The current status and issues to be solved are summarized in Table 4.3. Another issue noted in the use of agricultural machinery was that the Tajikistan side staff in general, as well as farmers, are not accustomed to preparing ledgers and other financial records. In response to the aforementioned situation, we examined the potential effectiveness of promoting the introduction of Japanese agricultural machinery as a means of resolution, in tandem with improvements in appropriate cultivation techniques, so as to advance sustainable agricultural mechanization in Tajikistan.

Table 4.3: Current Status and Issues to be Solved

MoA	· Ongoing concern with a lack of budget for all agricultural matters. · Sales of agricultural machinery handled by TAL, etc., but systematic operations have not developed. · Has jurisdiction over the maintenance and management of machinery, but lacks the necessary personnel and tools to fulfill this. · Has no personnel able to provide guidance on how to improve farming productivity through the use of agricultural machinery.
Agricultural machinery	· Machines are insufficient in number as well as aging in condition. · Currently utilized agricultural machinery: - Fuel economy is poor, component life is short, and replacement parts take time to obtain if not in stock. - The typical shallow ploughing with large-sized agricultural machinery (80 hp) presents problems with incorrect usage, agricultural machinery durability and design. - Ploughing by large-sized agricultural machinery (80 hp) causes sub-soil layer compaction after ploughing, hindering cultivation productivity. · Operation and accounting records are not being kept accurately.
Farms	· Hard soil and abundance of clods · Low soil organic matter · Worker shortages · Ploughing (mainly via rental business services) is under-effective · Effective cultivation is not being carried out (lack of understanding on concepts of ploughing, fertilization, weeding, crop rotation, etc.) · Crop and accounting records are not being kept accurately

Source: Survey Team

(1) Performance of Japanese agricultural machinery

The performance of Japanese agricultural machinery, including implements, was adequate to perform deep ploughing (GL-40 cm in February-April, GL-30 to -35 cm in June-July), being able to improve soil physical properties, aid root growth, and sufficiently agitate organic matter. Its high inversion performance also allows for improvement in the soil rate. Sub-soils are less fertile and require the use of supplemental chemical fertilizers for 18 months to 3 years, by which time the organic matter will then be sufficient. Thereafter, ploughing agricultural residues deep into the sub-soil can help to boost organic matter content and restore soil fertility.

(2) Advantages of Japanese small-sized agricultural machinery

Currently, ploughing is typically conducted with large-sized agricultural machinery in Tajikistan, but the operators and users of rental business services for these machines are aware of their poor fuel efficiency and the low effectiveness of ploughing. Although the initial investment cost for current agricultural machinery is low, there has not been a commensurate increase in productivity, leading to sluggish user expansion and stagnation in the agricultural machinery utilization (operation) rate. These issues are more about the performance of the agricultural machinery itself than about the lack of numbers or the state of aging of this machinery. In comparison, the small-sized Japanese agricultural machinery and implements utilized in the farming test in this survey shew promise in addressing the current issues. Table 4.4 below outlines the status of each machinery-related issue.

Table 4.4: Comparison of Large Size (Current) and Small Size (Japanese) Agricultural Machinery

Current large-sized agricultural machinery (80 and 120 hp tractor equivalent)	Small-sized Japanese agricultural machinery (40 hp tractor equivalent)
Fuel consumption	
Belarusian 80 hp tractor: 20-25 L/ha or 30-35 L/ha at 120 hp; Chinese 80 hp tractor: about 15 L/ha at 80 hp or 20-22 L/ha at 120 hp.	Depending on field slope angle and the type of implement used, but as low as 7-17 L/ha. This is an important factor in increasing utilization rates and improving cost-effectiveness. This also affects rental business.
Maintenance	
Parts are less durable, and while replacements can be purchased from local farm machinery venders, there are inherent risks of long lead times, discontinued parts, or manufacturers having closed down. In such cases, the rental business is also at a standstill until the parts arrive or a substitute can be found. In short, the backup system is insubstantial.	No local distributor, meaning service/repairs and obtaining replacement parts is difficult. This can be remedied with an efficient inventory system that analyses the replacement frequency of parts, secures storage space for inventory and improves operational efficiency, shortens lead times, manages storage quantities by usage frequency, and places orders at full container units. TAL or a MoA-commissioned private company becoming distributors for Japanese manufacturers is also a viable option.
Ploughing performance	
No suitable implement for deep ploughing is in circulation. Rotary ploughing does not increase the rate of soil crushing, also, even if repeated multiple times. This is from the weight of the vehicle causing soil compaction. (A soil rate of more than 60-65% is not achievable.) Given the performance of implements, it would be difficult to achieve deep ploughing with a high soil rate.	Soil can be ploughed deep to GL-40 cm, allowing improved root penetration. Rotary ploughing can also be done in a single pass with a soil rate of up to around 90%. Soil physical properties will certainly improve. Because of the light weight of the vehicle, subsequent ploughing is less likely to impair the effect of the first pass.
Initial cost (agricultural machinery purchase price)	
Inexpensive compared to Japanese machinery. However, user opinions indicate that it is still difficult to recuperate the initial cost even when used in rental business services due to low durability and ploughing effectiveness.	3 to 5 times the price of existing machinery. However, a commensurate increase in quality is visible in terms of high durability and low fuel consumption, and proper testing, which included fine-tuning of the implement blade angles as well as deep ploughing, confirmed the impact on cultivation effectiveness.
Cost-effectiveness	
Although manual labor is reduced, the shallow ploughing and low soil crushing ratio result in inadequate soil conditions for cultivation. Organic matter is also not being ploughed into the sub-soil layers, with ploughing producing minimal results in cultivation. As a result, many farmers are dissatisfied	The effect of deep ploughing on soil physical properties and productivity has been recognized. In the farming test, improved produce quality led to higher unit yields, unit sales prices, and profitability. Participating farmers were also satisfied with the results and highly motivated to use this rental business. On the other hand, the price

with the value of rental ploughing services. For existing large-sized machines, improvements in the way they are used (e.g., operating speed) and the integration of Japanese implements could enhance feasibility.	is 3 to 5 times higher than that of Belarusian, Chinese, and Iranian products, and there remain import-related risks concerning transport routes, exchange rate fluctuations, etc.

Source: Survey Team

(3) Cost and effect considerations regarding Japanese agricultural machinery

1) Pricing of Japanese agricultural machinery

Introducing Japanese agricultural machinery, raises the issue of ongoing procurement costs, which affect sustainability after the initial input. They are undoubtedly expensive when compared to the machinery currently used in Tajikistan, which is typically made in Belarus, China, or Iran. Particularly in light of the recent Russia-Ukraine and Israel-Palestine situations, reasonable local sales prices for small-sized Japanese agricultural machinery need to be sought through cost analysis of transportation from the manufacturers' production bases in Southeast Asia, etc., incorporating any possible ways to reduce shipping volume.

Adopting a local assembly for agricultural machinery is also an item for consideration. While this presents a challenge for the main (powered) units of agricultural machinery, implements are able to be disassembled and reassembled locally with relative ease. In this case, the dispatch of experts to instruct on assembly would be a necessary consideration, but we also conducted a survey of companies able to perform local assembly at their current facilities, which would eliminate the need to construct a dedicated factory. Regarding local assembly, it is also necessary to investigate whether manufacturers of agricultural machinery (tractors, tillers, etc.) and implements can handle on-site assembly in the course of future preparatory surveys and other activities.

2) Costs of cultivation

In the farming test, ploughing was conducted one to three times in the same field per crop, including the switching of implements. As such, cultivation practices are being continued by farmers, and it is considered that this is producing increased profits, if only slightly. The challenge is how to keep the cost of using agricultural machinery low enough that it pays for itself within a few years. Farmers are already burdened considerably by the cost of purchasing chemical fertilizers and labor shortages arising from domestic and international migration. As such, utilizing agricultural machinery rental business services will initially only increase costs. Under these circumstances, if rental business providers are to purchase expensive Japanese agricultural machinery, there is no strategy other than to maximize its utilization rate and minimize rental fees. To achieve this, it is necessary to have a plan for agricultural machinery input that considers the ideal area for ploughing by the rental business. By first doing a thorough job of soil preparation and thus increasing profitability for farmers, users are attracted, the number of times they plough will increase, and utilization rates will be improved. It is important to confirm profitability with farmers and promote awareness of the improvements of deep ploughing and complementary chemical fertilizer application as demonstrated in the farming test, which showed profitability of 60-93% in comparison to service users' actual profitability of 30-50% for 2023's cultivation. It is desirable thereafter to gradually expand investment to harvesting machinery, etc.

(4) Opinions of users of Japanese agricultural machinery rental business services

The results of interviews with users of Japanese agricultural machinery through the rental business are summarized below.

1) Users feel that their yield has improved, and are highly satisfied with the results, with profits increasing by more than 50% across all crops. They believe that Japanese-made agricultural machinery has high ploughing performance and can improve productivity.

2) Regarding the cost of agricultural machinery rental business services, users said they would prefer it be inexpensive, but can accept fees amounting to within the cost of existing rental business services (1,500 to 2,000 TJS/ha).

3) Combined with deep ploughing, an optimal fertilizer application amount of 1 to 2 bags/ha or less can increase the profit margin to 85-90% (1 bag being approx. 50 kg).

4) In farmers' own attempts, bottom ploughing and rotary ploughing with a large-sized Belarusian tractor (80 hp) had hardened the soil depths and adversely affected root growth, causing a 10% or so decrease in profit margins. In addition, a comparison of rain-fed and unfertilized pasture cultivation around the Dangara site showed that deep ploughing with a small-sized Japanese tractor (40 hp) and implements (plough-soiler, rotary plough) was about 11% more profitable (from 41.0% to 52.6%) than shallow ploughing with a large-sized Belarusian tractor (80 hp) and implements (bottom plough and rotary plough). Japanese agricultural machinery was found to be effective in promoting root elongation and increasing productivity, and it can be seen that suitable agricultural machinery is necessary for deep ploughing in Tajikistan, including the ploughing of organic matter.

5) Dehkan farmers have shown themselves to be capable of exchanging opinions amongst one another, which is considered to be a benefit of cooperatives. Given this, it would be easy to group neighbor farmers using rental business services so as to improve efficiency and utilization rates of ploughing operations.

4.2.2 Requirements for Establishing an MTC- or Cooperative-Based Rental Business Model

(1) Importance of business model for MTC and cooperative rental business (ploughing service)

As shown through the farming test, in order to establish a farming system using small size agricultural machinery and to get the rental business of MTCs and cooperatives (or farmer groups) on track, MoA and TAL need to take the lead in forming an operational structure that is staffed at the practical level, allowing target MTCs/cooperatives/farmer groups to use small size Japanese agricultural machinery as part of appropriate cultivation practices. In particular, it will be necessary to train personnel in selected MTCs and cooperatives who are able to understand small-sized agricultural machinery as an effective component of proper cultivation technique, and who can plan overall improvements to the agricultural system that do not rely solely on the introduction of this machinery. The MoA is should then conduct thorough planning and monitoring and, if necessary, actively consider outsourcing operations to private companies.

In order to realize a sustainable farming model utilizing small-sized Japanese agricultural machinery, it is necessary to focus on establishing both a farming system (crop selection, crop rotation methods, and cultivation techniques, etc.) and a business model for the rental business employing this machinery. In the farming test, the subjects (MTC in Fayzobod and the Cooperative in Dangara) providing rental ploughing services actively engaged in sales activities to promote this business. The benefits of a farming system utilizing small-sized Japanese agricultural machinery (i.e., overall improved cultivation techniques including appropriate use of the machinery) in increasing productivity were explained to users, helping them to understand the cost-effectiveness of the service and thereby inducing sales. As a result, they succeeded in increasing machinery utilization rates.

Although MTCs are currently not responsible for disseminating of cultivation techniques at the institutional level, having MTC or cooperative personnel able to manage such a farming model allows for promotional activities to be conducted that will bolster service users and machinery utilization rates, in turn leading to lower service fees and higher profit margins for farmers. Put simply, the rental business model can be explained as a “community-wide understanding of the importance of improving cultivation techniques, including the proper use of small-sized Japanese agricultural machinery”. Having a system wherein farmers can improve their own productivity through exchanging ideas on cultivation techniques with providers and operators of rental business services, upon seeing the proper application of agricultural machinery in these ploughing operations, is considered an important element of both the farming system and the business model. Therefore, the training of rental machinery operators at the field level for rental providers such MTCs and cooperatives in each region is of utmost importance

On the other hand, with a business model of maximizing the utilization rate of agricultural machinery, it will be necessary to incorporate a proper maintenance system in parallel. One of the requirements of the farming model is to establish an efficient and sound system for agricultural machinery maintenance and replacement parts inventory, either by TAL itself or a private company commissioned by the MoA.

(2) Income and expenses of agricultural machinery rental business

Table 4.5 summarizes the analysis of the collected data and interviews with farming test subjects and users of rental business. The Japanese procured agricultural machinery was delivered to both farming test sites in early February 2024, but there were no discussions thereafter between the two sites regarding rental business, with the following results reflecting each site's own views and internal discussions.

Table 4.5: Income and Expenditure, Opinions and Requests for Fayzobod (MTC-managed) and Dangara (Cooperative-managed) Farming Test Sites (40 hp Mini Tractor)

Item		**Fayzobod (MTC)**	**Dangara (Cooperative)**
1.	**Target area for ploughing (No. of Dehkan farms)**	60 to 70 ha (50 to 70 farmers)	60 to 70 ha (8 to 10 farmers)
2.	**No. of times each field is ploughed per year**	4-6 times/year; the fields are small, and travel expenses are incurred to/from each.	4-5 times/year; 1-2 more times if hauling of fertilizers/ harvest or in-row weeding is conducted.

Item		Fayzobod (MTC)	Dangara (Cooperative)
3.	**Total annual area under cultivation [ha]**	200 to 250 ha (approx. 490 ha when fully utilized with in-row weeding)	Approx. 240 ha (approx. 490 ha when fully utilized with in-row weeding)
4.	**Revenue projections from the rental business [TJS]**	When optimizing rental rates (aligning existing rates with the same standards) and adding intermediate cultivating (ridging)/ weeding, approx. TJS 263,000 [USD 25,000]/year → USD 20,000 /year at 80% utilization.	When optimizing rental rates (aligning existing rates with same standards) and adding intermediate cultivating (ridging)/ weeding, approx. TJS 255,000 [USD 24,000]/year → USD 19,200 /year at 80% utilization.
5.	**Possibility of grouping rental business users**	Possible under MTC guidance.	Possible within the cooperative; operation contingent upon having a private contractor authorized/commissioned by MTC or MoA for maintenance.
6.	**Opinions of rental business operators and users about agricultural machinery**	➢ Plough-soilers perform well, and crops root well and very long. ➢ After rotary ploughing, the soil is very soft as the crushing rate is higher than that of existing agricultural machinery. ➢ It was strongly requested that this agricultural machinery be formally introduced as soon as possible.	➢ Rotary ploughing performance is high, with a very high soil rate. ➢ The bottom plough's high soil turn-over performance allows weeds and residues to be ploughed in perfectly. ➢ The plough-soiler seems to be useful even if only used once a year. ➢ The soil remaining soft even at harvest time makes it easier to harvest.
7.	**Requests for future projects**	➢ Implements for in-row weeding [Could be a source of income for the rental business and attract other ploughing work] ➢ Potato planters [Fits for intercropping work with tractor (40HP)]	➢ Implements for in-row weeding [Want to cut down on weeding work] ➢ Potato planters ➢ Potato harvesters [Could be a source of income for the rental business]
8.	**No. of machinery sets that can be managed**	9 - 10 sets / 3 Jamoats under MTC management	1 set per selected cooperative (15 to 20 cooperatives can be selected)

Source: Survey Team

The following are some issues, countermeasures, and points to note based on the interview results and items in Table 4.5.

1) Each farm (Dehkan farm) has a different approach to utilization, and the average number of times agricultural machinery is used per year in the same field is difficult to determine at this time because soil moisture and other factors must be taken into consideration. Upon the implementation of technical cooperation projects or grant aid projects, three times (plough-soiler, bottom plough, rotary plough; or two times, excluding plough-soiler in the dry season) should be communicated in the technology transfer. Each site is estimated to have an area of 60 to 70 hectares that can be catered for with one set of agricultural machinery, and this figure is compared with the calculation

of farming test results as the basis for calculating the number of agricultural machinery needed in the country.

2) The number of times the rental business (ploughing service) is utilized in the same field per year ranges from 4 to 6 times, but it is difficult to say that users fully understand the functions of each implement. Although the Japanese-procured rotary plough, which has a higher rate of soil crushing, was particularly popular among users, it only targets the topsoil, e.g., to increase the ease of forming ridges. The fundamental issue to be addressed is ploughing deeper than GL-20 cm to promote good root growth, which will lead to the improvement and maintenance of soil quality. In all likelihood, the rotary plough will only be used up to four times per year per field, for about one to two years.

3) There were many requests for ridging-weeding implement for the soil preparation phase within two to three weeks after seeding and transplanting, which requires a lot of labor. This addition is worth considering to improve the utilization rate of the rental business and compensate for labor shortages. Potato sowing machines are often self-propelled, which can be expensive, so careful consideration of cost-effectiveness is necessary. As for harvesters, there are many inexpensive options, and it would be effective to introduce these through rental business profits.

4) The total area under cultivation at both sites is estimated to be around 240 ha. The average number of uses per year in the same field would be about 4 times. However, it is possible to operate up to approximately 490 ha by extending the usage period to cover in-row ploughing/weeding operations (reshaping collapsed ridges and treating weeds), grouping users for efficiency (aligning maintenance schedules to help in future planning), and ensuring logical management through proper recordkeeping. A utilization increase of 10-20% can be expected from the second year of operation. Given the current situation in Tajikistan, we believe it is appropriate to first increase the utilization rates of agricultural machinery and improve its cost-effectiveness through rental business services and related mechanisms while ensuring it is maintained properly. We believe that conditions of low utilization of agricultural machinery, as well as shallow ploughing with poor cultivation effects by existing rental business not only lead to "mechanization poverty," but also reduce soil fertility and hinder the establishment of appropriate farming systems. Also, given this, it can be seen that deepening the communication of the effectiveness and efficiency of such mechanization projects to their beneficiaries is also important. Without addressing the lack of productivity improvements from current ploughing services, agricultural mechanization in Tajikistan will stagnate in a situation where unit numbers are insufficient and utilization rates are low. We were able to demonstrate this through the farming test utilizing small-sized Japanese agricultural machinery by increasing the soil rate through deep ploughing. This means harvests with improved quality and higher unit yields, which improve the livelihoods of farmers using the rental ploughing service, sustain the rental business itself, and increase the utilization rate of agricultural machinery.

5) In the farming test, the rental price for small-sized agricultural machinery (40 hp tractor) was set at about half that for existing 80 hp tractors, because of the smaller size. Although it was a promotional period, as a set price, this is too low. Pricing should be decided based on the unit area to be ploughed, regardless of tractor output. Also, as mentioned previously in Chapter 3 (3.2 and 3.3), farmers are not averse so long as usage fees do not exceed the range of peripheral businesses, and since productivity will be improving at the same time, it is deemed possible to attract users even at 90% of the surrounding prices. Although usage fees set for each implement vary, assuming an average fee of TJS 900 to 1,200 /ha, profits of approximately TJS 195,000 /year [USD 19,000 to 21,000 /year] can be expected. This guarantees the continued viability of agricultural mechanization, with Japanese agricultural machinery able to be purchased independently within 2.5 to 3 years, within the asset depreciation period. Concerning fees, it is important to maintain good relationships with users. Operators being willing to consult on cultivation and other matters also forms an important aspect of promotional activity.

6) Both MTC's and cooperatives' operations appear to have a positive attitude toward user expansion and management. Appropriate transfer of technology is vital, including the keeping of machinery operation charts and financial records of the rental business services, and the systematic grouping of service users to reduce movement frequency between fields. The Tajikistan side states that they are confident in their ability to maintain the agricultural machinery, but they do not have sufficient tools, and as far as operation at MTC is concerned, they will need to have free tools provided in order to offer maintenance.

7) Farming test subjects, including the rental business users, have raised no objections regarding the performance of Japanese implements. The fuel consumption of Japanese tractors (40 hp) being 1/4 to 1/2 of that of existing small and large-sized tractors is also advantageous for the rental business.

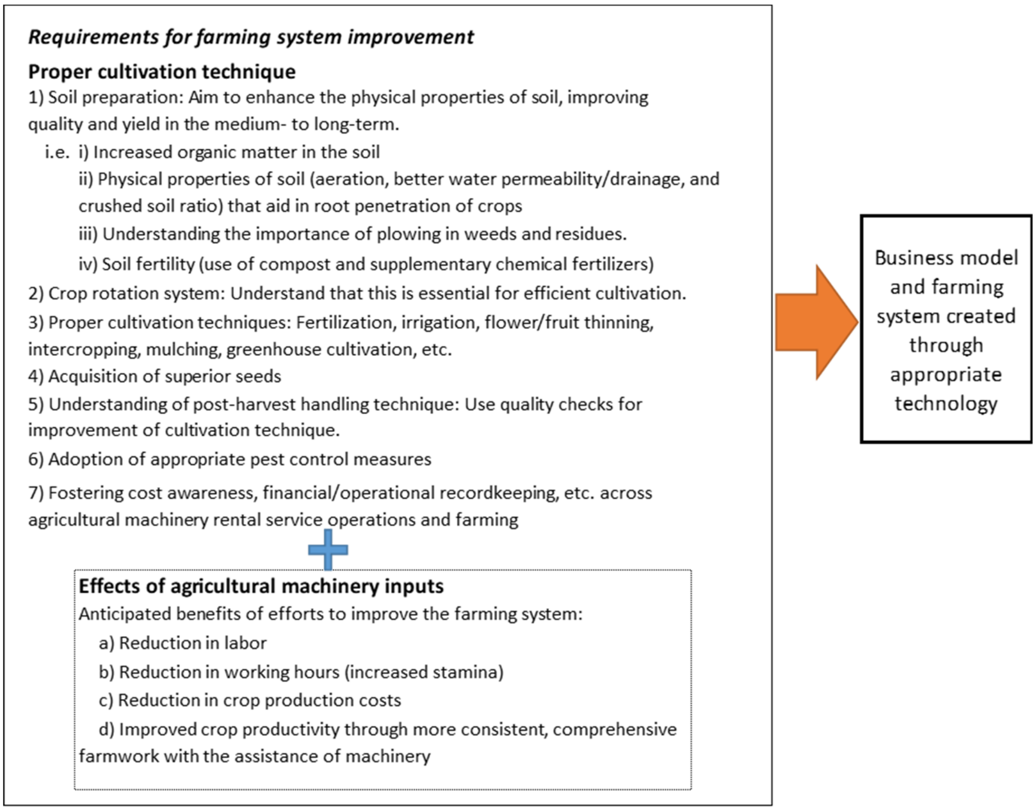
8) The tiller (11 hp) was utilized in greenhouse cultivation at the Dangara site, and when using complementary chemical fertilizers, the resulting profit margin was improved to about 70% for both cucumbers and melons, or about 50% for cucumbers and 21% for melons with no fertilizer application. However, weak rooting due to low ridge height caused by mulching indicates there is further room for improvement in profitability. Ploughing with a plough-soiler or bottom plough is deemed particularly necessary for greenhouses. Concerning tillers, as an item for technology transfer, it is desirable to limit the quantity of these and choose models which can be used effectively with respect to greenhouses and narrow intercropping of tree spans, as these can be utilized very effectively for ridging.

9) Figures for the number of sets able to be managed take into account the target cultivated area and are considered to be indicative of the scale at which the subjects are likely to be able to operate unassisted in the future. As for the Dangara site, it is important that the Cooperative possesses a leader capable of management.

4.2.3 Improvement of Farming Techniques (Farming Management)

As a concept of agricultural mechanization, in order to ensure agricultural machinery to be introduced in the future is properly utilized the purpose of that input must be clearly defined. Also, to ensure effectiveness, the machinery introduced must also be commensurate a clear set of requirements for necessary cultivation technique.

The following figure describes our approach to building an improved farming system.



Source: Survey Team

Figure 4.1: Farming System Improvement Through Agricultural Mechanization

The scope of cultivation technique is broad, including various processes from seed production all the way to harvesting and sales of the target product. It is recommended that soil preparation be the initial focus, as this requires a large amount of labor, subsequently moving on to gradual agricultural mechanization of seeding, fertilization, pest control, harvesting, etc., as productivity is increased, taking into account the inherent costs and the beneficiaries' ability to absorb this technology.

In promoting agricultural mechanization, it is necessary to understand that the mainstay will be the farming system itself. In other words, cultivation technique and the effective use of agricultural machinery are two catalysts for synthesizing a farming system which employs the appropriate technology.

As such, the introduction of technical cooperation projects for the transfer of technology (cultivation techniques) is deemed essential in promoting agricultural mechanization.

4.3 Model Business Implementation Proposal for Dissemination of Small-Sized Japanese Agricultural Machinery Through the Ministry of Agriculture

In the future, to further promote the introduction and diffusion of small size Japanese agricultural machinery through the rental business of MTCs and cooperatives, it will be necessary to communicate the effects and merits of this technology to both of these groups, as well as to the end users of the machinery, Dehkan farms and farmhouses. To this end, it is desirable to select sites from among Tajikistan's 450,000 ha target cultivation area and implement a model project, aiming for a demonstration effect.

The proposed structure for the model project implementation is described as follows.

- The MoA enters into an agricultural machinery management agreement (protocol) with the prime agricultural machinery operating body (MTC, cooperative, or other farmer group).
- An operational structure for agricultural machinery maintenance management is established centered on the MoA/TAL. If there are practical difficulties, the MoA will promote outsourcing contracts for management to private companies.
- As for the operating entities for rental business services in each district, these are be divided into roughly an equal number of MTCs and farmer groups (cooperatives, etc.), to diversify operational risks. However, the maintenance entity shall be a private company contracted by MTC or MoA.
- An inventory system for replacement parts shall be established alongside verification of the frequency of machinery use.
- While ramping up the utilization of initially acquired machinery, a business model will be developed based on the rental business (mainly ploughing), aiming to guarantee viability and to purchase new machinery at the end of a 3-year usage period (the owner of which will be the purchaser).
- A technical cooperation project for technology transfer will be implemented, aimed at increasing cultivation productivity through the use of small-sized agricultural machinery.
- Work will be put towards grouping rental business users and optimizing the efficiency of ploughing operations.
- Proper operation of the rental business will be ensured through the recordkeeping of its prime operating bodies as well as its users.

The following sections detail a draft method for implementation of the rental business (ploughing service).

4.3.1 Implementing Agency (Primary Operating Body) for Model Business (Rental Business)

Primary operating body requirements for the model business utilizing small-sized agricultural machinery are stated below.

(1) The model business (rental business) is to be implemented under the direct management of the MoA. This will be an agricultural machinery rental business with MTCs or farmer groups (cooperatives, etc.) serving as the operating body, to which the need for agricultural machinery in

cultivation will be conveyed at the same time so as to improve efficiency in the use of this machinery, and ultimately to enhance cultivation productivity for farmers. Regarding the involvement of cooperatives, there have been references from the Tajikistan side as to the low technical ability of cooperative farmers. However, operators at both sites (MTC and Cooperative) were found to have performed well in the farming test comprising this survey. If the maintenance of the machinery is able to be performed by MTC or a private (MoA-commissioned) contractor, this will enable increased productivity in cultivation through the effective utilization of agricultural machinery by each operating entity. Regardless of the form of operation, the maintenance entity would be MTC or a private operator contracted by the MoA.

(2) MTCs will provide services to farmers and cooperatives for guidance on cultivation using small-sized agricultural machinery, as well as conduct maintenance of agricultural machinery. The provision of training courses on agricultural machinery maintenance and cultivation will also be considered. This will help to improve farmers' livelihoods and build ties between the parties involved. When a cooperative acts as the operating entity of a rental business, it can share a degree of responsibility for sales together with the service users, and steer its business development uniquely in response to local market conditions.

(3) When small-sized agricultural machinery is input, the MoA shall be owner and the MTC or cooperative (farmer group) the user. As Tajikistan's registration system for agricultural machinery does not allow the user to be separately defined from the owner, a formal protocol will be required between the former and latter for agricultural machinery use and management. The registration system would also require an agreement on deadlines and methods for disposal.

Table 4.6: Proposed Commitments for Small-Sized Agricultural Machinery Inputs

Item	**MoA**	**MTC or Cooperative**
Agricultural machines set list	(See Appendix for list of agricultural machines to be procured.)	
Ownership	Ministry of Agriculture of the Republic of Tajikistan (MoA). They will assist with registration procedures, and work to prevent resale or chartering of agricultural machines for which penalties will be imposed on violating individuals/organizations.	The party authorized to use the agricultural machinery (operating body [user]) is responsible for its management. The supplied small-sized agricultural machinery sets may not be resold or chartered. Violators shall be subject to surrender of agricultural machinery and fines/ imprisonment.
Maintenance	This is transferred to the user, but MTC or an MoA-designated contractor will act as the point of contact as needed. MoA oversees the contractor's inventory management, regularly monitoring operations.	Consumables and parts that frequently fail will be replaced once or supplemented for one (1) year, after which a replacement purchase will be necessary. The warranty on failure shall be approximately six (6) months. Thereafter, any necessary parts will be purchased by the operating entity of the rental business.
Rental business	Conducts regular service management. Reviews working	Keeping of rental business management records (working records and account books that evidence

Item	**MoA**	**MTC or Cooperative**
	records, account books, savings, and agricultural machinery developing plans, consulting with the service operator as needed. For any new agricultural machinery being purchased through the project, they will assist the user in applying for registration.	the accumulation of proceeds) shall be obligatory. The party is periodically audited by the MoA, receiving guidance for proper operation as necessary. They will save profits so as to purchase new small farm machinery for the purpose of service expansion in about 2.5 to 5 years. Newly purchased agricultural machines through the rental business shall be applied for registration. After five (5) years, operators (including MTC) as yet unable to purchase new machinery shall return the initially input small-sized agricultural machinery to the MoA.
Utilization of small-sized agricultural machinery	Conducts training courses that explain the need for agricultural machinery in farming, employing local experts on cultivation.	The second and subsequent training sessions shall be charged for [xxTJS /time][1]. Users of the rental business shall also be included as targets for training.
Deadline for disposal of input (supplied) agricultural machinery	Assists with disposal procedures.	Applies for disposal. Based on depreciation (Tax Code) or the MoA's own deadlines for utilization of agricultural machinery, the disposal procedure will be carried in the range of 7 to 9 years after the provision of the agricultural machinery.
Overall administration	In light of the five-year plan Agricultural Mechanization Development Program and any amendments therein, broadly and regularly explain the plan contents to users (prime operating bodies) for the benefit of rental business users.	

Source: Survey Team

The operating organization must be capable of providing at least basic bookkeeping for business operations. In TAL/ MTC, there is a trend towards manufacturer dependence concerning maintenance activities for small-sized agricultural machinery, but from the standpoint of sustainability, it is desirable that TAL/MTC's independent management is realized within two years.

4.3.2 Sites and Scale for Target Area

Site and scale conditions for ease of rental business and maintenance operations are described below.

(1) Approximately six (6) target sites/districts are selected (with a view to a roughly equal number being MTC- and Cooperative-managed), with 10-20 sets of small-sized agricultural machinery furnished per district (projected manageable field area: 600 ha to 1,400 ha /district). Overall, the project assumes 100 machinery sets (centered on 40 hp equivalent tractors + implements).

[1] Course pricing to be set in consultation with the Tajikistan side.

As this amounts to a little more than 1% of Tajikistan's shortfall of small tractors (8,672 units), it is conceived to function as a demonstration effect. For two or three MTC locations, this will include repair agricultural machinery and additional implements such as ridging-weeding machine. In addition, up to about 10 sets of implements and tillers (about 10 hp) that are compatible with currently utilized large-sized tractors will be made available to appropriate operating entities.

(2) A set of repair agricultural machinery will be needed to be provided to the MTC in each selected region.

(3) In order to select an operating entity, it is necessary to investigate the size of the plots it can supply services to and whether or not products that can be grown in crop rotation are being utilized. When it comes to selecting target MTCs and cooperatives, they will be asked to submit a two- or three-year activity plan for repurchasing small-sized agricultural machinery (using profits saved up), and this will be used as a selection criterion.

4.3.3 Parallel Implementation of Rental Business Using Small-Sized Japanese Agricultural Machinery and Farming Technology Improvement Activities

In implementing this project, the rental business utilizing small-sized Japanese agricultural machinery and parallel activities to improve farming techniques serve as two inseparable components that will make up the driving force for establishing a sustainable farming system. We believe that without assistance for the improvement of cultivation technology, agricultural mechanization in Tajikistan will not be able to move forward in a sound and sustainable manner.

Figure 4.2 below describes the requirements identified for both project.

Rental business services using small-sized Japanese agricultural machinery

1) Select the target region.
2) Determine the type of implements and compile the necessary agricultural machinery specifications.
3) Formulate a business model for the agricultural machinery rental business.
4) Conduct activities aimed at promoting agricultural mechanization and transferring cultivation techniques so as to improve farmers' livelihoods.
5) Hand over management methods established for grant aid projects, such as inventory systems that take into account maintenance activities, and ensure their continuation.
6) Three to four years after the introduction of agricultural machinery, monitor the system nurtured by the results of project activities over a period of one to two years to confirm its sustained operation.
7) Examine local private companies capable of agricultural implement assembly and establish bridges between Japanese companies so that the system can continue into the future. etc.

⇑ ⇓ Frequent exchange of ideas, mutual information sharing

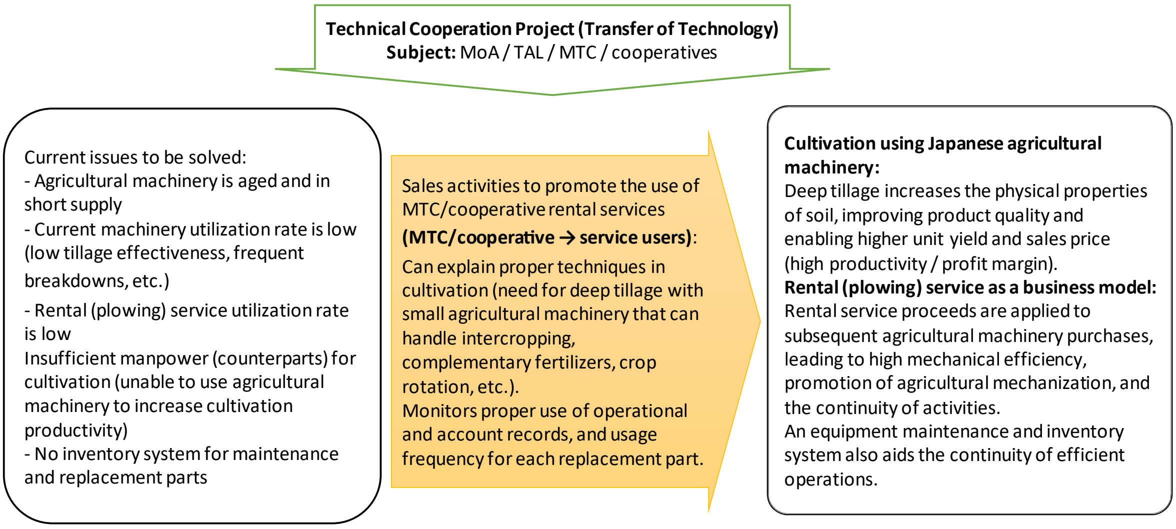
Requirements for activities to improve cultivation technologies

1) The MoA will develop a farming system plan in collaboration with the JICA technical cooperation project.
2) Draft plans (business model) for an agricultural machinery rental business.
3) Select implements, etc., specialized for the necessary soil preparation. The Tajikistan side recommended a stone-separating implement, but it is expensive and likely to be under-utilized after the first application. Therefore, depending on the scale of agricultural machinery input, one unit would likely be sufficient for the selected area.
4) In selecting a target area, the presence of human resources that can acquire operational capacity and cultivation techniques is highly important, and so this will be a condition when looking at locations (MTCs, or farmer groups such as cooperatives). The reference target area for the rental business is 50-70 ha per set of agricultural machinery. → Future technology transfer will be conducted in the area, including users of the rental business.
5) Consider agricultural machinery having specifications that allow for local assembly.
6) Propose methods of managing replacement parts (network systems for storage, inventory etc.).
7) Related to 4), establish a system for maintenance/repair of the agricultural machinery.
8) Agricultural machinery ownership will rest with the counterpart agency, but have them enter into an agreement with agricultural machinery users (farmers).

