Kingdom of Cambodia

# Preparatory Survey on BOP business Expansion in crop yields and empowerment of farmers driven by agricultural mechanization with used farm equipment

## Final Report
(Summary)

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Japan International Cooperation Agency
(JICA)

ReNet Japan Group Inc.

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## Map: Cambodia


Source: https://upload.wikimedia.org/wikipedia/commons/8/86/Cambodge_Carte-Provinces.png

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# Abbreviation

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| RJG: | ReNet Japan Group |
| JICA: | Japan International Cooperation Agency |
| MAFF: | Ministry of Agriculture, Forestry and Fishing |
| TPC: | Thaneakea Phum (Cambodia), Ltd |
| HKL: | Hatta Kaksekar Limited |
| MLVT: | Ministry of Labor and Vocational Training |
| ILO: | International Labor Organization |
| PCSDC: | Posen Chey Social Development Center |
| USD: | United State Dollar |
| GDP: | Gross Domestic Product |

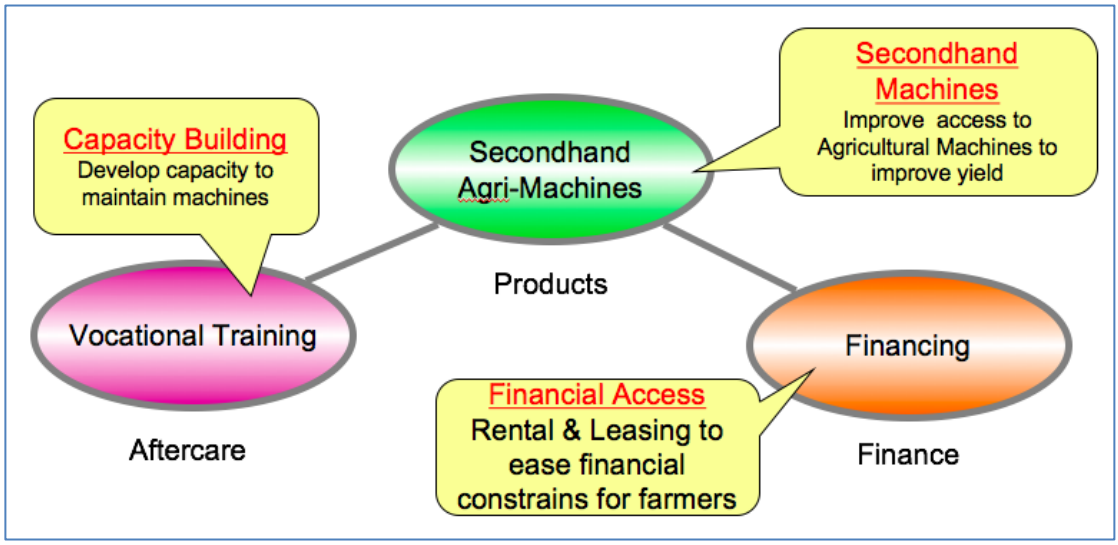
# 1. Project Background

This report is prepared by ReNet Japan Group Inc. (RJG), a private company incorporated in Aichi-Prefecture, Japan in 2000. The study, commissioned by Japan International Cooperation Agency (JICA) to RJG, examined the feasibility of the business model that promote agricultural mechanization in Cambodia by utilizing the secondhand agriculture machinery available in Japan and surrounding countries. The study was held from April 2013 to August 2015.

RJG involves in promoting reuse and recycle of the various products available in Japan. RJG's corporate vision is to contribute promoting the development of "Sustainable society with no waste" around the world. The company explorer options to promote the reuse of the used agricultural machines in Japan or other countries by supporting agricultural mechanization in the developing countries.

Mechanization is key to modernize agricultural practices and to gear up the speed of the agricultural sector development. The agricultural mechanization will initiate more efficient agricultural practices by lowering down the cost of labor and increasing the agricultural yield.

The study aims to consider the feasible business model to support agricultural mechanization in Cambodia. It focuses on the three important components that may enhance agricultural mechanization, which are, 1) Sourcing of the good quality, low cost secondhand agricultural machines, 2) Improvement financing scheme, 3) Development of technical capacity of mechanics and machinery users.




