

REPORT OF THE JAPANESE TECHNICAL  
GUIDANCE TEAM FOR DEWAHUWA  
RURAL DEVELOPMENT PROJECT,  
SRI LANKA

JANUARY, 1974

VERSEAS TECHNICAL COOPERATION AGENCY

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## INTRODUCTION

The Dry Zone of Sri Lanka is well known as the area which flourished many years ago with the development of the so-called tank civilization.

Three years have already elapsed since the Rural Development Project was formulated and set afoot to augment agricultural production and improve the people's livelihood in Dewahuwa, a community embraced in the Dry Zone, under a technical cooperation agreement concluded between Sri Lanka and Japan.

The last three years have seen many notable achievements creditable to the project implementation such as the infrastructural improvements including farmland consolidation, introduction of advanced farming techniques and practices involving active use of tractors, and fostering of the community's agricultural cooperative society with financial back-up. However, there still remains room for further improvement for wider spill-over of the project's benefits not only within the project area but in the neighbouring districts.

The problems awaiting such additional improvement effort include those to be solved on the spot in the village as well as those pertaining to arrangement and consultation between the governments of Sri Lanka and Japan under the current cooperation agreement.

It was for efficient solution of these problems that the present survey team was sent to Sri Lanka and had a series of useful discussions with the authorities concerned in Colombo and Dewahuwa.

The first Japanese survey team that visited Sri Lanka in 1968 was led by Dr. Nasu who founded the rural development concept. As a member of this team, I took part in the selection of the project area. In 1971, again, I had the opportunity to accompany Dr. Nasu and participate in the discussions held in Sri Lanka.

The present survey therefore constitutes the second technical guidance team.

Since my first visit to Colombo, the world has undergone considerable changes in physical and socio-economic conditions, to which Sri Lanka has not been an exception. The fact that the project has yielded many improvements in the face of changing conditions is quite significant. I wish to take the liberty of expressing my respect for all the specialists of Sri Lanka and the Japanese experts who have participated in the project and my personal attachment for Sri Lanka and the project.

On behalf of all the team members, I avail myself of this opportunity to express my deep gratitude to the competent authorities of Sri Lanka and Japan for

the valuable cooperation and assistance extended throughout the survey period.

Leader      Hitoshi Fukuda

October 1973

Hitoshi Fukuda

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MEMBER LIST OF THE SURVEY TEAM

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## I. Purpose of Survey

The survey team left Japan with the terms of reference covering the discussion with the Government of Sri Lanka about its proposals and the evaluation of the outcome of and establishment of the future implementation plan for Dewahuwa Community Project.

The following were the proposals made by the Government of Sri Lanka.

1. Transfer of the rice mill and 6-ton trucks to the agricultural cooperative society.
2. Provision of two-wheel tractors to the mid- and down-stream areas.
3. Cancellation of the plan to construct irrigation and waterworks facilities in the 100-acre highland area.

Prior to the deputation of the team, the opinions of the Japanese Government about these proposals had been conveyed to the Sri Lanka Government. The team's task was therefore to discuss with the Sri Lanka Government along the lines laid down by the Japanese Government with full account taken of the existing situation of the community and thereby reach an agreement acceptable to both governments.

With respect to another task assigned to the team under the terms of reference, i. e., evaluation of the project and establishment of its future implementation plan, it was understood that top priority should be given to the setting up of a system under which the outcome of the past and future development efforts could be most efficiently handed over to the Sri Lanka side before expiration of the project period. For this reason, the team was required to make an overall assessment of the results attained by the project over the last three years and select improvement plans to be carried through in the remaining about two years of the project period.



## II. Proposals Advanced by Sri Lanka Government

### 1. Transfer of Rice Mill and 6-Ton Trucks to Agricultural Cooperative Society

As regards this proposal, the Japanese Government informed the Sri Lanka Government, before deputation of the team, that it had no intention of effecting to the current agreement a revision necessary for the proposed transfer, but that it was ready to agree to the lease of the equipment on a long-term basis if the cooperative society so desires.

Through a series of discussions held in Colombo and Dewahuwa as well as during the survey of rural areas, the team gained a good understanding of the merits of the proposed total transfer. Nevertheless, it leaves little doubt that the provision of the equipment by lease has its own noteworthy advantages such as the technical training of farmers and supply of parts during the lease period. These advantages cannot be expected of the proposed total transfer.

After consultation with the Sri Lanka Government, it was mutually agreed that no revision would be effected to the current cooperation agreement and that the Sri Lanka Government would endeavour to persuade the cooperative society into concluding with the government a contract stipulating that during the project period, the equipment would be leased on a long-term basis for transfer upon expiration of the cooperation agreement.

### 2. Provision of Two-wheel Tractors to Mid- and Down-Stream Areas.

This proposal is indicative of the improvements attained by the past cooperation activities in the upstream project area, which present a sharp contrast to the delayed development in the mid- and down-stream areas. Considering the fact that all the three areas in Dewahuwa are placed under the water management of a single water system from Dewahuwa Tank and covered by a single cooperative society, the proposal is quite understandable and may as well be regarded justifiable.

In its reply to the Sri Lanka Government, the Japanese Government stated that the expansion of the project area mentioned in Article 1, Paragraph 1 of the Agreement should be dealt with by mutual agreement of the two governments, pointing out that the supply of equipment alone is a departure from the intrinsic nature of technical cooperation and should therefore be separately considered as, for example, under the KR aid programme.

During the survey in Colombo and Dewahuwa, it was mutually understood that additional services that can be offered by the Japanese experts, such as the training

of local operators and mechanics in the operation and repairing techniques, would be far more conducive to the community's development than the contribution of equipment only, and that there is ample possibility of providing such additional services.

Upon consultation on this matter, the Sri Lanka Government stated that it would follow the method provided for in Article 1, Paragraph 1 of the Agreement, to which the team replied, while admitting that it was not in a position to give a pledge to the said additional services, that the Japanese Government would be urged to make effort towards provision of such services.

In view of the purport of the Agreement and the capacity of Japanese experts now stationed in the upstream project area, it is quite probable that the cooperation activities in the mid- and down-stream area, if realized, will not be so intensive as in the upstream area. However, this type of cooperation will help the Sri Lanka Government find the opportunity to play a more pivotal role in coming development.

### 3. Cancellation of Plan to Construct Irrigation and Waterworks Facilities in 100-acre Highland Area.

Global occurrence of abnormal atmospheric phenomena in recent years has invited shortage of rainfall in Sri Lanka and storage decline of Dewahuwa Tank. The decline was the heaviest in the 1972 - 1973 Maha season and the following 1973 Yala season. In the face of this acute water shortage, the Government promised the farmers that irrigation water would be conveyed from the existing Nalanda Tank included in the development project of the Mahaweli river basin. The effort of the Government to supply irrigation water to farmers merits high appraisal.

Although the construction of irrigation and waterworks facilities is stipulated in the Agreement, it is quite understandable that the farmers in the highland area showed little interest in it because they are now pressed hard for water for Maha season farming, not to speak of water for irrigation farming in Yala season to which they are traditionally wedded.

The Government of Sri Lanka made clear to the team its intention to relinquish the construction of the above water facilities in the highland area, and expressed its hope that pumps and other equipment already delivered from Japan would be used elsewhere in the project. The team received the impression that this proposal of the Sri Lanka Government was made after careful examination of the prevailing situation in the highland area. The team was also notified that a note verbale con-

cerning the proposal would be shortly sent to the Japanese Embassy in Colombo.

At the outset, the team stressed the need for embarking upon the said construction work in the 100 acre area as early as possible in consideration of the possible delay in the arrival of some of the equipment and of the limited time allowed for the project. The intention of the Sri Lanka Government having been made thus clear, however, the team reached the conclusion that it should accede to the proposal.

### III. Overall Project Evaluation with Special Reference to the Outcome Made up to 1972

#### 1. Outline of Past Investments and Development Works

Development works are in progress in collaboration with the Sri Lanka Government according to the Community Development Programme presented in the Feasibility Report of 1969 in the upstream community of Dewahuwa which was selected as a unit of production-cum-livelihood improvement efforts.

As the outset, the total project cost was estimated at Rs 6,200,000, which was later revised to Rs 7,000,000 in the Definite Plan Report (1969).

Investment made according to the Definite Plan Report up to the end of 1972 amounted to about Rs 2,868,400 which is approximately 41% of the total project cost. 38% of this investment amount was disbursed by the Sri Lanka Government, and 44% by the Japanese Government. Machinery, equipment and materials to be supplied by Japan have been generally delivered on time, but the development works are somewhat behind the schedule.

The following is a summary of the past progress of the major development works contained in the Definite Plan Report.

##### (1) Infrastructural Improvement

Major infrastructural improvements effected up to the end of 1972 are the desilting of channels, slope protection, farm road improvement, and farmland consolidation over an area of about 85 acres.