Source: Survey Team

Figure 4.2: Requirements for Rental Business and Cultivation Technique Improvement Using Small-Sized Japanese Agricultural Machinery

Figure 4.3 illustrates the concept for operational structure establishment.



Source: Survey Team

Figure 4.3: Concept of Operational Structure for MTC/Cooperatives

4.4 Proposals for Grant Aid and Technical Cooperation Projects

4.4.1 Implementation Plan for Grant Aid Project

If the MoA implements a model business for the introduction and dissemination of small-sized Japanese agricultural machinery, the Japanese side may support the procurement of such machinery through a grant aid project. In such case, it is also considered an essential condition that the Japanese side implement a technical cooperation project to improve farming techniques in tandem with the grant aid project.

4.4.2 Setting Conditions for the Implementation of Grant Aid Projects

The following 10 points, listed from the perspective of organizational structure, describe the qualities and environment that should be possessed by recipients of small-sized Japanese agricultural machinery through grant aid projects. (For those not met at the time of procurement, training should be planned to ensure conditions are met swiftly thereafter.)

- Storage facilities are in place to prevent agricultural machinery from being stolen or damaged by the elements.
- Repair facilities are in place for handling minor breakdowns and maintenance of agricultural machinery.
- Will have personnel available who can handle minor breakdowns and maintenance of agricultural machinery.
- A spare parts supply system for the agricultural machinery is in place.
- Will have a proven track record of providing agricultural machinery rental business services.
- Will have an operator (preferably more than one) who can carry out agricultural machinery rental business services.

- The organization will have sufficient management knowledge and be able to submit a business plan concerning the provision of agricultural machinery rental business services.
- There are clients in the vicinity of the rental business base commensurate with the capacity of the agricultural machinery.
- During busy periods when requests for rental business services are concentrated, it will be possible to respond flexibly by extending the hours and days on which services are provided.
- The organization is in a sound financial position.

All of the above items are deemed necessary for a rental business to be a viable business, and are capabilities and qualities to be aimed for regardless of whether the recipient of the procured Japanese machinery is an MTC or a cooperative. On the other hand, by providing appropriate training, such as the business training previously implemented through the Business Incubation Project (BIP)[2], and training to develop agricultural machinery maintenance personnel and operators, it will be possible to expand the number of machinery recipients. In addition, with the rental farming service, it is important that the users (farmers) have the necessary cultivated area.

As previously mentioned, the main agricultural players in Tajikistan are "collective Dehkan farms and cooperatives" and "Dehkan farms and individual farmers." Relating to the former, the use of agricultural machinery should be entrusted to cooperatives (as per the farming test in Dangara district), and for the latter, agricultural machinery rental (ploughing) services provided through MTC (as in the case of Fayzobod district), with the MoA as the implementing agency and recipient of procured machinery. Furthermore, proceeds from the rental business should be accumulated to form a revolving fund (as per BIP), which will be linked to future purchases of additional machinery sets.

The agricultural machinery required for the implementation of the model business by the MoA under a Japanese grant aid program, as well as an outline of the implementation and project effects, are stated in the following table.

[2] Implemented by JICA from April 2020 to February 2023, this project involved establishing a revolving fund within TAL to purchase agricultural machinery, which was then leased to entrepreneurs, resulting in the implementation of six farming rental business projects.

Table 4.7: Outline of Grant Aid Project

Estimated cost	Approx. 1.11 billion JPY (Of which, transportation costs: Approx. 12%) (as of November 2024)	
Machines and implements	Main machines and implements: ➢ Small-sized tractor (40 hp) and implements for small tractor (plough-soiler [2-blade], bottom plough [2-row], rotary [1,200 mm], and locally procured implements: cultivator [weeding-ridger], ridger, and trailer)	100 sets
	Other supplemental machines and implements: ➢ Implements for existing large-sized (80 hp) tractors (plough-soiler [4-5 blades], bottom plough [3-4 row], rotary [2,400 mm]), and tiller (10-11 hp) with implements (bottom plough, rotary, ridger, domestic-produced trailer) (for verification of with existing large tractors; tiller used in greenhouses and intercropping)	12 sets (2 per selected district)
	➢ Additional implements for small tractor (40 hp) (chisel, de-stoner [stone-picker], potato harvester): 1-2 units per selected district	6 or 12 units
	➢ Spare parts/consumables for the above-mentioned machinery/implements (including those maintained as inventory by MTC or MoA-contracted private company)	10% of machinery price
	➢ Tools and equipment for maintenance and repair (MTC) Measuring instruments (soil hardness meter, soil moisture meter, PH meter, devices for measuring soil rate)	6 sets (1 per selected district)
Form of management	➢ Rental business is implemented in two patterns, with MTCs and cooperatives concurrently serving as primary operating bodies. If a private company is utilized to supplement the MTC, this shall be a private company contracted by the MoA. However, in the case of a cooperative operation, an MTC or entrusted private company in that area should perform rental business maintenance duties and inventory management for spare parts, including instruction in farming techniques. ➢ The procured agricultural machinery provided is to be registered with the MoA's registration system, which is designated as the owner, and the nominated MTC or cooperative shall be designated as the user. ➢ To ensure maintenance efficiency, districts comprising several Jamoats within a county are selected, and assuming 100 machinery sets, 10-20 sets are loaned to each selected area (upon the signing of a protocol with the MoA for use of the agricultural machinery). ➢ The primary operating body (MTC or cooperative) will procure and retain ownership of a new set of small-sized Japanese agricultural machinery with the revenue generated from the rental business within a target period of 3 to 4 years.	
Support from the Japanese side	➢ Supports the establishment of a farming system utilizing small-sized agricultural machinery through the implementation of a technical cooperation project related to rental business operations and cultivation technologies. ➢ Provides funding for the procurement of agricultural machinery sets in accordance with the detailed program formulated.	
Effects of the project	➢ Approx. 1.5% of the target cultivated land, 1.3% of farm households, 2.2% of total harvest production, and 3.2% of farmers' total sales income - over 3% of the total transaction value (over 4% of total profit) of farming in Tajikistan - is slated to be enriched by this project. Production through the program would be profitable for both sellers and buyers, lending momentum to the agricultural market, including through boosted product quality standards.	

Diplomatic significance	➢ The farming model initiated through this program could be further utilized to educate and enrich neighboring countries. ➢ Local assembly of implements is possible, and opportunities for exporting Japanese agricultural machinery to neighboring countries are anticipated as a knock-on effect of promoting the farming model established through this initiative.

Source: Survey Team

The following items are to be implemented in grant aid projects. (This assumes that implementation of a preparatory survey is achievable ahead of the technical cooperation project.)

(1) Conduct a preparatory survey.

- Collect basic data for site/district selection (current ploughing depth, soil rate, soil hardness, etc.; knowing the post-ploughing conditions with existing agricultural machinery is preferable).
- Provide basic guidance on cultivation using small-sized agricultural machinery (mainly ploughing) and conduct soil analysis to confirm organic matter content, etc. Collect basic data for training materials for the future implementation of agricultural machinery maintenance/rental business services.
- Perform detailed design of grant aid project.
- Finalize the protocol between the MoA and the agricultural machinery users (MTC and cooperatives).
- Share data and information obtained for the formulation of a technical cooperation project.

(2) Detailed design is initiated, bids are tendered, and the first of the procured agricultural machinery arrives on site at the end of the following year or the beginning of next.

- Agricultural machinery is delivered to the selected areas by the Tajikistan side.
- Registration for each set of agricultural machinery is conducted concurrently.
- The selected agricultural machinery users and the MoA sign an agreement (protocol) on the use of small-sized agricultural machinery sets. A copy of the executed protocol is handed over to the technical cooperation project.
- Training is provided in the initial setup of small-sized agricultural machinery and implements and in the use of each implement.
- For implements requiring on-site assembly, a (knock-down) assembly plant is selected wherein the assembly work will be performed. The knock-down assembly plant shall be a private company able to be certified by the MoA in the future.[3] After completion, agricultural machinery is transported to the designated areas. In the future, the knock-down assembly implements will be sold not only within Tajikistan but also exported to neighboring countries.

4.4.3 Implementation Plan for Technical Cooperation

As for the beneficiaries upon conducting a technical cooperation project, these can be grouped into

[3] In the case that Japanese manufacturers of agricultural machinery (including implements) are able to designate a local factory that can perform knock-down assembly in accordance with manufacturer specifications, alongside management of consumable and replacement parts, certification by the MoA is not necessary.

the primary operating body of the rental business (ploughing service) and the users of the ploughing service (Dehkan farms, farm households).

Regarding the primary operating body, MTCs and cooperatives have been put forward as contenders. In the case of cooperatives, there should be a medium-scale member (Dehkan farm) possessing a minimum cultivable area of 1-2 ha (depending on field conditions) that is able to afford purchases of fuel/lubricant, etc. The cooperative should also be able to secure a total target area of about 60 ha among ploughing service users.

Among the users of the ploughing service, small-scale farmers (having plots of 0.5 ha or less) who have had difficulty utilizing existing agricultural machinery thus far should comprise about 10% of the target service area (to be managed by the operating body through a list). However, from the viewpoint of safe operation of agricultural machinery, regardless of the size of the target field area, fields that are difficult to enter or are sloped at 5 degrees or more, as well as those on the micro-scale of a private vegetable garden (for self-sufficiency), are excluded. In addition, to reduce the travel distance/time of agricultural machinery sets and aligning work schedules for specific products being cropped, users should form groups of 2-4 farms for maximum utilization rate per agricultural machinery set. It is also essential to keep operating charts and ledgers for the rental business (ploughing service) as data to inform future improvements.

In the case of MTC as the primary operating body, there should similarly be approximately 60 ha of target field area in the vicinity (or 70 ha if small plots and double cropping areas are prevalent), with small-sized agricultural machinery sets allocated by assigning a head operator to each Jamoat, who distributes and manages, for example, 1 to 3 sets per Jamoat. Other operational conditions would be the same as for cooperatives.

Other common matters of note regarding the primary operating body are as follows.

(1) Maintenance of the small-sized agricultural machinery sets is performed by each regional MTC or a private contractor commissioned by the MoA.

(2) The MoA conducts a monitoring investigation regarding the administration of the rental business (ploughing service) and cultivation income/expenditure for user farmhouses about once every four months.

(3) The rental business (ploughing service) using the small-sized agricultural machinery sets conducts promotional activities, explaining the need for deep ploughing to user farmhouses.

(4) The use of small-sized agricultural machinery sets in greenhouse cultivation and intercropping is actively promoted.

(5) Existing ploughing services using large agricultural machinery have low ploughing effectiveness, and the results of the farming test show that small-sized agricultural machinery is more adaptable to Tajikistan's environment. Nevertheless, the utilization of existing large-sized machinery (80 hp tractors) is considered in the scope of the introduction of a small number of compatible implement sets. If realized, the primary operating body cooperates in comparison and discussion related to the ongoing utilization of large-sized agricultural machinery sets.

(6) Study sessions on cultivation using small-sized agricultural machinery are held once a year for users of the rental business, including small scale farmhouses, as part of promotional activities.

(7) Within a three-year activity period, two or so tentative plans for crop rotation systems adapted to each region are formulated to help build a farming model, and information is shared between regions.

As can be seen, there are many items to consider for monitoring surveys and transfer of technology, and input from a technical cooperation project alongside this is deemed essential.

A draft framework for a technical cooperation project is described in Table 4.8.

Table 4.8: Draft Framework for Technical Cooperation Project

Overall Goal	Improve farmers' livelihoods through a farming model which utilizes small-sized Japanese agricultural machinery.
Target	A farming model is established through the process of building a rental business (ploughing service) model effectively utilizing small-sized Japanese agricultural machinery sets.
Outcomes	1. The income of farmers who use the rental business (ploughing service) increases. 2. The primary operating body of the rental business (ploughing service) is able to generate revenue through the business.
Activity	1-1 Techniques in crop cultivation are improved. 1-2 Crop quality improves and yield is increased. 1-3 Differentiation in sales prices by produce quality accompanies the improvement in crop quality. 1-4 Cultivation income and expenditure of the rental business (ploughing service) user is improved. 1-5 The cultivation operating situation of the rental business user is improved. 1-6 Small-sized agricultural machinery sets are actively utilized in greenhouse cultivation and intercropped plots. 1-7 A crop rotation system (tentative plan) is established for each region. 2-1 The rental business (ploughing service) is maintained sustainably to promote the ongoing utilization of small-sized agricultural machinery. 2-2 A system is established to facilitate the smooth maintenance of small-sized agricultural machinery, including spare parts inventory. 2-3 Appropriate techniques for deep ploughing are properly understood by rental business (ploughing service) users. 2-4 The primary operating body is able to promote the rental business (ploughing service) to users. 2-5 The primary operating body is promoting appropriate ploughing techniques to rental business (ploughing service) users. 2-6 Revenue from the rental business of the primary operating body enables further purchase of new sets of agricultural machinery.

Source: Survey Team

If the provided outcomes can be achieved, transfer of technology to neighboring countries, comprising the farming model utilizing small-sized agricultural machinery sets and methodology for building a rental business (ploughing service) model, will also become viable.

Items to be noted regarding the activities of technical cooperation projects are listed below.

(1) Activities related to cultivation:

- Basic cultivation-related data is collected and shared with the preparatory survey.

- The possibility for transfer of technology related to cultivation using small-sized agricultural machinery for ploughing as the main implement (in a situation where crop rotation patterns can be formulated[4] and problems in cultivation technique identified) is explored.
- Approximately 2-3 sites (districts) are selected based upon the ability of the MTCs and cooperatives within to implement rental business services. Based on transfer of technology and the ease of maintenance of the small-sized agricultural machinery, approximately 10 to 15 sets per site will be selected, and this data shared with the preparatory survey.
- Attempt to explain/educate the MoA, TAL, and farming entities about the need for ploughing with agricultural machinery as a part of cultivation technology in the selected and surrounding areas, and develop a plan for transfer of technology after the introduction of small-sized agricultural machinery.

(2) Activities related to the use and operation of small-sized agricultural machinery:

- Provide technology transfer and monitoring concerning the preparation of operational and account records to operators (MTCs and cooperatives) of the small-sized agricultural machinery in order for rental business services to ensure ongoing viability.
- Continue transfer of technology to target areas regarding cultivation with appropriate technology that utilizes small-sized agricultural machinery, confirm improvement in the profits of farmers using the rental business, and set appropriate usage fees for the rental business (ploughing service) accordingly.
- Verify revenues for both operators and users of the rental business, and develop a farming model.
- Based on the monitoring results for rental business users, the project will advise in achieving the purchase of new small-sized agricultural machinery sets over a three-year period, leading to agricultural machinery upgrades and an increase in the number of agricultural machinery in the region, upon which an agricultural mechanization model will be proposed.

4.4.4 Division of Roles in Grant Aid Project/Technical Cooperation Project Implementation

The division of roles between Japan and Tajikistan concerning project implementation is described in Table 4.9.

Table 4.9: Division of Roles in Project Implementation

Item	Japanese side	Tajikistan side
Required agricultural machinery sets	Procurement through grant aid.	Import procedures and distribution to target areas upon procurement, registration procedures, and conclusion of an agreement (protocol) with the agricultural machinery users (MTCs and

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[4] One proposed crop rotation would require five to six products, and having two to three proposed forms would allow for the handling of more than 10 crop types. At this time, it is recommended that legumes be included in the crop lineup, if possible. Pasture grasses should also be selected from the legume family whenever viable. The benefits of this include: 1) prevention of repeated cultivation damage, 2) ability to regulate chemical fertilizer application, and 3) risk hedging for farmers' operations in Tajikistan, where prices of commodities fluctuate wildly.

Item	Japanese side	Tajikistan side
		cooperatives (farmer groups)).
Repair tools	Procurement through grant aid.	Provided to MTC, having jurisdiction over the agricultural machinery users (district MTCs and cooperatives/farmer groups), who will preside over the management system for repairs.
Contract (protocol) conclusion with operating entities	Confirm protocol conclusion.	The MoA will take the lead in preparing and concluding protocols.
Trial operation	Provide guidance on the startup and maintenance of machinery in the presence of the Japanese manufacturer, etc.	Convening of participants and other relevant arrangements.
Transfer of technology	JICA experts for the following will be dispatched. - Inventory/maintenance - Rental business - Cultivation, etc.	Provide mentorship for rental business operating entities such as MoA/TAL/MTC/cooperatives, etc., to become self-supporting in roughly 3 to 6 months after receiving training and local guidance from JICA experts. Acquire cultivation techniques utilizing agricultural machinery and assign technical experts for this.
Monitoring survey (Target period: one (1) year after agricultural machinery input)	JICA experts for the following will be dispatched. - Rental business - Cost-effectiveness for rental business users - Verification of technology dissemination, etc. Support for the purchase of new agricultural machinery sets by business entities through the rental business. Revision of program trajectory and summarizing of the final results; presentation of the farming model.	Assign counterparts. Plan and implement training and instruction on cultivation techniques for rental business managers and users. Assist in the formulation of a farming model.

Source: Survey Team

4.5 Environmental and Social Considerations (Weather Forecasting and Agricultural Water, Gender Issues)

4.5.1 Environmental and Social Considerations

This survey assumes the premise of a grant aid project for small-sized agricultural machinery, and based on the project outline and location environment, categorization based on the "JICA Guidelines for Environmental and Social Considerations (January 2022) " (hereinafter referred to as the "Guidelines") is sought. Therefore, we have considered the categorization of the project as follows, referring to Appendix 3 of the Guidelines, “Illustrative List of Sensitive Sectors, Characteristics, and Areas”. In conclusion, the survey team proposes to classify the assumed Grant Aid project as having "minimal or no adverse impacts (Category C)," with some points of note regarding the target area.

(1) Outline of the Project

The proposed project is to provide small-sized agricultural machines (a few dozen to a maximum of less than 100) to Tajikistan's cooperatives or MTCs through the MoA under Grant Aid, in order to promote agricultural mechanization. It is assumed that the agricultural machines will be used on existing farmland, but in terms of crops, it is also expected that new varieties will be introduced so as to realize profitable agriculture that is commensurate with the input costs of agricultural machines.

(2) Evaluation of the project sector

Among the "sensitive sectors" listed in the Guidelines is "agriculture involving large-scale land clearing and irrigation," but this project, which targets existing farmland, does not fall under this category, and can be assessed as having "minimal or no adverse impacts (Category C)."

(3) Evaluation of project characteristics

Among the "sensitive characteristics" listed in the Guidelines are "large-scale groundwater pumping," "large-scale land clearing," and "large-scale logging," but this project, which targets existing farmland, does not fall under these categories, and can be assessed as having "minimal or no adverse impacts (Category C)."

(4) Evaluation of the project implementation site

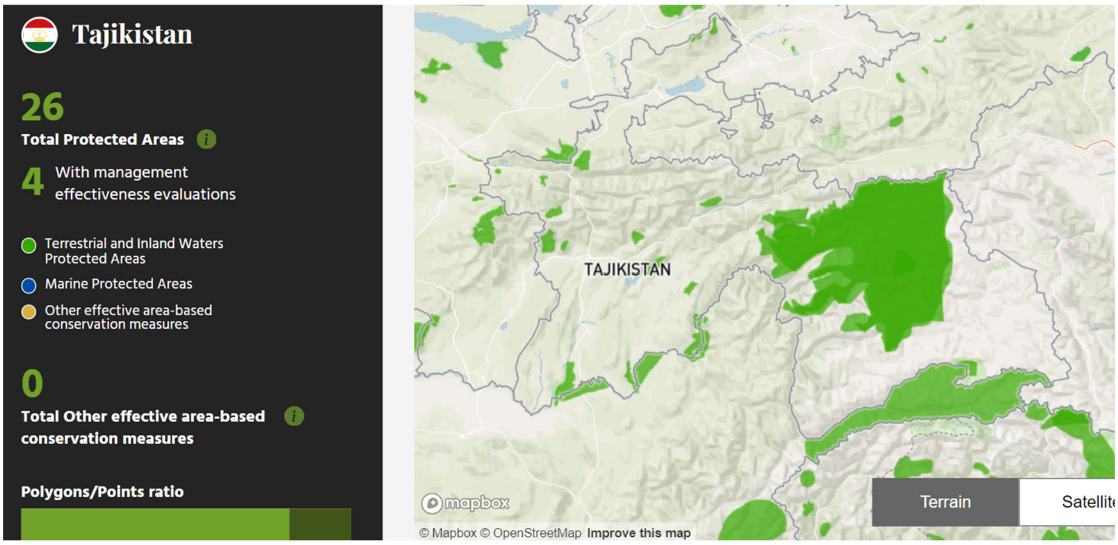
The areas where small-sized agricultural machinery will be provided will be considered in detail during the implementation stage. Therefore, on the premise that the following areas will be excluded for project implementation, the project is assessed as having "minimal or no adverse impacts (Category C)."

1) Areas at risk of large-scale soil erosion

Farming activities on steep slopes may cause large-scale soil erosion when agricultural mechanization is incorporated unless appropriate techniques such as contour or no-plough farming are employed. Therefore, if such areas are included in the target area, the classification may be moved to "limited adverse impacts which can be addressed by general mitigation measures (Category B)."

2) Nationally designated protected areas and ecologically important areas

Tajikistan is home to a variety of ecologically important protected areas, large and small, including the Tajik National Park (Figure 4.4). The Guidelines state that, in principle, projects cannot be implemented in protected areas, and even outside of protected areas, special consideration is required for project implementation in areas that comprise important habitats for rare species. Targeting such areas would mean that the classification may go beyond Category B and become Category A, i.e., "likely to have significant adverse impacts." Therefore, sufficient consideration is required when providing funds to such areas.



Source: The World Database on Protected Areas

Figure 4.4: Protected Areas in Tajikistan

4.5.2 Weather Forecasting and Use of Agricultural Water as Related to the Environmental and Social Considerations

Regarding the environmental and social considerations in the agricultural sector in Tajikistan, the situation regarding weather forecasts and the use of agricultural water was confirmed.

(1) Weather forecasting

Tajikistan is a geographic region prone to climate-related abnormal weather, especially floods, and it is said that 80% of disaster mortalities are caused by floods.[5] In order to properly utilize water, meteorological observation and water quality management are important from the perspective of flood control, and the State Agency for Hydrometeorology of the Committee for Environmental Protection (Hydromet)[6] is responsible for this task. However, Tajikistan's weather forecasting capabilities are limited, and the Asian Development Bank (ADB) has been implementing projects to strengthen those capabilities since the 2010s.

The main duties of Hydromet are (i) providing meteorological information, (ii) providing information related to the environment and weather, and (iii) providing emergency information. Information necessary for agriculture includes (a) prediction of changes in river water levels, (b) agricultural meteorological forecasts (predictions of planting times, cultivation seasons, and harvest yields), and (c) warnings of abnormal weather, etc. In addition to these, the Environmental Analysis Division also deals with surface water pollution and air pollution, and is equipped to disseminate information useful for agriculture. It is necessary to keep a close eye on the progress of ADB projects when taking environmental and social considerations into account.

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[5] From ADB Project No. 47181-003 report; https://www.adb.org/sites/default/files/project-documents/47181/47181-003-emr-en.pdf

[6] https://meteo.tj/en

(2) Agricultural water

Water for agricultural use in Tajikistan is diverted from rivers and pumped up from lakes and ponds. The Agency for Land Reclamation and Irrigation (ALRI) manages water intake from pumping stations and rivers, and supplies water for use.

60% of ALRI's water supply is diverted from rivers and/or lakes, and 40% is pumped up. Agricultural producers receive water from ALRI and pay an irrigation water fee. Farmland that cannot receive water from ALRI will have to use rainwater, and in such cases, the agricultural producers will likely have to use their own pumps to get water from rivers, lakes, ponds, etc., and bear the associated operating costs. There are fuel engine and electric pumps, and although the current status of how farmers are using these is not fully understood, it is not envisioned that the implementation of this project will result in any noteworthy increase in the number of pumps being used, so it is believed that the environmental impact of the project will be no different from the current situation regarding this (see (2.8.2 Taxes and Farming Costs in Tajikistan (6)) for details of water usage fees and pump operation electricity rates).

4.5.3 Gender Issues to be Considered When Providing Small-Sized Agricultural Machinery

When implementing agricultural mechanization using small-sized agricultural machinery, sufficient consideration must be given to avoid negative impacts with regard to gender issues. Based on the findings from the aforementioned FAO and ADB reports and field surveys, this section analyzes gender issues that should be considered from the following five perspectives when providing small-sized agricultural machinery, and proposes ways of addressing them.

(1) Access to information on extension services and training, participation in decision-making

In rural areas of Tajikistan, where Muslim customs are deeply rooted, it is common for meetings for men and women to be held separately, leading to concerns that communication with Dehkan farms and cooperatives via the MoA does not reach female farmers, meaning that they are unable to participate in decision-making regarding training opportunities and the introduction of agricultural machinery. In this project, too, we requested city authorities and cooperatives to gather farmers in various rural areas to survey the sales status of agricultural products. However, except in cases where a woman was the head of the Dehkan farm or where we asked female farmers who were selling on the street for cooperation, the farmers gathered were almost all male. As will be noted later, given that women accounted for approximately one-quarter of Dehkan farm heads in 2022, there was likely either a clear information gap or some factor that discouraged participation (e.g., the surveyor being male).

When projects to introduce small-sized agricultural machinery are implemented with support from Japan, care must be taken to ensure that information reaches not only male-headed farm households but also female-headed farm households at the public relations stage, for example, by having the Women's Committee and Jamoat women's councils notify them. Additionally, even in farms headed by men, when female members are engaged in farming, it is necessary to fully inform men in advance about the importance of including women in decision-making, so that decisions regarding the introduction of agricultural machinery are not made solely by the male head of the farm household or by men alone. Furthermore, the survey also revealed the opinion that “it is easier for women to operate a tractor than a tiller, which requires strength and physical stamina," and it would be desirable to conduct needs surveys separately for men and women.

(2) Ensuring equal access for women to agricultural machinery and training opportunities

As in the past in Japan, there are cultural barriers and traditions in rural Tajikistan where the opinions and convenience of men are implicitly prioritized, which raises concerns that women may end up at a disadvantage when it comes to reserving access to agricultural machinery or applying for training.

Generally, the use of agricultural machinery such as tractors and tillers tends to be concentrated at the beginning of the cultivation season, so it is necessary to establish clear regulations regarding the methods for reserving use and paying fees, ensure transparency, and ensure fairness in the use of machinery so that there is no bias in its use based on gender or social status within a group.

In addition, driving tractors and other machinery is considered a masculine job, but there are some businesses where there are no men present or where the actual workers are all women. Therefore, when training programs on operation and maintenance of agricultural machinery are planned by public organizations, etc., female farmers should be made aware of these programs and be given opportunities if they wish to participate, as mentioned above, but it should be kept in mind that women may be hesitant to participate if the instructors are only male. When providing agricultural machinery, it is important to ensure that the MoA, TAL/MTC, ATS, etc., are fully aware of the importance of providing gender-specific training, assigning female staff and female machinery operators, in order to ensure that female agricultural workers actively receive training and support regarding agricultural machinery. It is also important to ensure that gender-related considerations are widely disseminated to relevant parties by, for example, preparing a "Project Implementation Manual" that lists gender-related considerations for each activity.

(3) Access to financing for purchasing agricultural machinery

Since purchasing agricultural machinery requires a large amount of capital, ensuring access to loans is important. However, the fact that loans usually require collateral is a major constraint on access to loans for female-headed farm households with low land ownership rates and for female farming families who are in financial difficulty.

This results in disparities in the ownership of agricultural machinery, which in turn raises concern for a widening economic gap between male and female farmers.

(4) Agricultural machinery ownership

In rural Tajikistan, real estate such as farmland and housing sites, as well as personal property such as agricultural machinery and vehicles, tend to be registered in men's names, although there is no clear legal basis for this. Even in cases of legitimate marriages and divorces, women's rights to marital property are often violated, as movable property is usually registered in the husband's name alone or in the name of the father-in-law. Women themselves often do not know their property rights or how to protect them.[7]

Given this situation, when implementing this project, it will be necessary to consider providing training to female farmers on the ownership of agricultural machinery through the Women's Committee and Jamoat women's councils, and to raise awareness of their rights to property and how to protect them. In the case of farms headed by women or farm operations in which women play a major role, it is necessary to encourage thorough discussion within the farm household regarding in whose name agricultural machinery should be registered, including the option of registering in a joint name.

(5) Increase or decrease in workload and income opportunities

In general, the introduction of agricultural machinery replaces heavy manual labor and is therefore thought to lead to a reduction in working hours and workload for both men and women. However, the reality is that manual labor in the fields constitutes a source of income for rural women. Furthermore, if the introduction of agricultural machinery leads to an expansion of the cultivated area, it may also lead to an increase in the remaining manual tasks of cultivation management, harvesting, and post-harvest shipping adjustments. Therefore, if these are tasks that are reserved for a specific gender, then care must be taken to avoid a disproportionate workload being borne by that gender.

Specific countermeasures that could be considered include providing gender training to beneficiaries when the project is implemented, having them discuss the impact of the introduction of agricultural machinery and consider countermeasures for themselves, and providing support through the project to groups that are adversely affected with countermeasures that will lead to improving their livelihoods. In addition, when conducting gender training, it is important to keep in mind that discussions that draw upon the local cultural background, such as explaining that “showing appropriate consideration to women is the right thing to do as a Muslim,” will make it easier to bring about changes in men's behavior.

[7] FAO (2016): National Gender Profile of Agricultural and Rural Livelihoods – Tajikistan, p.14

Appendices

Appendix 1: Inception Report Agreed With the Tajikistan Side

22.06.2023

Республика Таджикистан

Исследование для сбора и проверки информации, касающейся оснащения малой сельскохозяйственной техникой

Первоначальный отчет

(проект)

Март 2023 г.

Overseas Merchandise Inspection Co., Ltd. (OMIC)

Asia Engineering Consultant Co., Ltd. (AEC)

タジキスタン国
小型農業機械の整備にかかる
情報収集・確認調査

インセプションレポート

2023 年 3 月

海外貨物検査株式会社（OMIC）
株式会社アジア共同設計コンサルタント
（AEC）

Appendix 2: Agreement on the Survey Working Group's TOR With the Tajikistan Side

TOR for launching the survey working group [hereinafter call "the WG"]

Reference to Data Collection Survey on the Condition of Small-size
Agricultural Machinery in the Republic of Tajikistan
under Japanese International Cooperation Agency [Hereinafter call "JICA"]

In conclusion, a Terms of Reference is a document that outlines the parameters of a specific activity or task. It is important to have a TOR when starting any new project/ working group so that all stakeholders are clear on what is expected and what the boundaries are. A TOR can be as simple or as detailed as necessary, depending on the scope of the project. Having a TOR in place from the outset will help to ensure that everyone involved knows what is required and can work together to achieve the desired outcome for the WG in this case.

【 Members [specialists] WG 】

Mr. Zevarshoev : Deputy Minister, Supervisor of WG.

Tajik side:

1. Mr. Shomamadov – Head of the Department of Technical Policy and Agricultural Infrastructure Development;
2. Mr. Batir Muminov – Deputy Director of RSUE "TajikAgroLeasing";
3. Mr. Khomidov Sharif – Head of the State Inspectorate for Technical Supervision of Agricultural Machinery;
4. Mr. Aliyev Avaz – Head of machine testing station;
5. Representative of the Academy of Sciences [institute of soil or agriculture].

Japanese side:

1. Kanamoto, Masakazu; Mechanization / Mission Leader;
2. Araki, Yasunori: Farming Techniques;
3. Akutsu, Takao: small agricultural machinery;

Mr. Karimov Iftikhor: Liaison for WG.

【 Activities/tasks for research 】

1. Collect the questionnaires mentioned in the inception report; From Q1 to Q4 on page 5 of the Inception report, the following is stated:

Question 1. Data by district for the last 3 years on the number of associations of dekhkan farms, the number of dekhkan farms, the number of farms and the population, disaggregated by gender (data on dekhkan farms - for the last 1 year).

Question 2. Data in the context of regions and crops for the last 3 years: cultivation area, yield, income per unit area.

Question 3-1. Data by district and crops for the last 3 years on the selling price for farmers (data to understand seasonal fluctuations).

Question 3-2. Data by crops for the last 3 years on wholesale prices and sales volumes in the main domestic markets (data to understand seasonal fluctuations).

Question 3-3. Volume of foreign trade by types of products for the last 3 years.

Question 4. List of legal mechanisms and laws governing the markets for agricultural products, and a list of the main markets.

Update table data: **Status of availability of agricultural machinery and equipment in the Republic of Tajikistan for 2022 (page 6 of the Inception Report)**

The collection and analysis of statistical data, which is a prerequisite of the Ministry of Agriculture regarding agricultural management, will also be necessary to conduct a comparative analysis of the results and select target sites, so you should once again contact the Ministry of Agriculture with a request to continue the study that was not completed during the previous study collection of data regarding the "Number of farms and Dekhkan Farms " and "Cultivation areas and yields for each type of crop."

2. Fix a farm test method.

Summing up and discussing the cost of a farming test to initiate a financial resource.

3. Select the sites for the farming test at two places; farmers, Dekhan farms [hereinafter call “DFs”] or cooperatives,

That soil condition of the site is hard silty/ not enough ploughing as typical example, without stones, and with the condition as following:

① Water is provided to break clod (crush a lump of clay); is necessary to check soil rate; more than 70% after farming test.

② Confirm Cropping calendar (the farming system) of having crops or not that even (the end of August and mid-December start or next February or March start when machine sets distribution is late). WG will try to make it which is similar condition the farmer used to do, in the farming test. WG will select at farming test start time and choose the product(s) which the farmer can cultivate of the farmer(s) concerned.

③ Warehouse is provided to store agro-machines sets to purchase in Japan, including MTC.

④ Presence (two) of the operators are provided for the farming test.

⑤ We should exclude the sloping field more than 10 degrees to secure farming field as agricultural machinery is not usable safely.

⑥ Area should be provided [example 0.4hax3, 0.2hax2] at each site for the farming test.

4. Organizational framework/ system

4-1 User [farmer] side

① Financial management; ability for accounting etc.

② Management for maintenance of agro-machine set.

③ Approach to internet banking system; e.g. payment for any transactions without handling cash.

④ Power supply condition.

⑤ Approach to the back-up service system; tuning-up, complicated repairing, purchasing spare parts.

⑥ Any requests to the Jamoat office/ District office / MoA/ TAL.