**1.1 Project Model Components**

1) Sourcing of the good quality, low cost secondhand agricultural machines

This component of the study aims to find approaches and route to source good quality, low cost agricultural machines. Currently, the secondhand machines are more popular than new ones as the most of the farmers are not afford to purchase the new machines. In this component, the focus will be to identify such as, what types of the machines suited for Cambodian farmers?, how and where do the machines source from?, what are the important check points when sourcing secondhand agricultural machines?

2) Improvement financing scheme

The most of the farmers cannot afford to purchase the machines. The component of the study aims to identify the feasibility of the various financing scheme to improve the machin-

ery access to the farmers. Such as provision of leasing and rental or agricultural machinery loans are the financing scheme to consider.

3) Development of technical capacity of mechanics and machinery users.

This component of the study identifies the approach to improve maintenance and repair skill by offering the vocational training program. Currently, there are shortage of the mechanics who have enough knowledge in maintenance, repair and operation of the machines. the maintenance and repairs shall be appropriate done in order to the machines continuously working during the high season.

The study will evaluate the feasibility and impact of the business model that included the above three approaches. It is assumed that the model will eventually to contribute in lifting up the incomes of the poor farmers by improving the agricultural productive by easing the access of the machinery.

# 2. Overview of the Sector

## 2.1. Agricultural Mechanization

The agricultural sector plays crucial role in Cambodia both in economic development and in social stability. The sector occupies one third of the gross domestic products (GDP) of Cambodia. Also, over half of the Cambodians are farmers that involve in the agricultural activities. Especially, the low income household depends on the farming activities for their source of income. The most of the low income household, which takes almost 30% of the total household, are small scale farmers.

Rice production covers the majority share in the agricultural production. Cambodia currently produce over 8 million tons every year with annualized growth of about 9%. However, the productivity of the agriculture is still remains very low compared to other countries in ASEAN. The farming is largely dependent on the traditional methodology using livestock and seasonal labor for the cultivation and harvest. Such labor dependent farming is becoming especially difficult due to the labor shortage and the increase of the labor cost due to the urbanization and increasing migrations.

In order to increase rice production, the government has set the so-called “Rice Policy” in 2010 which aims to increase rice surplus of 4 million tons and rice export to 1 million tons per annum by 2015. Although the rice surplus has reached its goal, the rice export goal will not likely be reached on 2015. The main issue is the cost of the rice price compared to other surrounding countries such as Thailand and Vietnam. The mechanization shall play an important role for increase production, improve quality and reduce the overall price of the rice.

The access of the agricultural machines is still limited for Cambodian farmers. Although the rapid increase in the number of machineries has seen in recent years, especially for the power tillers and tractors, the data by Ministry of Agriculture, Forestry and Fisheries (MAFF) in 2012 shows that there are only 140,000 units of those machines working in Cambodia.

Cambodia is surrounded by the two major agrarian machine market in ASEAN, Thailand and Vietnam. It holds the soil and climate condition similar to the two. Thus it is foreseen that Cambodia will show the rapid growth in the agriculture machinery similar to those surrounding countries.

The survey in Battambang shows that 52% of 104 farmers own the agricultural machines, mainly the power tillers. The rest of the farmers use agricultural machines by renting from the farmer who owns the machinery or use the traditional method of the farming. The research shows the 60% of the total agricultural land is currently mechanically plowed, considerable growth compared to 20% in 2001.

The agricultural machinery sector is growing rapidly in recent years and the growth is considered to continue as many farmers still do not have the access to the machinery. Especially, the farmers having access to the machinery by machinery rental shall expand furthermore and the upgrade of the machinery such as from the power tillers (Walking Tractors) to tractors or tractors to combines will be seen in recent years.

## 2.2. Financial Access

The formal banking sector in Cambodia comprises of three main types of financial institutions, Commercial Banks, Specialized Banks and Microfinance Institutions. Commercial Banks and Specialized Banks plays role in providing finance to the corporations and small & medium enterprises, while the Microfinance Institutions deems to provide finance to rural area including the farmers.

The microfinance sector shows double digit growth every year. In 2015, there are 51 microfinance institutions with total loan outstanding of 2.2 billion and 1.7 million clients. The annualized growth of the total number of clients reached about 15-20% and the growth of the loan volume shows even higher.

The growth of microfinance sectors, nevertheless, did not benefit the farmers as much as it should be. The study shows only 7% of total lending goes to the agricultural sector. The issues lie both lenders and borrowers. While the farmer (the borrower) tends to have less repayment capacity, the high interest rate and strict enforcement of loan collateral hinder the poor farmers to access microfinance loans.