Farmland consolidation set aside, improvement so far effected to farm roads and channels covers a portion of their total extensions so that it has not yet yielded the anticipated benefit.

##### (2) Initial Input for Better Farm Management

30 two-wheel tractors, 6 tractors and 5 sprinklers have so far been supplied to the community by the initial input for better farm management. In addition, 10 two-wheel tractors and 24 threshers have also been introduced under the KR aid programme. Of these farming equipment, the two-wheel tractors are exhibiting their excellent performance in the plowing and harrowing work as described in Chapter IV.

### (3) Pilot Farm

As regards the paddy field pilot farm, a 0.4 acre paddy field was acquired by lease from a farmer in the community and some experiments were conducted in the 1972/1973 Maha season. A 2.2 acre upland field was also created adjacent to the Mechanization Centre, but no trial cultivation has yet been made there.

Construction of the building and facilities of the Mechanization Centre, whose completion was originally scheduled for the end of 1972, is delayed and expected to be finished around the middle of 1973.

3 four-wheel tractors (24 P.S.), 6 two-wheel tractors (12 P.S. x 2 units and 5.5 P.S. x 4 units), two cutters, and two powered sprayers have already introduced for use at the centre.

## 2. Benefits Derived up to 1972

The project benefit can be considered in two categories, i. e., the direct benefit of accelerated agricultural production and the indirect benefit which includes the enhancement of the farmers' volition for production increase and the spill-over effect among the farmers living in the neighbourhood of the project area. The former benefit can be evaluated quantitatively. The latter benefit rejects a quantitative assessment, but it provides an immeasurable effect for the development of the project area and its environs.

From this viewpoint, the following may be said with respect to the benefits derived from the past project implementation.

### (1) Improvements in the Project Area

Before the project was set afoot, the roads in the project area were frequently waterlogged and the main channel banks collapsed in many sections in Maha season, causing siltation and change in the channel section. Ploughing therefore resorted to buffalos and tractors, and there were some paddy fields where the operation of tractors was just impossible.

Such being the situation, the farmers evinced little willingness for production increase. Since ploughing and levelling work was carried out after a considerably long time was spent for inundating the paddy field, sowing could not be done at the same time and the growth condition in any one plot differed from that in other plots. This not only made the fertilization control difficult but also gave rise to an extremely large loss of water.

In addition, non-fertilized farming practised over the last twenty years since the project area was colonized has exhausted the soil to a considerable extent. The absence of remedial measures for recovering the soil fertility was one of the major causes of the poor yield in the area.

During the two years since the project started working, the channels and farm roads were improved though not completely, allowing tractors to enter any paddy field in the project area. At present, the primary ploughing work is carried out by tractors in almost all fields, and buffalos are used for the second tillage when the soil becomes soft.

The peak transplanting season lasts from early November to mid-November. The acreage under direct sowing has been reduced remarkable to occupy only about 20% of the total paddy field area. Further, weeding and additional fertilization has become a part of the farming practice.

## (2) Income Increase

Although the farmland consolidation has progressed to cover only a portion of the total paddy field area, the yield of paddy per acre which registered 53 bushels in 1970/1971 Maha season increased to 74 bushels in the following Maha season.

The gross yield likewise increased from about 39,700 bushels to 55,500 bushels, recording an increment of 15,800 bushels in a matter of one year, which means that the paddy production rose by about 100 bushels per farm household in the project area.

This rapid production increase was attained by virtue of the technical guidance in the better farm management and application of tractors which made it possible to conduct the farming work at the right time.

To realize this accelerated paddy production, additional investment was made which covered the cost of introducing seeds of improved varieties, cost required for heavier dosage of fertilizer application, and expenses for initiating transplanting.

To put in more detail, a total of Rs 4,600 was disbursed in 1971/1972 Maha season to introduce 562 bushels of seeds of improved varieties. For heavier fertilizer application, Rs 7,700 was defrayed in 1970/1971 Maha season and Rs 26,300 in the following Maha season. Expenses required for initiating transplanting in a paddy field area of 167 acres amounted to a total of Rs 15,000. Thus, additional investment amount for augmented paddy

production totalled about Rs 38,200.

Since the income from the production increment totalled Rs 220,500 (Rs 14/bushel), the total income from paddy production marked an increment of about Rs 180,000.

Farmers in the project area were employed temporarily in the construction of the irrigation facilities, and female workers trained in the transplanting techniques were often hired by farm households. If the extra income earned by such temporary labour is added, the total farm income should amount to a substantially large value.

### (3) Indirect Benefit

Increased paddy production having been made a reality through application of improved farming techniques, the farmers in the project area are now making positive efforts for better farm management and augmented production as evidenced by the introduction of improved varieties, heavier fertilizer application and transplanting practice described in the preceding Item (2). It may therefore be said that the basis for future technical extension has now been well founded.

The farmers' voluntary effort ensued from the production increase in the project area has served as an incentive stimulant to better farm management in the downstream areas. Farmers in the mid- and down-stream areas alike have expressed the strong desire for introducing tractors to realize "transplanting at the right time". In the downstream area where the farmers followed the model set in the upstream project area, the acreage under transplantation of Maha season paddy increased from 40% (1971/1972) to 65% (1972/1973) of the total paddy field area, and the disbursement for fertilization also rose Rs 12,000 to Rs 44,000 during the same period. Thus, the project exhibited an excellent spill-over effect among the farmers outside the project area.

## 3. Economic Evaluation of Project

### (1) General Assessment

#### a. Production Increase

Despite the fact that the infrastructural renovation work is still in progress, an annual production increment of 15,800 bushels which provided an income increase of Rs 220,500 was attained (Rs 14/bushel).

The annual production increment is expected to surpass this figure when the project is completed and rational water management is put in practice.

b. Income Increase per Farm Household

1971/1972 Maha season recorded a yield of 74 bushel per acre. The primary production cost required to attain this yield totalled Rs 457, which included an increment of about Rs 150/acre over 1969/1970 Maha season. The increment was required to cover the cost of seed paddy and fertilizers as well as the expenses for establishing the transplanting and weeding practices.

This capital input produced a yield and income increment of 21 bushels/acre and Rs 294 (Rs 14/bushel), so that the income per farm household increased by about Rs 140/acre. Actual income is to be considered to exceed this amount because weeding is believed to have been conducted by the family members of farmers.

c. Extension of Agricultural Techniques

Agricultural extension is one of the major factors which contributed to the production increase. Through the active extension service, the farmers in the project area are now fully accustomed to the advanced farming techniques and applying them for betterment of their farm management. Training of 40 young farmers in the project area in the tractor operation and 4 other young farmers (1 from outside the project area) in the repair of tractors has already been completed. All the trainees having applied the techniques they acquired for practical purposes in the last two farming seasons, tractors can now be put in full operation at any time to save the labour and accelerate the production.

Further outcome can be expected of the extension work when the pilot farms are completed and put in full operation.

d. Activities of Agricultural Cooperative Society

The three agricultural cooperative societies which used to be run independently in the up-, mid- and down-stream areas respectively were amalgamated into a single society with the start of the project. The existing cooperative society has its head office in the project area and the offices of the former societies are operated as its branches to expand the scope of its activities.



The society's activities including the provision of agricultural credit, supply of producer- and consumer-goods to its members, and joint marketing of paddy have been expanding year after year. The society's net income as reported in its loss and profit statement for 1972/1973 amounted to as much as Rs 41,438.

In the credit business, recovery of loans advanced under the government-related financing system is in smooth progress and a special loan of Rs 50,000 is provided against receipt of land as security to prompt the dissolution of UGAS.

c. Farmers' Voluntary Effort for Production Increase and Its Spill-over Effect

The farmers' self-imposed effort for better farm management is truly remarkable in the project area. In addition to the control of fertilization and betterment of routine farm care which, as described already, can be cited as a good evidence to show their strenuous endeavours, all the farmers in the project now show a positive concern for betterment of livelihood and living environments as manifested in the drilling of new wells and repair of existing ones and increased remodelling or additional construction of their houses.

The voluntary improvement effort made by the farmers in the project area has exhibited a magnificent spill-over effect in the adjacent mid- and down-stream areas. Both the acreage under transplantation and the dosage of fertilizer application are increasing steadily in these two areas, assuring a rapid spread of the new and advanced farming techniques introduced in the project area.

The project can therefore be highly assessed as having produced the expected spill-over effect.

(2) Indices for Economic Evaluation

While less than half of the infrastructural renovation work has so far been completed, it is known that an annual net income of about Rs 180 thousand was attained by the application of fertilizers and advanced farming techniques.