4-2 Side _ Governments _ Tajikistan:

1) Clarify Government (Ministry of Agriculture) policy regarding agricultural mechanization. Confirmation of the agricultural mechanization organization system in the agricultural development program approved by the government in March 2023 as agricultural mechanization in the Ministry of Agriculture.
2) In the structure of the Ministry, clarify plans to identify a unit (department, sector or person) of agricultural mechanization and appoint it as a responsible unit within the framework of the grant aid project (transfer of Japanese small agricultural machines).
3) Clarify the positioning of TAL within the Ministry of Agriculture (its organizational structure).
4) The introduction of Japanese-made small agricultural machinery is positioned as the first step towards a systematic improvement of the agricultural sector in the Republic of Tajikistan. In this regard, it will be necessary to clarify the implementation structure on the part of the Ministry of Agriculture, including TAL (distribution of responsible persons, responsible units (including the creation of PMU: Project Management Unit - Project Management Unit)), joint work with the structure for the dissemination of agriculture knowledge, etc.).
5) Check the possibility of resuming the activity of the previously existing system of registration of agricultural machinery (experiment.)
6) Indicate the need not only for an agricultural mechanization plan, but also for an increase in crop production that will improve the financial situation of farmers, the availability of recommended crops, and the development of plans and programs related to increasing agricultural production.
7) Conduct a policy check on subsidies, etc., in connection with the introduction of Japanese-made small agricultural machinery (a future grant aid project).
8) Check whether the privatization plan for TAL and MTA will create pressure etc. on the private sector.

9) During the period of the survey, to collect and verify information, also develop TORs related to specific future agricultural mechanization activities, taking into account in particular the implementation of the technical cooperation project.
10) Confirm that TAL will be able to fully work on agricultural mechanization with the full support of the Ministry of Agriculture.
11) Confirming the agriculture mechanization organization; system to choose method of the products [crops] choice to each District/Jamoat that the government decides to select every year and the flow of such an information system sharing about agricultural machines/ mechanization; from each District/Jamoat to the government.
12) Confirming a problem, the suggestion about the organization system of the agricultural machines in the TAL.

5. Kinds farmers :

Clearing definition of farmer, farmer householder, DF, farmers' cooperative, private plot (which a farmer not share statistic data) to find the target person or groups in the future grant-aid project. And definition/ category of farmer size too:

e.g. Information on Amount of land by category/ type/ area (2020); Committee of Land Management and Geodesy

6. Activity in the private sector concerning agro-mechanization.

Confirming organization and strategy for future development of Agro Tech Service and others.

7.

【 Data collection, analysis and discussion for a future grant aid project 】

1. Dating for each stage; data collection, analysis and discussion.

Closing date of data collection: the end of August 2023;

Closing date analysis closing date: the end of September 2023;

Discussions:

1) End of October - mid-November 2023, before receiving machine sets from Japan.

2) March 7 to March 13, 2024 after farming test.

1. Selection of directions for providing sets of machines.

   Conduct discussions between the Ministry of Agriculture and the Survey Group regarding the criteria for selecting target regions for activities under the grant assistance project for the introduction of Japanese-made small agricultural machinery, which will be accompanied by a technical cooperation project in the future, as well as the basic principles of the crop structure.

2. Fixing the Organizational framework/ system for the sides of Tajikistan government/ farmers [users].

3. Considering a necessity and contents of the JICA technical cooperation project beside the future grant aid project and any other support.

【 Goal of WG activity】

1. Sort out the criteria to initiate the grant aid project.
2. Produce a procedure to initiate the grant-aid project and illustrate its figure.
3. Make and submit a final report to The Ministry of Agriculture in the Republic of Tajikistan and JICA.

ТЗ для создания рабочей группы по исследованию [далее именуемой «РГ»]

Ссылка на исследование по сбору данных о состоянии малой сельскохозяйственной техники в Республике Таджикистан, проводимая Японским агентством международного сотрудничества [далее именуемое «JICA»]

В заключение, техническое задание (ТЗ) — это документ, в котором излагаются параметры конкретной деятельности или задачи членов РГ. Важно разработать ТЗ при запуске любого нового проекта/рабочей группы, чтобы всем заинтересованным сторонам были ясны ожидания и каковы границы. ТЗ может быть настолько простым или детальным, насколько это необходимо, в зависимости от масштаба проекта. Наличие ТЗ с самого начала поможет гарантировать, что все члены РГ знают, что требуется в рамках проекта, и могут работать вместе для достижения желаемого результата.

【Члены [специалисты] РГ】

Г-н Зеваршоев является Руководителем РГ.

Таджикская сторона:

1. Г-н Шомамадов – Начальник отдела технической политики и развития аграрной инфраструктуры;
2. Г-н Батыр Муминов; Заместитель директора РГУП «ТаджикАгроЛизинг»;
3. Г-н Хомидов Шариф; Начальник Государственной инспекции по техническому надзору за сельскохозяйственной техникой;
4. Г-н Алиев Аваз; Начальник машино испытаной станции;
5. Представитель Академии наук [институт почвы или сельского хозяйства].

Японская сторона:

1. Канамото, Масакадзу: Механизация / Руководитель миссии;
2. Араки, Ясунори: Методы ведения сельского хозяйства;
3. Акуцу, Такао: Малая сельскохозяйственная техника.

Каримов Ифтихор – Представитель РГ.

【Мероприятия/задачи для исследования】

1. Собрать анкеты, упомянутые в начальном отчете; С B1 по B4 на стр. 5 указано следующее:

Вопрос 1. Данные в разрезе районов за последние 3 года о количестве ассоциаций дехканских хозяйств, количестве дехканских хозяйств, количестве фермерских хозяйств и

22-06-2023.

численности населения в разбивке по полу (данные о дехканских и фермерских хозяйствах — за последний 1 год).

Вопрос 2. Данные в разрезе районов и сельскохозяйственных культур за последние 3 года: площадь выращивания, урожай, урожайность, доход с единицы площади.

Вопрос 3-1. Данные в разрезе районов и сельскохозяйственных культур за последние 3 года о продажной цене для фермеров (данные, позволяющие понять сезонные колебания).

Вопрос 3-2. Данные в разрезе сельскохозяйственных культур за последние 3 года об оптовых ценах и объемах продаж на основных внутренних рынках (данные, позволяющие понять сезонные колебания).

Вопрос 3-3. Объем внешней торговли по видам продукции за последние 3 года

Вопрос 4. Список правовых механизмов и законов, регулирующих рынки сельскохозяйственной продукции, и список основных рынков.

Обновление данных таблицы: **Положение с наличием сельскохозяйственной техники и оборудования в Республике Таджикистан for 2022 г. (страница 6 Начального отчета)**

Сбор и анализ статистических данных, что является необходимым условием Министерства сельского хозяйства, касающимся управления агрохозяйствами, будет необходимо также для проведения сравнительного анализа результатов и выбора целевых мест, поэтому следует еще раз обратиться в Министерство сельского хозяйство с запросом о продолжении не завершенного в ходе предыдущего исследования сбора данных, касающихся «Численности фермерских и дехканских хозяйств» и «Площадей возделывания и урожайности по каждому виду культур».

1. Создать (разработать) метод фермерского испытания.

Подведение итогов и обсуждение стоимости фермерского испытания для инициирования финансового ресурса.

1. Выбрать участки для фарм-теста в двух местах; фермеры, дехканские хозяйства [далее именуемые «ДХ»] или кооперативы.

Типичное состояние грунта на участке сильно илистое/недостаточно вспаханное, без камней и при следующих условиях:

① Подача воды, чтобы увлажнить ком (раздробить комок глины); необходимо проверить норму грунта; цель - более 70% содержания почвы (земли) после фермерского испытания.

② Подтвердить посевной календарь (система земледелия) с урожаем или даже без него (конец августа и середина декабря 2023 года, или же начало февраля и марта месяцев 2024 года, когда распределение машин задерживается). РГ постарается создать условия фермерского испытания, аналогичные тем, которые использовал фермер для работы на своей земле. РГ выберет время начала фермерского испытания и выберет продукт(ы), который фермер может выращивать.

③ Предоставление склада (включая склад МТС) для хранения закупаемых в Японии комплектов агротехники.

④ Наличие 2 (двух) операторов (водителей) для проведения фермерского испытания.

⑤ Мы должны исключить наклон поля более 10 градусов, чтобы обезопасить фермерское поле, чтобы сельскохозяйственная техника могла безопасно использоваться во время испытаний.

⑥ На каждом участке должна быть выделена площадь [примерно 0.4hax3, 0.2hax2] для фермерского испытания.

1. Организационная структура/система

4-1 Пользовательская сторона [фермер]

① Финансовый менеджмент; умение вести учет и т.д.

② Руководство по обслуживанию агромашинного комплекса.

③ Подход к системе интернет-банкинга; например оплата любых операций без наличных денег.

④ Состояние источника питания.

⑤ Подход к системе обслуживания; настройка, сложный ремонт, закупка запчастей.

⑥ ⑥ Любые запросы в офис джамоата / районный офис / МСХ / TAL.

4-2 Сторона Правительства Таджикистана:

1) Уточнить политику Правительства (Министерства сельского хозяйства), касающуюся механизации сельского хозяйства.

   Подтверждение системы организации механизации сельского хозяйства в программе развития сельского хозяйства, утвержденной правительством в марте 2023 года, в качестве механизации сельского хозяйства в Министерстве сельского хозяйства.

2) В структуре Министерства уточнить планы по определению подразделения (отдела, сектора или лица) механизации сельского хозяйства и назначить его ответственным подразделением в рамках проекта безвозмездной грантовой помощи (передачи японских малых сельхозмашин).

3) Уточнить позиционирование ТАЛ в рамках Министерства сельского хозяйства (его организационной структуры).

4) Внедрение малой сельскохозяйственной техники японского производства позиционируется в качестве первого шага в направлении системного усовершенствования сельскохозяйственного сектора в Республике Таджикистан. В связи с этим, необходимо

будет уточнить структуру реализации со стороны Министерства сельского хозяйства, включая ТАЛ (распределение ответственных лиц, ответственных подразделений (включая создание PMU: Project Management Unit – Группы по управлению проектом)), ведение совместной работы со структурой по распространению с/х знаний и т.д.).

5) Проверить возможность возобновления деятельности существовавшей ранее системы регистрации сельскохозяйственной техники (эксперимент.)
6) Указать необходимость не только плана механизации сельского хозяйства, но также увеличения объёмов выращивания сельскохозяйственных культур, которые будут способствовать улучшению финансового положения фермеров, наличие рекомендуемых сельскохозяйственных культур, а также разработку планов и программ, связанных с увеличением объёмов сельскохозяйственного производства.
7) Провести проверку на предмет политики в отношении субсидирования и пр. в связи с внедрением малой сельскохозяйственной техники японского производства (будущий проект безвозмездной помощи).
8) Существует необходимость проверить, не возникнет ли в связи планом приватизации ТАЛ и МТС давления и пр. на частный сектор.
9) В период проведения исследования для сбора и проверки информации проработать также ТЗ, касающееся конкретной деятельности по механизации сельского хозяйства в будущем, принимая во внимание, в частности, реализацию проекта технического сотрудничества.
10) Подтвердить, что ТАЛ будет способен полноценно работать над механизацией сельского хозяйства при полной поддержке со стороны Министерства сельского хозяйства.
11) Утверждение организации механизации сельского хозяйства; система выбора метода продуктов [культур] для каждого района / джамоата, который Правительство решает выбирать каждый год, и поток такой информационной системы обмена информацией о сельскохозяйственных машинах/механизации; от каждого района/джамоата Правительству.
12) Подтвердить проблему, предложение по организации системы с/х машин в ТАЛ.

2. Виды фермеров:

Уточнение определения фермера, фермера-домохозяина, ДХ, фермерского кооператива, частного участка (по которому фермер не делится статистическими данными), чтобы найти целевое лицо или группы в будущем проекте грантовой помощи.

И определение/категория размера фермера тоже:

например Сведения о количестве земель по категориям/типам/площадям (2020 г.); Комитет по землеустройству и геодезии.

3. Деятельность в частном секторе по агромеханизации.

Подтверждение организации и стратегии будущего развития Агротехсервича и других.
4.

【Сбор данных, их анализ и обсуждение для будущего проекта грантовой помощи】

1. Датировка для каждого этапа; сбор данных, анализ и обсуждение.

Дата окончания сбора данных: конец августа 2023 г.;

Окончание анализа данных: конец сентября 2023 г.;

Обсуждения:

1) Конец октября – середина ноября 2023 г., до получения машин из Японии.

2) с 7 по 13 марта 2024 г. после фермерского испытвния.

1. Выбор направлений для предоставления комплектов машин.

   Провести обсуждения между Министерством сельского хозяйства и Исследовательской Группой касательно критериев выбора целевых регионов для проведения деятельности в рамках проекта безвозмездной помощи по внедрению малой сельскохозяйственной техники японского производства, который будет сопровождаться проектом технического сотрудничества в будущем, а также основные принципы структуры посевов.

2. Создание организационной структуры/системы для сторон Правительства Таджикистана/фермеров [пользователей].

3. Рассмотреть необходимость и содержание проекта технического сотрудничества JICA и любой другой поддержки для будущего проекта грантовой помощи.

【Цель деятельности РГ】

1. Определить критерии для инициирования проекта грантовой помощи.
2. Разработать процедуру инициации проекта безвозмездной помощи и проиллюстрировать ее на рисунке.
3. Подготовить и представить итоговый отчет в Министерство сельского хозяйства РТ и JICA.

Appendix 3: Meeting Minutes

(1) MoA/TAL 1)

Minutes	
Name of meeting	Visit to Tajikagroleasing
Data/Time	The 7th day of April 2023（Fri） 9:00-10:40
Place	Tajikagroleasing (TAL）
Attendance	・**TAL**： ➢ Director of TAL- Mr. Akramzoda Yusuf Akram; ➢ Deputy director – Mr. Muminov Botir; ➢ Deputy director – Mr. Boltaev Bakhtiyor; ➢ Director's advisor – Mr. Urozov Avliyoqul. ・**JICA**：Mr. Sano, Mr. Shohrukh, Mr. Jafar. ・**Study team**: -**OMIC**: Mr. Kanamoto, Mr. Karimov -**AEC**：Mr. Hamroev
Agenda contents	
＞**Mr. Akramzoda:** Greetings and sharing of information on Tajikistan related project. "Welcome dear guests, we're appreciate your coming. We're appreciate JICA interested support to the agriculture sector of Tajikistan. We have proposed a project proposal and it has been under consideration for 7 years already, and I am sure that the guests present at the meeting are aware of the situation. I would like to remind you that several trips and meetings have already been made to regions and cities with our representatives. Of course, it is true that we and the agricultural sector need support. There are more than 200,000 Dekhkan farms in Tajikistan, which are growing year after year. As you know, 93% of Tajikistan is mountainous, including 7% agricultural land and hills etc. In addition, most of the land is clay, with 15-18% sand. Large-capacity tractors are essential in terms of the hardness of Tajikistan soil. We agree with whatever equipment is to be procured from Japan, which is planned to be implemented this project, but it is better to understand the current situation of the local soil and DF (60% of DF do not have agricultural equipment) before forming a project. We remind you that we agree with all your proposals, but I want to make comments and additions that according to our indicators, we do not need small agricultural machinery (tillers). Based on this, we need heavy equipment that could work on the clay and rocky conditions of our land. The second question we asked is that since we have written and submitted the project and we want it to be successful, we want 50/50% or 70/30% to be based on leasing. Otherwise, if we give 100% of the equipment to the use of dekhkans, then we will not be able to monitor and control the farms and they will either sell the machines or something else. When we work on the basis of leasing, we will be able to monitor 100% of their performance in work and cover not 100, but 1000 DFs. There are fears that the	

dehkans will not share or rent the equipment to neighboring farms, they will not operate the equipment enough and the main problems will remain for the dehkans. Therefore, we would like to inform you that when things go according to the rules of financial leasing, DFs will listen to us. And this is just an idea a proposal we are not forcing you, it's a subject for further discussion to find any alternative mechanism maybe though grant, it should be suitable for all of us. Our idea as I mention before it is good for sustainability of the project, as well as expunction of the service and benefit of the community. Just to conclude, we're open for further discussions, and previously we provide any kind of any documents and there were several meetings regarding this project, but we can't understand it has been seven years since the request was submitted, and we would like an explanation as to why this project has been extended. This project with the very high priority for the RT and during our meeting with the Government, and during our meeting we're explaining and informing that the project is on the process, but unfortunately its taking too long. We are available for further cooperation and glad to provide or support with any needed information or documentation. Kindly request to accelerate this project because it took quate long time already to start the project.

＞**Mr. Sano:** Greetings and explanation of overview of the mission of the Team leader Mr. Kanamoto.

I am also agreeing with you that it took much time to start the project, but we have never forgot about that project. Seven years after submitting the request, the project has been delayed because of COVID19 and the global situation. This time we are very much happy to send Mr. Kanamoto, he's one the most understandable consultant since beginning. Dirung his servey Mr. Kanamoto will his best to identify the best way and scheme for implement the project. This time he is not only came for agromachines, but also, he has a task to future cooperative with technical cooperation as well. JICA's or Japanese Government point of view is that anyone can have benefit though that activities. Another reason may be that JICA and TAL have different approaches.

＞**Greetings from Team leader Mr. Kanamoto**

＞**Team leader Mr. Kanamoto** : I understand that TAL's request is for large machinery, but this project is for Japanese-made small agricultural mechanization and is targeted at intercropping and medium-sized farmers, including greenhouses and orchards. Japanese-made small agricultural machinery is particularly appropriate machinery for the targets mentioned above. At first it was decided for the project to work with a small cultivation land, such as 0.3-05 ha [small size farmer HHs/DFs], at least for the farming tests. After, I tried to increase the territory by 1 ha or a little more, because there may be difficulties with the good maintenance on small size farmer HHs, but not 30-50 ha. My visit is purely exploratory. If the project is approved and in the future we will bring the equipment in the form of a grant, then after that we will be able to launch another technical project to improve the mechanisms for project implementation. It was also discussed with TAL earlier that there are problems of lack of specialists. I agree with you that if you give the equipment into the hands of Dehkan farms, this may cause problems with the use of machines. To this end, it would be good if there was a specialist who could correctly explain the correct use of the machine. That's why we need to try to find solution together to get to new step.

A meeting with the MoA yesterday reaffirmed the absence of agricultural extension officers in rural areas, e.g., Jamoat. The implementation of the project requires districts, groups, etc. with agricultural extension officers and agricultural machinery specialists.

＞**Mr. Akramzoda**：Each district has a TAL representative and there are no staffing issues.

＞**Mr. Muminov**：The opinions on the assignment of experts have already been exchanged with Team leader Mr. Kanamoto during the last survey. Also provides information on the role of TAL. MoA plays a political role in the agricultural sector and TAL is a State unitary enterprise under the MoA control. The director of TAL is also a member of the government and reports responsibly on agricultural mechanization before the president. Agricultural mechanization is mandated by the Government of Tajikistan only for TAL. In each region, district and town, TAL has representatives, facilities, experts and technical service centers.

The last project implemented by JICA was recognized as a failed project in terms of equipment and machinery contribution to Jamoat, as the machinery contributed to Jamoat is not currently in use and has not been maintained. The Japanese Ambassador requested machine monitoring of TAL's contribution to Jamoat, but we were unable to respond as it was a free contribution to Jamoat and TAL was not involved in the case formation.

Starting from 2017 we proposed another project, aim of this project was straightening MTC though equipment. Therefore, it is necessary to pilot the project in two areas to demonstrate to farmers how to use Japanese agricultural machinery starting from tillers to big tractors. As you know, better cultivation is impossible without agricultural mechanization, and we would like to discuss with each other to make this project a success and formulate an excellent project that will satisfy the governments and farmers of both countries.

＞**Mr. Akramzoda**：Taking into account the fact that we have more hilly lands, it is not practical to use tillers, because it is easy to work for farmers when he comes down and it is difficult to ride tiller up. For working load if normally operation takes one hour, in this case it will be two hours.

Regarding mini-tillers, first of all, Tajikistan is considered to have hard soil, and women from male foreign migrant DF families are less likely to use them. This information is sharing because of the experience from the last implemented project.

＞**Mr. Sano：** We are grateful for the valuable information provided. Mr. Kanamoto is also aware of the information on the ground but would be happy to provide updated information and cooperation. I hope you aware and have read Mr. Kanamoto's inception report, which we provided you earlier.

＞**Mr. Kanamoto：** As stated in the inception report, we would like to procure and test the listed machines locally during the implementation of this survey. Only machines that have passed the tests are kept on the list.

TAL experts will be invited to participate during the implementation of the farming tests and the opinions of local experts will be taken into account. It is possible to add if other machinery is needed during the test implementation.

Mr. Shomamad from the MoA requested a Stone collector - is it necessary? Removing the stones it is farmer's duty. Stone remover implement is very expensive and good to use just one time. If it's still need, we will discuss later about this issue.

And important thing is soil ratio should be more than 70% to be reached by Japanese machines.

It is important to understand that when using large equipment to plow the land, the disk of the equipment only "scratches" the surface of the soil (5 to10 cm maximum), which in turn leads to poor cultivation. Then the big truck presses the soil well compact. Japanese made machines, which we're planning to bring and use in the project territory will plow up to 30 cm. It should be understood that the size of the machines is not important, but what is important is the versatility and design of attachment, how exactly the machine works. Further survey indicators will show us whether we will be able to use the machines and their equipment, or whether we will need to replace some equipment with others, or even abandon the equipment altogether. Option should be sorted out.

We have brought some equipment to check soil conditions together.

＞ **Mr. Akramzoda：** Not necessary Stone collector (Destoner).

The government requires DFs to create orchards, and if they target medium-sized farmers, we must target machinery capable of ploughing more than 40 or50 cm depth.

＞**Mr. Kanamoto：** We will discuss during the survey.

Is it necessary to obtain a permit from the Minister of Agriculture for the machinery on the list?

＞ **Mr. Muminov：** All machines commissioned by TAL, will be agree by the Minister.

＞**Mr. Sano：** I request from TAL to MoA for assistance regarding lists.

＞**Mr. Kanamoto：** We need the inception report agreed as soon as possible. The sooner you approve the list, the sooner we will order and start shipping the machines. This will help to start the test sooner before the farmers start cultivation. We suppose to deliver machines in the end of July beginning of August, but it depends of your approval and logistic.

＞**Mr. Muminov：** A reply will be provided within three days.

＞**Mr. Boltaev：** Comments on inception report;

1. It is not possible to procure equipment for the MoA listed in the inception report. The MoA implements a political policy and cannot monitor the machinery and register any equipment in its balance.
2. About leasing:
   Leasing is not possible. No DFs to lease. Leasing prices are determined by the price of the machine itself, and Japanese machines are perceived to be very expensive. Prices were confirmed at a recent meeting with Toyota Tsusho. Regarding this, the request letter from seven years ago requested a project for the rehabilitation of MTC centers.

In addition, TAL provides services to DFs in the private sector (about 200 000),

although at the last meeting JICA stated that it only cooperates with the private sector.

＞**Mr. Kanamoto：** Please explain the regulations, laws, etc. under which the MoA cannot monitor and have jurisdiction over DF. It is enough.

＞**Mr. Muminov：** It is shown in the Organizational Chart.

＞**Mr. Sano：** Are the machines used in the survey covered by the tax exemption?

＞**Mr. Muminov：** TAL will carry out the procedures.

＞**Mr. Kanamoto：** Should I coordinate my visit to the MTC next week through the MoA's Foreign Affairs Directorate?

＞**Mr. Muminov：** You can contact me directly.

＞**Mr. Kanamoto：** Thank you very mush for your kind offer. But I am afraid that we should take necessary procedure [through MoA].

Mr. Hamroev and Mr. Kanamoto maturely agreed.

Conclusion:

On the part of Tajikagroleasing, there were dissension about the purpose of the project implementation, and the issue of such a late implementation of the project was also raised. Tajikagroleasing shared with his ideas about providing the necessary information and about the early start of the project.

On the part of the team leader, Mr. Kanamoto, the terms, steps and stages of the survey for further approval of the project were explained in detail. An important fact was conveyed about the timely provision of the necessary information, about mutual cooperation and the importance of conducting a survey. TajikAgroleasing denied the importance of using small agricultural machinery, and focused more on large machinery. They insisted that the machines be provided under their responsibility for further control and monitoring through leasing. They also denied handing over the machines under the responsibility of the Ministry of Agriculture, referring to the legal charter of the Ministry. Further, they promised to share and provide documents stating that the Ministry of Agriculture cannot accept machines on its balance. On the part of the project specialist, it was explained that at this stage such an action is impossible, but after reviewing the documents and discussions together with other project specialists, we will return to this topic. The parties agreed on the stages of the survey and further close cooperation during the survey.

End

(1) MoA/TAL 2)

Minutes	
Name of meeting	Visit to Ministry of Agriculture of the Republic of Tajikistan
Data	7.04.2023（Thu）14:00-15:30
Place	Ministry of Agriculture of the Republic of Tajikistan（Below MoA）
Attendance	・MoA：Mr. Zevarshoev Deputy minister, (Below deputy minister) Mr. Shomamadov Abdumamad Chef of department of technical policy and agricultural infrastructure development, Amonov Fayzimahmad Chef of international department (leaves midway) ・JICA：Mr. Sano, Mr. Shohrukh ・OMIC：Mr. Kanamoto, Mr. Karimov ・AEC：Mr. Hamroev
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・Greetings from the Mr. Zevarshoev Deputy minister ・Greetings from the Mr. Sano JICA Tajikistan office ・Greetings from the Mr. Kanamoto and explanation of overview of the inception report. In addition, the KRII program has some challenges, such as the lack of a functioning revolving fund, and no donor is currently implementing projects in line with KRII. Therefore, Tajikistan needs to move from a business model that only sells to farmers and manages the ticks to one that can provide backup services and support farmers' rental services. ＞**Mr. Sano**：Since KRII is no more, it is difficult to continue with the same form of business as before. ＞**Deputy minister**：Has the local soil been surveyed? ＞**Mr. Kanamoto**：I am aware that there is a lot of clay, but I will now test it in more detail. ＞**Deputy minister**：The soil in Tajikistan is not similar to that of Japan, Russia, and other countries and is very hard. I believe that powerful, large farm machinery is appropriate. ＞**Mr. Shomamadov**：We expect large tractors etc., but I have seen parts of the inception report and it is not the scheme we expected and needs to be modified considerably. ＞**Mr. Kanamoto**：Therefore, I came for this purpose and discuss the inception report with the CP. We would also like to test the machinery described in the inception report during the survey, in discussion with the CPs on the site. Continuing with the small agricultural machinery grant aid projects planned for the future, technical cooperation projects will also be presented in the report of this study. For this, a questionnaire is prepared in the inception report and I will request the MoA and TAL. One of the questions is: is there an agricultural extension officer in each region of the country? ＞**Mr. Shomamadov**：No. All the so-called agricultural extension officers in Jamoat etc. do not	

specialist in agriculture and are responsible for collecting statistical information, accounting, etc.

＞**Mr. Kanamoto：** It would be difficult to implement this project without an agricultural extension officer.

＞**Mr. Shomamadov：** 2017 requested an MTC rehabilitation project, which included capacity building for agricultural extension workers.

＞**Mr. Kanamoto：** I am not aware of any 2017 request forms, but I have seen the machinery list and there are a number of machines available for farmers to use themselves. First, future maintenance is difficult because of the large number of models. Farmers do not want large farm machinery either. The current situation, where large tractors pull desk harrows and scoop up only the surface layer (5-10 cm) of soil at high speed, and then machine-push it into the ground like a road roller, is not considered good for soil preparation. The current situation, where large tractors pull desk harrows and scoop up only the surface layer (5-10 cm) of soil at high speed, and then agricultural machine (big tractor etc.)-well-compact the ground like a road roller, considered no good for soil preparation. I would like to realize grant aid projects with small Japanese-made agricultural machinery, initially targeting a small area, including greenhouses and intercropping areas.

＞**Mr. Shomamadov：** The machinery contributed was not for farmers, but for MTC; it was formed under a scheme that provided services to farmers rather than MTC.

＞**Mr. Kanamoto：** The MTC confirmed during the last survey that it does not provide adequate services to agricultural extension workers and DFs. MTC had not enough human resource and its budget.

＞**Deputy minister：** For this purpose, capacity-building scheme projects for agricultural extension workers and experts were requested by MoA.

＞**Mr. Kanamoto：** I'm not sure if there are any problem on extension agents or not, but why not start together with total farming support? We will not meet any successful results if you might get agricultural machinery only.

＞**Mr. Sano：** I would like to request you respond to the questionnaire from Mr. Kanamoto.

＞**Deputy minister：** Response. However, only agricultural machinery should be discussed.

＞**Mr. Shomamadov：** Additional information is that we are currently in the process of forming a small agricultural machinery deal with WB, and we want to make sure that the deal is not similar to WB's. The PJ (7 mil UDS) of a small tiller(tractor) is scheduled to start from WB at the end of this year or early next year. I would like to talk about that in detail. In this project, the MoA is grateful but would like to make the project sustainable by listening to everyone's opinions.

＞**Mr. Sano：** JICA also expects sustainable projects and would like to request your cooperation and provision of updated information on MoA policies and responses to questionnaires.

＞**Mr. Kanamoto：** Do you have any comments on the inception report?

＞**Deputy minister：** Confirmation is underway.

＞**Mr. Sano：** This inception report is a draft and should be completed and returned with comments etc.

＞**Mr. Kanamoto：** Can we start the field survey?

＞**Deputy minister：** Can start.

＞**Mr. Sano：** I would like the MoA to decide who is responsible for this project.

＞**Deputy minister：** Shomamadov is the contact point for the project.

＞**Mr. Sano：** We will share the local schedule of Mr. Kanamoto with Mr. Shomamadov.

・Continued meetings in the room of Shomamadov

＞**Mr. Shomamadov：** At the end of 2019, WB initiated a USD 50 mil PJ to the MoA, which was for seeds for DF and the establishment of a laboratory. In addition, a second phase of the project started in 2022 with an additional USD 50 mil, of which USD 7 mil is for the provision of small agricultural machinery. However, the main objective of the project is seed projects.

＞**Mr. Kanamoto：** What kind of machines are included?

＞**Mr. Shomamadov：** Small tractors and small tillers. But the project has just been proposed to the WB by the MoA and has not yet been approved by the WB.

＞**Mr. Kanamoto：** Did you request WB because JICA's project was delayed?

＞**Mr. Shomamadov：** That is partly true, but the donor also made a suggestion. Each donor is interested in providing small agricultural machinery accessible to women.

＞**Mr. Kanamoto：** We think the same because of farming area size.　I'm not sure tiller operation can fix to female farmers.

＞**Mr. Shomamadov：** However, the Tajik mindset must also be understood. It cannot be guaranteed that women will be able to take small agricultural machinery and use it in the fields. There are religious and medical hazards. It is also recognized that the hardness of the soil makes it difficult to use small agricultural machinery.

＞**Mr. Kanamoto：** Farmers made the same statements. But let us see, please.

＞**Mr. Shomamadov：** What do you think about Stone collector?

＞**Mr. Kanamoto：** They are not included in this list. The collection of stones is the responsibility of the DF. If MTC is available, such special equipment could be considered possible. Regarding this, we would like to exchange opinions with the MoA to see what machinery can be used locally and formulate a project. I would like to request an update of questions Q1-Q4 and Table 1 in the inception report. Also, will machinery from Japan be exempted from duty during the survey?

＞**Mr. Shomamadov：** There is no need to ask the Minister, as the law provides for this, and it is not a problem. Possible.

＞**Mr. Kanamoto：** If you do not approve the inception report as soon as possible, the arrival of the equipment will be delayed and we would appreciate your consideration as soon as possible. If there is a delay, depending on the selection of the site, the start of the farming trials will be in November or March, and this data survey itself will be delayed.

＞**Mr. Shomamadov：** Before doing so, you should like you to confirm TAL's intention; if TAL is agreed, the Deputy Minister will coordinate with the Minister for approval.

＞**Mr. Kanamoto：** How should requests for regional survey trips be made, e.g., to Fayzobod, Vakhsh, and Dangara?

＞**Mr. Shomamadov：** If you let me know the dates and where you will be traveling, I will arrange for a local representative to respond to your request.

End

(1) MoA,/TAL 3)

Minutes	
Name of meeting	Visit to Ministry of Agriculture
Data/Time	The 20th day of April 2023 14:30 to 15:30
Place	The Ministry of Agriculture（Hereinafter referred to 'the MoA'）
Attendance	・**MoA**： ➢ Chef of Department of Technical Policy and Agricultural Infrastructure Development – Mr. Shomamadov Abdumamad; ➢ Deputy director of TojikAgroleasing (TAL) – Mr. Muminov Botir; ➢ Head of the State Inspectorate for Technical Supervision of Agricultural Machinery－Mr. Homidov Sharif ・**Study team:** **OMIC**：Mr. Kanamoto, Mr. Karimov**.**

Agenda contents

- **Mr. Zevarshoev:** Greetings from the Ministry and express the gratitude for coming and meeting.
- **Mr. Kanamoto**: Greetings and explanation of the survey's progress.

I printed out and brought you a progress report for the last 3 weeks, where I included the main points and objectives of the study. Let me explain the main points.

Point 1: Creation of a working group.

Regarding your proposal/offer or comment (from MoA and TAL to JICA) to create and include in the Survey a Working Group, which will include specialists from different departments and structures of the Ministry based on the Inception report, we support and consider this task one of the priorities. During my absence (approximately 1 month), I hope that a working group will be created with an expectation of your active participation and sincere reporting to us, the JICA survey team.

Regarding the provision of transport and daily expenses to the working group, first I need to discuss this issue with the HQ of JICA and letter on I will let you know about the decision.

- **Mr. Muminov:** Confirm it, thank you!
- **Mr. Kanamoto**: **Point 2. The choice of territory for research/selection of the territories.**

Of course, we will use the working group functions to select the territories. The 5 important things are listed in the Progress report:

- o *Land for cropping(0.4ha x 3fields、0.1～0.2ha x 2～3fields)*
- o *Irrigation water/well for farming tests for sprinkling before using rotary*
- o *2 operators*
- o *What products do you have? Available production for the end of August to beginning of March, also harvest calendar/cropping pattern. For example, what can we plant from the*

end of August to the beginning of March (garlic, onions, potatoes, etc. including the pastoral grass) with cropping calendar? For this issue I may say, that I have visited the territories and couldn't see the cropping calendar/cropping pattern. And I need not just during making the soil, but continuously planting or growing products in the fields (onion ets.)

- *A warehouse / storage facility for equipment during the test near the field, as security measure*

- **Mr. Muminov:** Do you need cropping calendar just for survey areas?
- **Mr. Kanamoto**: Yes, just for survey areas. The machines may arrive with the delay – end of August, November, December or even next year, and in such case, we need cropping calendar to know what kind of products dehkan farm can grow. To finish the test, we need 2-3 weeks and we need to watch the growing expectation. And we need to plow the soil upside down, because the poor soil gets to the surface and mix, after that you have to wait up to the best condition, which will take 1.5 or 3 years.

  The other important thing is we need a warehouse for protection our machines, because we don't know exactly how long we will stay on the survey field. And it doesn't matter in which warehouse we are going to keep our machines. It can be TALs', MTCs', farmers' or some cooperatives' warehouse, but it should be convenient and not far from the survey area for a quick use of machines every testing day.

  The next important thing (number 6) which is not shown in Progress report is let the farmers make running record.
- **Mr. Muminov:** When there will be a technical task for the commission, which includes the State Enterprise "Machine Testing Station of the Republic of Tajikistan" and they have special forms that are filled out during the testing of machines. This form includes all the parameters of the machine that must pass the test. There we can include your 6th point about running record. Your machines will also pass this test. Then a protocol will be made and a report will be provided by State Enterprise. On the basis of this protocol, the State Standard of the Republic issues a certificate of permission to use equipment on the territory of Tajikistan. That is why we are going to establish the Survey working group to help with all issues regarding your test.
- **Mr. Kanamoto:** I will bring the equipment and the most important item is the rate soil before test and after.
- **Mr. Muminov:** So, Mr. Kanamoto will bring some equipment for test.
- **Mr. Homidov:** It's very good that you want to take farming test first. Now we need to think about the future, that is, I want to say that Japanese technology is new to us, before never used it. After 2-3 years of operation of the machines, we will need to properly do technical repairs and fit spare parts. We must also pay attention to this. If there is no service, then the machines will stand aside and not be used.