Several microfinance institutions started to provide finance to the agricultural machines. For example, Thaneakea Phum (Cambodia), Ltd (TPC) has started the pilot program on Agricultural Machinery Loan products in 2013 and made an official launch of the product in April 2014. In addition, Hatta Kaksekar Limited (HKL) and AEON Microfinance also started the agricultural machinery loan programs.

Also, there are several new players in the microfinance field that focus on agricultural machinery as its key business area. ORO Financecorp started in 2014 focus agricultural machinery loan in their core business activity. Also, a Japanese investor plan to open a microfinance institution which is currently conducting a registration process to launch a microfinance operation specifically focused in agricultural sector.

Although the microfinance sector is under high competition with many lenders in the field, the outreach to the agricultural sector has not yet covered well. The product for agricultural mechanization is started to be considered by the several players, yet the number of the institutions offering such products are still limited. It is considered that there is still large gap between demand and supply for the loan for agricultural machines.

### 2.3. Technical skills and Vocational Training

The vocational training field is mainly driven by the government and NGOs. The Ministry of Labor and Vocational Training (MLVT) is the government institution that oversee the formal vocational trainings.

The formal vocational training program comprises of 4 types of education levels, 1) “Certificate”, 2) “Diploma”, 3) “Higher Diploma” and 4) “Bachelor”. The Certificate is provided to the students that has enrolled for the short term training course such as in the provincial training schools. The Diploma course is the high school level of education in the technical schools. The Higher Diploma is the college level education within 2 years. The Bachelor degree is the 4-year university level education.

MLVT offers the vocational training programs under its technical schools in Phnom Penh and provinces. There are It offers from certificate level training to university level Bachelor degree. The total number of student in MLVT schools is around 6,000 in 2010. Over 50% of the students enroll for higher diploma level of education.

The study by International Labor Organization (ILO) showed the graduate of vocational training schools can earn higher income compared to the workers without the degree. Compared to the students that only graduated high school, the average salary is 30 dollars higher. Also, the men with technical school diploma earn as much as the university graduate. Therefore, the demand of the vocational training is high in order for the Cambodians to increase their earning.

Currently, there is no formal vocational training program related to the agricultural machinery. Several educational institution plans to open the agricultural machinery course including Royal University of Agriculture, University of Battambang and Chea Sim University in Prey Veng. Those institutions are universities that focus on providing theories rather than the technical practices.

In summary, the vocational training is the important field for the Cambodians as it improves the technical skills and increases income of the mechanics. In turn, there are virtually no vocational training offered for agriculture machineries in Cambodia. As the demand for the machinery increases, such program to lift up the technical capacity of the agricultural mechanic is becoming important field in the education sector.

# 3. Result of the Pilot Program

The pilot program was implemented during the study to identify suitable approach to promote agricultural machinery through the offering of the secondhand machinery, rental and leasing service and vocational training programs.

The pilot was held during October 2013 to June 2015 divided by the 2 periods. First period was the pilot held in Battambang province and second period was held in provinces around Phnom Penh such as Takeo, Prey Veng, Kompong Cham, Konmpng Speu and Svay Rieng.

## 3.1. First Period (October 2013 – April 2014)

During the first period, the agricultural machine rental program and vocational training program were implemented. The rental program was held in Battambang, the province that is one of the largest rice production areas in Cambodia with local partner, JC Group. The vocational training program was held in Phnom Penh at the Posen Chey Social Development Center (PCSDC). PCSDC is the vocational training center under Ministry of Social Affairs, Veteran and Youth Rehabilitation. It offers various training programs to the person with disabilities or the person under extreme poverty.

The rental program offered the famers to plow their rice or vegetable field on service. RJG provided the tractors with operators and fuel and charge certain amount of fee based on the hector that was plowed. The tractors were the secondhand machines made in Japan, one was the 50 horsepower and the other was 73 hp. JC Group maintained field operation including sales, service operation, money collection and reporting while RJG involved in monitoring and development of management systems, training to the JC Group's mechanics.

The service was offered during March and April 2014. There were total of 127 customers that requested the service. The service was offered to about 30% of the customers requested. The rental price was 35-45 US Dollars per hector depend on the distance and the depth of the plow. The result of the pilot shows that there is high demand for the service. However, as the demand are concentrated in the specific period during the plowing season, the machine requires to be operated with high efficiency. Also, the fuel saving is the important factor to consider since 40-50% of the rental fee have gone to the fuel cost during the pilot.