With this fact taken as the basis, the economic justifiability of the project is studied in this item using the equations applied in Japan for economic assessment of the validity of land improvement works.

$$\text{Investment efficiency} = \frac{\text{Justifiable investment amount}}{\text{Total project cost}}$$

- Notes: 1. It is generally accepted that the investment can be offset if its marginal efficiency is larger than 1.0.
2. The total project cost covers only the infrastructural renovation cost.

The amount of justifiable investment can be calculated by the following equation.

$$\text{Justifiable investment amount} = \frac{\text{Annual net income}}{\text{Capital redemption rate (1 + Interest during construction)}}$$

The above equation should be rearranged as follows because the infrastructural renovation of this project does cause any financial burden on the farmers, nor does it incur any interest during construction.

$$\text{Justifiable investment amount} = \frac{\text{Annual net income}}{\text{Capital redemption rate}}$$

Assuming that the facilities constructed by infrastructural renovation work have an average durable period of 35 years, the capital redemption rate turns out to be 0.065 as calculated below.

$$\text{Redemption rate} = \frac{8(1+i)^n}{(1+i)^n - 1}$$

where,  $i = 0.055$  ,  $n = 35$

Hence,

$$\text{Justifiable investment amount} = \frac{182,308}{0.055} = \text{Rs } 2,804,738$$

The total project cost considered for the current land improvement work is the cost of infrastructural renovation alone. If an amount of Rs 3,496,000 which is appropriated for infrastructural renovation from the aforementioned total cost of the present project (Rs 7,000,000) is taken as the total project cost, the investment efficiency turns out to be 0.8 as calculated below.

$$\text{Investment efficiency} = \frac{2,804,738}{3,496,000} = 0.8$$

The above equation indicates that the optimal investment amount is somewhat too small to make the project economically justified. However, if the effect of infrastructural renovation in the entire project area, saving from rational management and maintenance of channels, and savings from the mechanized and labour saving farm management, which are all excluded from the net income, are taken into account, the investment efficiency will naturally

surpass 1.0.

It is consequently believed that the project will yield benefits that can amply set off against the investment.

#### IV. Future Implementation Plan of the Project

During its stay in Sri Lanka, the team learned fully that the Rural Development Project which started nearly three years ago in Dewahuwa Community is now highly evaluated for its rational implementation and stable nature as exemplified in the introduction of advanced farming techniques and practices and operation of the agricultural cooperative society. It must be pointed out, however, that the team also noted a number of problems awaiting further improvement efforts.

By reason of its intrinsic nature, agricultural development calls for a considerably long period of time and should be implemented according to a well balanced and flexible programme. What counts most for the present project is that the Sri Lanka Government plays a more pivotal role in its future implementation to promote the dissemination of advanced farming techniques and ensure an extensive spill-over effect of the project. The team hopes that the Sri Lanka Government will direct its efforts towards providing the farmers with the capability and willingness to augment agricultural production and improve their livelihood and welfare.

The following sections deal with the improvements desired to be effected to the project, which materialization was considered by Japanese and Sri Lanka experts to be indispensable to the success of the project.

##### 1. Improvement of Irrigation and Drainage

The infrastructural renovation involving irrigation and drainage improvement, farmland consolidation and road improvement completed before September 1973 as well as the existing state of water utilization and hydrostructures are explained below because the improvement of irrigation and drainage presupposes a full understanding of these factors.

##### a. Side slope protection of the main channel

Destruction of the main channel side slope is caused chiefly by the bathing of cattle in the channel and inflow of water from the mountain side. While the slope protection plan was mapped out to cover a total extension of 6,000 ft, the protection work completed by December 1972 covered 1,400 ft.

##### b. Desilting

Desilting has been completed along the total length of the main channel (9.75 miles).

c. Installation of check gates

Of the six check gates planned to be installed, two are now under construction.

d. Parshall-flume

Two Parshall-flumes have already been installed in the main channel.

e. Outlet

Outlet have been completed at 54 points along the main channel.

f. Road improvement

Road improvement has been completed along the entire length of the main channel.

g. Bridge

One bridge has been constructed.

h. Farmland consolidation

Since it started in 1971, farmland consolidation has been conducted mainly in Yala season because of its nature. The following table shows the past progress of farmland consolidation.

<u>Year</u>	<u>Acreage Covered</u>
1971	25 acres
1972	60 "
1973	155 "
Sub-total	240 "
.....	.....
1974	200 " (planned)
1975	200 " (planned)

The table means that the farmland condition in some parts of the total project area 770 acres does not call for consolidation.

Water management in the project area has not yet been sufficiently rationalized and integrated. To cite just one evil practice still followed by farmers, intake of water from the upper reaches of the main and branch channels and drainage into rivers is freely conducted for each 5 acre farmland cultivated by individual farmers, so that the farmers in the downstream areas are forced to suffer extreme water shortage. But it is known that the farmers cooperated with each other and adopted the rotational distribution system to save irrigation water in the 1972 - 1973 period when they experienced

a heavy shortage of rainfall. This fact is meaningful in that it points to the possibility of bringing a rational and systematic water management to a reality.

On the strength of the past infrastructural renovation described above, it is proposed that the effort for increasing the availability of water resources be effectively coordinated with the rationalization of water management.

(1) Augmentation of Water Resource

Farm management is largely dependent on the availability of water resources which, however, is subject to fluctuation of the Maha season rainfall. Except when rainfall is copious in Maha season, the storage of Dewahuwa Tank, the water resource of the project area, does not always maintain a level which is large enough to enable irrigation farming in Yala season.

In this connection, the plan of the Sri Lanka Government to convey water from Nalanda tank to increase the storage of Dewahuwa Tank is quite opportune and deserves high appraisal. The team sincerely hopes that the plan will be materialized at an early date.

(2) Rationalization of Water Management

Of a number of measures conceivable for rationalizing water management, those compatible with the progress so far made under the project are described below.

1) Introduction of Rotational Irrigation for Maha Season Farming

In the beginning of Maha season, the storage of Dewahuwa Tank is not very large and there is no assurance that it will be increased by abundant rainfall. It is therefore proposed that rotational irrigation be adopted from the outset of the season to take the place of the prevailing plot-to-plot irrigation and thereby retain as large a storage as possible for Yala season farming. Rotational irrigation is not anything new or ingenious. Farmers accepted this method during the 1972 - 1973 drought period. This proposal is made in the hope that the farmers will see that such intensive irrigation is a must for the improvement of their water management.

2) Establishment of Minimum Unit of Water Management and Integration of Outlets

From the experience gained through agricultural development carried out in various parts of Southeast Asia, it is generally accepted that the

minimum unit of water management should consist of 20 to 25 farm households or cover a farmland area of 10 to 50 ha. Such a minimum unit is to be covered by one outlet.

In Dewahuwa, farmers have one each of outlet and drain outlet for each 5 acre farmland they cultivate. In each of such 5 acre blocks they are conducting plot-to-plot irrigation freely and at their own convenience, causing extreme loss of water.

As a remedy to this water wastage, the team proposes that the whole Dewahuwa community be divided into blocks of suitable size (embracing about 15 farm households in the upstream project area) by the Cultivation Committee and each of such blocks be designated as the minimum unit described above. It is to be added that the realization of this proposal calls for integration or control of drain outlets. The team hopes that a workable plan be mapped out with consideration given to the existing situation of the community.

General management plans of irrigation and drainage are shown in Figs. 1 and 2 by way example.

Fig. 1 - Example of Outlet Integration

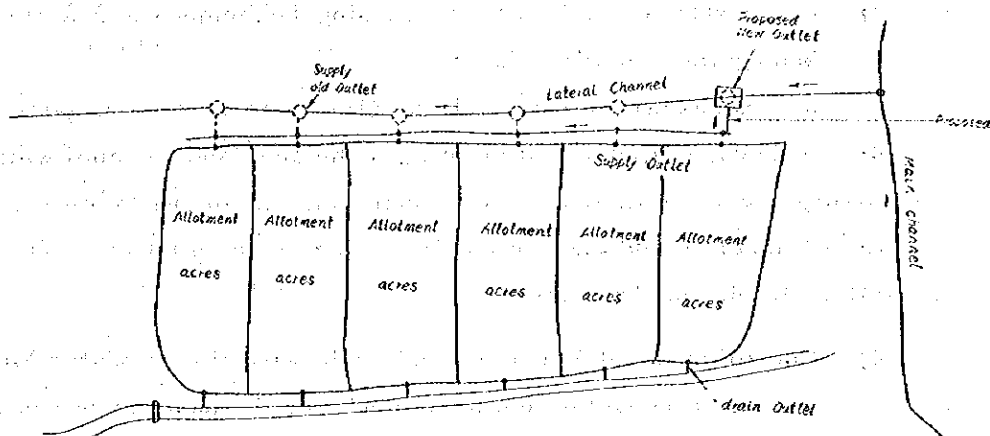
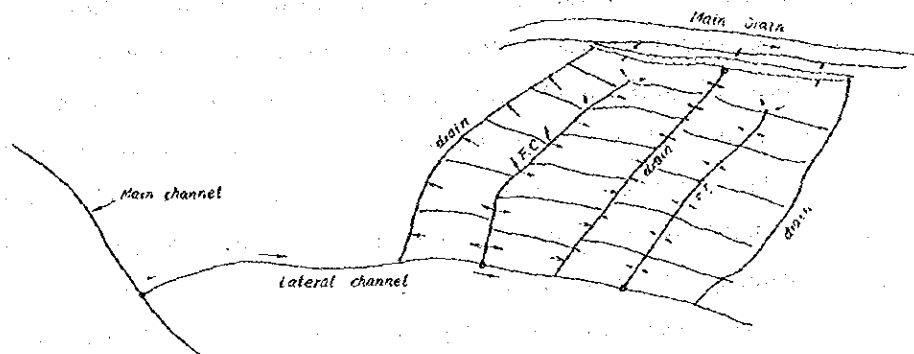


Fig. 2 - Example of Drain Outlet Checking



3) Demonstration of Advanced Farming Techniques and Rational Water Management at Pilot Farm

It is necessary to establish the pilot farm as soon as possible for demonstration of advanced farming techniques and rational water management and their effective dissemination among farmers. The team wishes to add that the establishment of the pilot farm is expressly stipulated in the Agreement.