- **Mr. Kanamoto:** Sure, of course. We need to consider the future project and put this inventory function (system) for spare parts, but not include it in the farming test. But during the farming test, please don't focus about backup service and other things. We will consider future inventory system of spare parts through the WG discussion (on the table).
- **Mr. Homidov:** Ok, right. Just for the information, in the market we have agro machines mostly from Belorussia and China, in this regards we are able to purchase any spare parts and provide a service for those machines. It would be good if with the Japanese machine would have same market situation.
- **Mr. Abdumamadov:** I think it won't be an issue in the future with the providing service to Japanese machines. If we have enough Japanese machines in our market, the Japanese companies will be interested in that and will try to open some dealer centers for providing a service and sale spare parts.
- **Mr. Muminov:** Right. The Japanese machine maker company will be interested on that. This is not issue of JICA project, because in the framework of future project we will just bring and distribute the machines, but Japanese agro-machine Maker Company will try to provide best guarantee service in the future to keep the Brand of the Company in high level. When we submit our project proposal to JICA, the first question we got from that is "Who is going/will to provide a service?"
- **Mr. Kanamoto:** You misunderstand maintenance service things. Through discussions we will try to make a system of Tajikistan side (you shall proceed with it) and then you will consider about establishment of proper machine maker agent in Tajikistan finally. It is your task.
- **Mr. Muminov:** We have already sent a letter to JICA, that we have a specialist from Agrotechservice which has enough capacity is ready to provide a service for Japanese machine. What we need is just teach or trainee them in the future for some time. And Japanese side already visited Agrotechservice and met with the specialists and already approved.
- **Mr. Kanamoto:** Don't worry us will survey first and let's choose the best way for Tajikistan.
- **Mr. Abdumamadov:** Which cities or districts have you visited so far?
- **Mr. Muminov:** It is written in Progress report – Faizabad, Dangara, Rudaki and Hisar.
- **Mr. Kanamoto:** Right**.**
- **Mr. Muminov:** We need to review the districts first and discuss ourselves, maybe we want to change the locations. We grow potatoes in the Garm region and the soil there is very suitable for motoblocks (tillers), that is, sandy. It is also necessary to take into account the far distant regions of the country.
- **Mr. Abdumamadov:** There are 11 climatic zones in Tajikistan and, of course, soil conditions are different from other climatic zones.
- **Mr. Muminov:** Why are you considering only nearby areas to Dushanbe?
- **Mr. Kanamoto:** We must consider about farmer income and the first approach it's should close to the market. I think it is better. One more point, please don't confuse between farmer

test and future project.

- **Mr. Muminov:** All clear. As we said before, we have 11 climatic zones with different conditions, and if the machines are used in all zones, we will get different readings. And then, those who live near Dushanbe, they will well/ easily provided for and can approach the sites. We need to help those who cannot afford to transportation to the sites.
- **Mr. Kanamoto:** I understand, but far areas difficult to succeed, very difficult to maintain and if someone, for example TAL, can make another satellite far from Dushanbe then is ok. But remote area people always asking to come to Dushanbe, which is not so easy. First step closer areas are better just for conducting the farming test.
- **Mr. Muminov:** We have no problem with this. We are talking about helping low-income families who cannot afford to buy equipment. When TAL analyzes requests for assistance, almost all of them are from distant regions, and not like Faizabad, Dangara, etc.
- **Mr. Kanamoto:** Just donate the machines to you is very easy. But latter they need to proceed with good post performance in remote area; expensive maintenance, expensive fuel, very difficult to ask for backup service despite you require the super maintenance system as you know. Anyway you introduced those areas to me before, didn't you?
- **Mr. Muminov:** I understood everything, and therefore, we will talk about the distribution of the mechanism (to whom to distribute, to whom to give, how to do the service) after the farming test. The Ministry of Agriculture entrusts TAL with control over the machines, as TAL is the mechanization unit in the Ministry of Agriculture. Therefore, the ministry will instruct us, of course, to open a service center, for example, in the Garm region. Our specialists, being there, will look after the machines and it is not necessary for farmers to come to Dushanbe for service. As for the test, we do not see any problems here, we can all go together for 2-3 weeks and conduct all the tests.
- **Mr. Kanamoto:** we will initiate such as inventory system, spare parts or backup service not JICA Organization, but Tajikistan Organization, don't misunderstand please.
- **Mr. Muminov:** Today, the economic subject of leasing, which is responsible for mechanization in the Republic, is TAL - a state structure. Since there is a state structure for mechanization, then the minister can instruct the director of TAL to distribute agricultural machinery according to the needs of the regions, for example, "give it to Rasht, give it to Garm, give it to Ganji, etc.", and it turns out we tested the machines in other regions. And what we are going to tell him if he asked to send Japanese machines to far distant area? - "Sorry minister, we will never test machines up there"!?
- **Mr. Kanamoto:** We try our best to decide such system not by political reason, but only by technical reason, considering to demarcate between the areas, for the farming test and for poverty alleviation activity in the distance place. Please remember to select the area[district] which you can have a good back up services for agro-machines with MTC, satellite station of Agro Tech Service or other station(s) other than remote area, following your idea [criteria to

select area] and the result of the last survey February 2022. Otherwise it is difficult to get the sustainable situation for agro-mechanization in Tajikistan. Any Japanese staffs will not stay here forever after the certain period of the grant-aid with technical corporation project, so you only shall control those including backup services for agro-mechanization in Tajikistan.

- **Mr. Muminov:** We advise you to test not only in the regions you mentioned, but let's test in remote regions too. But anyway, let's first wait until the equipment and machines arrive, and then decide further steps.
- **Mr. Kanamoto:** If we will get test well within a limited manpower and time, so we have to decide the areas for the farming test including appropriate rental business using those small size agro-machines' sets and for finding good market. Suddenly you asking for taking the farming test at the remote region, I think it is not possible at the moment and we don't get a good test there. For the farming test, there should be typical soil condition where we could manage flexibly.
- **Mr. Muminov:** I understood. Let's consider all on our fixed plans, not to change them at last moment.
- **Mr. Kanamoto:** please let me know the time when I shall come back here [e.g. at the last week of May 2023]. And, please read the other part of Progress report and if you have any questions or clarification, please contact to Mr. Karimov.

Conclusion:

A progress report was provided by the survey team, which outlined further objectives and plans for the survey and completed milestones. The MoA has reviewed the report and will contact the team if there are any questions.

At some point, the MoA proposed to reconsider the regions of the survey and conduct of the site, explaining this by the fact that the minister can send machines to far distant regions if there is a need for them. This proposal puts the project itself at risk for the farming test. But after explanations, the parties concerned came to a decision not to change the conditions of the survey, and stick to the approved plans.

End

(1) MoA/TAL 4)

Minutes	
Name of meeting	Visit to Tajikagroleasing
Data/Time	The 24th day of May 2023 10:00-12:20
Place	Tajikagroleasing（Below TAL）
Attendance	・**TAL**： ➢ Deputy director - Muminov Botir. ・**OMIC**：Mr. Kanamoto, Mr. Karimov. ・**AEC**：Mr. Hamroev.
Agenda contents	

- **Mr. Muminov:** Greeting and welcoming words.
- **Mr. Kanamoto:** Greetings words and appreciations words that could find the time for meeting with us.
- **Mr. Muminov:** We are always happy to see you! Could you please explain what is your plan during your stay here? What are you planning to do?
- **Mr. Kanamoto:** First, let me report to you about purchase of machines in Japan. Everyone (JICA side, Trending firm and others) has already agreed on the terms of the survey, production and delivery of machines to Tajikistan. There is only one problem is how to break down the price of transportation. Normally the price depends on purchasing volume, but averagely the price of transportation fee from Japan to Tajikistan is 10-15% of commodity price. JICA already set a budget in the end of last year and we are carrying that. We requested a quotation from 3 companies in order to choose the most suitable company for delivering machines to Tajikistan. But in our case, after breakdown the prices of transportation fee we got the price 6-7 time higher than the regular price. Please understand this very special situation about condition for transportation.
- **Mr. Muminov:** I understand and I know the situation. Before we faced same issue regarding transportation fee. One of the examples, we brought 4 tractors and the transportation fee for each tractor was 3000 Euro, total we have paid 12000 Euro.
- **Mr. Kanamoto:** We are considering the case that the machine sets will shift by port from Japan to Turkey and from Turkey move by truck to Tajikistan. By the way, Turkey port in Izmir has some problem because of earthquake happend earlier and it takes time to load the containers one by one. We are still considering which route to choose, but not yet decided which route is safer.
  At the moment we have 2 issues, and the first issue is the price, which is over the budget. I already requested to the JICA HQ to let us proceed anyway with a

farming test in Tajikistan. JICA HQ agreed about testing concept and they are interested on availability of using Japanese machine in Tajikistan. You see, if 10-20% price difference in the budget, then is ok, but in our case the price difference is 6-7 times over the budget. JICA HQ asked us to try our best to process of manufacture and delivery to Tajikistan as much as possible. But JICA HQ needs time to consider about price issue which is over the budget, especially the budget on transportation fee, so please understand JICA's situation as well. If after considering the price, JICA approved the budget and let us to procedure with procuring and delivering the machines, then OMIC president will sign a contract to the supplier (trading firm).

Second problem is choosing the safe route to deliver Japanese machines on time and with a less risks. Normally, it takes 1-1.5 months takes for manufactural company to assemble the machines and it takes 2 months for transportation thought Siberian route. Totally to deliver the machines to Tajikistan, before it would take 90-100 days from Japan to Tajikistan. But now the situation shows to us that the delivery time will be extended by 30-60 days. So, now we rush to sign the contract in the beginning of next month and it means averagely it will take 5 months to deliver the machines to Tajikistan, the earliest date is the end of October and beginning of November. It is mean, that we are going to have a farming test in the end of October or beginning of November, which we can't proceed about that time. In this case we must mind and consider, that the farming test we can get only in the end of February or in the beginning of March next year.

- **Mr. Muminov:** Yes, agree with that. Actually, on October and November we are harvesting.
- **Mr. Kanamoto:** We will request to JICA to let our specialists to come to Dushanbe before 2-3 weeks when machines will arrive (Mr. Akutsu or Mr. Kanamoto). Our contract says at least one engineer or mechanic should attend the handing over process.
- **Mr. Muminov:** Can we not wait for February to conduct a farming test, but in October or November we use machines and run a farming test?
- **Mr. Kanamoto:** We will not be able to transplant or seed the areas during November. I would like to see the regular growing of products. But if you have an available area on November, we can try to start the test and see the growing of products.
- **Mr. Muminov:** In autumn plowing we have grain (wheat), green radish, garlic, I think there is a chance to conduct farming test.
- **Mr. Kanamoto:** We are sorry for that news, but no one known about

transportation situation. There are many risks, I am just afraid to say that, but we can start our farming test on October or November, for example, it could happen some troubles in the border and we have to wait 2-3 weeks to solve the problems. The case if we use China railway service and they can create a problem and delay the machines for 2-3 months. And we think to choose the safer route. If machines will come on November, the best way is to start our farming test on February.

- **Mr. Muminov:** Now it is very risky situation, even for businessman regarding the prices, which goes up and down and the rate of dollar same - up and down.
- **Mr. Kanamoto:** That's why I say, to make a contract with the company in Japan to rush and let them to finish manufacturing the machines as soon as possible, otherwise they can change the price at the end. I am very appreciating if you could understand the situation. Thank you very much!
- **Mr. Muminov:** As you know, agriculture is the data industry, some kind of help is needed for farms at some stage of growth. The Minister is very happy to see donors appear and support the agricultural sector in Tajikistan. He is also grateful that JICA supports this campaign. For example, we have regions where there are problems with drought and water. And we are glad that you are interested in supporting the agricultural sector of Tajikistan.
- **Mr. Kanamoto:** The most important thing for agriculture is soil condition, secondary is water, next is applying fertilizer.
- **Mr. Muminov:** Right. We are very interested in your instruments and equipment, which you noted in your Inception report. These are such equipment as studying the hardness of the soil, soil moisture, the presence of mineral fertilizers etc.
- **Mr. Kanamoto:** For checking the minerals we have to use laboratory in Tajikistan. Physical matter – soil hardness, moisture contains we need to use at the field place.

  We have to consider, if machine sets come within the November, we need 2-3 months keep them in the warehouse. What shall we do in this case, if in that time we not decide the farming test site? Can we keep them in Vahdat warehouse? How much will be cost to keep the machines in TAL warehouse? At least we need to hire one security guard for those machines. Could you please estimate the cost of warehouse and security guard, so I will be able to ask HQ for additional budgeting.
- **Mr. Muminov:** No need to pay to TAL to keep machines in our warehouse and for security. Only consider please about transportation cost to the sites for farming test.

- **Mr. Kanamoto:** Sure, that is in our responsibility to keep the machines, transport them to the sites, security guard for machines – we are going to cover (pay) all this services. We ask the JICA to provide financial support for warehouse fee including the security, transportation to the sites (2places), warehouse for around 2-3 weeks on the sites.
- **Mr. Muminov:** Sure, got you! Thank you! We will help you to find the warehouses and security for your machines!
- **Mr. Kanamoto:** So, start to consider about this matter and finally give us some quotations, so I will be able to discuss with JICA HQ about that issue.
- **Mr. Muminov:** For that I need to know the farming test districts and after I will prepare a contract.
- **Mr. Kanamoto:** Ok! That is working group matter. Please start thinking about quotation from today.

  Here you can find the working schedule. Our contract up to February next year, but due to (according) the transportation, signing the contracts we have to extend 6 months around, up to August next year. And JICA HQ agreed about extension up to August next year, understanding the situation regarding transportation issue, contract signing and budget problem. Regarding WG activity, JICA not yet gave final budget approval or acceptance. Let me also explain our comments replied to MoA letter on Inception report. Someone mantion that MoA not accepted Inception report. Around 50 days ago we got allowance from minister of MoA to get machines for farming test. So, does it mean you regect the Inception report? We just want to clarify this issue.
- **Mr. Muminov:** You see, when some cases were commented here in the report, it stepped aside from the project proposal that Tajikistan and TAL put forward to JIKA. Because in our project proposal the topic was different - the Development of machine technological stations (MTC), and you have a title of small-size mechanization. Since the proposal moved a little from the original project proposal, they did not agree with this only. And in the end, they agreed that they would consider small-size mechanization. When the former consultants from the headquarters came, they coordinated with us the techniques with 20 HP, 40 HP or 90 HP. When we coordinated everything with previous mission, suddenly you came and proposed the development of small-size mechanization – tillers and mini tractors. Why did we previously discuss one topic, including big machines too and their diversity, then suddenly come to small machines? And our past project proposal was left aside. And for the most part, MoA wasn't happy with that.
- **Mr. Kanamoto:** This is not my project proposal offer, this is JICA's offer. But

can MoA accept Inception report or can't accept? The purpose is we try to use Japan made machines through the farming test and understand will we be able to use it in Tajikistan or not? Secondly, we try to find some cultivation problem growing methodology through this test.

- **Mr. Muminov:** In turn, we are interested in small-scale mechanization, because we have applications for supporting small agricultural machines. And so we decided to agree, but in the future, next future projects we will try to consider on large-scale mechanization.
- **Mr. Kanamoto:** Sure, you have your own request and we have to listen about that.
- **Mr. Muminov:** On behalf of MoA, we were instructed to build a Friendship Garden between the Republic of Tajikistan and the Republic of Uzbekistan in the Rudaki district. The area of the intensive garden with drip irrigation is 22 ha. And 2 presidents will open this garden. TAL was instructed to prepare the soil for planting trees. The soil of the garden was in a very bad condition, the soil had not been plowed for years and not been leveled. I worked 8 days on the soil to improve it using a variety of techniques. If you have a desire to see how we cultivated the soil, then I can show you.
- **Mr. Kanamoto:** Sure, one day we go and visit the garden. But could you please tell us did the minister accept Inception report?
- **Mr. Muminov:** The minister agrees, I spoke with him yesterday. He said, let' them bring and conduct farm test.
- **Mr. Kanamoto:** Thank you for clarification. Regarding Section 1 of our comments on who is the target group – we will survey together and check during Data collection survey.
- **Mr. Muminov:** Yes, it is ok. We will discuss together with commission.
- **Mr. Kanamoto:** The second point is the character of Working group. Please don't misunderstand I have no mind to reject the launching the WG. Launching the WG for survey is a very special case, because even JICA side don't have such experience, they don't know how to handle this issue.
- **Mr. Muminov:** First, we must create a ToR for the WG and describe activities what they should do.
- **Mr. Kanamoto:** I agree. The first we have to see the figure of WG, it's mean TOR and including schedule.
- **Mr. Muminov:** There should be some criteria for choosing dehkan farms - area, climate, product and other. There are many criteria.
- **Mr. Kanamoto**: You are right. The point is end of second half of period of WG assignment we have to decide some program of the future project, we discuss

and mutually agree, including the methodology and farming test result. Such case we discussed and JICA expect that we are mutually agree. But including some program, for example methodology, farming test for future program very important is inventory system of spare parts. In this case we introduce (or provide) the methodology/activity to the WG members, because not everyone has experience on that.

- **Mr. Muminov:** What do you mean by inventory of spare parts?
- **Mr. Kanamoto:** For example, in this case it's mean control management of spare parts. For some machines we provide a spare part very rare, one time in 5-6 years, but still we need to put one spare part. If one group has 10-20 sets of machines, I just provide 1-2 sets of such special spare parts to the group. At the same time, we have frequently changed spare part (consumable) that need to be change every 5-6 months and we must keep good number of spare parts, which are nice for 1-2 years. Then after years of using the machines, you will know how to consume the spare parts, after that you calculate and order for next 1-2 years ahead.
- **Mr. Muminov:** I understood, thank you! It is still too early to talk about this, because we have not yet conducted a survey. After we do the survey and use the machines, then we can already know what we need.
- **Mr. Kanamoto:** Of course. Because maybe such things are happened. We will have a stage, which look like technical transfer. So, it's mean working group look like a technical cooperation. Technical transfer will take a time little longer than simple data collection survey. This survey and working group look like a technical cooperation activity and character is much different. So, I am talking about WG and transfering the machines to tajik side from Japan. At the final the inventory system, item system, rental system and extension system we will agree one by one. That case means, when we explain the technics specification or procedure the technics including the name, it's kind of technical transfer, which means, character of working group is very close to the technical cooperation. And our reply to the Section 2 is Ok we will discuss how to launch WG.

  When we make ToR with the working schedule, we will know the working volume and will try to make a budget from Japan side. And on our replied letter to MoA comments, we mantion how to handle the resource for WG activities, of course though the discussions.
- **Mr. Muminov:** This working plan shows the period of WG activities, based on this plan, you can determine the budget.
- **Mr. Kanamoto:** Working plan, that you have on your hands is just a draft, we

will discuss in detail on this plan in the future. Now I hope you understand my stay in Dushanbe. I want to finish all mentioned above activities. Last, I would like to have 2-3 times meeting in a week to discuss about future data collection survey.

- **Mr. Muminov:** Sure, we open for cooperation and conversation!
- **Mr. Kanamoto**: Thank you for your time!

End

(1) MoA/TAL 5)

<table>
<tr><th colspan="2">Minutes</th></tr>
<tr><td>Name of meeting</td><td>Visit to Ministry of Agriculture</td></tr>
<tr><td>Data/Time</td><td>The 25th day of May 2023
09:30 to 12:00</td></tr>
<tr><td>Place</td><td>The Ministry of Agriculture（Hereinafter referred to 'the MoA'）</td></tr>
<tr><td>Attendance</td><td>・MoA：
➢ Chef of Department of Technical Policy and Agricultural Infrastructure Development – Mr. Shomamadov Abdumamad;
➢ Deputy director of TojikAgroleasing (TAL) – Mr. Muminov Botir;
・Study team:
OMIC：Mr. Kanamoto, Mr. Karimov.
AEC：Mr. Hamroev.</td></tr>
<tr><th colspan="2">Agenda contents</th></tr>
<tr><td colspan="2">➢ Mr. Shomamadov: Greetings from the Ministry and express the gratitude for coming and meeting.
➢ Mr. Kanamoto: Greetings from survey team. Let me first express my gratitude to you for taking the time to host us.
➢ First, I'd like to talk about transportation. At the moment, we are at the stage of signing the contract, after which the Machinery Manufacturing Company will start its work. The contract contains the conditions for the transportation of goods, in our case machines, to Tajikistan. We considered several options on how to deliver machines to Dushanbe faster. There are 3 ways of delivery: 1) through the Siberian route; 2) through China route; 3) through Turkey route. The transportation company has several criteria for choosing a route, but the most important selection criterion is the safety and timely delivery of machines. Based on these considerations, the companies do not want to deliver machines through the Siberian route and the Chinese route. Because there is a possibility of machines being delayed at the border, which we encountered earlier. It happened that our stuff (goods) was delayed for 3-4 months, just stayed in the border. In this regard, the only acceptable solution is the delivery of machines through the Turkish route. But here there is one problem, having learned about which we were also upset. Delivery of machines will take longer than we expected. If we sign the contract at the beginning of next month, it will take approximately 2 months for the company to manufacture the machines. It turns out that in August the machines will be loaded and sent to Tajikistan. The machines are expected to arrive to Tajikistan in late October or early November. Since you are in your harvesting period at this time, we will not be able to make farming test at that time and, therefore, we are going to move the farming test to the end of February and the beginning of March. We apologize for this news and hope for your understanding as we no longer have any other choice but to reschedule the farming test.</td></tr>
</table>

- **Mr. Shomamadov:** Thank you very much for the information. We appreciate your support, but to be honest, we do not agree with the decision to reschedule the farming test to next year. If we move the farming test to the beginning of next year, it turns out that we will be able to implement the future grant aid project in 2025. It takes a very long time. This information will upset the Minister of Agriculture, as we expected the implementation of the farming test and the future grant aid project at an early date. Why don't you reconsider the route through China? We work with China and bring our own goods, and we know that it takes 20-25 days to bring the goods from China. So, if you send the machines through China they will arrive earlier and we can start and finish the test this year. It seems to us that it will be better and faster if you try to send machines through the Chinese route. We can come to the next decision, we will explain the whole situation to the minister, and if he has any questions about the survey and the farming test, then we will arrange a meeting with you and you will explain everything to him.
- **Mr. Kanamoto**: Ok, I agree! Thank you!
  One more subject, we have already discussed yesterday with Mr. Muminov, did you accept the Inception report? We have replied to your comment on Inception report, and JICA sent it through the Ministry of foreign affords. You will get it in 7-10 days. Section 1 is the subject that we will learn together during the survey. Section 2 regarding the launching the WG and I want to discuss on this issue. Except these 2 comments our Inception report is ok, no any other comments?
- **Mr. Shomamadov:** Yes, it’s fine to us!
- **Mr. Kanamoto**: WG matter have to mention at existing Inception report or not? Why I am asking, because it is not so easy to mention it there.
- **Mr. Shomamadov:** If we don’t mention it in Inception report, then where to mention it?
- **Mr. Kanamoto**: In the JICA replied letter is clearly mentioned that we are going to launch the WG and make a ToR, so based on this letter we can launch the WG including creating a ToR. And could you please send to us an official letter that you accept the Inception report?
- **Mr. Shomamadov:** All right, we agree! And the letter of acceptation we will send by replying to your letter from JICA.
- **Mr. Kanamoto**: The situation itself is not so simple, and this situation needs to be explained to JICA. In order to get a budget, that is, additional funding, we first need to create a TOR, since the creation of a WG in itself is a new activity that requires additional funding.
- **Mr. Shomamadov:** We agree with you, the only thing we ask you is not to delay too long.
- **Mr. Kanamoto**: To confirm the procedure to make a ToR, could you please tell us firstly, who is the stakeholder of ToR of WG concerning this matter (for example MoA, TAL, farmer, district officer, MTC, Academy Science etc.). You can give me the list later, now I am just confirming. First, stakeholder is for clear the purpose, after that the members of WG, and then activity.

- **Mr. Muminov:** The stakeholders are MoA, TAL, machine testing station. But the Ministry of Agriculture will be responsible for everything. The ministry is the only stakeholder.
- **Mr. Kanamoto:** Stakeholder and WG member are different. Stakeholder is who will participate in the survey.
- **Mr. Shomamadov:** It is enough to include only the Ministry of Agriculture. Since all subordinate 26 structures obey him (Institute of soil, TAL, MTC and others). For example, MoA itself will oblige the Institute of soil to do a soil analysis. And we have all the soil data for all 11 climatic zones for all over the country. And getting a report and results with MoA help will be free of charge for you. The Ministry also has its own testing lands/stations in over the regions, where you can test without disturbing the farmers.
- **Mr. Kanamoto**: Stakeholder issue we will shift to another day and discuss detail next time. In terms of soil samples, we intend to analyze the soil conditions before and after using the machines. Then see the results and give advice to Tajik side on how to use or improve the composition of the soil. Thank you for the offer to use the Ministry's land for testing, but we need land where crops are being planted. They should not be salty or stony. But we will talk about this next time. Thank you for your time and discussion.
- **Mr. Shomamadov:** Thank you!

End

(1) MoA/TAL 6)

Minutes	
Name of meeting	Visit to Tajikagroleasing
Data/Time	The 26th day of May 2023 09:30-11:30
Place	Tajikagroleasing（Below TAL）
Attendance	・**TAL**： ➢ Deputy director – Mr. Muminov Botir. ・**OMIC**：Mr. Kanamoto, Mr. Karimov.
Agenda contents	

- **Mr. Kanamoto:** Greetings! Thank you for the yesterday's meeting at the MoA. We are now very close to signing the contract. But yesterday I contacted my colleagues in Japan, based on your yesterday request, I asked them to recheck the route through China. According to your suggestion, if the machines get stuck at the border with China, will you be able to get the machines out?
- **Mr. Muminov:** Sure, without any problem we can assist to get machines clearing the custom zone. Machines will be transported on the territory of China by trucks. The help that we can provide is to ask the Tajik customs not to detain machines at the border between Tajikistan and China.
- **Mr. Kanamoto:** But in any case, there is still a risk, for example, if the machines get stuck in the port, then no one can help and handle to get the machines. There is another issue regarding the transportation of machines in the China route. They will manufacture base on order/signed contract at different 3 locations and shipped individually in 20- or 40-feet containers. They turns out to come at the border of China-Tajikistan separately and you may go 2-3 times to the border to get the machines.
- **Mr. Muminov:** In our experience, our transportation companies collect goods at a specific location and bring it all together to the border. We also try to fill the container as much as possible to make it cheaper. I advise you to also consider this option, and if possible, fit your machines in one container.
- **Mr. Kanamoto:** We will not be able to load everything in 1 container, as the machines and equipment adjacent to them are large and take up a lot of space. But you do not worry about this, professionals' working with the supplier [trading firm] and they know what/how to do. In any case, using the route through China, the machines will arrive at the same time as the route through Turkey under the existing circumstances. The difference is just the price, the China route costs a bit cheaper than Turkish. But there are more risks about the necessary days of the transportation to use the Chinese route. And, no one can commit it in advance

either how soon the machines will arrive.

We are going to consider your suggestions conveying your advice on transporting machines to the Japanese side, but please note that we do not have much time to stay on this issue for a long time as a global situation is changing day by day. We must already resolve all issues before the end of this month and start producing machines, otherwise, the process of manufacturing machines will be delayed and we will fall further behind the time.

- **Mr. Muminov:** Thanks for the information, we will take into account all your comments and try to start the process as soon as possible. I would also like to note that in neighboring countries, for example, in Uzbekistan, modern European machines (technics) is already being used, while we continue to use old Belarusian or Russian machines.
- **Mr. Kanamoto:** For next project just request to us how to effectively use Belarusian or Russian machines or how to manage the existing machines. Next period the pre mission will come before when machines arrives to Dushanbe as grant-aid project, they will consider and handover the technical cooperation beside grant aid project. Please focus on this data collection survey. First, we have to run the WG and calculate the budget during my stay in Dushanbe. As for the issue of transportation, we will try to consider all possible options for the delivery of machines as soon as possible. I'm afraid if we delay with the issue of transportation, then snow will fall on the border with China and our machines will be delayed for a long time. But at the moment I don’t know which route we will take; we have already offered 2 options for machine delivery – Turkish and Chinese routes.
- **Mr. Muminov**: Thank you, I understand the whole situation. In turn, I want to say that the situation on the market situation is changing every day, services are becoming more expensive every time, and therefore we must speed up with the choice of route and delivery of machines. I agree with you on this issue.
- **Mr. Kanamoto:** We try to expedite the process as quickly as possible. We have already asked the company to send us a quotation for transporting machines through China route. If there is any news, we will definitely inform you. Thanks for the meeting.
- **Mr. Muminov**: Fine! And thank you!

End

(1) MoA/TAL 7)

議事録	
会議名	The process of future investigation
日時	01 June 2023（Thu）14:00-15:40
場所	MoA
出席者	MoA：Mr. Zevarshoev、Deputy minister、Mr. Shohmamadov、 TAL：Mr. Muninov Inspection of state control of agricultural machinery: Director Mr. Homidov Sharif Tel：+992904166000 The state institution of the state testing station of Tajikistan：Director Mr. Aliev Avaz Tel：+992900102480 JICA：Mr.Kikuchi、Mr. Shohrukh OMIC：Mr. Kanamoto AEC：Mr.Aslam Hamroev

議題内容

- **Mr. Zevarshoev:** Greetings to the JICA survey team.
- **Mr. Kanamoto:** Thank you for taking the time to meet with us and discuss the survey questions.
- **Mr. Zevarshoev:** I informed about the research situation, talked about the issues discussed during previous meetings. Unfortunately, I was on sick leave and could not meet with you. I also informed the Minister about your arrival and explained to him what kind machines you will bring under the grant aid project. He listened and said that we do not need small agricultural machines. We have good big modern machines of European and Indian production. Although there is no doubt that Japanese machines are of very good quality. Today, before your arrival, we had a meeting with scientists and specialists on the issues of agricultural mechanization, including all types of equipment. Let me ask you again, what is the purpose of your visit? Give me your clear plan for this year. We are listening to you.
- **Mr. Kanamoto:** In April, we provided you with the Inception Report, and I hope you have read and understood the report. Our goal is also to understand the existing potential of agro-techniques in Tajikistan. During this period, as part of the data collection survey, we want to test all possible aspects and further discuss it with you, after which we develop the final report and program. Also, as part of the survey, we plan to conduct a farming test using 2 sets of Japanese machines (mini tractor and a tiller with implements per set). As I came to Tajikistan, I realized that the soil in Tajikistan is very hard. The test will show

us whether Japanese-made machines can be used or not. Upon completion of the tests, we will decide which machines are suitable for working with your soil - large or small agricultural machines. Besides, we have to confirm the issues to be resolved on the growing matters including the need of improvement of the soil condition.

We provided you with the Inception Report in Russian, after which you sent us your comments, no doubt we will consider and include your comments in the Inception Report. One of your comments was the establishment of a Working Group (WG) for the survey, which is a good initiative to improve the quality of the study and will make our work easier. The Japanese side supported this Tajikistan side initiative and asked to quickly create a working group if Tajikistan side want it. By the end of the year, we must follow this plan and complete the tasks assigned to us. If you have any questions, then please, I'm listening.

- **Mr. Zevarshoev:** Does your survey have a timeline?
- **Mr. Kanamoto:** Of course, there are deadlines. There is only one difficulty we are facing at the moment. First of all, we collected 3 lots for the contract purchasing machine sets, and there is no problem with the production of machines in Japan. The only thing is that the price for transportation over the past 2 years has grown a lot, by about 6-7 times. And transportation will take time, it is planned that the cars will arrive in Tajikistan at the end of October or at the beginning of November of this year, we hope.
- **Mr. Zevarshoev:** And what kind of machines?
- **Mr. Kanamoto:** The machines are already detailed in the Inception Report; 2 tractors and 2 tillers with implements for mainly phoughing. As I noted earlier, at the moment we are faced with a route problem. We first decided that we would use the Siberian route, but we were not given permission. After that we stopped on the Turkish route (via Izmir). The manufacture of the machines themselves takes 1 month, but transportation from Japan to Dushanbe takes from 3 months. Earlier, in discussions with Mr. Muminov and Mr. Shomamadov, we were advised to consider a route through China. Our team considered and we came to the conclusion that it would also be expensive and take a long time to transport with high risks.
- **Mr. Shomamadov:** As far as we understand, we are talking about survey at the moment. You asked us to get acquainted with the survey execution plan and we understood that the farming test itself will take place in February 2024. After

that, it takes a year for the Government of Japan to approve the grant aid project, and only in 2025 or 2026 will we be able to launch the grant aid project. As we see it takes a very long time, we would like to start and complete the survey for a grant as soon as possible. Secondly, I would like to note about our 2017 project request form. If you need to submit a project request form again, we will modify it and deliver it to JICA again. It is not known what will happen in the future, in 2025 or 2026. Maybe the same situation as with COVID-19 will happen and we will still have to wait 5 years to receive grant aid assistance. During our last meeting, we decided that we would arrange a meeting with the Minister and let Mr. Kanamoto explain the whole situation himself. After the Deputy Minister met with the Minister, the Minister asked the Deputy Minister to meet with Mr. Kanamoto in the presence of JICA and discuss the problems and come to a common solution. This is the purpose of our meeting today.

- **Mr. Zevarshoev:** The Minister noted that the study takes a lot of time and now we have little time, it is better to focus and start the grant aid project as soon as possible.
- **Mr. Kikuchi:** Thank you very much for the meeting and the questions that were raised today. As Mr. Kanamoto noted, it is important for us to conduct survey. The purpose of this survey is to clarify some questions of mechanization and matters concerning for the JICA office, and based on the results of the survey, we will be able to tell you whether we will support the grant aid project in the future or not.

[Untranslated part (discussions in Tajik language only):

Minutes - 37:10 Shohrukh > *Aslam, in principle, is our side man and we talk in front of him comfortably, he will never brings our talking to others, so I want to say that I don't understand one thing. I read that project request form (2017).*

Minutes - 37:22 Zevarshoev > *We've already given up on those project ideas based on the request form (2017). Leave it.*

Minutes - 37:25 Shohrukh > *Let me finish one second. I know 100% the concept and purpose of your project request form (2017). Have you ever asked Kanamoto if he has read the project request form, if he is aware of the project request form?*

Minutes - 37:41 Muminov > *Yes, we need to ask once.*

Minutes - 37:43 Shohrukh > *I also note for myself that the work that is now going on is superfluous (additional).*

Minutes - 37:53 Shomamadov > *I will respond to this comment, but what I will say does not need to be translated, so that Kanamoto does not take offense. They perfectly read our project* *request form (2017). Before survey team arrived in Tajikistan, they had already stated in advance the purpose of their arrival. But to be blunt, they had one unsuccessful experience, they want to repeat this experience a second time and convince us that this experience will be successful. Why did I come to this conclusion, because when they started visiting places like Faizabad and others, they basically discussed exactly this, they began to agitate the people that this is how we would work. And then project request form (2017) is generally about something else, about MTC basically, not the distribution of machine and equipment just like that.*

Minutes - 38:51 Shohrukh > I would like to translate. I inform them about Kekuchi san replying regarding aim of the survey. There is one question to you Kanamoto san from their side, whether he had reviewed or studied this grant aid project request form the Ministry requested in 2017? Have you reviewed that request form (2017)?

Minutes - 39:36 Mr. Kanamoto: I have never read that request form, only saw the list of machines and implements, JICA HQ showed one year ago, which could work nicely for the rice growing.