**3.1 Used agricultural machinery (Tractor) in plowing**

The vocational training program for maintaining and using agricultural machinery properly is provided in Phnom Penh during the pilot period. The training was 3-month course held on weekends. The total number of the participants was 15 including teachers and students in

Royal University of Agriculture, Instructors of technical school such as JVC Technical school or Don Bosco Technical School and mechanics in PCSDC. Over 90% of the participants has responded that the course was satisfactory. The pilot program was offered for free of charge but the participants were willing to pay for 40-60 USD for the course. Also, the short training course was provided to the University of Battambang for the professors in the university extracting the key points of the 3 months course.

**3.2 Training scene with real machine (Tractor)**

### 3.2. Second Period (May 2014 – June 2014)

The second pilot program was implemented during plowing period for the rainy season rice. The lesson learnt from the first period of the pilot was that the high fuel cost hinders the business feasibility of the rental service. As such, the second period limit the service in the specific area in order to save the fuel cost. Also, it was found that it requires efficient operation working with the local entities who can oversee the operation since the rental service requires a lot of effort in identifying customers, assign the machines, evaluating the land size and money collection. Then, the second phase attempted to identify local farmers groups to outsource the rental operation.

Furthermore, the second phase has focused on providing machines on lease to the local farmers groups and let such groups to implement the machinery rental business. In this way, the local farmers groups can improve its business operation by receiving additional income from the machinery rental business, learn operational know-how and attain the skill and experience in machinery maintenance.

The initial study on the local farmers groups found that there are 500 cooperatives in Cambodia organized under the supervision of the MAFF. The interviews with several cooperatives in Prey Veng, Svay Rieng, Takeo, Kampong Cham and Kampong Speu resulted that the majority of the farmers in the cooperative has demand for the machinery rental. Among the 8 cooperatives interviewed, 3 cooperatives expressed interest in conducting rental program for pilot.

The pilot rental service was held with two cooperatives, one in Prey Veng and the others in Takeo. The pilot in Prey Veng provided incentive to the cooperative while outsourcing the field operation. During the 1 month pilot, the total revenue was 862.5USD and provided about 90 USD for the cooperative. Considering that the plowing season is generally about 2 to 2.5 months, the seasonal revenue can be expanded. The issues lie in the high fuel cost and

high idle rate due to the machinery repair. If the machines did not face any repairs the revenue has increased and use less fuel, indicating the good quality machines and maintenance to reduce the risk of breakdown is very important for the rental service.

The second phase pilot has shown that the potential of the business scheme working with the local farmers groups such as the cooperatives. Although the operational improvement shall further be in place in order to make the business profitable, it has shown the high demand by the cooperatives to enroll in the rental service and further to lease the machines for their additional business.

# 4. Proposed Business Strategies

The result of the pilot program showed the agricultural mechanization would be promoted through the business model that combined three components, Secondhand Machinery, Vocational Training and Finance. The model would also be financially feasible for the private sectors to sustainably involve in the business.

The strategies to develop the business are proposed in each different category; the business phases, operational structure, sourcing and sales and marketing. The agricultural machinery market in Cambodia is still under early stage development, the business development follows to the advancement of the customer's technical capacity and recognition towards the machinery. Also, the sourcing of high quality machines at lower cost would be important factor for the business.

## 4.1. Business Phases

The business model could be expanded by going through the following 4 phases.