4) Consolidation of Farmland and Rationalization of Water Management

Farmland consolidation prompted over the past years has produced many benefits including the improved maneuverability of tractors. It is hoped that the water saving effect will be brought about at an early date through harmonious coordination of farmland consolidation and water management rationalization. It is also hoped that further effort will be made to attain increased efficiency of farming equipment and rationalization of water management which are the most outstanding benefits of farmland consolidation.



### (3) Establishment of Integrated Water Management System

For effective implementation of the improvement measures proposed above, it is an imperative that individual farmers and all the organizations concerned should until their efforts and cooperate with each other.

The team is of the opinion that an intensive and organic water management system embracing the whole community should be established with the mutual understanding and agreement of the farmers' organizations such as the Water Meeting, Cultivation Committee and Agricultural Cooperative Society as well as the Department of Irrigation and Department of Agriculture after a careful and comprehensive study of the problems entailed in the operation of such a system.

The water management in the Dry Zone under the time-honoured tank system enjoys the world-wide renown for its ingenuity. The team is convinced that its improvement will add to the modernization of Dewahuwa Community.

## 2. Farm Machinery

In Sri Lanka, tractors were introduced some years ago chiefly for the purpose of "ploughing and land levelling at the right time." Having taken the place of manual and animal labour, these tractors are now used extensively, reportedly covering 70% of the country's arable land. They comprise four-wheel tractors and two-wheel tractors. According to the statistics of the Sri Lanka Government for the period from 1950 to 1968, there are about 12,000 four-wheel tractors consisting chiefly of the Ferguson type and about 3,200 two-wheel tractors.

The working efficiency of four-wheel tractors used in paddy fields for ploughing with a tyre tiller is limited to 3 to 4 acres per day, which is only about twice the area covered by two-wheel tractors. This poor working efficiency is attributable to the following reasons.

- 1) Paddy fields arranged into large plots are virtually absent, and the average area of one plot is as small as 1 a to 2 a.
- 2) The ploughing and levelling work is therefore made difficult and rather rough.
- 3) Farm roads are not satisfactorily improved.

Thus, two-wheel tractors are not exhibiting their capacity to the full in the ploughing work for which they are designed. However, since they proved to be very useful for many purposes including transportation, it is likely that the demand

for four-wheel tractors will keep on growing in future.

Two-wheel tractors, on the other hand, promise a higher working efficiency and better finish of land preparation work because most of paddy fields are arranged into small plots. In addition, general farmers give preference for two-wheel tractors over four-wheel tractors because of the broad expanse of applications they offer. It is therefore probable that two-wheel tractors will enjoy increased demand in the coming years.

Most of these tractors are owned by individual farmers, but there are some belongings to the government or agricultural cooperative society which are leased out on the commission basis at the request of farmers.

With the exception of tractors, there can be found no farm machinery and implements which deserve special mention.

In the following items, the future course of mechanization will be described with reference made to the existing situation of Dewahuwa Community.

(1) Tractor

1) Existing Condition of Tractor Utilization

At present, Dewahuwa Community has 40 two-wheel tractors, of which nine were supplied by the O. T. C. A. (Kubota's Model KR 850, 6 P.S.) and the remaining 31 under the KR aid programme (Izeki's Model KL 780, 6 - 7 P.S.). At the outset, they did not exhibit their capacity in the ploughing and levelling work due to frequent failure and deficient training of operators. With the training of 40 operators completed, however, ploughing by tractors is now conducted smoothly with the support of three mechanics who are capable of repairing malfunctions and failures excepting heavy damages.

The following table shows how tractors have been applied in the ploughing work in the project area.

Item	Primary Ploughing (A) (acre)	Second Tillage (acre)	Total (acre)	Number of Tractors Used (Number)	<u>A</u> 770 acres (%)
Maha Season					
70 - 71	190	38	228	20	25
71 - 72	638	285	923	40	83
72 - 73	640	221	861	38	83

The above table indicates that more than 80% of paddy fields in the upstream project area are ploughed by tractors, and that the soil is harrowed during the primary ploughing by the rotary tiller to the extent that the second tillage can be performed by buffalo-drawn leveller in many fields. In the second tillage, tractors need to be used in less than half the area covered by the primary ploughing.

A rental of Rs 35/acre used to be charged for tractor ploughing up to 1971/1972 Maha season. In 1972/1973 Maha season, the rate was changed to Rs 40/acre for the primary ploughing and Rs 35/acre for the second tillage.

The rental is collected in advance by the agricultural cooperative society. One-third of the receipts from this rental system is dispersed to cover the personnel expenses and the remainder is set apart for procurement of new farm machinery. Annual amount of the receipts thus set apart is shown below.

Item	Annual Reserve	Remarks
Maha Season		
70 - 71	Rs 4,768	
71 - 72	Rs 21,167	
72 - 73	(Rs 21,000)	Estimated from the total receipt of about Rs 34,000

Ploughing by two-wheel tractors is conducted when the soil becomes soft after watering for some days because it is sandy loam containing gravels. In paddy fields arranged into large plots, one two-wheel tractor can cover an area of 2 acres per day in primary ploughing, which is approximately twice the average area coverable in unconsolidated fields. Thus, two-wheel tractors are effective for ploughing paddy fields. The area coverable by a two-wheel tractor in the second tillage is 1.3 to 1.5 times the area ploughed in the primary ploughing, and this is because the second tillage is carried out after the soil becomes soft.

The above-mentioned two acre/day capacity is comparable to the standard capacity recorded in consolidated paddy fields in Japan (10 a/h). The average daily capacity in the entire farmland area, however, is 1.5 acres in the consolidated fields and about 0.8 acres in the unconsolidated fields.

2) Tractor Operation as Envisaged by Farm Management Plan (Mechanization Plan) Presented in Feasibility Report

In the farm management plan presented in the feasibility report, it was planned that the Maha season ploughing would be started on October 20 for completion by the end of November, so that a period of 35 days was set aside for ploughing and levelling work. Since the area coverable by a two-wheel tractor during this period was set at 25 acres under the plan, the numbers of days required for primary ploughing and second tillage can be obtained from the daily ploughing capacity described in the preceding Item (2).

$$\begin{aligned} 25 \text{ acres} + 1.5 \text{ acre/day} &\div 17 \text{ days (Primary ploughing)} \\ 25 \text{ acres} + 2.0 \text{ acre/day} &\div 13 \text{ days (Second tillage; 2.0 acre/day} \\ &= 1.3 \times 1.5 \text{ acre/day (capacity} \\ &\text{in the primary ploughing) )} \end{aligned}$$

This means that a joint farming group cultivating an area of 25 acres can complete the ploughing work in 30 days, and that the remaining five days can be appropriated for the repair service of tractors. The plan can therefore be considered justifiable.

It is assumed in the said feasibility report that the tractors will be operated for 600 hours per year and that two-thirds of transplanting work (one-third each of wet paddy and other crops) will be completed in Yala season. A simple calculation indicates that the season-wise breakdown of the operating hours turns out to be the following.

Maha season	8 hrs/day x 30 days	= 240 hrs
Yala season	240 hrs x 2/3	= 160 hrs
	Total	400 hrs

Considering the operating hours required for driving the tractors to and from the fields and transporting materials, the planned 600 operating hours is quite reasonable.

The two-wheel tractor operation plan for 25 acres contained in the feasibility report is thus justifiable from the past record of tractor operation in Dewahuwa Community.

3) Parts and Attachments

As described already, the soil in Dewahuwa is extremely solid and rejects ploughing work by tractors until it becomes soft by watering for

some time.