Minutes - 39:39 Shohrukh > *He never read the project request form.*

Minutes - 39:45 Shomamadov > *On what basis did they then come and conduct a survey if they did not read the project request form (2017). So much we met with them, we always told them the same thing (one topic).*

Minutes - 40:08 Shohrukh > *I'm someone who doesn't have as much experience as you, of course, but when I started working and read your project request form, it clearly states exactly what you want. Basically, there is an increase in the potential of the Government in the provision of MTC services. It does not indicate whether we will give leasing. Why I gave this example, I also informed my management that there is ambiguity here. If he didn't read this application (project request form), what is the purpose of this survey, why we are doing this survey?*

Minutes - 42:19 Zevarshoev > *Let there be survey, we do not mind! It's just a matter of timing. It takes almost 3 years.*

Minutes - 42:32 Shohrukh > *If we count from 2017, then it will be 9 years.*

Minutes - 42:35 Zevarshoev > *No no, we're talking about today's survey plan and future grant aid project. It will take 3 years.*

Minutes - 42:49 Shohrukh > *Dear Zevarshoev, I want to say that this does not mean that they will approve the grant in 2026. The JICA Grant Aid Project, once they have done their survey and come to the decision that they will support the grant, it may take another 2 years for the project to go live.**] (ending Tajikistan language controversy)***

- **Mr. Zevarshoev:** Have you read (reviewed) project request form submitted in

2017?

- **Mr. Kanamoto:** I have never read that request form, only saw the list of machines, JICA HQ showed one year ago, which could work nicely for the rice growing.
- **Mr. Shomamadov:** If you didn't read this application (project request form) what is the purpose of this survey, why we are doing this survey? MoA objective to collaborating with JICA is follow up such a application.
- **Mr. Kanamoto:** This is JICA HQ offer, and they didn't mansion any matter of request of 2017. From the last year JICA focus on small-size agro mechanization. After that we made a request form. The only way we have is follow the Inception report.
- **Mr. Zevarshoev:** We agree with the survey, there are no problems. But the issue is time consuming, the period of the test and its further approval takes a very long time. The best scenario would be if the grant project is approved in 2026, or it may turn out that the project will drag on even longer. That is, it will take more than 9 years since we submitted a request and the project was approved.
- **Mr. Muminov:** We met with many missions that came from Japan to us during the writing of the project request form. During the meetings, we even agreed that 50% of the equipment will be Japanese and the other 50% from the post-Soviet region (Belarus). JICA headquarters is aware of the project request form and our request. Why, after numerous negotiations and meetings, are we considering a completely different project? The only issue on JICA's part was who would be responsible for providing the service (maintenance) if we provided Japanese machines. And we officially sent a letter to JICA that the full service will be provided by Agrotechservice.
- **Mr. Homidov:** In 2004, we visited the Kubota in Japan and the cost of an 80 HP tractor cost 75,000 thousand dollars. The same tractor in Belarus cost 12,000 thousand dollars. Now a tractor of 80 hp in Belarus costs 28,000 thousand dollars, but I don't know how much a tractor costs in Japan, I can foresee that it is more expensive. The difference of cost of the tractors is significant. If you want to focus on grant aid project of course procuring of expensive tractor is not feasible for both sides, either for farmers here and either for JICA. The quantity of tractors will be less than expected. I want to know if it is still possible to focus on Japanese tractors, for the price point of view it is not so attractive.
- **Mr. Muminov:** You said that we needed a survey to write a grant aid project

request form. May I ask, do we have to conduct survey in order to receive a grant from Japan or do we do without survey?

- **Mr. Kanamoto:** As you noted earlier, before you decide on a particular issue, you need to go through a number of procedures, for example, from discussions of specialists to a Deputy Minister, then from a deputy Minister to a minister, and then a discussion at the government level. Please understand that we also have procedures that we must follow. We will conduct a survey, and after verification, we will decide whether to allocate money for a grant aid project or not. That is, it is the only way to gain tax money from Japanese people. So, the Japanese side also has its own procedure. Therefore, in this case, we must understand each other, and understand this is a good chance for you to get machines to improve farming.
- **Mr. Zevarshoev:** Thank you for the detailed information and discussion. We agreed with the conduction of the survey and with the timing of the future grant aid project. You can start research work, you will need our help, we will be happy to provide.
- **Mr. Kanamoto:** I appreciate it, so I am honor to hear that, I can expect your help for survey. Thank you very much for your time today.

以上

作成日時： 2023年6月1日（木）	作成者： ハムロエフ　アスラム

(1) MoA/TAL 8)

Minutes	
Name of meeting	Visit to Ministry of Agriculture; Discussing the WG TOR
Data/Time	The 09th day of June 2023 09:00 to 10:30
Place	The Ministry of Agriculture（Hereinafter referred to 'the MoA'）
Attendance	➢ **MoA**： ➢ Deputy Minister of MoA – Zevarshoev Z. ➢ Chef of Department of Technical Policy and Agricultural Infrastructure Development – Mr. Shomamadov Abdumamad; ➢ Deputy director of TojikAgroleasing (TAL) – Mr. Muminov Botir; ➢ Mr. Khomidov Sharif – Head of the State Inspectorate for Technical Supervision of Agricultural Machinery; ➢ Mr. Aliyev Avaz – Head of machine testing station; ➢ **JICA:** ➢ JICA national staff – Mr. Atoev Shohrukh. ➢ **Study team:** ➢ **OMIC**：Mr. Kanamoto.

Agenda contents

- **Mr. Zevarshoev:** I want to request Mr. Kanamoto to address the meeting opening today.
- **Mr. Kanamoto**: I'm honor to hold the meeting on WG activity and select of its members/ assignments on today's good day.
- **Mr. Zevarshoev:** What are the main points to discuss today?
- **Mr. Kanamoto**: We have a demarcation to work which the Tajikistan side mentioned to share a role to each WG member to be suitable for data collection and, also, we are going to analyze the data to draw up a plan in the future while showing the current situation of the agriculture in Tajikistan. For example, the JICA Survey team will confirm the market situation of agro-product/ agro-machine, make a plan to achieve a farming test including the selection of farming test site, and analyze the collected data. And Tajikistan side will collect the data mentioned in the draft WG TOR and the Inception report throughout. Then the both sides confirm and discuss the result of survey.
- **Mr. Zevarshoev**: There are some questions we would like to clarify, let's discuss on each item, which mentioned in the draft TOR and the inception report.
  1. Collect the questionnaires mentioned in the inception report; From Q1 to Q4 on page 5 of the Inception report, the following is stated:
     Question 1 – OK;
     Question 2 – OK;

Question 3-1 – OK;

Question 3-2 – OK;

Question 3-3 – Why we need information about the volume of exportation? MoA doesn't do export. MoA is not in charge of this question, and we are not responsible for it. In Tajikistan we have a Government organization - Agency of Export, which is responsible for this kind of question.

- **Mr. Kanamoto:** That one is the reference from ordinary marketing data. This is one of the criteria to select the area, so can make a good farming system. Through the relationship between the MoA and the Agency of Export, you can introduce them about the survey program so that we can collect data from them as this WG function.
- **Mr. Somamadov**: In principle, the collection of information is not a problem, as it is in the interests of the ministry. In question 2 (*Data in the context of regions and crops for the last 3 years: cultivation area, yield, income per unit area*), it is a problem for us to get the "income per unit area" data. The calculation of income does the Ministry of Economics and they are doing the general calculation, but not each area separately. We can get a certain general information from the Ministry of Economics, for example livestock, plant growing or cotton production.
- **Mr. Muminov**: Some questions are very confidential and very difficult to get some data from Committee of Statistic or Ministry of Economics.
- **Mr. Kanamoto**: Don't focus too much on complex issues. As far as possible, we will request applicable ministries and/or government institutes/ offices and collect data from them.
- **Mr. Shomamadov**: We can coordinate on JICA SHEP Project to collect such data, as they are currently working into similar issues.
- **Mr. Atoev**: Ship project working (implementing) just in 3 districts only.
- **Mr. Shomamadov**: Even data from those 3 districts will help us. We have a free market in our country and not a single farmer will say for how much he sells his products. On the 3-3 question, no one will help us and no one is collecting such data. No one reports to us for how many (means the price) products were sold.
- **Mr. Atoev**: Agency on Antimonopoly is not working in this issue?
- **Mr. Zevarshoev:** The Agency on Antimonopoly works, but they don't cooperate on price issues with us. And even when we reach out to them with an official letter, they refuse to respond.
- **Mr. Shomamadov:** The Antimonopoly Agency operates as follows, when someone provides public services, the Agency determines the price, and this price should not be exceeded. And when the price in the market rises, the Agency must find out the reason for the rise in prices. For example, to find out the wholesale price, we need to go around all the farms in the Tajikistan (around 180,000 DF) and ask them for how much they sold their products. The same situation with the data of sales volume.

- **Mr. Muminov**: This is a very big job.
- **Mr**. **Shomamadov:** The fact is that Survey team (Japan side) took into account all their professional experience, provided us with these questions. In Japan is much easier, there are cooperatives, group or associations and very easy to identify such kind of questions.
- **Mr**. **Zevarshoev:** I have a friendly and personal question for you that I have wanted to ask you for a long time. Are you a scientist or academician?
- **Mr**. **Kanamoto**: Please you should just find applicable agent. Up to now, we have experience to work in many countries, I am doing an analysis.
- **Mr**. **Zevarshoev**: I found you as a very good analytic. Those questions and activities you have mansion need very big volume of job. We need to hire specific group who need to focus just on your questions.
- **Mr**. **Kanamoto**: Even within one year, if you can collect this data, that's good. I think it will also be useful for your Ministry. Providing general information or data that you work with, then this data is sufficient (enough). If any information is confidential, then you can reflect it within the working group. We welcome all situation. This is WG function. Before when we start, please don't reject all questions.
- **Mr**. **Zevarshoev**: We would like to dispute question 4-2 point 2. Here it is incorrectly indicated and we do not agree with this. All the people who sit here are mechanization workers. The sentence itself has an affirmative meaning (as a statement), and not in the form of a question. Could you put it in the form of question, not statement?
- **Mr**. **Kanamoto**: If you have such organization, just please show us and this is enough. This is a question to WG, but anyway in this matter we will correct the wording and confirm with MoA. I tried to support you to create a TOR and I think it is not a 100 % on our responsibility. And today's meeting is not a place of argue, but we need to move to a new step.
- **Mr**. **Muminov**: It seemed to me that the WG is needed for testing machines during the farming testing, but not for the survey of mechanization.
- **Mr**. **Kanamoto**: No need to reply to those questions today, we giving you time to response to questions.
- **Mr**. **Shomamadov**: We will need answers to these questions when we have already tested and found out that Japanese Agro-machines are suitable for us. Once we get approval for the grant aid project, then we can get together and do the research, collect the necessary data and answer those questions. And for the test of 2 sets of machines, we do not need to waste time collecting detailed data and answering your questions.
- **Mr**. **Muminov**: The ministry is in charge of policy. The main task of the ministry is the reasonable use of land for a good harvest. But today we have gathered on the issues of mechanization, and specifically to understand whether Japanese machines are suitable for use on Tajik soil and environment, that is, we create a WG on the issues of conducting a farming test. If the farm test is positive, then according to the procedures of the Ministry is applicant

of the project proposal. When the Ministry submit to JICA new grant aid project, then JICA has the right to request from us questions based on the quality of application, and after that we will reply to the questions. Unfortunately, after 2017 when we applied our project proposal, so far there were no any questions from the JICA HQ.

- **Mr**. **Kanamoto**: These all questions will concern for establishing grant aid project. I want to repeat once again that all the questions that are reflected here were provided by the JICA HQ. Don't worry if you have lack of something, we need to initiate ideas in order to get further support from JICA. The WG that we have created and will continue to work with it is not only to promote the grant project, but also as a support of whole mechanization. When we request and collect information from you about the status of the MTC, we may also provide other support, for example, the provision of tools to improve work quality of MTC. In addition to providing technology, I believe that you have a need for a good engineer, mechanic, agronomist and we will try to support you in that also.
- **Mr**. **Shomamadov**: We understand you and will try to provide you with as much data as we can collect. Let's define the further action. As we know you are leaving tomorrow, how should we provide the information?
- **Mr**. **Kanamoto**: Let me confirm from you the timing of collection date, analyzing date until September 2023.
- **Mr**. **Zevarshoev**: Based on our capacity we will provide the information.
- **Mr**. **Kanamoto**: Try your best please. Based on availability of information please provide as much information as you can. Thank you! May I confirm from you the communication issue between us while I am in Japan? We would like to assign our assistant Mr. Karimov as a liaison. If you have an availability to contact by Skype or Zoom, we can communicate in this way also.
- **Mr**. **Shomamadov**: Sure, no problem. Thank you!

End

(1) MoA/TAL 9)

<table>
<tr><th colspan="2">Minutes</th></tr>
<tr><td>Name of meeting</td><td>TV meeting with the Ministry of Agriculture (online meeting)</td></tr>
<tr><td>Data/Time</td><td>The 23rd day of August 2023
15:00 to 16:30</td></tr>
<tr><td>Place</td><td>The Ministry of Agriculture（Hereinafter referred to ‘the MoA’)</td></tr>
<tr><td>Attendance</td><td>・MoA：
➢ Chef of Department of Technical Policy and Agricultural Infrastructure Development – Mr. Shomamadov Abdumamad;
➢ Deputy director of TojikAgroLeasing (TAL) – Mr. Muminov Botir;
・Study team:
OMIC：Mr. Kanamoto, Mr. Karimov.</td></tr>
<tr><th colspan="2">Agenda contents</th></tr>
<tr><td colspan="2">➢ Mr. Shomamadov: Greetings from the Ministry.
➢ Mr. Kanamoto: Greetings from survey team. Let me inform you about machine situation first, before we start to discuss our main meeting points. We have already sign the contract in the middle of July with supplier, Toyota Tsusho, but us still discussing with them when they can reach the machines to Dushanbe. The machine sets will come from 3 places: Japan, Thailand and Indonesia. So, it means 3 containers will come to Dushanbe from 3 different countries and, most probably, the containers will reach Tajikistan not at the same time. The delivery time of container from Indonesia still under discussion. The supplier firstly said to us, that the container will reach Dushanbe on February, which is late for us due to limited time of farming test on February and March and we need 7 to 10 days to transport our machines from Dushanbe to the sites. And finally, they confirm the possibility of delivery the machines at some day on January 2024. Anyway, the Maker already starts to assemble and manufacture the machines. The latest news regarding the status of machines I will tell you on September during my visit to Dushanbe. Around October the containers will come to the port and in that time I will provide you detail information, so you will be able to arrange and prepare a warehouse to keep machines. In case, if shipper will not be able to unload the machines, we kindly request you to provide this service and unload the arrived machines.
➢ Mr. Muminov: Sure, we will provide all necessary assistance to unload machines.
<u>Agenda of meeting</u>:
1. Member to come and conduct the farming test from Tajikistan side?
2. Progress of data collection based on the inception report and the WG TOR
3. Definition of private land for cultivation
4. Taxation rule for purchasing the devices manufactured locally.
5. Site selection for the farming test
6. Budget application concerning the future grant-aid and technical cooperation project.</td></tr>
</table>

- **Mr**. **Kanamoto**: As you know, we are planning to conduct a farming test on February and March 2024. For our budget calculation, what's cost we need to know how many persons from Tajikistan side will join a farming test?
- **Mr**. **Shomamadov**: Maximum 10 persons will join the farming test.
- **Mr**. **Kanamoto**: It is too many persons, please consider only official ones who will join the farming test under WG members, though we never stop the observers; they are always welcome.
- **Mr. Muminov**: We will consider the number of members and tell you later how many persons exactly will join the farming test. But for the moment let's consider 7 persons: 1 from MoA, 1 from TAL, 1 from Academy of Science (soil section), 1 from State registration department, 3 from Machine test station.
- **Mr**. **Kanamoto**: We need to consider the transportation for those members. Mr. Karimov, please, try to get information about transportation issues.
- **Mr. Muminov**: Let me clarify, which company is the maker of agro-machine?
- **Mr**. **Kanamoto**: Yanmar Company for the mini-tractor and tiller with some implements. And Sugano agro-machinery Co., for implements, plow-soiler, chisel from Japan.

  Mr. **Kanamoto**: The next question is what is the progress of data collection in Tajikistan?
- **Mr**. **Shomamadov**: The data collection still in process. As far as possible, we will try to collect all the necessary data. We would like to note that in September we have a very busy schedule at the Ministry. The government of Tajikistan plans to hold 2 international summits, MoA also plans to hold a national agricultural holiday in September. We will try to pay maximum attention to our survey and your visit, but if suddenly we are busy these days, we apologize in advance.
- **Mr**. **Kanamoto**: Thank you for information. It is very difficult for us to change our schedule now. We will try to not take much of your time, just collect necessary data from you.
- **Mr**. **Muminov**: We will clarify our business schedule of September and let you know which days we will be available for our meetings.
- **Mr**. **Kanamoto**: Thank you!

  The next question is what is the official definition of private land? We raised this question several time on our previous meetings and this information will be very useful for us and our survey. We would like to clarify the taxation issue of private land?
- **Mr. Muminov**: Ok, let me find the official definition of private land and then I'll let you know.
- **Mr**. **Shomamadov**: MoA also helps to collect the agriculture taxation conditions and share with you.
- **Mr**. **Kanamoto**: Thank you! The next question is regarding taxation of trailers. We are planning to purchase local made trailers and could we ask to make free taxation for them?
- **Mr**. **Shomamadov**: Yes, sure, the purchasing agriculture trailers is free of tax.
- **Mr**. **Kanamoto**: In this case, do we need to process any paper work to get free taxation.

- **Mr**. **Shomamadov**: No need to do any paper work, based on Cadex and Low agricultural trailers free of tax. If you are going to purchase a local manufactural trailer, the necessary tax already includes to the price. Let me inform you that Agrotechservice also manufacturing the trailers.
- **Mr**. **Kanamoto**: Thank you for your information. <u>The next question is site selection. We have received a request from JICA regarding a farming test. And they ask can we conduct a farming tests with MTC on the one site and without MTC on the second site (with the help of Cooperative or Dehkan).</u>
- **Mr. Shomamadov**: Yes, we can.
- **Mr**. **Kanamoto**: During my visit to Dushanbe in September, I will first have to obtain consent (confirm) from the farmer to conduct a farming test on his site. It has not been finalized yet, but I think that Fayzobod and Dangara will be for farming test sites. In the case of Dangara, I want to use Cooperative. Before I leave Dushanbe, I would like to finalize the farming test sites.
- **Mr. Shomamadov:** We agree with your proposal. We will use Faizabad with MTC and Dangara with Cooperative (without MTC).
- **Mr. Kanamoto:** Thank you. What do you think about conducting a farming test in Rudaki and Hisar, if DF/ MTC in Fayzobod and Dangara are not suitable for conducting the firming test?
- **Mr. Shomamadov:** These areas are also fine, but they have same type of soil. Fayzobod and Dangara have different soil type and it is better to conduct farming test there.
- **Mr. Kanamoto**: Thank you! Other issues will be discuss in detail on September during my visit to Dushanbe. If possible, let have one more TV meeting among us.
- **Mr. Muminov** and **Mr. Shomamadov**: It will be available to have it before you will come. Thank you!

End

(1) MoA/TAL 10)

M inutes	
Name of meeting	Visit to Ministry of Agriculture; Discussing the current situation of farming test and data collection.
Data /Time	The 20th day of June 2024 10:00 to 11:20
Place	The Ministry of Agriculture （ Hereinafter referred to 'the MoA ')
Attendance	➢ **MoA** : ➢ Deputy Minister of MoA – **Mr. Zevarshoev Z.** ➢ Chef of Department of Technical Policy and Agricultural Infrastructure Development – **Mr. Shomamadov Abdumamad** ; ➢ Deputy director of TojikAgroleasing (TAL) – **Mr. Muminov Botir** ; ➢ Head of the State Inspectorate for Technical Supervision of Agricultural Machinery – **Mr. Homidov Emomali**; ➢ Leading specialist of the State Inspectorate for Technical Supervision of Agricultural Machinery – **Mr. Aliev Rahmonali** ; ➢ **Study team :** ➢ **OMIC** : **Mr. Kanamoto , Mr. Karimov**.

Agenda contents
➢ **Mr. Zevarshoev :** Greetings from the Ministry. Thank you for your support and organizing the farming test. I got acquainted with Japanese machines and saw with my own eyes how your machine works. I have one question for you: what progress have you made so far? ➢ **Mr. Kanamoto:** As we know**,** 2-3 months have passed since the arrival of our machines and the weather conditions during this period were very bad (lots of precipitation), even mudflows were observed in our study areas. I would like to note that, despite the weather conditions, both sites Faizabad and Dangara planted their crops safely. I will not go into detail about the tests that I carried out during my visit to Tajikistan due to limited time, I will go straight to the results. As for the situation in Dangara site, we have 3 types of potato plots: with NPK, without NPK and control field. We dug up the soil of the potatoes plots and saw in cross-section that the roots of the potatoes with NPK reached a length of 40–42 cm and well spread. This test shows that we were able to carry out deep ploughing and reach a depth of 40 cm. Also, the number of potato fruits during harvesting can reach 10 pieces. You can find a more detailed comparison between plots in the table that I gave you. The same test we have done in Faizabad. I would like to note important information for you, even with ploughing upto (under ground) GL-40 cm, the soil layer at a depth of GL-30 to -40 cm is not rich in minerals, therefore the area without NPK and the control field are almost the same. Therefore, it is important to give NPK initially to support the minerals in the soil. The importance of such deep ploughing is that the

soil absorbs water, air penetrates to the required depth and the roots branch well. But don't misunderstand that the chemical fertilizer is just auxiliary function [supporting role] only in this case of well-using the agro-machine, so we should use agro-machinery for ploughing humus in to the soil as much/ deeply as possible in order to make the soil condition better for the next growing.

- **Mr. Muminov:** Thank you for your test. I would like to add an important comment. During previous visits of the Japanese side to Tajikistan, there were a lot of questions about the implementation and use of Japanese machines in our country. One of the important issues is the provision of service for Japanese equipment. Please include in the final report "In the Republic of Tatarstan there is the possibility of providing service for Japanese machines."
- **Mr. Kanamoto:** I understand. The next test we carried out was to prove the affects by large machinery on soil compaction. We walked the 40 HP tractor 6 times across our site as a tire tread test and noticed the affects of the heavy weight on soil compaction to avoid the plant root spread if 8 to 12 times of the mini-tractor passes at the subsoil; GL-20cm lower being harder (soil hardness was more than 2.0MPa).

  (The following explains the **Summary on the Rental service of agro-machines in Fayzobod [MTC management] and Dangara [cooperative's management] under the farming test attached to this meeting minutes: Attachment 1**)I could state that the both site can operate (cover) 60 to 70ha for ploughing service, more than 4 times use per year at the same field of DF, and could take approximately 240ha of the rental service per year. It will make 100,000 to 150,000tjs of the annual profit to initiate the sustainable agro-mechanization, with the both site's confirmation.

  In order to write the final report and submit it to JICA headquarters and to the Government of Japan in the future, it is important to obtain data from you. Therefore, I will be grateful if you share the requested data as soon as possible.

  I would like to inform you that in the case of Fayzabad side, MTC will need to gather a Rental service User Group(s). In the case of Dangara site, this is not necessary since Cooperatives already exist DFs' group(s) under the MTC maintenance service, I guess.

  Mr. Shomamadov: What is the essence of the Cooperative? Several DF unite into a Cooperative to obtain a tedious amount of agricultural product. And if we unite the DF to create a users' group, this will take a lot of time to do. We know this from our own experience with the IFAD project. We created a group of 10 DF, 5 of which were relatives. The essence of the project was to pay 90% of the cost of machines, and farmers paid 10% themselves. Also, the money received from renting business should have been used for maintenance and the purchase of spare parts. A organization charter was created. The machines itself was on the balance of the Jamoat. But it turned out that one of the farmers took the machines and refused to share it with others, which resulted in a scandal between relatives.

  I say this repeatedly to all donors who want to implement a project in the Republic of

Tajikistan. Before starting a project, we must pay attention to 2 important points: 1) mentality; 2) we will not be able to copy the design model of other countries and implement it in the Republic of Tajikistan.

- **Mr. Kanamoto**: Nobody and no institute can resell and donate to others. In this case, we will select stable candidates for our project from among many candidates. The MoA shall have an ownership for each machine set. Base on this situation, you have to have a contract with MTCs and cooperatives.
- **Mr. Shomamadov**: I want to assure you that we need support and help from donors. For this reason, we asked the Japanese Government to help us provide a grant. Having 30 years of experience, and knowing all the mistakes and shortcomings, we want to prevent mistakes and generate such a model so that the future grant aid project get sustainability.
- **Mr. Kanamoto**: Thanks for the information. My conclusion would be the following - I recommend the working model with Cooperatives, but I also cannot forget about MTC, and want to include both management styles for a future project. There is no reason I could fine that we would reject the both site which made good results in spite of a bad situation. I thought that the both sites did their best to proceed with the faming test's tasks.
- **Mr. Shomamadov:** I want to comment on why MTC showed a good effect. Compering with the Dangara MTC, farmland in Faizabad is small, with few crops planted.
- **Mr. Kanamoto:** For this reason, we will select several areas for our project among the several types of products/ area sizes/ managements/ other conditions. Don't worry our small size agro-machinery for ploughing work could cover the patterns of Tajikistan fields other than dangerous places [e.g. the edge of cliff, sloping land], because of the farming test results.
- **Mr. Shomamadov**: I want to note that the project will be effective when you distribute the machine sets under the responsibility of the MoA. Many cooperatives only have a name on a piece of paper, but in reality they are not functioning. A very small number of independent DF unite into cooperatives; they can even be counted on one hand. The majority of cooperative members (80%) migrate for work, so we included mentality as an important factor. Therefore, we recommend working with the MoA only, which has the necessary information for the sustainable implementation of the future grant aid project. In turn, we can control MTC for the efficient use of machine and having rental business. There is no guarantee that we can control the private sector if they cannot use the machines effectively.
- **Mr. Zevarshoev**: Thank you very much for the meeting and time, we are waiting for your report.
- **Mr. Kanamoto**: Thank you, and we are waiting for the necessary data [e.g. Current situation of agro-machinery in Tajikistan (2023 or 2024), the latest version of cooperatives situation including DFs' nemver etc.] from you.

End

Attachment 1: Summary on the Rental service of agro-machines in Fayzobod [MTC management] and Dangara [cooperative's management] under the farming test

Confirmed data/ Interviewed items		Fayzobod (MTC)	Dangara [Cooperative]
1.	**Operable service area [ha] and (number of DFs)**	70ha (50 to 70 DFs)	60 to 70ha (8 to 10 DFs)
2.	**Number of plowing service per year**	4 to 6 times/field/ year	4 to 5 times/ field/ year and expect to transport fertilizer and production
3.	**Expecting total plowing service area [ha]**	200 to 250ha	Approximately 240ha
4.	**Expecting annual profit for the rental services [tjs]**	100,000 to 130,000 tjs/year without a consideration of consumable parts: blades etc.	130,000 to 150,000 tjs/year without a consideration of consumable parts: blades etc.
5.	**Possibility of the users group organization in the near future**	Yes, it is possible under control of MTC.	Possible in each cooperative with maintenance service of MTC or private company authorized by the MoA.
6.	**Users' comments**	➢ Plow-soiler workability is excellent due to surprise: improvement of root spreading. ➢ Soil condition is very soft after using rotary. ➢ We strongly demand introducing those machines' sets as soon as possible.	➢ Rotary is well-worked to make a high soil rate. ➢ Performance of the bottom plow in turning over is perfect for putting residues and weeds into the soil. ➢ Plow-soiler will probably be used once a year. ➢ Soil is still in soft condition at the harvesting time.
7.	**Requirements for the future program expected by users**	➢ Extra implements: Grass-cutter and earthing-up (re-ridging) [suitable for the rental business] ➢ Potato planter [suitable for intercropping with the mini-tractor]	➢ Extra implements: Grass-cutter and earthing-up [ideal for weed control] ➢ Potato planter ➢ Potato harvester [suitable for the rental business]
8.	**Expecting sets for the future program**	9 to 10 sets covering 3 Jamoats under MTC	15 to 20 sets for the selected cooperatives

Source: ・Study team

Appendix 3: Meeting Minutes

(2) WB 1)

Minutes record	
Name of meeting	Courtesy visit to World Bank project and explain/ discuss on the Inception report
Data/Time	The 14th day of April, 2023 14:00 – 14:55
Place	World Bank project office（Hereinafter referred to "WB")
Attendance	・**WB**：Mr. Kurbonov Boymurod – Deputy director of State Institution "Agriculture Entrepreneurship Development" and Project Coordinator of WB project. ・**Study team** -**OMIC**：Mr. Kanamoto, Mr. Karimov; -**AEC**：Mr. Hamroev.

Agenda contents

- **Mr. Kanamoto:** Greetings from the survey team and very thanks for finding time to have a meeting with us.
- **Mr. Kurbonov:** Greetings from the WB project. "First of all, let me express my gratitude to meet our partner. Secondly, let me give a brief introduction about our project and what we are doing so far. This project is granted and supported by World Bank and contains 4 main project components:
  1. Seed and tree nursing;
  2. Establishment of agro-logistics centers: in Districts of Republican Subordination, in Sughd and in Khatlon regions;
  3. Support the Ministry of Agriculture(hereinafter referred the MoA) for agricultural monitoring;
  4. *Nutrition [this component is under discussion].*

  We are now discussing with the WB team to receive additional financial support to add Nutrition as a subcomponent.

  I think it is better to discuss component 1 (one), and I will try to give you the detailed information. Our beneficiaries under this component are:
  - *seed farmers, and*
  - *Poor farmers*

  according to the data and registration in the Government totally we have 90 seed farms. Under the project, we are going to provide 4 types of seeds – cotton, potato, wheat and maize. The proposal of the project is importing the elite group of seeds for multiplication of them. We provide it to seed farmers (SF) the seeds for further sale for food production. We have already provided wheat, and cotton seeds, and right now we are processing potato seed distribution. With the seeds, we are providing 5 kinds of fertilizer.
  - **Mr. Kanamoto:** What do you mean by 5 kinds of fertilizer? Is it like – for nursing, after transplant, or maybe for planting?
  - **Mr. Kurbonov:** Just only for growing, not for harvesting.
  - **Mr. Kanamoto:** Does it include the Mg, Mn, Sulfur, or else?

- **Mr. Kurbonov:** Sure, including these ones and also Superphosphate. Under the project, we are going to provide capacity building training to farmers who received the fertilizer and seeds. Also is planned to provide farmers with agriculture machinery and equipment. The procurement of this is in the process. We are going to buy some tractors, cultivators, planters and also machines for harvesting. The budget of the project is 58mln USD, with additional funding of 50 million USD, a total of 108mln USD. This is a big project, so our partners are the MoA, Academy of Agriculture Science and all research development institutes under the Academy and MoA, Food Security Committee. Under the additional funding, we are going to cooperate with the Ministry of Health and Social Protection.
- **Mr. Kanamoto:** Is Tajik Agro Leasing (hereinafter referred "TAL") your partner as well?
- **Mr. Kurbonov:** TAL is under the structure of the MoA, yes TAL is one of our partners. I would like to highlight the support we are providing to the farmers is on a grant aid base, not leasing.
- **Mr. Kanamoto:** I got an explanation on this JICA survey for the future grant-aid project helping farmers through the MoA and TAL to manage the rental business of agro-machine sets.
- **Mr. Kurbonov:** We purchase and give to the farmers the equipment as a grant. We are also supporting farmers on water irrigation (pump, construction of the water system) for poor farmers who have land up to 5ha.
- **Mr. Kanamoto:** What is the amount (USD) for the equipment grant?
- **Mr. Kurbonov:** 2mln USD under 1st project, but with additional funding from 2nd project in general we have around 5mln USD. With 1 million USD we are going to support seed farms and 1 million USD for nursing. Poor farmers, we are going to support farmers with 3mln USD.
- **Mr. Kanamoto:** You have mentioned greenhouse materials. Is it in this budget?
- **Mr. Kurbonov:** No! Another budget lines. We are going to support the MoA for the construction 4 green houses and for Tajik Agrarian University 2 greenhouses.
- **Mr. Kanamoto:** Does your project provide soil analysis laboratories?
- **Mr. Kurbonov:** We are working with the Soil Institute of Agriculture Academy and we are going to sign the contract to let them manage to get a better result and what kind of fertilizer need to use in different areas of seed farmer's land based on soil results.
- **Mr. Kanamoto:** Agree with you. Institute of soil can approach some physical properties, but they can't approach chemicals, because they don't have an operator of the equipment. It means a lack of manpower.
- **Mr. Kurbonov:** According to components 1 and 3 under this project we are going to support all research institutes under the MoA and Tajik Agrarian Sciences Academy for the construction and repairing the offices and purchase of 3 kinds of equipment (office, laboratory and agriculture devices).
- **Mr. Kanamoto:** With our issue, the Tajik side requested just to give them all agro machines under our project, but we are afraid to do that.
- **Mr. Kurbonov:** According to our project we are going to purchase a tillers. Together with the

MoA we will identify the beneficiaries, farmers. The process is next: we ask (or send a letter) the MoA to identify, and after that, the MoA will request Districts and Jamoats to help us with the beneficiary's identification. We are working all over the country in 4 Regions: DRS, Sughd, Khatlon and Badakhshan.

- **Mr. Kanamoto:** So, will you try to distribute the machines though Jamoats?
- **Mr. Kurbonov:** You know, there are 126,000 DFs with land up to 5 ha. We can't support all of them, but we have criteria, like the farmer should be poor, with no economical or financial sustainability, and can't purchase any kind of equipment. Further, we ask Jamoats to identify such farmers. But due to a limited budget, we can't support all of them, approximately 3,000-4,000 poor DFs out of 126,000.
- **Mr. Kanamoto:** Who takes care of and maintains the machines after distribution (backup service)? Farmers have experience with big or even small agro machines, but basically, they don't know how to use the machines. For example, large tractors pull desk harrows and scoop up only the surface layer (5-10 cm) of soil at high speed, and then a big machine well-compacts the field like a road roller, which is not considered good for soil preparation.
- **Mr. Kurbonov:** Farmers in Tajikistan have experience with agro machines and we don't need to teach them how to use them. But of course, there are some innovations/new equipment that needed to be taught to farmers. In this case, we request the supplying company to provide also training on usedness of equipment.
- **Mr. Kanamoto:** In our opinion, the idea is we need to have an extension officer or agronomist in each small area mainly from TAL/ MoA.
- **Mr. Kurbonov:** So, you are going to work together with the TAL?
- **Mr. Kanamoto: The** case is like that, our project is granted to the MoA, but this is not yet decided, this is one of the ideas. The ownership of the machines is the MoA, and managing is for TAL or the farmer itself. Thought rental business farmer after 3-5 years needs to purchase any kind of machine or equipment from Japan.
- **Mr. Kurbonov:** I have experience (based on 22 years of consulting) and would like to share it with you. Previously, we implemented another WB project which calls **ACP** (Agricultural Competitiveness Project). In that project, we had a grant in the amount of 3 million USD to support farmers to purchase agro machines and equipment. The system was like that: we have "Tractors" and secondly "Other equipment". At the same time, we have "Project budget (PB)" and Beneficiary contribution (BC)". From the PB contribution gross is max 70%, BC should be min 30%. BC needs maintenance and other issues, to let the farmer feel that he is the owner of the machine. And for other equipment, it should be 80% for PB and 20% for BC.
- **Mr. Kanamoto:** Our case we are trying to use Japanese machines, which are expensive, so in that case we go with PB 50% and BC 50%, one of our ideas.
- **Mr. Kurbonov:** Sure, you can, it's up to you. Anyway, after the distribution of tractors, we developed a maintenance plan for farmers to provide regular monitoring for tractors. So, we

decided to provide a tractor to not only one farmer but to the group, which contains a group of farmers (HH or DF). For example, if the tractor cost 20,000 USD, or 6,000 USD the farmer should pay for BC, which is normally not payable. In these groups farmers we have an operator (driver), a technical monitoring person and so on. The farmer monitors the farmer.

ACP	Project Budget	Beneficiary Contribution
1. Tractor	70%	30%
2. Other equipment	80%	20%

- **Mr. Kanamoto:** The temporary idea of our project was TAL needs to monitor and lead the farmers, but MoA says they don't have any officers.
- **Mr. Kurbonov:** We should know, that support is for farmers, who really need help and they are coming to us to ask assistance, otherwise they would go to TAL to rent a tractor. We need to actually support farmers as beneficiaries. If we going to work through TAL, it means we are supporting TAL, but not farmers. Because the leasing money comes to TAL and they getting the profit, becoming strong, leaving farmers behind, we think.
- **Mr. Kanamoto:** I understood!
- **Mr. Kurbonov:** We should understand that we have project indicators and we must achieve those indicators. Without the right way, we will not be able to achieve indicators.
- **Mr. Kanamoto:** Farmers are not to be satisfying with TAL's service. The price of machines is higher up to 20-30%, capital offered money 35-50%. TAL needs to rethink its way of working and gain more trust among farmers.
- **Mr. Kurbonov:** Totally agreed with you! We also know it. Do you plan to create/organize an agro machinery center in the future?
- **Mr. Kanamoto:** We will give you the Inception report, for your reference, if you have any comments, please provide them to us. Regarding your question, yes, we are thinking about this, otherwise, it is very difficult to control the inventory system of the spare parts and backup

services for users. We need some specialists! The issue is that Japanese machine makers don't have an agency in Tajikistan.

- **Mr. Kurbonov:** It is a very good objectives, idea, that any farmer has access to service. It is very important to develop the right mechanism (full control) – it should not be under the Government institute. If so, after 2-3 years you will not see your tractors, no more consultants, etc. The idea it should be privatized.

  [The parties thanked each other for meeting and getting to know each other and agreed to stay in touch if any questions arise.]

Conclusion.

The meeting was very fruitful. We learned about the activities of the WB project, especially on agro machines activities. Also shared our ideas and plans for the survey and project.

One of the important results of the meeting was that we agree on each other's strategy for providing machines and developing a good mechanism of control. Mr. Kurbonov is afraid that using leasing in our grant projects is not efficient and will not provide the necessary assistance to farmers by the JICA side (another technical support). On the other hand, it will not change the situation of farmers if the present Tajikistan side will control their system [manpower, availability. knowledge] would control the future project.

We, the WB project and JICA Survey team, mutually agreed, that we will keep in touch exchange of ideas, knowledge, information, experience back-to-back.

End

(2) WB 2)

Minutes record	
Name of meeting	Courtesy visit to the World Bank project and exchanges the view on the progress
Date/Time	The 08th day of June 2023 09:00 – 10:00
Place	World Bank project office（Hereinafter referred to "WB")
Attendance	・**WB**： Mr. Kurbonov Boymurod – Deputy director of State Institution "Agriculture Entrepreneurship Development" and Project Coordinator of WB project. ・**Study team** **-OMIC**： Mr. Kanamoto, Mr. Karimov;

Agenda contents

- **Mr. Kanamoto:** Greetings from the survey team and very thanks for finding time to have a meeting with us.
- **Mr. Kurbonov:** Greetings and welcome!
- **Mr. Kanamoto: [**An explanation about using small tractors in the future through our data collection survey]
  What are the differences between small and large tractors use? What are their advantages and disadvantages in the WB project?
- **Mr. Kurbonov:** If large tractors are used, it leads to a pressed condition of the soil and further hardening soil. Even during the former Soviet Union era, people tried to avoid hardening soil through the use of machines. Now many farmers use Belarusian tractors, they thought they are efficient for soil conditions/[but farmers could not meet good results]. Under the vibrating condition with heavy weight of big size machines, it well-compact the soil, which has a very negative impact on farmers and field situations in the future. Now the Ministry of Agriculture is also thinking about this, how to avoid hardening the soil. We were thinking of using caterpillar tractors, but the first problem with these tractors is transportation between the fields. Caterpillar tractors destroy asphalt [pavement] of public roads, and it is very expensive to transport [carry] them using trailers. Most of the farmers' land is small and does not have a route approaching there for the use of caterpillar tractors. The second problem with caterpillar tractors is that they can only be used for plowing, unlike Belarusian tractors. Therefore, farmers think about the economic part first before buying and using all kinds of tractors. If you think about the technical part, it is better to use caterpillar tractors, not big-size tractors. As you know, our project under the additional financing is aimed at small agricultural machinery, like tillers. Because our beneficiaries are farmers with a land area from 1 to 5 hectares poor farmers. We thought it would be more expedient to provide farmers with tillers so that they should work throughout the year better than using big-size tractors. Usually, large tractors are used 15-20 days a year and the rest of the time is in the garage; quite low-cost performance.
- **Mr. Kanamoto**: Small tractors also press the soil, but I think using it for deeply plowing (-40 to -50cm ground level) organic matters [chemical fertilizer if possible] into the soil and also rotavating

to crush soil clods well once in 1-2 years it is enough to get good soil condition.

- **Mr. Kurbonov**: You are totally right. We can once use a small tractor in 2-3 years to well plow and after that work with the tillers for each growth. That is why we selected small agro machinery only for our project. Also, the use of small equipment is beneficial for farmers, since little money is spent on fuel and repairs (including purchase of spare parts). As part of a previous project, we bought and provided tillers to farmers, and a year later we went to check and saw that they were still using tillers as a monitoring.
- **Mr. Kanamoto**: Everything is correct, thank you for your advices. Also, as part of our grant in the future, we are going to recommend to provide trailers with water tanks for farmers to use to transport implements, as well as to irrigate fields from tanks and spray crop chemicals (fertilizer). We are considering to recommending the stone remover in the future, people often say that the soil contains a lot of stones. But it is the responsibility of the farmer himself to remove stones from the soil. But nevertheless, we will provide a stone remover considering the number of farmers in the area+ e.g., the population, maybe one stone remover for 10-30 DFs depending on. We can't provide it to each farmer, because the cost of the machine is expensive and if one use it, it will not be used often after use once.
- **Mr. Kurbonov**: When we're providing any machine, we have to think about tool or equipment issues. First, we need to think about maintenance (backup service including the arrangement of necessary spare parts), and second technical service (tuning up and usage). We need to consider, in the future, whether our farmers will be able to find the spare part of machinery or not, and do they have enough capacity for maintenance. If these two points are okay, in future our farmers can use this equipment or machinery. Let me give you an example of our experience. We provided laboratory equipment or agriculture machineries and we have monitored that after 2 years of using some part of equipment destroyed. The machine stands by on the side for a long time until the farmer could find the necessary spare part. This shows that the availability of spare parts in the market is very important.
- **Mr**. **Kanamoto**: In the future, we are planning to manage the inventory system. For some machines, we provide a spare part very rarely, one time in 5-6 years, but still, we need to put one spare part. If one group has 10-20 sets of machines, we just provide 1-2 sets of such special [rare use] spare parts to the lot of sets. At the same time, we have frequently changed spare parts (consumable one) that need to be changed every 5-6 months and we must keep a good number of spare parts, which are nice for 1-2 years.
- **Mr**. **Kurbonov**: When you would decide, will you provide machines through TAL? And what are the selection criteria? In our project our 1st criteria are the farmers within 5 ha of land and the second criterion - the farmer should be poor. We hired the NGO, which identify the correct farmers out of 13000 DFs with the land area of less than 5 ha.
- **Mr**. **Kanamoto**: We are thinking to provide machines though MoA. if MoA assigns TAL it is also ok. But registration and the owner are MoA on the grant base. We want the farmers to use the machines as much as possible. The land criteria we are considering are from 5 to 10 ha for tiller and

from 10 to 20 ha for mini tractors. There is one question I would like to clarify, beneficiary farmers should pay 30% worth of the price for the machine set, as you mentioned in our last meeting. How to control the management of maintenance or purchasing the spare part for example, and who is going to manage backup service including arrangements of spare parts, usage including running records and accounting matters?

- **Mr**. **Kurbonov**: It needs to be managed by the farmer(s)! But there are 2 types of ownership – 1) individual ownership, and 2) group ownership. In my experience from that project, which was provided only one tractor to the farmers as a group of 20 to 25 farmers, but there was a problem in the maintenance and usage of the tractor. I think, it is better to purchase a small tractor and to give it individually to a farmer householder because there is one owner of the tractor machine set and he takes care of and keeps it in good condition. In group farmers, each farmer tries to get more benefits from the machine set, but they don't take care much and don't think about future maintenance. In my opinion, the individual distribution of the machine set is better than the group distribution under deep consideration.
- **Mr**. **Kanamoto**: Thank you for your information!

End

Appendix 3: Meeting Minutes

(3) FAO 1)

Minutes record	
Name of meeting	FAO mechanization related activities in Tajikistan
Data/Time	The 08th day of June, 2023 11:00 – 12:00
Place	FAO Project Office in Dushanbe, 48 Ayni Street, Dushanbe
Attendance	・**FAO:** Mr. Ahmadov Ibrohim - National Technical Officer on Food Security and Nutrition at FAO; Contact - +992 935700746 ・**Survey team** **-OMIC**：Mr. Kanamoto, JICA Survey team leader, Mr. Karimov, Assistant of team

Agenda contents

- **Mr. Kanamoto:** Greetings from the survey team and very thanks for finding time to have a meeting with us.
- **Mr. Ahmadov:** Greetings and welcome!
- **Mr. Kanamoto:** [The explanation of purpose of visit and small size mechanization survey, about farming test, current situation and future plans.] We are interested in your experience with small machine mechanization. It would be highly appreciated if you could share with us your experience and tell us why you also did or are doing projects on agro-mechanization with small mechanization.
- **Mr. Ahmadov**: Thank you for your information and your mission! I can reply as following:
  - ✓ When we started our mechanization project, we were thinking about the Japan experiences, because your system was replicated in Moldova (KR2 project). And you know first we involved the one international Consulting Mr. Bumakov (he is formed Minister for Agriculture, now he became an ambassador from Moldova in Japan since 2018) in order to help us in situational organization content.
  - ✓ In framework our agricultural mechanization project we assisted big project of IFAD (International Fund of Agricultural Development project, namely Community-based Agricultural Support Project): it was contribution of FAO with 250,000 USD. Mainly our activities were on capacity building and developing documentations. We proposed to have and realize our project in six districts in Tajikistan: Jayhun and Dusti (Khatlon region), Rasht and Tojikobod (Rasht region), Shahriston and Devashtich (Sugd region). We conducted some meeting with IFAD PMU (Project Management Unit) staff and FAO staff to support IFAD PMU staff we conducted some orientation meetings, after we involved one facilitator for each region. They assisted to us for conducting the orientation meeting and collecting proposal for improving MTC under TAL's control. For this matter, we prepared an announcement, technical specification for each expected tractors and equipment for Agriculture Machinery Services Centers' (AMSPs) and Maintenance and Repair Workshops (MRWs). In 3 regions we conducted several training sessions on capacity building of farmers, also local Hukumats, Jamoats and overall, we collected more than 50 proposal 56 applications for AMSPs were completed and 3

applications for MRWs) , which we submitted to PMU of IFAD for further procurement and submission of proposed mechanizations. The preparation of business plan was very difficult for the farmers; our field mobilizers assisted it. All format forms, starting from announcement of collecting the proposals was organizing by FAO. For improving the capacity building of our partners (the Ministry of Agriculture; hereinafter call 'the MoA'), we organized study tour to Moldova, in order to see the structure, mechanism and other institutional part. We achieved for all planned activities and results, which were indicated in our project document.

- ✓ Our project was small, only 250,000 USD, but we contributed with this as a part of big project of IFAD. We prepared for Agriculture Machinery Services Centre [hereinafter call 'AMSC'] the proposal, which are collected from the farmers and submitted them to IFAD. Our project is the contribution for Community-based Agricultural Support Project (IFAD) project. According to the farmers' proposal, PMU of IFAD project purchased the tractors, equipment or tools for DFs. Also, FAO had an international consultants (International Maintenance and Service Expert, International Legal and Trade Logistics Expert, International Maintenance and Repair Expert), each of them involved for 30-60 days. The international specialists assisted to us from preparation of the documents until conducting the training sessions in the regions. Under the project FAO developed several documents also. However, in the end of our project (means FAO project), we faced the COVID-19, and instead of visiting of our consultant, we were still working in on-going status. In addition, it turned out that at the end of the project we had money left, around 20,000 USD. Based on FAO regulation we need to spend the money within 24 months, otherwise we will lose the money. The budget holder proposed to prefer small tractors in order to use more efficiently from the funds.
- ✓ Finally, at the end we had four mini tractors. It means that we are looking only for mini tractor, it depends on the area. In Tajikistan, we have 190,000 DFs and the small size of the DFs starting from 0.1 ha to 1000 ha, but average is from 1 ha to 3 ha which doesn't require big size of agro-machines like tractors. The big size tractor can be used 3 to 4 months around per year. If farmer has, for example 0.5 ha and/ or less then 5ha, it is not necessary to have big tractors or big equipment. We have 2 types of DF: 1) Collective DF [consist of several shareholders], 2) Family DF [the farmers are mostly family members; ≒ a householder]. For Family DF, who has 2 ha it is enough to have a mini tractor, because the farmer needs to follow several agro-techniques/ technologies, like agro-machines' maintenance, crop rotation system and fertilizer application method etc.
- ✓ Additionally, we have to see the soil structure, because, for last 30 years, we have been believing only research institute tests of the farming soil. 99% of DFs never checked the soil condition by themselves, neither corroborated with any donors/ government institutes. Just now, under big WB project PMU is going to improve the soil condition or check soil parameters by using the specialists. Based on results, they can say that DFs need to use fertilizers or something else after good ploughing. Under the Tajikistan soil situation, if the size of DF's fields are small, then we

had better use the small tractors. We have farmers who has "traditional" land and "kitchen" garden (means private land). For example, in many cases we have 0.1 ha such kind of lands, but if you visit Rudaki district we can meet farmers who have 0.2, 0.4 or even 0.7 ha to grow agro-products. For such kind of householders, we need to support with mini tractors or tillers conveniently. If we will be establishing our approach/mechanism in Jamoat level (means Jamoat or farmer group in that Jamoat is going to make machinery tractor station; MTS), so on that time we can equip with big tractors. In our case T-28 model (Uzbekistan made tractor), MTZ (Belarus made tractor) and some other (Chinese made tractors), which are popular in Tajikistan, can be used in Tajikistan for the moment. We have Taj-Iran factory, which had a standard specification of mini-tractor; not bigger than this model in Dushanbe, but now it is discontinued. According to the practice and observation, Tai-Iran big size tractors are not good for using due to the low-cost performance, expensive spare parts and low quality.

- ✓ Now we are planning to implement new project to improve digitalization [system] on agriculture management. For example, to have a driving [using] license of agro-machines, the responsible officer write by hands on the license. Right now, we have number of tractors and etc., but no one knows manufactural year of the tractors, their number and operating situation. In the framework of that project, we would like to help with the inventory of all equipment and tractors, in order to know demand of agro-machines in the country etc. We are on the finalizing stage of the project, but the budget not so big, around 50,000-60,000 USD, we are afraid that.

- ➢ **Mr. Kanamoto**: Thank you a lot for your information!

NOTE: AMSC - Agriculture Machinery Services Centre.

End

(3) FAO 2)

Minutes record	
Name of meeting	FAO mechanization related activities in Tajikistan
Data/Time	The 28th day of September, 2023 16:00 – 17:20
Place	FAO Project Office in Dushanbe, 48 Ayni Street, Dushanbe
Attendance	・**FAO:** Mr. Ahmadov Ibrohim - National Technical Officer on Food Security and Nutrition at FAO; Contact - +992 935700746 ・**Survey team** **-OMIC**：Mr. Kanamoto, Mr. Akutsu, Mr. Karimov
Agenda contents	

- **Mr. Kanamoto:** Greetings from the survey team and very thanks for finding time to have a meeting with us.
- **Mr. Ahmadov:** Greetings and welcome!
- **Mr. Kanamoto:** Thank you for your last meeting with us, we could understand the FAO position on agriculture machines. Let me introduce Mr. Akutsu – specialist on mechanization and agriculture machines in our Survey. Today we planning to know more about FAO experience on rental business beyond the farmers. Could you please tell us about such activities?
- **Mr. Ahmadov**: Thank you! Sure, we have, first, the farmers at school level in some areas where we are implementing a training for farmers. Additionally, right now we are working with the Cooperatives. With the initiative of the Minister of MoA we established cooperatives in 4 districts. In the cooperative we are assisting to construct the logistical center, for example in Nurobod district, where with the participation of JICA Tajikistan were distributed machines to cooperatives, in order to use these machines by cooperative members and of course share (rent) to neighbors. Based on my experience on 2002-2003 under several projects we created Community Based Organization (CBO). Each CBO has own fund, but that time was not existing the Micro landing organization, that is why they provided credit to the members and non-members. For the members the service is lower, but for non-members the service is higher. Actually, in many similar organizations, for example Water Association, which organized and straighten by USAID, there is a mechanism for members and nonmembers. The members of cooperative or members of organization pay the membership fee. But in some organization the member pays membership due just ones and that’s it. Membership fee normally is on year basis. As a member of cooperative, they should have some benefits or advantage from cooperative. In May and June, we conducted small survey with cooperative members, in order to find and identify the needs, capacity building related issues including their main demand for employing those cooperative members. Our agrobusiness development specialists just now busy with another job and right now we didn’t receive the final report to share with you. Later when I will get the final report I will share with you. Overall, I can tell to you, the mechanism is very good, but in order to use longer this practice you have to work on capacity building institutional development of

these cooperatives or organizations. It is needed because the members should know each other, for example, we have the organizational capacity building and training sessions, which we conducted for the members, and we explained how collectively work together. It is good to bring such kind of idea for future cooperative development.

- **Mr. Akutsu**: So, you mean we should enhance administrative capability?
- **Mr. Ahmadov**: If you look to the structure, usually our structure next: General Assembly, Bord of Directors, Chair persons, Secretory and Tracheary. Also, there is an Evaluation Committee, which report only to the General Assembly. Bord of Directors, Chair persons, Secretory and Tracheary should be trained very well, because they are leaders of the agency. They should bring the community to the better condition place. Therefore, the capacity building is very important. But for today's condition and situation, if you prepare the Chair person for 2-3 years to provide technical assistance, there is no warranty that the chairperson stays for longer period. Sometimes they move or migrate to the other country or find the other project to work.
- **Mr. Akutsu**: Local national team you need, otherwise after your training the person will move to other job or country, right?
- **Mr. Ahmadov**: Right, exactly. We are planning to implement another small project on digitalizing the agro machines in Tajikistan (90,000 USD), but due to some internal procedure and comments from FAO HQ in Rome and FAO in Tajikistan by PR Mr. Oleg Guchgeldiev there might be changes in project proposal. So, we are waiting for final approval. In the framework of this project, we are responsible to do capacity building activities for farmers and PMU of IFAD, and preparation of business plans for farmers.
- **Mr. Akutsu**: This project you implementing together with the MoA?
- **Mr. Ahmadov**: Yes, MoA our main partner.
- **Mr. Akutsu**: When you import the machines or equipment from abroad, do you ask MoA to help you with the Custom clearance o other?
- **Mr. Ahmadov**: If we plan to import machines from abroad, first we identify the needs of these machines for farmers. We have bad practice with TajIran factory, the quality of those tractors was very bad. Normally, in Tajikistan MTZ-Belarus tractors are most famous. For cotton production farmers mostly using T-28 model tractor made in Uzbekistan. We develop the technical specification and share with the MoA to get from them an agreement. After that we will use our procurement regulations (tenders). FAO is tax exempt in Tajikistan.
- **Mr. Kanamoto**: What are you thinking about lack of extension officers and specialists' capacity? We feel lack of specialist and before starting our Survey, I advised MoA to introduce the districts with the enough specialist, so can target these districts first. We introduce to such districts machines and collaborate well to get high production.
- **Mr. Ahmadov**: One person in the farms replacing 2-3 positions, because nobody wants to work. For example, statistical officer works as an agronomist.
- **Mr**. **Akutsu**: Do you give tractors to cooperatives free of charge?

- **Mr**. **Ahmadov**: Yes, we donate them machines.
- **Mr. Kanamoto:** So, let me confirm. FAO case is donation machines directly to the cooperative, right? We are also planning to do like this, donate small agro machines to the farmers, but government agencies are not satisfied with our idea. Do you have any system in FAO how to give directly to the farmers?
- **Mr. Ahmadov**: Before starting our project, we have a discussion with MoA how to improve a small mechanization activity in Tajikistan. Leasing system should be in better condition to the farmers. Today, the service fee is very high for farmers. Banking system is not developed very well and the credit is high.
- **Mt**. **Akutsu**: For our farming test we are planning to bring 2 sets of machines and each set has mini tractor, tiller and implements. Mini tractor – 40HP, tiller – 11 HP.
- **Mr**. **Ahmadov**: There are made in Japan?
- **Mr**. **Akutsu**: By Japanese company Yammar. By using these machines and implements we consuming to plow up to 35-40 cm deep.
- **Mr**. **Ahmadov**: Very good. We need small size machine in Tajikistan. Wish you best of luck for your farming test.
- **Mr**. **Kanamoto**: Thank you very much for the meeting.
- **Mr**. **Ahmadov**: Thank you!

End

Appendix 4: Protocol for Enforcing the Farming Test With the Tajikistan Side

Protocol for enforcing the farming test
Under JICA survey "Data Collection Survey
on the Condition of Small Size Agriculture Machinery"

Thorough several Working Group (hereinafter called 'WG') joint meetings of the Ministry of Agriculture (hereinafter called 'MoA') with the specialists of JICA Survey team (hereinafter called 'Japan side') for the farming test at the farming test sites the following was approved:

1. Purpose of the farming test

   ① Inspecting/ confirming the durability of Japan-made agro-machinery and the effectiveness of the plowing work to lead to good soil-making.

   ② Confirming the possibility of the administration, including rental business, using the agro-machinery.

   ③ Confirming its cost performance.

   To lead to a future effective farming system [a tentative idea].

2. Subjects [farming test sites/ parties]

   The two (2) sites that will be carried out the farming test are to decide:

   - At the DF (Name of DF: "Mavlavi," Fayzobod district, Jamoat Dustmurod Ali, with MTC management; Name of MTC: MTC of Fayzobod) of Fayzobod
   - At Cooperative (Name of the cooperative: "Sharif-Shirin," Khatlon, Danghara, Jamoat Korez, with cooperative management) of Dangara.

3. Schedule of the farming test

   Based on the arrival date of the agro-machine sets from Japan, the WG decided on the farming test period at two sites as follow:

   - First period： the middle of February to the beginning of March 2024; duration: 5～7days at each site
   - Second period: the end of June to the beginning of July 2024; duration: 2～3days at each site

   Chart 1 shows "Schedule for the farming test in Fayzobod and Dangara."

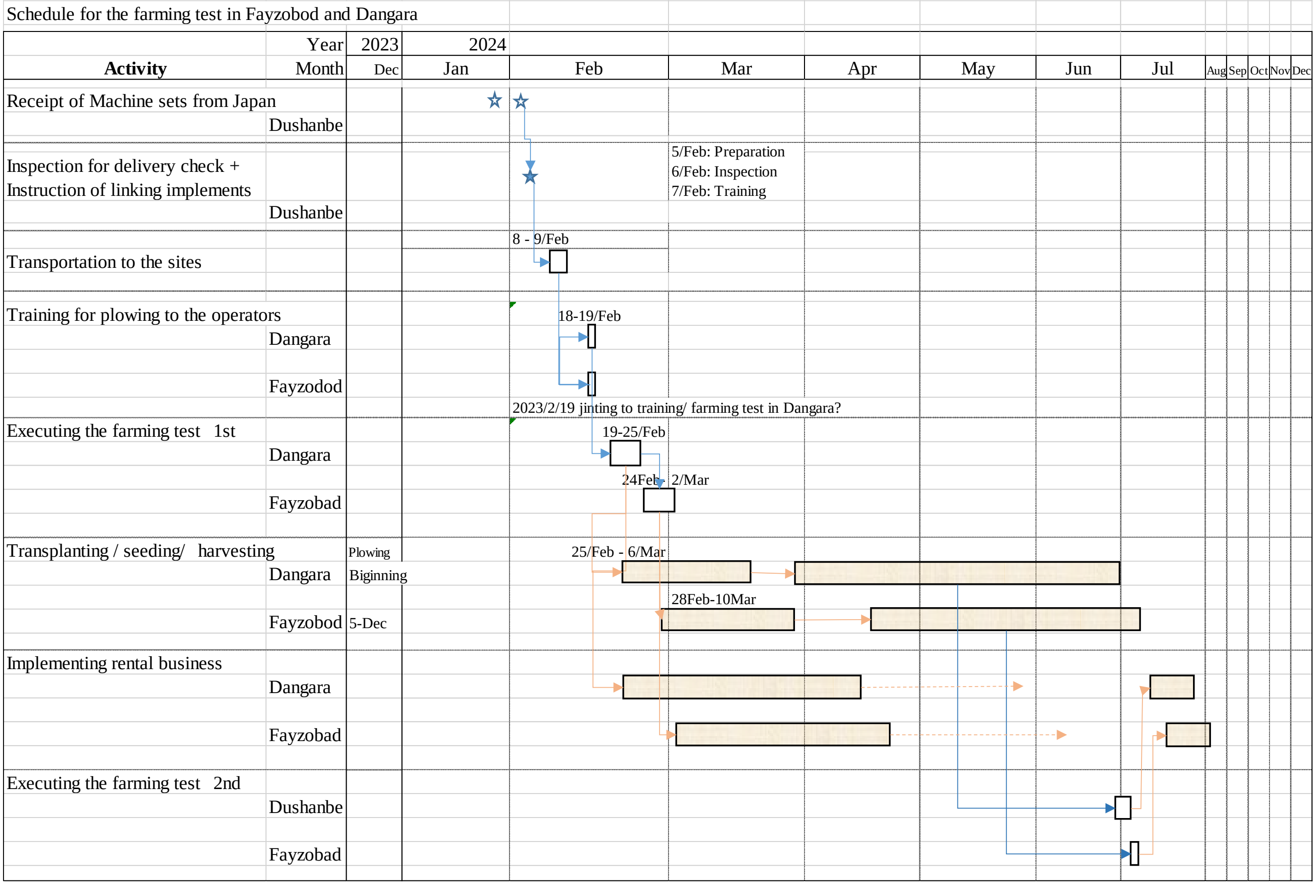

Chart 1: Schedule for the farming test in Fayzobod and Dangara

4. Work description for the farming test enforcement

4-1 The Tajikistan side [the MoA and TAL] shall provide/ arrange requirements as stated below:

- To support custom clearance of machine sets for the farming test.
- To arrange a warehouse for temporary storage of machine sets after customs clearance.
- Farming test will begin in early February, once the machines have been received and inspection has been carried out. The second farming test will take place in July, after the harvest and plowing of the soil.
- To ensure the transportation of machines to Faizabad (MTC Faizabad; temporally storing at ADF Faizabad warehouse) and Dangara (Sharif Shirin Cooperative) immediately after inspection.
- To arrange/ provide two (2) drums (400 liters) of diesel oil per site during the farming test, which begins in early February 2024.
- To ensure proper participation of the working group member during the farming test.
- To arrange/ resolve issues related to registration, and issuance of plate numbers and documents for tractors and trailers during the farming test.

4-2 Japanese side shall provide/ arrange requirements as stated below:

- To provide a description of the farming test details [methods, procedures] during the farming test. [refer to the attachment: Description for the farming test]
- To provide travel allowances to WG members during the farming test. Travel allowances are to be:
  - A per diem – $15;
  - Accommodation per night – $40.
- To sort out the future programs: proper use of agro-machine sets, introduction of good soil making, tentative plan of crop rotation, etc.
- To provide 1 (one) set of hand tools for each site.

4-3 Subjects (farming test site/parties) shall provide/ arrange requirements as stated below:

- To arrange/ provide two (2) operators and two (2) manual laborers during the farming test [plowing test].
- To provide/ refill the engine oil to the machine sets; e.g., first period: 50 hours, after the first period: every 100 hours, considering the engine oil quality the subjects will be able to purchase.
- To provide the necessary amount of seeds and chemical fertilizer for farming test plots during the farming test; before using a rotary implement.
- To obey the instruction of the Japan side specialist advice and description procedures.
- To appropriately fill up working records (Annex 2-1 [for tractor] and 2-2 [for tiller]) and accounting notes (Annex 3) as specified in the Description of the farming test.
- To make maximum use of machines for field work and rent it out, remembering to enter data into working records and accounting notes.
- To record the crops growing at the plots of the farming test up to their harvest.
- Do not use the machine sets at a steep field of more than 10 degrees to ensure safety.

[Attachment: **Description of the farming test in Fayzobod and Dangara, Republic of Tajikistan**]

Protocol confirmation

The protocol is confirmed by the Deputy Minister of the Ministry of Agriculture, the Supervisor of the WG - Zevarshoev Z.

Date: 29 / Jan /2024 Signature: ____________

1. Shomamadov A. – Head of the Department of Technical Policy and Development of Agrarian Infrastructure

   ____

2. Muminov B. – Deputy Director of RSUE "TajikAgroLeasing"

   ____

3. Kanamoto M. – Mechanization / Mission Leader

   ____

4. Kamolov M. – Director of MTC Fayzobod

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5. Sharipov A. – Director of the Sharif Shirin Cooperative Dangara

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Протокол проведения фермерского испытания
в рамках Исследования JICA «Иследование по сбору данных»
о состоянии малой сельскохозяйственной техники»

В результате нескольких совместных совещаний Рабочей группы (далее «РГ») Министерства сельского хозяйства (далее «МСХ») со специалистами исследовательской группы JICA (далее «Японская сторона») для проведения сельскохозяйственных испытаний на сельскохозяйственных испытательных участках, было одобрено следующее:

1. Цель фермерского испытания

   ① Проверка/подтверждение долговечности агротехники японского производства и эффективности вспашки, обеспечивающей хорошее состояние почвы.

   ② Подтверждение возможности управления японской техники, в том числе использование техники для сдачи в аренду другим хозяйствам.

   ③ Подтверждение эффективности затрат.

   Привести к будущей эффективной системе земледелия как [предварительная идея].

2. Субъекты [фермерские испытательные участки/стороны]

   Решено выбрать два (2) участка, на которых будут проводиться сельскохозяйственные испытания:

   - В ДХ (Наименование ДХ: «Мавлави», Файзабадский район, Джамоат Дустмурод Али, с руководством МТС; Название МТС: МТС Файзабад) г. Файзабад
   - В Кооперативе (Наименование кооператива: «Шариф-Ширин», Хатлон, Дангара, Джамоат Корез, с его же управлением) Дангары.

3. Расписание фермерского испытания

   Основываясь на дате прибытия комплектов агротехники из Японии, рабочая группа определила период сельскохозяйственных испытаний на двух участках следующим образом:

   - Первый период: с середины февраля до начала марта 2024 г.; продолжительность: 5～7дней на каждом участке
   - Второй период: конец июня – начало июля 2024 г.; продолжительность: 2～3 дня на каждом участке

В таблице 1 представлен «График проведения фермерских испытаний в Файзабаде и Дангаре».

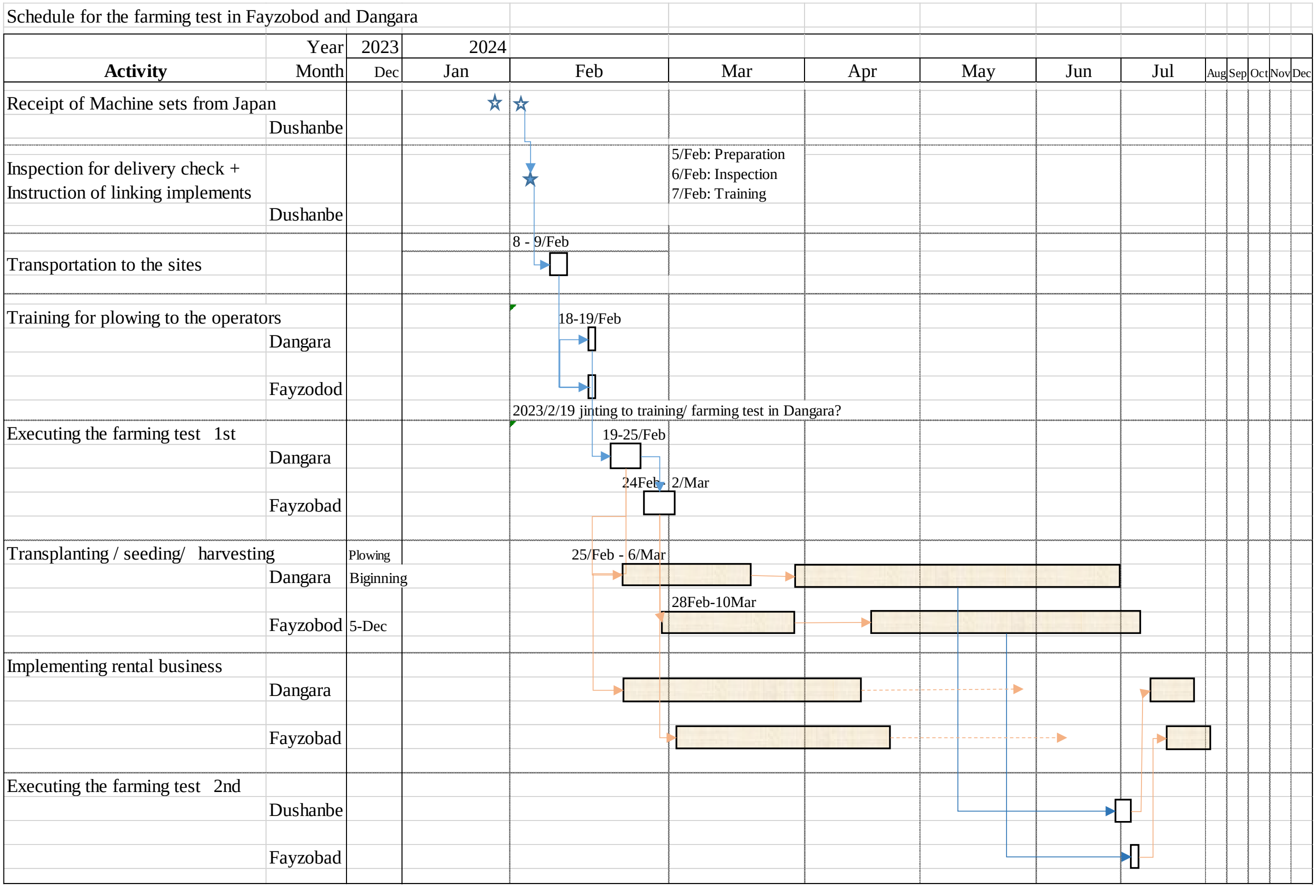


Таблица 1: График проведения фермерских испытаний в Файзабаде и Дангаре

4. Описание работы по обеспечению соблюдения фермерских тестов

4-1 Таджикская сторона [Министерство сельского хозяйства и ТАЛ] должна предоставить/организовать требования, как указано ниже:

- Сопровождение таможенного оформления комплектов машин для сельскохозяйственных испытаний.
- Организовать склад для временного хранения комплектов машин после растаможки.
- Сельскохозяйственные испытания начнутся в начале февраля, как только машины будут получены и пройдены проверки на целостность. Второе сельскохозяйственное испытание состоится в июле, после сбора урожая и вспашки почвы.
- Обеспечить транспортировку машин в Файзабад (МТС Файзабад; временное хранение на складе Файзабад) и Дангару (Кооператив Шариф Ширин) сразу после проверки.