This soil condition incurs heavy wear of the parts and attachments including rotary tillers. In the 1972 - 1973 season, the rotary tiller had to be replaced as often as three times to complete the ploughing work in an 18 acre area.

This holds true in other parts of the country where four-wheel tractors are used. The team learned that the tyre has to be replaced with a new one for each 7 acre land.

One of the measures conceivable to make the rotary tiller adaptable to this soil condition is to harden it intensely in the production process which, however, is liable to make the tiller easy to break and incur a larger production cost.

Since the availability of parts is rather limited at the moment in the project area, it is necessary to provide some allowance for the tractor operation and secure the fund required for the repair service.

#### 4) Establishment of Farming Groups for Joint Tractor Operation

Under the existing rental system, applications for renting tractors are accepted by the agricultural cooperative society with the rent collected in advance, and organization of farmers into joint farming groups each covering 25 acres which is suggested in the feasibility report has not yet been started.

For effective future utilization of tractors, it is imperative that the farmers in each 25 acre land be organized into a unit. In this case, account must be taken of the fact that the 40 two-wheel tractors leased by the Government to the farmers in Dewahuwa Community are not handled with sufficient care and develop far more malfunctions than privately owned tractors.

It is therefore proposed that the joint tractor operation be carried out in either of the following two methods.

- (a) One of the farmers in each 25 acre land is designated to own a tractor for its utilization under the rental system, or
- (b) The tractor is owned by all the farmers in each area through their joint capital participation.

It may also merit consideration to bring all the joint farming groups under the control of the Mechanization Centre now being constructed,

and transfer the Centre to the cooperative society at some future date for its management by farmers themselves.

5) Application of Compost

Needless to say, compost exhibits the fertilizing and soil fertility preserving effects, and improves the physical characteristics of soil accelerating its aggregated structure and softening it, which makes tractor operation easy.

The easiest way to secure the supply of compost would be to make use of rice straw which is burnt and thrown away in the project area.

(2) Prevention Machinery

20 units of Hatsuta type mist blowers (shoulder type) are now available in Dewahuwa Community, but most of them are not in use because the area's paddy production is still on a low level and occurrence of diseases and insects is limited. Farmers therefore show little concern for them.

When paddy production increases in future by fertilizer application, they will be naturally required to control diseases and insects.

(3) Rice Seedling Planter

Rice seedling planters have not yet been introduced in Dewahuwa, but both the Government and farmers show a keen desire for their introduction. Since the planters have a very delicate structure and make easily the nursery bed work difficult, their application may not be materialized in the immediate future but should be given due consideration as part of future development plans.

(4) Future Course of Mechanization

Upon completion of the farmland consolidation work now in progress in Dewahuwa Community for rearrangement of fields into plots of 15 a - 30 a, ploughing by four-wheel tractors will become possible. Considering the Sri Lanka Government's hope for mechanized farming which is based on the availability of rural labour force, however, it is likely that two-wheel tractors combined with prevention machinery will play the principal role in the future mechanization. If used in paddy fields alone, the two-wheel tractors are not required to have any larger output than 6 - 8 P. S. If they are to be used in both paddy and upland fields, however, they should have an output of 12 to 15 P. S. just as the tractors currently used at the pilot farm.

Four-wheel tractors are now widely used for threshing. If BG 11 - 11, the representative paddy variety grown in about 70% of Sri Lanka's paddy field area, continues to be planted in future, four-wheel tractors will continue to be demanded just as at present. Admitting, therefore, that two-wheel tractors will play the central part in the forthcoming mechanization, it would be necessary to make studies on the use of four-wheel tractors with account taken of the progress of farmland consolidation into large plots.

### 3. Farmers' Organization

#### (1) Evaluation of the Past Activities

Considering the diversity of professional careers prior to their settlement into the Cology plus heterogeneity of their personal traits, re-institution and strengthening of the farmers' organizations in Dewahuwa Community should have been quite a painstaking task. In this connection, the joint efforts by Japan and Sri Lanka Governments under the Project in bringing the agricultural cooperative society to the existing level would deserve high appraisal.

Dewahuwa Multi-Purpose Cooperative Society has also successfully established and maintained a system of functional cooperation with the Cultivation Committee which is held responsible, as will be elaborated below, with water-management, farmland improvement and better farm management in its service area. Organization of the young-men and women in the area into the Young Farmers' Club and their training through active participation in the programmes for the Project implementation is another brilliant achievement; it has a lasting value of infusing fresh blood among, and eventually replace through evolutionary means, the village elders who have an inevitable inclination against modernization either ideologically or technically.

Among its credit services, Dewahuwa MPCS introduced for the first time in the history of rural credit in Sri Lanka a systematic liquidation of rural indebtedness among the colonist-members with the full understanding and all-out support of the Government of Sri Lanka, on and above the "Expanded Credit System".

It would be only after the authorities concerned of the Project should have exhausted their efforts in replenishing the shortcomings of these organizations during the remaining period of the Agreement that they could legitimately hope to "spill-over" the good examples attested in Dewahuwa Cology to the entire Dry Zone. Due to the lack of data and shortness of study period,

the Mission deeply regrets its inability to discuss on these tasks in full. It will be happy if the following observations and comments may serve, even in a limited way, the future programming and implementation of institutional development plan in Dewahuwa Project area.

(2) Agricultural Cooperative Society

1) Characteristics

By reason of its historical background, the cooperative society functioning in Dewahuwa is called by the name of Dewahuwa Multi-Purpose Cooperative Society, and its activities for its members have been and still basically are confined to the allocation of the cultivation loans, collection of paddy in return of these loans and surrendering the paddy thus collected to the Government-designated godowns, distribution of rations, and supply of daily necessities and restricted items of producer/consumer goods. Those other activities which would accredit the organization as a genuine "agricultural cooperative", such as the transportation, processing, storage and marketing of the agricultural products (other than paddy), the installation of the facilities for common-use by its members and for improving the farm labour efficiency, etc. are going to be taken up by Dewahuwa MPCS through the "external" help which originates from the Governments of Sri Lanka and Japan, but not spontaneously by the MPCS itself. Similarly, the land improvement, farm management betterment, installation of irrigation facilities and their management as well as guidance for better farming and better living has been entirely initiated and implemented by the said "external" forces.

All these activities should essentially be conducted by the co society in close contact with its members. At present, the society is not satisfactorily functioning partly because of the little concern shown by the farmers.

2) Business of the Cooperative Society

(i) Crediting

Credit available to the member-farmers through Dewahuwa MPCS is almost entirely that originating from the Government financed fund. Under this system, the paddy production in the Project area is depending on the cultivation loans (in cash for land preparation, transplanting, weeding and harvesting, and in kind as for seeds,



fertilizers and agro-chemicals) which are provided through the cooperative. Besides these loans, medium-term loans for redemption of cultivation-rights (liquidation of indebtedness through the cooperative) and procurement of tools, equipment and machinery are being offered in small amounts.

Since the cooperative societies operating in the Dry Zone naturally differ in their pattern of management from those in the Wet Zone, it might be worthwhile to study the feasibility of introducing a new credit system with the Government financial aid, such as the provision of the Natural Disaster Rehabilitation Loan at a lower interest rate and over a longer repayment period, or a creation of the Mutual Relief Fund for Crop Failures jointly by the Government, Society and the farmers which might help the farmers quickly recover from the damages wrought by bad weather or any other causes and reasons beyond their control.

Loan recovery has been improving over the past few years, registering about 75 per cent at present. This high recovery rate is attributable to the efforts of the Japanese experts and the counterpart officers of the Government of Sri Lanka. Farmers who fail to repay their loans by due date and show little concern for their obligations mostly cultivate very small tracts of land, which is rather surprising in view of the current regulations which restrict inheritance to the cultivation-rights entitled with each colonist within two persons and prohibit any sub-division or mortgaging of any portion of the cultivation rights. Since the cultivation loan provided by the Cooperative does not cover the entire input and labour cost, in additional investment out of the farmers' own capital is needed for adequate paddy production. Because of their poor economic footing, these farmers often find it difficult to raise the fund required for the purpose and, sooner than the cultivation loan is obtained, a considerable part of it would be spent for consumptive purpose to feed and clothe themselves and their family members. These farmers are doomed to become "defaulters" plus those who misuse their loans for speculative purposes in transaction of tobacco and other cash crops and/or animals. Since loans will be provided to the "defaulters" within a specific limit starting from this year, the

guidance in the advancement of loans and farmers' own planning of their livelihood will have to be offered in a more careful manner than before.