- Организовать/предоставить две (2) бочки (400 литров) дизельного топлива на каждый участок во время сельскохозяйственных испытаний, которые начнутся в начале февраля 2024 года.
- Обеспечить надлежащее участие членов рабочей группы во время фермерского испытания.
- Организовать/решить вопросы, связанные с регистрацией, выдачей номеров и документов на тракторы и прицепы во время проведения сельскохозяйственных испытаний.

4-2 Японская сторона должна предоставить/организовать требования, указанные ниже:

- Предоставить описание деталей фермерского испытания [методов, процедур] во время фермерского испытания. [см. вложение: Описание фермерского испытания]
- Обеспечить командировочные расходы членам рабочей группы во время фермерского испытания. Компенсация проезда должна составлять:
    - Суточные – 15 долларов США;
    - Проживание в сутки – 40 долларов США.
- Разобрать будущие программы: правильное использование агротехники, внедрение хорошей обработки почвы, примерный план севооборота и т. д.
- Предоставить на каждый участок 1 (один) комплект ручного инструмента.

4–3 Субъекты (фермерские испытательные участки/стороны) должны предоставить/организовать требования, указанные ниже:

- Организовать/предоставить двух (2) операторов и двух (2) ручных рабочих во время сельскохозяйственного испытания [испытания на вспашку].
- Обеспечивать/заливать моторное масло в машины; например, первый период: 50 часов, после первого периода: каждые 100 часов, с учетом качества моторного масла, которое субъекты смогут приобрести.
- Обеспечить необходимое количество семян и химических удобрений на тестовых участках во время фермерских испытательный; перед использованием ротара (фреза).
- Соблюдать указания специалистов японской стороны, советы и описания процедур.
- Правильно заполнить рабочую отчетную форму (Приложение 2-1 [для трактора] и 2-2 [для мотоблока]) и бухгалтерскую форму (Приложение 3) согласно Описанию фермерского испытания.

- Максимально использовать технику для полевых работ и сдавать ее в аренду, не забывая заносить данные в отчеты.
- Учитывать посевы, произрастающие на участках агроиспытания, до их сбора.
- Не использовать ткхнику на крутых склонах с углом наклона более 10 градусов.

[**Приложение**: Описание сельскохозяйственного испытания в Файзабаде и Дангаре, Республика Таджикистан]

Подтверждение протокола

Протокол утверждает заместитель министра Минсельхоза, супервайзер РГ Зеваршоев З.

Дата: 29 / 01 /2024 г.

Подпись: ____________

1. Шомамадов А. – Начальник управления технической политики и развития аграрной инфраструктуры

   ____

2. Муминов Б. – Заместитель директора РГУП «ТаджикАгроЛизинг»

   ____

3. Канамото М. – Механизация / Руководитель миссии

   ____

4. Камолов М. – Директор МТС Файзабад

   ____

5. Шарипов А. – Директор кооператива «Шариф Ширин» Дангара

   ____

Appendix 5: List of Collected Material

(Procurement and Taxation: 12 types）

No.	Document title	Publication date	Language	Number of pages	Publisher/Creator	Type of data Original material > Final form
1	農業機械型式検査標準 GOST 30730-2001	04 JUL 2001	RUS	29	Euro-Asian Standardization Council	PDF
2	農業機械関連標準一覧 List of Standards for Agriculture	6 NOV 2023	RUS	3	Arranged by Survey Team from WEB information	Word > PDF
3	農業機械型式試験結果例 Protocol No16-2020 (114)	3 SEP 2020	RUS	32	Machine Testing Station under Ministry of Agriculture	JPG > PDF
4	農業機械登録規則 Registration Procedure of Agricultural Machinery	12 MAY 2012	RUS	6	Government of Republic of Tajikistan (GRT)	Word > PDF
5	関税法（税関法） CUSTOMS CODE	19 JUL 2022	RUS	280	Supreme Assembly of Tajikistan	A6 Book > PDF
6	輸入関税率規定 Import Customs Duties	8 AUG 2018	RUS	115	GRT	PDF
7	通関手数料規定 Customs Clearance Fee	3 MAR 2011	RUS	2	GRT	PDF
8	税法 TAX CODE	23 MAR 2022	RUS	311	President of Tajikistan	PDF
9	2024 年国家予算 2024 State Budget of the Republic of Tajikistan	18 NOV 2023	TJK	23	President of Tajikistan	PDF
10	2024 年土地税率 Land Tax Rate	9 JUN 2024	TJK	6	Chairman of the Tax Committee under GRT	PDF
11	灌漑水料金表 Water Supply Tariff from Irrigation Networks	MAY 2018	TJK	2	Antimonopoly Service under GRT	A4 Paper > PDF
12	2024 年電気料金表 New Electricity Tariff	29 NOV 2023	TJK	4	GRT	A4 Paper > PDF

Language　RUS: Russian, TJK: Tajik

Appendix 6: List of Procured Equipment (1)

Data collection survey on the small size Agricultural Machinery by JICA in the Republic of Tajikistan

Note: Following machine and spare parts listed show equipment procured by OMIC (JICA HQ) and delivered to **MTC Fayzobod site** for trial use and being kept at their warehouse. Q'ty means delivered numbers to each site.

List of Machines and Spare Parts

No.	Name of machine	Specification	Manufacturer & Model name	Q'ty
1	40ps Tractor	2 axle, 4 wheel drive type.	Yanmar	1
		Maximum output: about 40ps	Model : EF393T	
2	Rotary Tiller	Overall length: about 1,770mm, Overall width: about 950mm and Overall height: about 1,25mm	Yanmar	1
		No. of blade: 48pcs, Tilling width: about 1,670mm	Model: Y1600RH	
3	Disc type Ridger	Size: 24 inches x 2pcs type	Yanmar	1
		Ridge width: adjustable from about 370 to 1,500mm	Model: Y2410RGK	
4	Bottom (Mold) Plow	Size: 14 inches x 2	Sugano	1
		Plowing width: about 700mm, Plowing depth: about 250mm, with Coulter.	Model: P142MFBG	
5	Plough-Soiler	2 Blade type	Sugano	1
		Distance of Blades: Adjustable from 700 - 1,200mm	Model: J452AEG	
		Working depth: about 300～450mm		
6	Mini-Chisel	3 Blade (Tyne) type	Sugano	1
		Working width: about 1,240mm	Model:B153AAF	
		Working depth: about 50 - 300mm		
7	Power Tiller	Type: Power tiller with rear rotary	Yanmar	1
		Water-cooled 4-cycle diesel engine, about 583cc	Model: YZC-DL	
		Manual starting with 10-11ps rated output		
8	Rotary Tiller	For YZC-DL Power Tiller, removable	Yanmar	1
		No. of Blade: 18 pcs	For YZC-DL	
		Tilling width: about 600～700mm		
9	Bottom (Mold) Plow	Metal single reversible plow	Yanmar (Matsuyama)	1
		Adjustable tilling width and tilling depth	Model : MR-83N	
		Tilling width: about 250～300mm (adjustable)		
		Tilling depth: about 160～230mm (adjustable)		
10	Ridger	1 row Ridger	Yanmar	1
		Direct fixing type to the Rotary Tiller	For YZC-DL	
		The ridge height and width is adjustable		
11	Trailor	750kg load for minitoractor		1
		500kg load fot tiller		1

13	Spare Parts for Tractor and implement			
	Mission oil filter	For EF393T	Yanmar	1
	Engine oil filter	For EF393T	Yanmar	1
	Fuel filter	For EF393T	Yanmar	1
	Air cleaner element	For EF393T	Yanmar	1
	Fuel filter for the fuel tank	For EF393T	Yanmar	1
	V belt set	For EF393T	Yanmar	1
	Set of Blade for the rotary tiller	For Y1600RH	Yanmar	1
14	Spare Parts for Power Tiller			
	Fuel filter	For YZC-DL	Yanmar	1
	V belt set	For YZC-DL	Yanmar	1
	Cable for engine throttle	For YZC-DL	Yanmar	4
	Set of Blade for the Power Tiller	For YZC-DL	Yanmar	1
15	Spaare Parts for Botttom Plow	For P142MFBG		
	Sheer		Sugano	2
16	Spare Parts for Plough-Soiler	For J452AEG		
	Steel mold-board	Right x 1 set with bed and spacer	Sugano	2
	Steel mold-board	Left x 1 set with bed and spacer	Sugano	2
17	Spare Parts for Mini-Chisel	For B153AAF		
	Chisel 194121	with fixing bolt	Sugano	3

Note: The Q'ty listed in above tabel shows the Q'ty which the study team delivered to each site separately, except No. 11 Soil Moisture Meter and No. 12 Soil Hardness Meter, one set each were being kept by Sharif-Shirin Cooperative at Dangara, as the Q'ty procured by OMIC (JICA HQ) is one (1) set each, so these equipnent were not delivered to MTC Fayzobod.

Appendex 6: List of Procured Equipment (2)

Data collection survey on the small size Agricultural Machinery by JICA in the Republic of Tajikistan				
Note: Following machine and spare parts listed show equipment procured by OMIC (JICA HQ) and delivered to **Sharif-Shirin Cooperative at Dangara site** for trial use and being kept at their warehouse. Q'ty means delivered numbers to each site.				
List of Machines and Spare Parts				
No.	Name of machine	Specification	Manufacturer & Model name	Q'ty
1	40ps Tractor	2 axle, 4 wheel drive type.	Yanmar	1
		Maximum output: about 40ps	Model : EF393T	
2	Rotary Tiller	Overall length: about 1,770mm, Overall width: about 950mm and Overall height: about 1,25mm	Yanmar	1
		No. of blade: 48pcs, Tilling width: about 1,670mm	Model: Y1600RH	
3	Disc type Ridger	Size: 24 inches x 2pcs type	Yanmar	1
		Ridge width: adjustable from about 370 to 1,500mm	Model: Y2410RGK	
4	Bottom (Mold) Plow	Size: 14 inches x 2	Sugano	1
		Plowing width: about 700mm, Plowing depth: about 250mm, with Coulter.	Model: P142MFBG	
5	Plough-Soiler	2 Blade type	Sugano	1
		Distance of Blades: Adjustable from 700 - 1,200mm	Model: J452AEG	
		Working depth: about 300～450mm		
6	Mini-Chisel	3 Blade (Tyne) type	Sugano	1
		Working width: about 1,240mm	Model:B153AAF	
		Working depth: about 50 - 300mm		
7	Power Tiller	Type: Power tiller with rear rotary	Yanmar	1
		Water-cooled 4-cycle diesel engine, about 583cc	Model: YZC-DL	
		Manual starting with 10-11ps rated output		
8	Rotary Tiller	For YZC-DL Power Tiller, removable	Yanmar	1
		No. of Blade: 18 pcs	For YZC-DL	
		Tilling width: about 600～700mm		
9	Bottom (Mold) Plow	Metal single reversible plow	Yanmar (Matsuyama)	1
		Adjustable tilling width and tilling depth	Model：MR-83N	
		Tilling width: about 250～300mm (adjustable)		
		Tilling depth: about 160～230mm (adjustable)		
10	Ridger	1 row Ridger	Yanmar	1
		Direct fixing type to the Rotary Tiller	For YZC-DL	
		The ridge height and width is adjustable		
11	Trailor	750kg load for minitoractor		1
		500kg load fot tiller		1

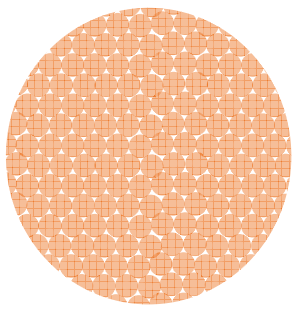
12	Soil Moisture Meter	Moistuer measure, DIK Display type	Daiki Rika Kogyo	1
			Model: DIK-311F	
13	Soil Hardness Meter	Stick type soil hardness meter	Daiki Rika Kogyo	1
			Model: DIK-5590	
14	Level surveying set	Leveler, tripod, slide scale		1
15	Yamanaka type soil hardness meter	Pencil type soil hardness meter	Daiki Rika Kogyo Model: DIK-5553	1
13	Spare Parts for Tractor and implement			
	Mission oil filter	For EF393T	Yanmar	1
	Engine oil filter	For EF393T	Yanmar	1
	Fuel filter	For EF393T	Yanmar	1
	Air cleaner element	For EF393T	Yanmar	1
	Fuel filter for the fuel tank	For EF393T	Yanmar	1
	V belt set	For EF393T	Yanmar	1
	Set of Blade for the rotary tiller	For Y1600RH	Yanmar	1
14	Spare Parts for Power Tiller			
	Fuel filter	For YZC-DL	Yanmar	1
	V belt set	For YZC-DL	Yanmar	1
	Cable for engine throttle	For YZC-DL	Yanmar	4
	Set of Blade for the Power Tiller	For YZC-DL	Yanmar	1
15	Spaare Parts for Botttom Plow	For P142MFBG		
	Sheer		Sugano	2
16	Spare Parts for Plough-Soiler	For J452AEG		
	Steel mold-board	Right x 1 set with bed and spacer	Sugano	2
	Steel mold-board	Left x 1 set with bed and spacer	Sugano	2
17	Spare Parts for Mini-Chisel	For B153AAF		
	Chisel 194121	with fixing bolt	Sugano	3

Note: The Q'ty listed in above tabel shows the Q'ty which the study team delivered to each site separately, except No. 11 Soil Moisture Meter and No. 12 Soil Hardness Meter, one set each were being kept by Sharif-Shirin Cooperative at Dangara, as the Q'ty procured by OMIC (JICA HQ) is one (1) set each, so these equipnent were not delivered to MTC Fayzobod.

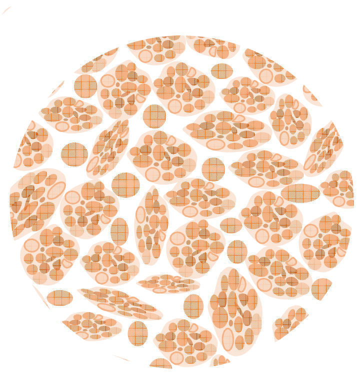
Appendix 7: Training Materials on Site **(November 2024)**

Training material 1 (English)

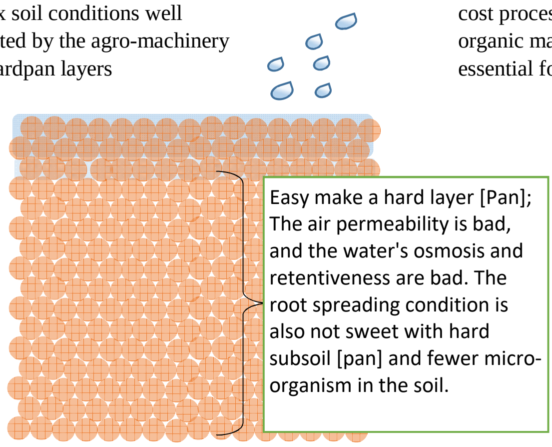
Single grained structure of soil



Aggregated structure of soil

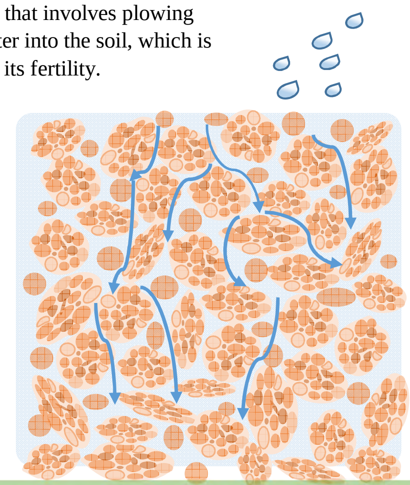


A lack of organic matter and complex soil conditions well compacted by the agro-machinery make hardpan layers

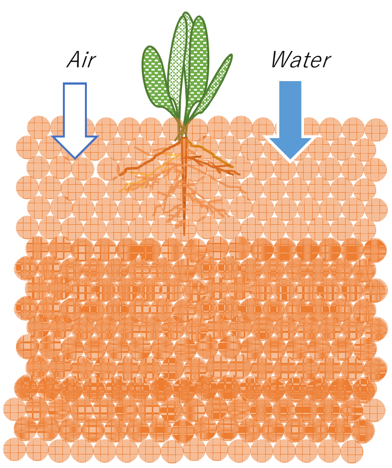


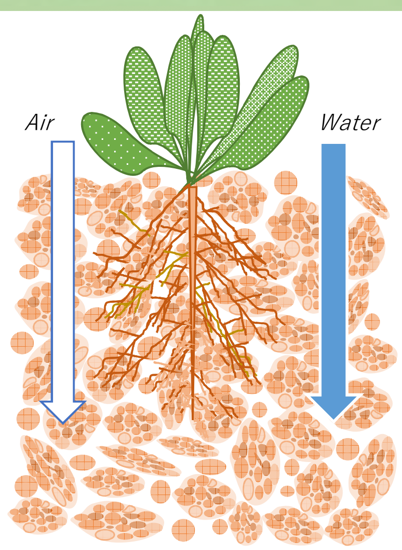
Single-grained soil conditions with a well-compacted layer could not be expected to make a good growth of products.

Aggregating soil is a simple, low-cost process that involves plowing organic matter into the soil, which is essential for its fertility.



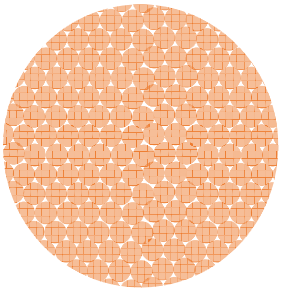
Agregated soil could make a fertile soil; The air permeability inproves, and the water's osmosis and retentiveness develop. So, the root spreading conditions are sweeter with softer subsoil and more active micro-organism.



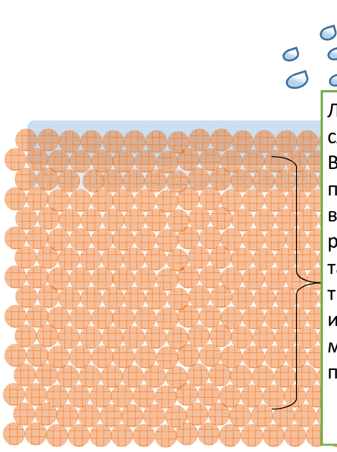


Training Material 1 (Russian)

Однозернистая структура почвы

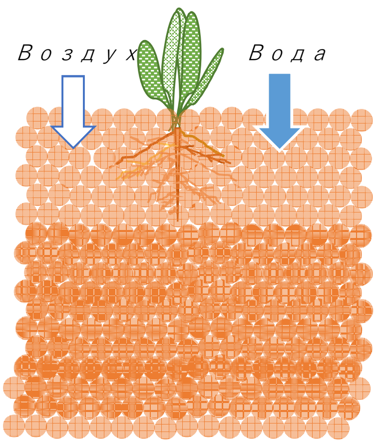


Недостаток органического вещества и сложные почвенные условия, хорошо уплотненные агротехникой, приводят к образованию слоев твердой почвы.

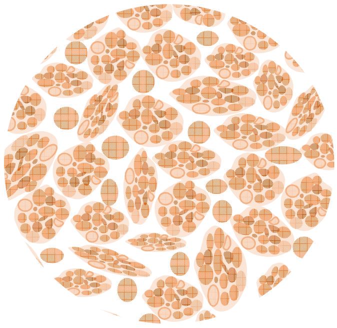


Легко сделать жесткий слой;
Воздухопроницаемость плохая и удерживаемость воды плохое. Условия распространения корней также не гладкие с твердой подпочвой [пан] и меньшим количеством микроорганизмов в почве.

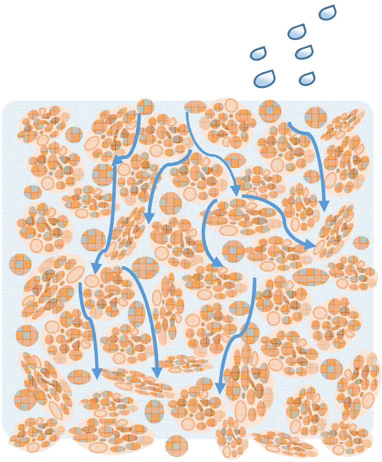
В условиях однозернистой почвы с хорошо уплотненным слоем нельзя ожидать хорошего роста продукции.



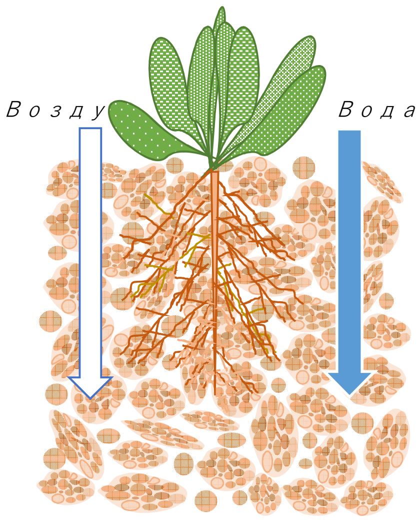
Агрегированная структура почвы

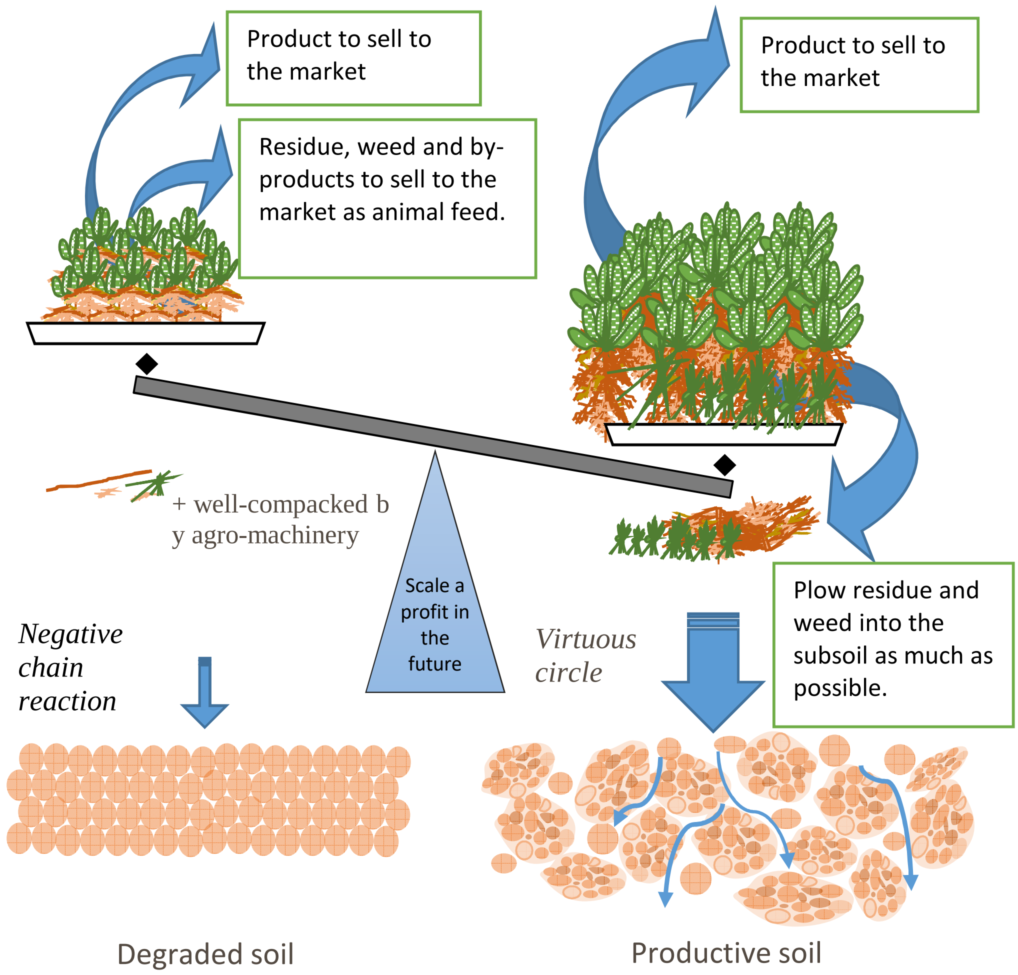


Агрегация почвы — это простой и недорогой процесс, который включает в себя внесение в почву органического вещества, необходимого для ее плодородия.

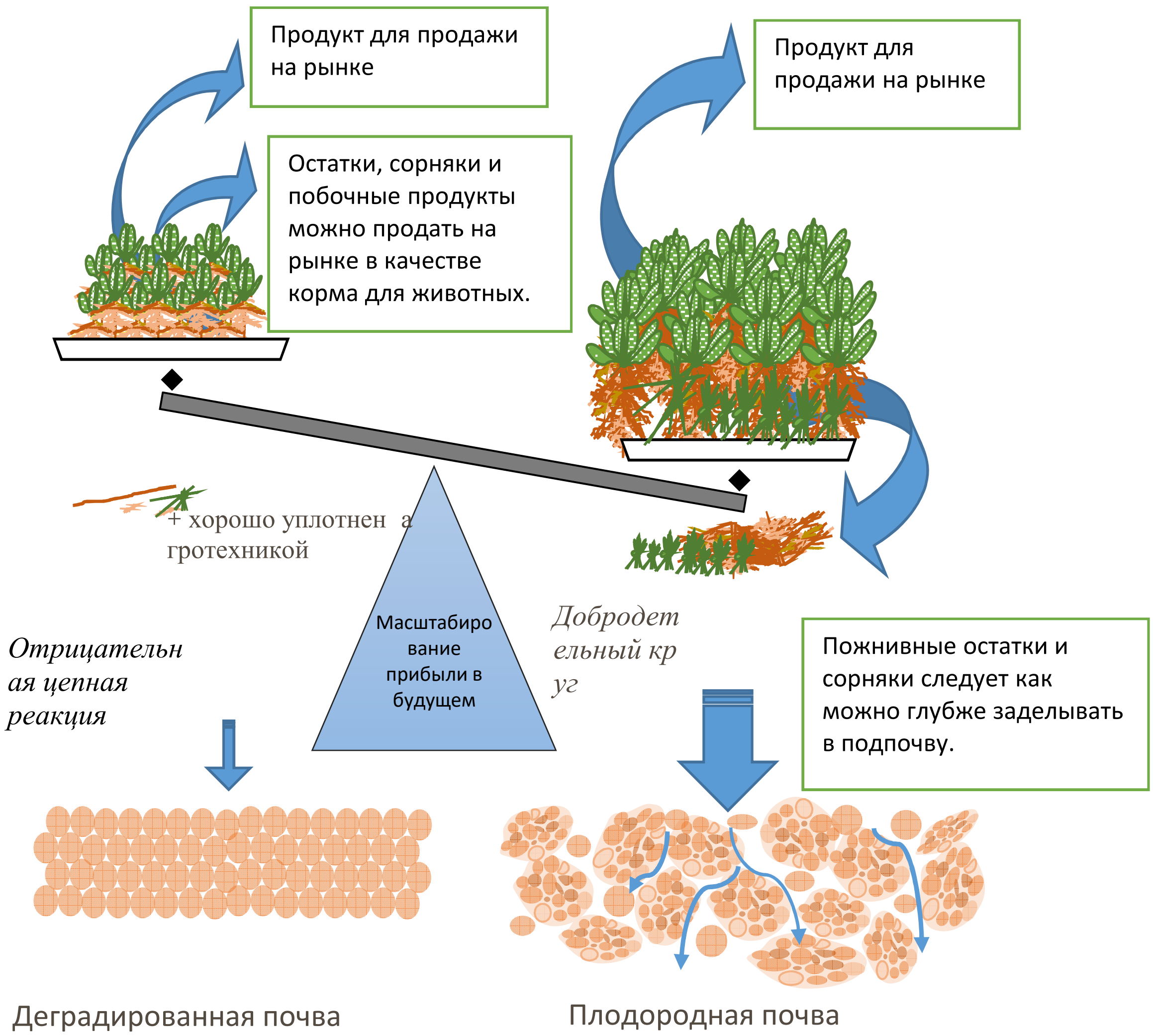


Агрегированная почва может стать плодородной почвой;
Улучшается проницаемость воздуха, развиваются осмос и удерживаемость воды. Таким образом, условия распространения корней лучше с более мягкой подпочвой и более активными микроорганизмами.




Product to sell to the market
Residue, weed and by-products to sell to the market as animal feed.
Product to sell to the market
+ well-compacked b y agro-machinery
Scale a profit in the future
Negative chain reaction
Virtuous circle
Plow residue and weed into the subsoil as much as possible.
Degraded soil
Productive soil

Важность увеличения гумуса в почве



Примечание:
для глубокой вспашки остатков/сорняков в почву. Для увеличения содержания гумуса [более 3% в почве]

Гумус – это гнездо микоризных грибов и полезных бактерий.

Appendix 8: Agricultural Mechanization Program 2025-2029 and Action Plan 2025-2027

Translated by the MoA

Annex 1
by decision of the Government of the Republic Tajikistan from "__" _____ 2024, No. __

Program on development of the agricultural mechanization sector and agricultural innovation in the Republic of Tajikistan for 2025-2029

1. GENERAL PROVISIONS

1. Program on development of the agricultural mechanization sector and agricultural innovation in the Republic of Tajikistan for 2025-2029 (hereinafter - the Program) has been developed taking into account the importance of agricultural mechanization in solving agricultural problems, increasing productivity in this context, increasing the production of agricultural products, effective use and preservation of land resources, maintaining the natural structure and fertility of the soil, creating new jobs, ensuring stable development and establishing a system resistant to scientific changes and forming the responsibility of agriculture in modern conditions using modern agricultural machinery and equipment, the aspect of forming innovative processes in agricultural production.

2. The program was developed based on the requirements of the National Development Strategy of the Republic of Tajikistan for the period up to 2030, reflecting the general perspective of the use of modern (innovative) agricultural machinery and equipment, and its main purpose is to raise the standard of living of rural women and significantly reduce the level of poverty. and achieving one of the main goals - ensuring food safety.

3. The share of agriculture in the national economy of the country is huge, and the development of all its sectors in the complex is the primary necessity of the national economy. One of the main areas of scientific and technical achievements in the development of agriculture is the mechanization of agriculture.

4. Agricultural mechanization is the replacement of manual work with agricultural machinery and equipment, in order to ensure effective development and reduce the original cost of agricultural products, that is, the use of modern joint technical tools in production, which can perform several technological operations at once, to contribute to the saving of energy and energy resources.

5. The development of agricultural mechanization, that is, increasing the level of providing farms with agricultural machinery and equipment, plays an important and decisive role in increasing the fertility of the land, improving its land reclamation, increasing the productivity of agricultural crops, and increasing the volume of agricultural production. The rapid development of the agricultural sector is inextricably linked with the use of machinery and equipment, modern technology in soil cultivation and the proper development of agrotechnics for the cultivation of agricultural crops.

6. The Program takes into account the existing possibilities of the state budget, the ability of the development partners to attract financial resources for programs and projects aimed at the development of the agricultural sector and the food system, as well as the amount of domestic and foreign investments.

2. ANALYSIS OF THE CURRENT SITUATION AND MAIN PROBLEMS OF THE SECTOR

7. At the current stage of the development of the agro-industrial complex, ensuring the accountability of the domestic agricultural production is mainly determined by one of the indicators of the supply of agricultural production with modern agricultural machinery and equipment, the cost of labor, energy, materials and the efficiency of resource use.

8. Mechanization of agriculture means, first of all, replacement of manual labor with more sophisticated machinery and equipment, individual machines and their systems. The development of the mechanical shadow mainly includes three stages:

- mechanization of the body;
- mechanization of the complex;
- automatic mechanization.

9. The first two stages are the stages of preparation for the automated mechanization stage, which the Republic of Tajikistan is currently in the first stage.

10. The effectiveness of the mechanization of the agricultural sector in the production of agricultural products is highly appreciated. The transition from manual work to mechanical work provides an opportunity to increase work productivity, including during soil cultivation, tillage, soil treatment before planting - grinding of lumps and pieces of soil, milling, harrowing, planting, inter-row processing, plant protection, and up to the harvesting of agricultural crops from 9 increases up to 40 times. As for the mechanization of cattle breeding, the use of technical means allows to reduce labor costs by 60 to 90 percent.

11. In the conditions of mechanization of the complex, all technological processes aimed at the production of products are carried out both in the main work and in the auxiliary work, using modern agricultural machinery and equipment.
12. The main indicators that describe the mechanization of agricultural production are as follows:
- provision of laundry service;
- energy supply and energy storage;
- technical improvement of production.
13. A high indicator of economy in the use of agricultural machinery and equipment is the complete implementation of agricultural work mechanically, which achieves the following results:
- increasing labor productivity, reducing labor costs per unit of manufactured products or work in progress;
- the number of workers and resources to be dismissed;
- lowering the original cost of manufactured products and improving their quality;
- ensuring the full annual efficiency of the economy;
- regularization and shortening of the period of return of the invested amount;
- saving labor costs and means of production, including fuel, lubricants and other types of energy-saving activities, which are planned within the framework of the Program.
14. In the conditions of a steady decrease in the number of workers in the agro-industrial complex of the country, and in this context, an increase in the size of the agricultural land area, in general, the increase in the amount of agricultural products in the shade of plant growers and in the shade of livestock, the use of agricultural machinery and equipment and the use of modern technology in the shade, depending on this requirement, productivity, efficiency, reliability of agricultural machinery and equipment will also increase.
15. Improvement of agriculture with agricultural machinery and equipment is one of the main factors of ensuring sustainable development of agriculture.
16. At the time of the development of market relations, the level of supply of agricultural machinery and agricultural machinery was reduced by 15-20%. low losses in production, it is given that this issue is within the scope of the Program is implemented.
17. For the purpose of carrying out agrotechnical activities, according to statistical data, as of 01.10.2024, there are 27,552 tractors of various types, of which 1,442 are plowing tractors. Also, 1,128 combine harvesters, 8,367 tractor attachments, 10,979 tractor attachments, 2,308 seed drills, including 1,890 cotton seed drills, 3,501 softeners, 1,647 tractor attachments, 928 combine harvesters, 18 combine harvesters. There are corn harvesters, 132 combine harvesters, 229 potato planters, 424 potato

harvesters and other agricultural machines, which is used in the course of land preparation, soil processing before planting, sowing of crops, intermediate processing, chemical processing and harvesting of agricultural crops.

18. The analysis of the technical condition of existing agricultural machinery and equipment shows that 60 percent of tractors, combines and agricultural machinery have passed their service life, some of them are in unusable condition, and most of them have been used in agricultural production for more than 30 years. However, due to limited production, poor financial situation, and inability to purchase agricultural machinery and equipment, farms are holding back. Due to the expiration of their useful life, the efficiency of agricultural machinery and equipment is low, and the possibilities of agricultural production are limited for good (favorable) agrotechnical conditions and high quality of agricultural work.

19. According to the latest data of the World Bank, the Republic of Tajikistan is much lower than the CIS countries in terms of the level of supply of agricultural machinery and equipment. This factor determines the level of fertility and productivity.

20. The level of supply of farmers with agricultural machinery and equipment is as follows:

- cotton and cotton seeds - 60%;
- shade of vegetables and polyps - 30%;
- forest and vineyard shade - 20%;
- breeders - 40%.

21. If in 1991-2010, the level of modernization of agricultural equipment and machinery was equal to 2-3 percent per year, since 2011 only 13 percent has been updated, which is a little less than 1 percent per year.

22. Today, in the field of corn farming, most of the agricultural work, including tillage, planting, inter-row processing and harvesting of agricultural crops, from 40 to 60 percent, is done mechanically, and the total is 46 percent on average. gives In some types of technological processes, the level of mechanics is still low, and the amount of manual labor is high. This process belongs to vegetable growers, cultivation and production of crops, rice, potatoes, processing between orchards and vineyards, production of fodder and in general to livestock farmers (in livestock farms).