(ii) Marketing

Paddy used to be almost the only commodity marketed in a worthy quantity by Dewahuwa MPCs. While there are many other crops, such as chilli, green gram and pepper grown during both Maha and Yala seasons, their marketing through the Cooperative has seldomly been ventured. As things stand now, the Society could lose the very cause of its existence. The purpose of agricultural cooperative society lies not only in supply of production materials and daily necessities but also in marketing of the commodities produced by its member-farmers. The prevailing poor activity of Dewahuwa MPCs in its marketing sector is assignable to the fact that, while some ten crops including paddy, onions, pepper and hot pepper are covered by the Guaranteed Price Scheme and the Society is prepared to collect these crops at the designated prices, the intermediary merchants buy them directly from the farmers at prices higher than GPS prices. To put an end to this situation, the Society should try to purchase these crops at the prices comparable to those offered by the broker-merchants or the market prices, and obtain profit by cutting down the distribution cost by collecting and selling them in larger quantities. Crops whose prices are not supported by the Government might be purchased at somewhat lower price-levels than the market price and the profit minus the Cooperation's marketing commission returned to the farmers after sales. These improvement measures will become workable through the cooperation and understanding of the individual member-farmers and their confidence in the Society's activities. Fund required for purchasing these crops will have to be sought from the Co-op's own capital (plus members' savings) and replenished, if necessary, but the loans from the People's Bank; an adequate marketing commission will have to be collected for the smooth performance of the marketing business.

(iii) Education, Training and Guidance

Managerial and organizational guidance is placed in the hand of the Assistant Commissioner-in-charge and a Cooperative Inspector who are both the Government officials. Direct guidance service is given by the counterpart officers participating the Project. Cooperative services in such as credit, input supply and marketing, etc. would better satisfy the needs of the member-farmers if combined with technical guidance in farming, operation and maintenance of agricultural machinery and demonstrative education in better living practices. Therefore, it would be most desirable that Dewahuwa MPCs itself should extend its sphere of activities to these branches of farmer service activities. The Mission is of the opinion that the Society should train technical staff who could work in the above-said fields of farmer services and employ their services to provide technical guidance to its members in close collaboration with the Government officers.

(iv) Co-op Facilities for Common-Use by the Member-Farmers

Facilities intended for common-use by the member-farmers must be established, operated and maintained by the Cooperative. It should be an essential part of the Society's activities and could be prompted in relation to its marketing services. Dewahuwa MPCs is planning to operate in this sector through appropriation of a part of its net profit as the necessary cost for the purpose. It is very much hoped for that such facilities as agricultural machinery service station, oil supply station, joint speed sprayers, rice mill, farm produce processing and manufacturing plants, and collecting yards of vegetables, pulses and fruits will also be included in its plan. As the marketing business increases in volume, it will call for agricultural warehouses and trucks. It is, therefore, proposed that a long-term plan be worked out with all these conditions taken into full account.

3) Corner-Stones for Building a Stronger Co-op.

(i) Long-Term Planning

For the sound and smooth operation and management of the Co-

operative Society, a working plan should be formulated for each business year. The annual working plan must contain the well defined policies with unmistakably stipulated processes and procedures for implementing the strategically more important business lines of the year, the target to be reached in each sector in terms of the volume to be handled and the profit to be raised, the financial programme, etc., which will have to be determined after careful assessment of the member-farmers' farm management plans and better living programmes for the corresponding year. Annual working plan, to be more useful, should preferably be set into the framework of a perspective plan extending for a period of three to five years; long-term plan needs to be worked out by taking into consideration such factors as the trends of the consumer market, the price fluctuations of agricultural commodities there, the commodity distribution system and other relevant factors in the years to come. Both annual and long-term planning of this nature has never been worked out by Dewahuwa MPCs to far. Since a lack of systematic approach would lead to make-shift decision at each turn of the event and eventually result at instability of management and failure to meet the members' desires, the Mission strongly urges that efforts be directed toward formulation of a long-term management plan by Dewahuwa PMCS.

(ii) Strengthening of the Society's Capital Position

The share-capital subscribed to by the outstanding members of Dewahuwa MPCs falls short for expanding the scope of its business, installing additional facilities and advancing more credit to its member-farmers (including advance payment for the commodities to be purchased by the Society). It is, therefore, an imperative need to improve the capital position of the Society by all the possible ways and means; there may be some practical methods to attain this purpose. Strengthening of the capital position of Dewahuwa MPCs can not be attained overnight; it should be planned as a long-term intensive programme or campaign.

(iii) Education and Training of the Co-op. Office-Bearers and Employees

Needless to say, agricultural cooperative society is an organization of the farmers, by the farmers, and for the farmers; accordingly its office-bearers and employees are constantly required to provide the best services and wisest guidance for the benefit of the member-farmers. This intrinsic nature of the agricultural cooperative calls for the services of the well experienced organizers with practical knowledge as the custodians of the members' properties and the managers of appurtenant business affairs.

Judging from this yard-stick, Dewahuwa MPCS has many miles to go before it arrives at its goal of perfection.

(3) Cultivation Committee

The Cultivation Committee in the Project area is composed of eleven members and each one of them is allocated with his own duty area. The Cultivation Committee's duties as stipulated by law include the guidance in farm-management, the land improvement, the irrigation and drainage control, etc. In actuality, however, the Committee has not yet recorded any appreciable achievements in any one of these aspects.

The Committee collects dues for water management and irrigation facilities' maintenance at Rs 6 per acre/year. The Mission failed to ascertain whether this amount is collected as maintenance cost or water rate or land tax. The Mission felt that the Committee should certainly be able to carry out various activities for the benefit of the farmers if this much dues are regularly and exactly collected from every farmer who till the land.

(4) Young Farmers' Club

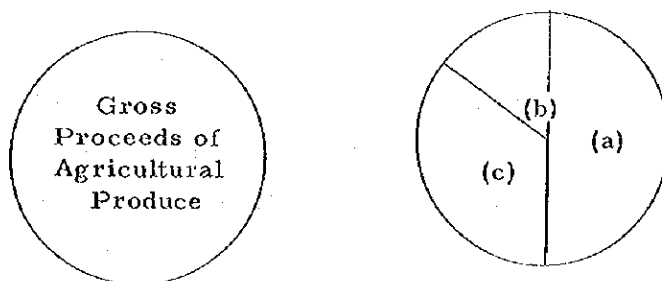
The Young Farmers' Club in the Project area deserves attention in that it promises to provide ample opportunities for training young male and female agricultural successors, ranging from 14 to 25 years of age, in improving farming techniques and better living practices through active participation in various development works sponsored by the Project, while preventing them from juvenile delinquency. The youth organization in the Project area was initiated in 1971 by the efforts of the Project authorities in two independent groups, one for the youngmen and the other for the young women. It might be desirable that this Young Farmers' Club should be re-organized into Dewahuwa

MPCS's sub-organ so that its constituent members could be commissioned to undertake farming of either whole or part of the land whose productivity has not been fully developed due to poor management by so-called "defaulters" and/or those farmers who surrendered the whole or part of their cultivation rights under "Ande" or "Ugas".

The optimal development of the productivity of the neglected lands by application of the advanced farming technology learned by the young-men and women under the Project's guidance in the past is the such novel venture will have to be made on a well considered basis among the three parties concerned, viz; the youth group who will be the actual tillers of the land, the MPCS which will be responsible for an overall operation, and the farmer who is entitled with the cultivation-rights of the land. The Mission is generally in favour of the principle that the gross proceeds from the agricultural production there may be distributed as follows:

- (a) Farm Management Consignment Fee . . . . . Youth Group
- (b) Overall Supervisory Fee, plus Commissions for input supplies and marketing of the products . . . . Dewahuwa MPCS
- (c) Rent . . . . . Farmer

which may be illustrated as below:



(size of the respective slices of the pie will differ according to the terms and conditions of farming contract and prevailing circumstances)

The Mission learned that the similar idea had once been proposed for the deliberation of the Board of Directors of Dewahuwa MPCS but was not adopted. Assuming that the Board's decision against the proposal was influenced by the restrictions and limitation set in its implementation, viz; Rs 5,000 only as the fund and in the upper-stream area alone in the sphere of operation, this proposal may enjoy the support of the Board of Directors when two more Young Farmers' Clubs, one in the mid-stream area and the other in

the down-stream area of the Colony will be duly organized. In support of this proposal, the Mission likes to invite the attention of the village elders' unviased attention to the appreciable results the similar experiment brought about in the upper-stream area during Yala seasons in the last few years.

#### 4. Cultivation

##### 1. Achievements

##### (1) Increased Paddy Yield

The Project's attempts to improve paddy production practices preceded the construction and repairs of farm roads, irrigation facilities etc. The efforts on these improvements almost instantly brought about their effects in the form of increased paddy yield in the project area, namely, 74 bushels per acre in '71/'72 Maha season, as 50 per cent increase over 53 bushels in the previous season. The project was able to retain the yield of 72 bushels per acre, in spite of a heavy drought which affected all through the country in the later part of '72/'73 Maha season.