23. Many years of domestic and foreign experience in the production of agricultural products shows that it is impossible to increase the efficiency, volume and increase the accountability of agricultural products without constant updating of the material and technical base and the introduction of modern scientific and technical achievements in production.

24. In the remote regions of the country, there is a clear lack of services, especially the services of mechanics, as well as spare parts for agricultural machinery and

equipment. This causes uncertainty in the repair and maintenance of agricultural machinery and equipment during the busy season, and harms agricultural farms as well as small women's farms. Although some importers, distributors and suppliers of agricultural machinery and equipment offer 1-year after-sales service, the amount of these services is not enough to satisfy the demand. In addition, due to the seasonal use of agricultural machinery and equipment, it remains idle during the year, which leads to an increase in repair costs.

25. In the development of mechanized agriculture today, the introduction of agricultural machinery and equipment designed on the basis of innovation or green technology plays an important role. In recent years, a number of production and service cooperatives, rural farms, limited liability companies and other producers of agricultural products operating in the country have gradually switched to the use of modern green technologies that save water, energy and resources.

3. PRIORITY AREAS

§1. Improvement of the system of control, testing, registration and training agricultural machinery and equipment

26. The imperfection of the system of control, testing and registration and production of agricultural machinery and machinery in the State Inspection of Agricultural Machinery of the Ministry of Agriculture has led to the fact that low-quality and unstable machinery is entering the market.

27. Within the framework of the Program, the establishment of a transparent and effective system of regulation, control and registration and production of agricultural machinery and equipment, as well as encouraging the modernization of the equipment and machinery fleet, increasing the efficiency of their use and reducing the amount of their maintenance cost.

28. The main tasks of improving the system:

- improvement of collective regulatory documents that regulate the issues of regulation, control, testing, registration and production of agricultural machinery and machinery, as well as the issuance of a mechanist-machinist's certificate in the field of agriculture, including on the basis of international laws and standards;
- carrying out daily accounting of agricultural equipment and machinery in all types of farms and determining the technical condition of existing equipment and machinery;
- creation of a single database of registration and production of agricultural machinery and equipment according to regions, cities and districts;
- improvement of the system of monitoring the technical condition of agricultural machinery and machinery and the safety of their use, regardless of the form of

ownership and financing during their use, in order to ensure the safety of life and health of people, safety of property, protection of the living environment;
- strengthening the technical material base in the direction of purchasing machinery and equipment, which helps to issue a mechanic-driver's certificate.

§2. Improvement of the state certification and testing system agricultural machinery and equipment

29. The purpose and main task of the testing, testing of new agricultural machinery and equipment, which is already in production, is to determine the technical classification of agricultural machinery and equipment for their purpose.
30. The development of innovative mechanization and solving the problems of access to high-quality modern agricultural machinery and equipment require revision and improvement of the system of state certification and testing of agricultural machinery and equipment.
31. The testing of agricultural machinery and equipment is carried out by the State Institution "Tajikistan State Machinery Testing Station" of the Ministry of Agriculture of the Republic of Tajikistan in regional natural and climatic conditions, especially the soil structure, which corresponds to the production conditions of the country.
32. Within the framework of the Program, with the aim of creating an effective system of quality control of agricultural machinery and equipment and ensuring its compliance with modern requirements, the basic tasks will be improved:
- preparation of a joint regulatory document that regulates the issues of state testing and testing of agricultural machinery and equipment in the direction of quality and its compatibility with agricultural conditions based on the provided standards;
- improvement of the testing system by creating new methods and criteria for assessing the quality of agricultural machinery and equipment based on the expected standards;
- reconciliation of national standards with international requirements;
- reconstruction of the material and technical base of the State Institution "State Machine Testing Station of Tajikistan" with modern equipment and tools;
- creating favorable conditions for holding regular public seminars for specialists in the field of testing and certification;
- establishment of a unified information system for storage and processing of certification data;
- strengthening the material and technical base in the direction of purchase of machinery and equipment for testing manufactured and imported agricultural machinery and equipment.

§3. Development of financial leasing relations in the sector

33. An analysis of the current state of financial leasing relations in the agricultural sector of the republic shows that the methods of implementing state support and regulating production on the basis of financial leasing may be different, but they should be based on financing from the state budget, credit policy, and a rational financing system.

34. Currently, the share of the state financial leasing sector in the mechanization of agricultural machinery in the republic, which has a service life of more than 20 years, is 59 percent, while the annual rate of renewal of agricultural machinery fleets for 1991-2023 in the republic was only 10-12 percent.

35. The financial leasing market in Tajikistan can be described as decentralized, since 80 percent of the financial leasing market is controlled by the Republican State Unitary Enterprise "Tajikagroleasing" of the Ministry of Agriculture of the Republic of Tajikistan, which is a positive trend.

36. In today's conditions, the development of financial leasing relations is the main and only investment tool that allows individuals and legal entities to purchase the necessary means of production, including agricultural machinery and equipment, using long-term financing from the state budget and other sources.

37. In conditions of acute shortage of financial resources for most agricultural producers to renew fixed assets, implement achievements of technical progress and innovations, financial leasing can be an effective and preferential tool in solving the problems of modernization of the material and technical base.

38. At the same time, there is a need to increase the number of modern agricultural machinery and equipment designed within the framework of innovation, of various names and brands, such as plowing tractors (track-type), inter-row (three-wheeled), grain harvesters, forage harvesters, corn harvesters, grain seeders under film, seeding machines and other modern agricultural machinery.

39. The main directions of development of financial leasing relations are:

- improvement of the legislative framework, which is being developed and adopted in a new edition - a regulatory legal act, taking into account the current requirements and the specifics of the development of the agricultural and food sectors, and aimed at stimulating the development of financial leasing relations;
- increasing state support, which involves increasing budget funds for the development of financial relations and expanding benefits for agricultural producers;
- developing the financial leasing infrastructure, which involves the establishment of new leasing companies, including with the participation of state capital, expanding

branches and representative offices of financial leasing companies in the regions, and developing a system for training personnel for work in the financial leasing sector;
- increasing the availability of financial leasing by reducing the interest rate on financial leasing contracts and increasing their terms, as well as developing online financial leasing;
- stimulating demand for leasing services by conducting educational campaigns on the benefits of financial leasing, as well as organizing a system of financial leasing discounts for certain categories of agricultural producers;
- expanding the list of financial leasing objects, including modern and energy-efficient brands that can increase its productivity and reduce its operating costs;
- ensuring transparency and equal access to financial leasing services for all participants;
- organizing trainings and seminars on the use of modern agricultural machinery obtained under a financial lease agreement;
- establishing information platforms for the exchange of experience and information between agricultural producers;
- attracting international financial institutions and other development partners to projects aimed at expanding financing of financial lease programs;
- providing a legal framework and tax and customs privileges for investors in the financial leasing sector of agricultural machinery and equipment;
- developing new types of financial leasing relationships.

§4. Assistance in the modernization of agricultural machinery and equipment, the introduction of modern agricultural machinery and equipment

40. Ensuring access to innovative agricultural machinery and equipment and modern technologies for agricultural producers is not possible without implementing a set of measures aimed at modernizing the existing infrastructure and introducing new technologies in the field of agricultural production.
41. The Program's measures are aimed at modernizing existing agricultural machinery and equipment and introducing modern technologies in the agricultural production sector, including the implementation of financial measures for the acquisition of new agricultural machinery and equipment, especially for small and medium-sized agricultural producers, and non-financial measures, including information support through the organization of exhibitions, seminars and conferences to demonstrate modern technology and equipment, the creation of information platforms and a single database on agricultural machinery and equipment available on the market, and the development of methodological manuals and recommendations on the use of new technologies.

42. Modernization of agricultural machinery and equipment, as well as the introduction of innovative technologies, is carried out taking into account the implementation of the following principles: - it is envisaged to ensure comprehensive mechanization at all stages, from land preparation to harvesting. Agricultural machinery and equipment should be suitable for the natural conditions of the regions of the republic, be productive and energy-saving. At the same time, social aspects, such as the availability of qualified personnel and the level of mechanics in the regions, cities and districts, should be taken into account;

- individual approach to regional characteristics: agricultural machinery and equipment should correspond to the agro-ecological, natural and climatic, and soil and land characteristics of different regions;
- adaptability and adaptability of agricultural machinery and equipment to changing external conditions, such as weather conditions, soil conditions, market conditions;
- widespread use of digital technologies that allow for sustainable use of resources, increasing the accuracy and efficiency of agricultural work, taking into account social aspects;
- environmental friendliness and energy efficiency of equipment and technologies that should contribute to environmental protection and adaptation to changing climate conditions;
- Innovative agricultural technologies should be effectively integrated with other technologies, such as water management systems, plant protection systems, storage and processing systems.

43. To achieve these goals, it is proposed to:

- develop measures to encourage importers and producers to import modern, energy-efficient and environmentally friendly agricultural machinery and equipment, as well as introduce modern technologies that improve soil cultivation and irrigation management to save resources in the context of climate change, including the use of precision agriculture, automated irrigation management systems, drip irrigation, field cultivation using unmanned aerial vehicles (drones), etc.
- modernization of existing enterprises producing agricultural machinery through the establishment of joint ventures with foreign investment in Tajikistan, as well as encouraging the production of domestic components for agricultural machinery and equipment;

44. To develop innovative agricultural mechanization and transition from complex mechanization to high-yield agricultural machinery and equipment and advanced technology, it is necessary not only to improve existing capacities, but also to conduct scientific research and design work in the field of agricultural machinery and equipment production, establish agricultural waste processing systems, as well

as identify needs and priority areas, mobilize the necessary resources, and develop educational and professional development programs.

45. The program envisages active cooperation between authorized bodies and manufacturers of agricultural machinery and equipment, as well as agricultural producers themselves, to identify their needs and develop appropriate support measures.

§5. Development of a system for servicing agricultural machinery and equipment

46. The high level of wear and tear of the country's agricultural machinery and equipment fleet, the insufficient development of the service sector, and the low qualification of repair personnel create a need for the establishment and development of a modern service infrastructure and the readiness of agricultural machinery.
47. In order to develop a modern service infrastructure and increase the service life of agricultural machinery and equipment, the following measures are envisaged: - reconstruction of existing service points, including technical service centers, through the provision of preferential loans and the establishment of new points on this basis;
- on the basis of the State Unitary Enterprise "Tojikagroleasing" of the Ministry of Agriculture, to organize technical service centers in all cities and districts of the republic and equip them with agricultural machinery and equipment and equipment for the repair of spare parts;
- to organize a system of granting privileges to agricultural producers for the purchase of spare parts and consumables for the maintenance of agricultural machinery and equipment;
- to develop training and advanced training programs for employees of technical service centers;
- to create conditions for the organization of specialized enterprises, such as associations of users of agricultural machinery and equipment;
- to develop a system for monitoring the technical condition of agricultural machinery and equipment.

§6. Development of the machine system

48. The introduction of a mechanized system is aimed at implementing the achievements of modern science in production and thus increasing the yield of agricultural crops, reducing labor costs, and increasing labor productivity, and requires constant improvement.

49. The system of machines in agriculture is a set of agricultural equipment and machinery that ensures the implementation of all planned technological operations with minimal labor and production costs throughout the year. The design and composition of the machine system within the framework of this Program is being studied and designed by industry research institutes, machine testing bases, design bureaus and specialists from relevant departments, including, in the Republic of Tajikistan, by the Academy of Agricultural Sciences of Tajikistan, the State Institution of the Tajik Agrarian University named after Shirinshah Shotemur, the State Institution "State Testing Station of Tajikistan" of the Ministry of Agriculture of the Republic of Tajikistan, domestic enterprises producing agricultural machinery and equipment, such as the Closed Joint-Stock Company "Agrotechservice".

50. The research conducted in the field of machinery systems makes it possible to identify the specific needs of different regions of the country and the main directions of mechanization of the sector, to take into account the specific features of the production of various agricultural products and the requirements for each type of machinery and equipment for different regions, primarily the mechanization of individual technological processes. Such research makes it possible to prevent unnecessary expenses for the creation and construction or import from abroad of inefficient machinery.

51. During the implementation of the Program, the following types of mechanization systems will be designed for the agricultural sectors of the republic:

- for mechanization of only the work process;
- for the comprehensive mechanization of agricultural production of a farm or sector;
- for the comprehensive mechanization of agricultural production of the country or its separate region.

52. The interdependence of the machine system, the complex mechanization of agricultural production for all farms of the republic or a separate region thereof is carried out taking into account the following indicators:

- between similar machines that are necessary for different working conditions;
- by unifying components, parts and creating special devices - by technical means;
- by rationally reducing the variety of agricultural machinery and equipment necessary for all farms of the country.

4. GOALS AND OBJECTIVES OF THE PROGRAM

53. The main objective of the Program is to implement the policy of the Government of the Republic of Tajikistan on the development of agricultural mechanization, the import into the country and, on this basis, the provision of farmers with modern agricultural machinery and equipment, the restoration of the production and technical capacity of farms and organizations in the agricultural sector, the modernization of agricultural machinery and equipment parks, and the introduction of modern machinery and technology in farm production and agricultural enterprises, regardless of the form of ownership, aimed at conducting agricultural activities in accordance with international standards.

54. The program provides for improving the activities of the bodies supervising the mechanization of agriculture, training highly qualified scientific personnel, retraining specialists in the field, developing financial leasing relations, introducing a system of machines taking into account regional requirements, and conducting state testing of agricultural machinery and equipment.

55. The goal of the Program is to gradually create favorable conditions for increasing the number of modern agricultural machinery and equipment in the farms of the republic, establishing and improving technical service centers and repair points, as well as providing them with spare parts in the cities and districts of the republic. At the same time, the Program is aimed at fully mechanizing the cultivation and harvesting of major agricultural crops on the farms of the peasant community and household plots of the country's population, introducing new and advanced, energy-saving techniques and technologies, and ultimately increasing productivity and quality of agricultural products, improving the living standards of rural people, and on this basis, reducing manual labor and achieving productive agriculture.

56. The program is aimed at solving the following problems:

- increasing the number of modern, high-quality agricultural machinery and equipment designed on the basis of innovation, at the expense of imports and the development of domestic production, adapted to various climatic conditions;
- improving access of agricultural producers to high-quality service of agricultural machinery and equipment;
- improving the qualifications of the personnel involved.
- developing a system of machinery for the cultivation and production of agricultural products depending on the type of crops, taking into account the natural conditions of the regions;
- adaptation of the machinery system to the regional natural and economic conditions of production (for example, the use of high-power machinery and equipment with greater power and coverage of the volume of work on large areas, while using relatively small and convenient machinery on small areas);

- organization of consulting and representative services in the regions and cities and districts of the republic related to the use of agricultural machinery and equipment;
- provision of modern agricultural machinery, technology and equipment for temporary use as a paid service;
- on the basis of the material and technical base of the State Unitary Enterprise of the Republic of Tajikistan "Tajikagroleasing" in all cities and districts of the republic, the organization of technical service centers and equipping them with repair and maintenance equipment, the main activity of which is aimed precisely at this purpose;
- design, development and introduction of combined and multifunctional agricultural machinery in the process of introducing energy-saving technologies in all sectors of agriculture;
- assistance in the organization of sales outlets for spare parts for agricultural machinery and equipment in the cities and regions of the republic;
- through the Republican State Unitary Enterprise "Tajikagroleasing" to purchase more agricultural machinery and equipment for provision to farmers in the cities and regions of the republic through financial leasing;
- support for the development of the agricultural mechanization sector by providing loans, attracting grant assistance, foreign investment and creating conditions for healthy competition among importers of agricultural machinery and equipment;
- support and promotion by the Government of the Republic of Tajikistan of the development of financial leasing relations, which is the only means of providing farmers with agricultural machinery and equipment in the republic;
- allocation of certain funds from the state budget for the purchase and provision of agricultural machinery and equipment to farmers through financial leasing, as well as allocation of funds for the establishment and equipment of technical service centers during the two stages of the Program's implementation;
- development of financial leasing relations;
- simplification of the mechanism of financial leasing relations by granting tax benefits to lessor enterprises and reducing the percentage of leasing fees for lessees in order to facilitate the attraction of foreign investment;

57. Achieving the above-mentioned tasks is an important contribution to the creation of agro-industrial systems and sustainable agriculture in the Republic of Tajikistan. The implementation of the Program is expected to:
- increase the volume of crop and livestock production;
- increase the yield and productivity of agricultural products and labor productivity;
- reduce losses during harvesting and increase the efficiency of land cultivation;
- improve the reclamation condition of agricultural lands;
- increase the resilience of agricultural production to climate change;
- increasing the mechanical energy efficiency and quality of agricultural work;
- creating new jobs in the field of servicing agricultural machinery and equipment;
- improving the qualifications of agricultural workers and improving the quality of their working conditions;

- increasing the export potential and the level of self-sufficiency of the country in food products, etc.

58. Achieving the set goals and objectives is a significant contribution to the creation and development of the agricultural system of the Republic of Tajikistan, ensuring the transition to energy-saving and environmentally friendly technologies, increasing its efficiency and competitiveness.

5. TRAINING OF PERSONNEL AND RE-STUDY OF SPECIALISTS

59. Another problem in the agricultural mechanization sector is the shortage of highly qualified personnel in the sectors of technical support of agricultural production processes, modernization and automation of agriculture, technical support of mechanical processes and processing of agricultural products, mechanical engineering and management, organization and technology of technical service, safety of technological and production processes, technical support of land reclamation and water management. The majority of personnel working in the sector are relatively older specialists. Therefore, in accordance with this Program, it is envisaged to train young specialists in the field of mechanization and machinist at the expense of women and retrain personnel in the field of agricultural mechanization within the country and abroad, as well as to attract young specialists by increasing their interests.

60. Training and retraining of personnel in the field of agricultural mechanization, including technical support of agricultural production processes, modernization and automation of agriculture, technical support of mechanical processes and processing of agricultural products, mechanical engineer-management, organization and technology of technical service and safety of technological and production processes at the State Institution of the Agrarian University of Tajikistan named after Shirinshoh Shotemur, vocational technical lyceums, State Unitary Enterprise "Center for Advanced Training of Personnel in the Agricultural Sector" of the Ministry of Agriculture of the Republic of Tajikistan and the Scientific Center for Innovative Technologies and Agricultural Mechanization of the Academy of Agricultural Sciences of Tajikistan with education at the bachelor's, master's, doctoral levels, as well as through short-term courses, educational and familiarization trips, courses Professional development is being implemented.

6. PROGRAM IMPLEMENTATION AND FINANCING MECHANISMS

61. The implementation of the Program consists of three stages:
- the first stage in 2025-2027;

- the second stage in 2028;
- the third stage in 2029.

62. The Program is planned to be financed from all sources of funding in the first stage of 2025-2027 in the total amount of 207.9 million somoni, of which 95.0 million somoni are from the state budget, 112.9 million from development partners, the private sector, as well as other sources not prohibited by the legislation of the Republic of Tajikistan. During the implementation period of the Program, funding (from the state budget) of paragraphs 17 and 36 of the Program's action plan, aimed at developing financial leasing relations and establishing and equipping technical service centers, will be implemented within the framework of paragraph 3 of the Resolution of the Government of the Republic of Tajikistan dated 01.08.2015, No. 474 "On the Report of the Director of the Republican State Unitary Enterprise "Tajikagroleasing" on the progress of implementing the Resolution of the Government of the Republic of Tajikistan dated March 5, 2008, No. 107.

7. MONITORING AND EVALUATION

63. Monitoring and evaluation of the implementation of this Program will be carried out by the Ministry of Agriculture of the Republic of Tajikistan in accordance with the Resolution of the Government of the Republic of Tajikistan dated December 29, 2018, No. 615 "On the Rules for Monitoring and Evaluation of the Implementation of National-Level Strategic Documents, Sectoral and Regional Development Programs in the Republic of Tajikistan".

64. The Ministry of Agriculture of the Republic of Tajikistan may involve representatives of relevant ministries and departments and experts to monitor and evaluate the implementation of the Program.

8. FINAL PROVISIONS

65. The Ministry of Agriculture, in cooperation with relevant ministries and departments, executive bodies of the state power of the Gorno-Badakhshan Autonomous Region, regions, the city of Dushanbe and cities and districts of the republic, shall ensure the implementation of the Program by attracting funds from the state budget, loans from financial partners (banks), grant and investment projects, as well as attracting investors.

66. The Ministry of Agriculture of the Republic of Tajikistan shall annually prepare information on the progress of the Program implementation, and shall also develop a further action plan for the Program for 2028 and 2029 in accordance with the established procedure and submit it to the Government of the Republic of Tajikistan for consideration.

Annex 2
by decision of the Government of the Republic of Tajikistan
from "___" "_____" year 2024, No. __

Action Plan for the First Phase for 2025-2027
in frame of the Program on development of the agricultural mechanization sector and agricultural innovation in the Republic of Tajikistan for 2025-2029

#	Goals, tasks and activities	Expected results	Indicators (final results)	**Budget foreseen, thousand somoni**	**Funding sources, thousand somoni**		Implementation period and allocated amount, thousand somoni						Responsible person	Development partners	Implementing time
							2025		**2026**		**2027**				
					Budget state	**Other sources**	State Budge	Other source	State Budge	Other source	State Budge	Other source			
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
	1. Improving the system of control, testing, registration and deregistration of the agricultural machinery and equipment														
1.	Improvement of regulatory legal acts that regulate the system of control, testing, and registration and deregistration of agricultural machinery and equipment, including the procedure and standards for their implementation.	Regulatory legal acts are being developed to improve the system of control, testing, registration and deregistration of agricultural machinery and equipment.	Number of updated regulatory legal documents; assessment of clear and transparent procedures for the control, inspection, registration and deregistration system										MOA	FAO GIZ WB USAID	2025 2026

1

2.	Conducting an accurate accounting of agricultural equipment and machinery, regardless of the form of ownership	Determining accurate information on the quantity and technical condition of agricultural machinery and equipment	The priorities of agricultural machinery and equipment are being determined.	**200**		**200**		100		100			MOA, Statistical Agency	FAO USAID JICA	2025
3.	Creation of a unified database on the number, registration and deregistration of agricultural machinery and equipment	The quantity and technical condition of agricultural machinery and equipment is determined.	The digital transformation of agriculture involves the integration of digital technologies into all aspects of agriculture and the transition from mechanical operations to digital processes.	**5000**	**1000**	**4000**		1000	500	2000	500	1000	MOA MOFRT, Agency of innovation and digital technologies	FAO WB GIZ JICA	2025 2027

4.	Strengthening the material and technical base for the purchase of agricultural machinery and equipment and educational equipment			**4000**	**1000**	**3000**		1000	600	1500	400	500	MOA MOFRT, Committee on Primary and Secondary Vocational Education,	IFAD GEF JICA	2025 2027
5.	Development of investment projects and submission to partners to improve the system for monitoring the technical condition and safety of agricultural machinery and equipment in order to ensure the safety of people's lives and health, the safety of property, and environmental protection	The system for monitoring the technical condition and safety of agricultural machinery and equipment is being updated.	A set of technical safety rules and control procedures are disclosed; responsibility is indicated.										MOA, State Investment and State Property Management Committee	FAO GIZ USAID JICA	2025 2026

2. Improvement of the system of certification and state testing of agricultural machinery and equipment															
6.	Development of a regulatory legal act regulating the system of state testing and inspection of agricultural machinery and equipment according to established standards	Legal normative acts are being developed .	Availability and public access Rules for state testing and inspection of agricultural machinery and equipment for compliance with established standards	**100**		**100**		50		50			MOA Academy of Agricultur al Sciences of Tajikistan	FAO GIZ USAID JICA	2025 2026
7.	Development and improvement of procedures, norms and standards of the state inspection and testing system, taking into account modern requirements	New regulations are being developed.	Availability and accessibility of official technical regulations and standards	**100**		**100**		50		50			MOA ACADEM Y OF AGRICU LTURAL SCIENCE S OF TAJIKIST AN Tajik Agrarian University	FAO GIZ USAID JICA	2025 2027

8.	Improving state testing and inspection methods, taking into account the development and implementation of new methods for assessing energy efficiency, environmental performance and other technical characteristics of agricultural machinery and equipment	Introduction of testing methods to assess energy efficiency, environmental safety and other technical characteristics of agricultural machinery and equipment	Availability and general accessibility of testing and evaluation methods for assessing energy efficiency, environmental performance and other characteristics										MOA ACADEMY OF AGRICULTURAL SCIENCES OF TAJIKISTAN Tajik Agrarian University	FAO GIZ USAID JICA	2025 2027
9.	Harmonization of national standards with international requirements	National standards are harmonized with international requirements .	Availability and general accessibility of documents confirming the compliance of national standards with international requirements	**180**		**180**		60		60		60	MOA ACADEMY OF AGRICULTURAL SCIENCES OF TAJIKISTAN Tajik Agrarian University	FAO GIZ USAID JICA	2025 2026

10.	Strengthening the material and technical base of the State Institution "State Machine Building Station of Tajikistan" in the direction of purchasing laboratory equipment, equipment and machinery for state testing and testing of machinery and equipment produced and imported from abroad and repairing the necessary infrastructure	The process of testing and testing will be improved, and the number of state tests will be expanded	The number of state inspections and tests will increase; The availability of standards and methods for inspections and tests will be implemented	**15000**	**3000**	**12000**		4000	1500	4000	1500	4000	MOA MOFRT State Investment and State Property Management Committee of the Republic of Tajikistan	IFAD GEF JICA	2025 2027
11.	Development of new methods and standards for assessing the quality of agricultural machinery and equipment	Methods and standards for assessing the quality of agricultural machinery and equipment are being developed.	A set of standards and methods is being developed .	**200**		**200**		100		100			MOA ACADEMY OF AGRICULTURAL SCIENCES OF TAJIKISTAN Tajik Agrarian University	FAO GIZ USAID JICA	2025 2026
12.	Establishment of a single database for producers, importers and users of agricultural machinery and equipment with information on certified products	The information system is operational	Availability of relevant information	**600**		**600**		200		200		200	MOA Agency of innovation and digital technologies	FAO GIZ USAID JICA	2026 2027

13.	Organization of favorable conditions for regular public seminars for specialists in the field of certification and state testing of agricultural machinery and equipment	Increasing the capacity of the institution	Increased number of seminars and events	**150**		**150**		50		50		50	MOA, Committee on Primary and Secondary Vocational Education, ACADEMY OF AGRICULTURAL SCIENCES OF TAJIKISTAN Tajik Agrarian University	FAO GIZ USAID JICA	2025 2027
14.	Creation of a single database for storing and processing state testing and certification data	A unified database for storing and processing inspection, testing, and certification data will be established.	Availability of a single database. Dynamics of the number of records in the database	**200**		**200**				100		100	MOA Agency of innovation and digital technologies	FAO GIZ USAID JICA	2026 2027

	3. Development of financial lease relations (leasing)														
15.	Introducing amendments and additions to the Law of the Republic of Tajikistan "On Financial Leasing (Leasing)" in order to stimulate the development of financial leasing relations	Adoption of the Law of the Republic of Tajikistan "On Financial Leasing (Leasing)" in a new edition	Stakeholders are aware of the new law and are taking advantage of it.										MOA MOFRT	FAO GIZ USAID JICA	2026
16.	Development of a regulatory legal act on the procedure for conducting financial leasing operations and the mechanism for returning funds	The set of economic and social relations to be established in connection with the lease of the financial lease agreement, including the purchase of the subject of the financial lease	The procedure will be determined in the new edition.										MOA	FAO GIZ USAID JICA	2025
17.	Expanding state support by increasing funding from the state budget for the development of financial leasing relations (within the framework of the Resolution of the Government of the Republic of Tajikistan dated 01.08.2015, No. 474)	Proposals to increase state budget funding are being prepared and submitted.	The number of purchases of innovatively designed agricultural machinery and equipment is increasing	**120000**	**60000**	**60000**	20000	20000	20000	20000	20000	20000	MOA MOFRT	IFADA GEF WB JICA	2025 2027

18.	Developing a system for training specialists to work in the field of financial leasing relations	Capacity building for activities in the field of financial leasing relations is being created.	Training programs for specialists ; Number of trainees increases										MOA Committe e on Primary and Secondary Vocational Education, TAAS, Tajik Agrarian University	FAO GIZ USAID JICA	2025 2027
19.	Expansion of branches and representative offices of financial leasing companies in the regions	Branches and representative offices of leasing companies will be established in the region .	The number of financial leaseholders is increasing										MOA	IFADA GEF JICA	2025 2027
20.	Consideration of the issue of reducing the interest rate on financial lease payments and extending the term for the leased asset	The interest rate on financial lease payments is reduced and the term for the leased asset is extended.	The number of financial leaseholders is increasing										MOA	FAO GIZ USAID JICA	2025 2027
21.	Development of an online financial leasing system	Establishing an online financial leasing system and fully implementing its operations	The number of online transactions is increasing	**400**		**400**				200		200	MOA	FAO GIZ USAID JICA	2025 2027

22.	Establishing a system of discounts for financial leasing relations for certain categories of agricultural producers	Establishing a system of discounts for financial leasing relations	The number of financial leaseholders is increasing.										MOA	FAO GIZ USAID JICA	2025 2027
23.	Conducting information campaigns on the benefits of financial leasing relationships	Information and outreach activities will be increased.	The company's outreach to stakeholders is absolutely										MOA	FAO GIZ USAID JICA	2025 2027
24.	Expanding the list of financial leasing items, including modern and energy-efficient brands , which can increase profitability and reduce operating costs	Organization of the discount system of financial lease relations	The number of financial rent recipients will increase.										MOA	IFAD GEF JICA	2025 2027
25.	Ensuring transparency and equal conditions for access to financial leasing services for all participants	Adoption of clear and transparent access procedures	The number of financial leaseholders is increasing.										MOA	FAO GIZ USAID JICA	2025 2027
26.	Organization of training courses and seminars on the use of modern agricultural machinery and equipment for financial lease to beneficiaries	Workshops and seminars are held regularly.	The number of trainings and seminars contributes to increasing the level of knowledge of specialists.	**150**		**150**		50		50		50	MOA	FAO GIZ USAID JICA	2025 2027
27.	Establish information platforms to exchange experiences and information among agricultural producers.	Establishing and activating information platforms	The dynamics of the number of users is increasing	**200**		**200**				100		100	MOA	FAO GIZ USAID JICA	2025 2027

28.	Involvement of international financial institutions in the development of projects aimed at expanding financing for financial leasing programs	Participation of international financial institutions in project development	The volume of investment by international financial organizations (monetary contributions , technical assistance) is increasing.										MOA	FAO GIZ USAID JICA	2025 2027
29.	Creation of a legal framework and tax incentives for investors in the development of financial leasing of agricultural machinery and equipment	Legislative framework and tax incentives have been adopted and are operational .	The volume of used benefits expands										MOA MOFRT	FAO GIZ USAID JICA	2025 2027
30.	Development of new forms of financial leasing relationships												MOA MOFRT	FAO GIZ USAID	2025 2027
4.	**Assistance in updating agricultural machinery and equipment and introducing modern technologies**														
31.	Development of measures to encourage producers and importers to import and use modern agricultural machinery and equipment in accordance with the conditions of diverse climates and standard requirements	Proposing incentive measures for manufacturers and importers of agricultural machinery and equipment	Incentive measures are developed and adopted by authorized bodies.										MOA	FAO GIZ USAID JICA	2026 2027

32.	Development of incentive measures for the introduction of modern technologies that facilitate soil cultivation and irrigation management to save resources in the context of climate change , including the use of precision agriculture methods , automated irrigation management systems , drip irrigation , field cultivation using drones , etc.	Proposing incentive measures for manufacturers and importers of agricultural machinery and equipment	Incentive measures are developed and adopted by authorized bodies.										MOA	FAO GIZ USAID JICA	2026 2027
33.	Conduct a complete analysis of the demand for agricultural machinery and equipment by region, city, and district of the republic	The research is conducted across the region .	Research results are used to fully identify needs.	**300**		**300**		100		100		100	MOA TAAS, Tajik Agrarian University	FAO GIZ USAID JICA	2025
34.	Development of a concept and general structure for the development of a machine system for agricultural producers, taking into account the characteristics of each region and crop type	Development of the concept and overall structure of the development of the machine system	The machine system is being put into practice. The mechanics of the structure are being developed.										MOA TAAS, Tajik Agrarian University	FAO GIZ USAID JICA	2025 2027

	5. Development of the service system of agricultural machinery and equipment														
35.	Modernization of the material and technical base of existing repair points by providing preferential loans for the organization of technical service centers in order to organize service	Updating existing points continues.	Increasing the volume of investment										MOA	IFADA GEF JICA USAID	2025 2027
36.	Strengthening the material and technical base of the technical service centers of the Republican State Unitary Enterprise "Tajikagroleasing " with agricultural machinery and equipment (within the framework of the Resolution of the Government of the Republic of Tajikistan dated 01.08.2015, No. 474)	Technical service centers are being established.	Increase in the number of centers ; increase in the volume of center income	**60000**	**30000**	**30000**	1000 0	1000 0	1000 0	1000 0	1000 0	1000 0	MOA MOFRT	IFAD GEF JICA USAID	2025 2027
37.	Development of a system of granting privileges to agricultural producers for the purchase of spare parts and maintenance of agricultural machinery and equipment	A system of granting privileges is being developed.	The dynamics of the volume of benefits offered is increasing .										MOA	FAO GIZ USAID JICA	2025 2027
38.	Creating favorable conditions for the establishment of service enterprises based on outsourcing	Creating favorable conditions for outsourcing companies	Increasing number of companies outsourcing										MOA	IFAD GEF JICA USAID	2025 2027

39.	Development of training and professional development programs for service personnel	Training and staff development programs are developed and implemented.	Increasing the number of qualified specialists										MOA Committee on Primary and Secondary Vocational Education, TAAS, Tajik Agrarian University	FAO GIZ USAID JICA	2025 2027
40.	Creating favorable conditions for the establishment of enterprises such as Associations of Agricultural Machinery and Equipment Users	Favorable conditions are created for the establishment of enterprises.	The existence of the enterprise										MOA	FAO GIZ USAID JICA	2025 2027
41.	Development of a system for monitoring the technical condition of agricultural machinery and equipment	A system for monitoring the technical condition of agricultural machinery and equipment will be established.	Dynamics of the number of records in the system										MOA	FAO GIZ USAID JICA	2025 2027

6. Increasing the technical competence of agricultural producers and the specialization of recruited personnel															
42.	Consideration of issues of training and retraining of agricultural mechanization personnel at the bachelor's, master's, and doctoral levels, as well as conducting long-term courses, trainings, and educational seminars for agricultural producers and organizers of technical and service centers	Optimal training programs are being developed	Increasing the number of qualified specialists	**800**		**800**		200		400		200	MOA	FAO GIZ USAID JICA	2025 2027
43.	Development and dissemination of information materials on maintenance and service provision	Information materials on the maintenance and service of agricultural machinery and equipment were developed and distributed .	Availability and availability of materials	**300**		**300**		100		100		100	MOA	FAO GIZ USAID JICA	2025 2027
44.	Introduction of a system of attestation and certification of personnel of technical and service centers	An attestation and certification system is being introduced .	Dynamics of the number of certificates and attestations issued										MOA	FAO GIZ USAID JICA	2025 2027

45.	Involve development partners in conducting information sessions to promote innovative agricultural mechanization	Development partners are involved .	Dynamics of development partners ' participation in information meetings										MOA	FAO GIZ USAID JICA	2025 2027
Total				**207 880**	**95,000**	**112 880**	**30,000**	**37 060**	**32 600**	**39 160**	**32 400**	**36 660**			