The project has set the yield target at 80 bushels for the coming '73/'74 Maha crop. It seems to be certain that this target will be achieved, unless the nationwide drought which started in the last Maha still continues in this season. Besides, a steady increase in the rate of the adoption of improved practices by the farmers appears to warrant early achievement of the projects initial target yield, 90 bushels per acre.

##### (2) Improved Practices in Paddy Cultivation

Technically, the following factors have mainly contributed to the yield increase in paddy cultivation.

##### 1) Adoption of Transplanting

The traditional seed broadcasting (direct sowing on puddled field), is of comparatively labor saving. The observation by one of the Japanese experts indicates that broadcasting takes only one day labor per acre while transplanting needs 15 - 20 days. However, heavy fertilization on the broadcasted paddy field easily causes lodging, which sets a limit on yield. On the other hand, transplanting rice seedling makes its stems and roots resistant to lodging, and it brings about better yield response to fertilizer application on the field. Row transplanting, compared with

random transplanting, enables the use of weeding wheels and contributes further to increased production. The project's recommendation, demonstrations, etc. to the Dewahuwa farmers on this practice have increased the rate of transplanted area to more than 80%.

#### 2) Fertilization

The project added another example of a remarkable paddy yield increase in response to fertilizer application. The Sri Lanka Government has made various efforts to persuade farmers to increase fertilizer application, for example, by setting a guideline in the quantity of its application and by subsidizing farmers 1/3 to 1/2 of their fertilizer purchase costs. Its efforts seem to have had a certain effect on the Dewahuwa farmers prior to the beginning of the project. But it is the project's intensive guidance and recommendations to the farmers that realized a remarkable increase in fertilizer consumption.

#### 3) Tractor Ploughing

Traditionally most paddy fields had been ploughed using buffaloes as a main power source. Lack of enough power had caused ploughing period to take more than two months, lasting until the end of December. It causes a delay in paddy transplanting and broadcasting, and decreased production compared with earlier cultivation. The project introduced thirty two-wheel tractors to this area, and using additional ten two-wheelers allocated to Dewahuwa out of the machines given to this country through Kennedy Round Economic Aid Programme, covered about 80 per cent of paddy fields in about one month, thus enabling earlier transplanting.

#### 4) High-Yield Varieties

BG 11 - 11, which the Sri Lanka Government is strongly recommending as a high-yield variety for Maha crop, has favorable fertilizer response, and is resistant to lodging due to its short stems. The project has succeeded in increasing the acreage under this variety up to 60 per cent in '72/'73 Maha.

#### (3) Cultivation in Yala Season

The project have enjoyed a remarkable achievement in Maha cultivation, while its works on expansion of Yala cropping has apparently delayed. The



Initial plan indicated that it was possible to grow paddy on one third of total acreage in the upper stream area of Dewahuwa, and auxiliary food crops on one third. The farmers voluntarily made a resolution to withhold '71 and '72 Yala cropping in order to facilitate earlier completion of construction works. Water shortage in the Dewahuwa Tank due to severe drought prevented the farmer from cultivating any crop in '73 Yala.

The project, however, devised a little alternative in irrigating Yala crops by pumping water from a drainage canal. It facilitated cultivation of auxiliary crops on 23 acres in the upperstream area and 40 acres in the middle- and downstream area in '73 Maha. The upperstream's 23 acres were cultivated by the Young Farmers Club members who applied for the projects invitation to Yala cultivation. Some farmers in the area individually cultivated additional 9 acres in the upperstream area and 10 acres in middle- and downstream area without pumped irrigation.

Another plan has been under close consideration, in which the Tank's seepage to a drainage canal is pumped up to a 100 acre upland field facilitating additional Yala cropping. The plan, however, appears to be facing a difficulty due to lack of water in the canal.

#### (4) Spillover Effects to the Middle- and Downstream Areas

It is an indisputable fact that diffusion of improved farming practices and a resulting increase in paddy Yala in the upperstream area has affected to a great extent the farmers' thinking and practices in the middle- and downstream area, due partly to the fact that they also have used irrigation water from the Dewahuwa Tank.

Rate of transplanting acreage in the area, for instance, increased from 30% in 170/'71 Maha to 65% in '72/'73 Maha, while it rose from 43% to 84% in the same period in the upperstream area. It appears that the farmer is trailing the latter in one year lag. Another example is that paddy yield per acre increased from 53 bushels to 72 bushels in three seasons in the latter, while it is estimated the yield rose to about 60 bushels in the latter. (Data is not available for '70/'71 Maha.)

These figures appear to show us that the farmers' fervor to increase their paddy production is no less intense in the area where the project's intensive "extension and supervision" does not directly reach. However, the farmers in the area is definitely handicapped compared with their prede-

cessors. They are handicapped because they are unable to receive the tractor plowing service which made earlier cultivation possible and the project-oriented special loans such as the Expanded Credit System which facilitated the introduction of improved practices. Judging from their present economic conditions, it is difficult for them to obtain the same achievement as the upper-stream area overcoming these handicaps, unless some effective assistance is given them from the project or the Sri Lanka Government.

## 2. Suggested Improvements

### (1) Expansion of Yala Cultivation

There is a delay in the expansion of Yala cropping due to reasons explained in 1 (4). A solution to this problem, however, largely depends on a quantity of the Tank water held over from Maha by economizing its consumption in order to irrigate Yala crops.

It goes without saying that cultivation of Yala crops is essential for achieving expected economic returns to investment and increasing farm income in the project area. Expansion of Yala cultivation is, in this context, bears no less importance than what the project has achieved in Maha paddy cultivation. Its fundamental answer may come from an additional water supply from the Nalanda Dam to the Dewahuwa Tank, which is under close examination by the Sri Lanka Government. For the moment, however, the project needs to make every efforts to economize water use in Maha season and try to expand acreage under Yala crops.

A choice of crops planted in Yala season has become more important from economic viewpoint than it used to be. In addition to rice the major crop, so-called auxiliary food crops such as green grams, soybeans, groundnuts, vegetables, etc. are planted in Yala. In these days both farmers and the Government officials are more interested in the expansion of acreage under auxiliary crops rather than rice because of a sharp increase in the former's market price.

It appears that most managers in development projects the Mission visited were trying to increase production of these crops in Yala season. This is a justifiable behavior from the standpoint of economy in water use. Because irrigation water is a production factor whose supply is limited to the greatest extent among production factors such as land, labor, etc. for Yala cultivation in the dry zone areas, the farmers' best choice would be to plant

the one which would bring about the greatest income from a given quantity of irrigation water. The Dewahuwa project, therefore, needs to make a careful examination of cost-income relationships for each Yala crop.

## (2) Changes in the Methods of Extension and Supervision

The project's efforts in improving farming practice and farm management have been unfolded in the form of close examination of and recommendation to individual farmers mainly by Japanese Experts. Now that the term of the Agreement expires in about two years, the project has to set on a work in laying a firm organizational foundation on which the farmers and their organization are able to continue the improvement of the area's farming without any intervention by Japanese experts. For this purpose, the following improvements are suggested.

- i) Enhancement of farmers incentives to improve their farming
- ii) Intensified activities within the framework of farm organizations, for example through Cultivation Committees, Young Farmers Club, etc.
- iii) Improvements and strengthening of activities by the Sri Lanka staffs within the Project.

It is understood that the Project faces multifold obstacles to the targets listed above. Experiences in agricultural extension in Japan indicates that technological innovations either by individuals or groups are carried out by a new generation i. e. by young successors of the farms rather than these practiced farming for a long period. This suggests that a key question is how the project have the Young Farmers Club commit itself not only in operating tractors and transplanting, but also in the whole process of organized activities. The Project is presently examining the possibility that leading persons in the YFC join the Cultivation Committees as auxiliary members and take over practical jobs, releasing the Committees decisions from traditional way of thinking. This proposal appears to be the most practical means to activate the farmers organized activities in the area.

## (3) Further Research for Higher Yield

The initial plan (the feasibility report) set target yield at 90 bushels per acre for paddy production in Maha season. (It is equivalent to 370 kilograms of brown rice per ten areas. Compare it to normal rice yield of 444 kilograms in Japan.) Though extension of improved practices to a greater

extent would easily push the yield up to the target, still greater yield will be desired in a long run. The Project also appears to need an allowance in addition to ninety bushels for periodical drought year. It is suggested, therefore, that further researches and experiments are made in order to find what are needed to realize a greater production in paddy. Although the researches may not bear their fruits on the field of Dewahuwa farmers in the remaining two years, they will undoubtedly benefit the project as well as farming in whole Sri Lanka in the long run.

The following items would be interest

- i) Desired amount of fertilizer applied
- ii) Effects of organic matter in soil and method of its application.
- iii) Intensive water management.
- iv) Improvements in seedling beds
- v) Effects of trace elements.

Priority should be given to fertilization levels and its timing. It is expected that a greater productivity will be realized by heavier fertilization than the Government's guidelines, due largely to improvements in cultivation as well as introduction of lodging resistant and high yield varieties.

Effect of organic matters of soil on the growth of rice plants and paddy production has been deeply examined and a fairly large amount of information has been accumulated in Japan. In Sri Lanka, however, much of the question remains unanswered. Effects of compost or other organic matters applied to soil should be carefully examined, because the fields are under different productivity level, different physical and chemical properties of soil, etc. from those of Japan. Besides, fumus changes soil structure, namely to crumbled structure, thus facilitates tractor ploughing study should be made also on this question.

In addition to these items, the project seems to be interested in the use of paddy planters which are spreading all over Japan in these days. In fact the introduction of the machines into Dewahuwa may substantially increase acreage by row transplanting, which will affect paddy yield favorably. However, further studies will be needed on (1) labor and technical level needed for nursing seedling, and (2) costs of machine use. It is desirable to examine its technical and economic possibility on experiment level.

3. Pilot Farm

The Feasibility Report planned the Pilot Farm to be established as a part of the Project. The Farm, it declared, would be established in order (1) to instruct farmers improved practices and demonstrate what the improvements would bring about, and (2) to study and experiment various questions which the farmers wanted answers to and which the Project would face in implementing its plan.

The Farm, however, has not started its operation yet. Last year a small scale experiment on fertilization was made on a 0.4 acre paddy field rented from one of the farmers in the area. The Project also opened a 2.4 acre field for upland crops in 1972, but no crop was sown due to absence of water supply facilities. Building supposedly used by pilot farm has recently been completed next to the new Mechanization Center.

The delay in the operation of the Farm occurred (1) because the Project was forced to introduce technical improvements directly into the farm fields without examination on the experimental level, in order to materialize economic improvements in the early stages, (2) because the Project's consultations and instructions to individual farmers left no spare time to spend on research and experiments, (3) because site of the farm had to be changed, and (4) because there was a discrepancy in views between the Project and the Government over the administration of the farm.

In the course of implementing its plan, the Project is facing new questions to be studied and new practices to be demonstrated on the pilot farm, some of which are as follows:

- i) Research and demonstration concerning new water management on paddy fields.
- ii) Technical and economical studies in auxiliary food crop cultivation.
- iii) Research for still greater yield for paddy.

Presence of these problems appears to necessitate early operation of the Pilot Farm.

Administration of the Pilot Farm should be carried out under close cooperation among all Project staffs, because the problems to be examined and solved through its operation covers every field of the program implementation, such as crop cultivation, farm machinery, irrigation, etc.

Pilot Farm operation would need an additional fulltime technician such as an Agricultural Instructor who was assigned to the Project from the Government in

1972. Some effective ways to alleviate administrative problems could be devised. The Project, for example, is considering the possibility of living labor on temporary employment instead of on permanent basis, and of renting paddy field from a farmer.

## V. Conclusion

The project has yielded notable achievements through its implementation along the line of rural development for which it was originally planned. More than half of the project period having already elapsed, the team considers that now is the high time for both Japanese and Sri Lanka experts to expend further effort for the development of Dewahuwa community.

For this purpose, the Sri Lanka Government should naturally take a more positive part in the project, and it is strongly hoped that the project will be implemented in a more intensive way with full cooperation of Japanese experts. To be more precise, the team hopes that opinions and views will be exchanged more frequently and coordination intensified between Japanese and Sri Lanka sides at all levels involving central and provincial as well as farmers for whom extension work will be conducted. Needless to say, such intensified implementation calls for further cooperation efforts of Japanese experts and all organizations concerned.

In concluding this report, the team wishes to express its desire for augmented efforts of all parties concerned and for organic interrelation between the whole project and individual development plans.

# ANNEX



## ANNEX - 1

### Brief of the Japanese Mission on the Activities of the Dewahuwa Project

In very comprehensive characteristics of agricultural developments, depending on their locality, technically, economically and also socially, the Dewahuwa Project cannot be exceptional.

Their progress should be made flexibly and realistically, adjusting itself to the present and changing environments. But the basic concepts of efficient agricultural extension among farmers through intensive technical cooperation between two Governments Sri Lanka and Japan cannot be overlooked too.

Namely in order to level up the profit of farmers through agricultural products and its economical considerations, the host country is expected to play a pivotal role. The Japanese Mission is quite pleased to have found that the Project at Dewahuwa has been carried out very efficiently and dynamically in the favourable direction pointed above. And at the same time the Mission has understood some important problems, practical and basic, which are essential to accelerate the Project activities so efficiently that in our remaining term of the Agreement, they can meet the desire of farmers to the possible maximum extent.

Frankly speaking, it seems to us that we are at the keen fringe of the step of "to do or not to do". It is not a question, we should put as many measures as possible into practice at the earliest time, to make our attractive Project a "SRI" success.

The problem are briefed as following, and will be explained more in detail separately.

1. Providing two wheel tractors to the Middle and Lower Stream Areas.

To this problem, it is reasonable and favourable to apply No. 1, Article 1 of the Agreement in which the co-operation between the two Governments may be extended by mutual agreement to any other fields in case of the necessity for the Project.

In this time, some amount of such technical co-operations as training operators, and mechanic and so on are besides the tractors, to be considered, and also some financial procedures, though not in so quantity as in the upstream area, may be needed.

The Mission is expecting this procedure be taken up by the Sri Lanka Government as soon as possible.

2. Upland Water Supply for Irrigation and Domestic Purposes.

Now that the projected area has been severely suffering from shortage of water due mostly to the global unusual phenomenon of climate, the Mission is in a position to understand the farmers' feeling being reluctant to carrying out water supply facilities in the upland area.

But on the other hand, the term of the Agreement is limited and might not be enough for us to send some additional articles for water supply from Japan, and to complete the works, if the final decision delayed. The Mission would like to expect the final decision of the Sri Lanka Government be made by January 1974 as requested by the Japanese experts to the Government, though the mission was informed that the Government intends to settle the matter by May of 1974.

1. Irrigation and Drainage

1) Increase of water resources in the Project area.

The mission is glad to have heard that the Government is conveying water stored in Naland tank to supplement the capacity of Dewahuwa tank, which is a most suitable means to stabilize and prosper the agricultural development of the Project to a great extent. The mission earnestly desires the increase of the capacity of Dewahuwa tank be practiced as soon as possible.

2) Rationalization of Water Management in the Project Area

2)-1 Introducing rotational irrigation system through Maha season.

2)-2 Integrating supply outlets of water into a bigger one and its control for cultivation practices.

2)-3 Integrating drain outlets of water into a bigger one and its control for cultivation practices.

The big supply and drain outlets are intimately cooperated with each other to manage water use efficiently.

3) Integrating related organizations for rational water management.

Farmers, cultivation committee, cooperative society, water meeting, Departments of Agriculture, and Irrigation etc. are requested to set a unified body to understand and function the rational water management at the level of the whole area to be irrigated by Dewahuwa tank.

2. Cultivation

- 1) High evaluation of improved farming carried out in the Project combined with a practical credit means for the farmers.
- 2) Intensifying the activities of Cultivation Committees in cooperation with agricultural extension promoted by the Government.
- 3) Rationalizing water management veloted with crops in Yala season.
- 4) Establishing pilot farms, as scheduled, for solving the technological and management problems.

3. Farm Machinery

- 1) Two Wheel Tractors
  - 1)-1 Promoting consolidation for efficient use of two wheel tractors.
  - 1)-2 Considering a system of common use or ownership of a two wheel tractor working now in 25 acres among five farmers.
  - 1)-3 Providing parts and repairing fund sufficiently to some amount.
  - 1)-4 Increasing compost application for efficient ploughing through physical improvement of soils.
- 2) Machines for controlling damages from diseases and insects should be put into careful consideration from now.

4. Agricultural Cooperative Society, Cultivation Committee and Young Farmers Club.

- 1) Agricultural Cooperative Society
  - 1)-1 Promoting the systems for production guidance and common use of such facilities as machinery service- and processing-stations etc.
  - 1)-2 Stable expansion of credit system.
  - 1)-3 Establishing common sales system.

Collecting farmers' products at the guaranteed prices (equivalent to market prices), the society finds its own route to sell them and makes compensation for any loss to farmers due to price changes.

- 1)-4 Training manager, salesmen and clerk for improving their ability of management.

- 1)-5 Setting a long term plan of 3 - 5 years in which the farmers are led to make their farming plan, and based on that the society prepares some guiding principles of its management.
- 2) Improving Cultivation Committees and cooperating intimately with Agricultural Cooperative Society.
- 3) Vitalizing the activities of Young Farmers' Club for making big contribution to agricultural development and also for increasing farmers' dependence on the Agricultural Cooperative Society by their mutual intimate linking.