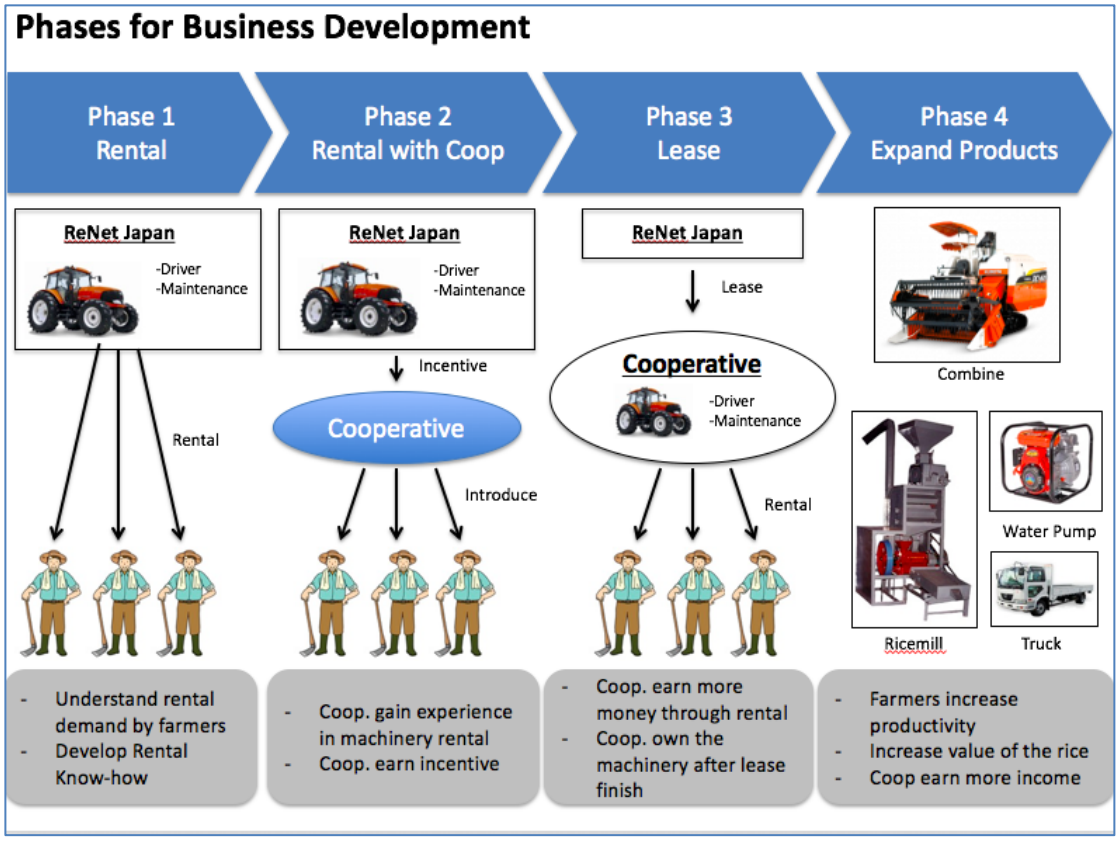



**Figure 6.1: Business Development Phases**

**Phase 1:** The model provides the machinery rental business to the farmers. The operation and maintenance of the machines are held by the company and provided service directly to the service.

**Phase 2:** The expansion of the rental network will be achieved by partnering with the local farmers' groups and cooperatives. The Phase 2 will focus on providing know-how of the machinery rental service to the groups and cooperatives. The cooperatives will identify the rental demand from its members. RJG provides the rental service based on the demand. The incen-

tive will be provided to the cooperative as per set amount per hector. In this process, the co-operatives will earn only incentives, however, they learn how to identify customer and how to conduct rental operation through working RJG.

**Phase 3:** RJG will provide leasing to the cooperative in the phase 3. In this phase, the cooperative will provide rental service with their own machine provided by RJG through the lease. The cooperative will be in charge of the whole rental operation, maintenance. Compared to the phase 2, the cooperative will take higher revenue by conducting rental service. Also, they are able to own the machines after the lease is fully paid back.

**Phase 4:** The similar model can be expanded to other machineries besides tractors including combines, rice mills, water pumps and trucks. RJG will provide those products on lease. After going through the previous 3 phases, the cooperatives are assumed to be capacitated to use the agricultural machines both in maintenance and operating rental business.

### 4.2. Operational Structure

There will be three functions necessary to operate the business model, which are "Souring & Sales", "Maintenance & Repair" and "Finance". "Sourcing & Sales" involves in identifying the secondhand machinery to purchases and sell to the prospective customers. It is assumed that 1 person can take charge of about 10 machines. "Maintenance & Repair" functions conduct support to the customers to develop their maintenance skills and provide repairs if it is necessary. It assumes that 1 staff per 15 machines. "Finance" will involve in the credit evaluation of the leasing customers.

### 4.3. Sourcing

The study revealed four potential sourcing routes for the secondhand machines, Japan, Korea, Thailand and Cambodia. Thailand has the highest potential as the sourcing route. The logistic cost is lower than from other regions. The size of the machinery does not match when the machines are sourced from Japan. The secondhand machineries available in Japan are mostly small size machines from 20-30 horse power. Thailand has plenty of over 40 horse power machines that are suitable to the soil condition in Cambodia.

### 4.4. Sales & Marketing

The three sales and marketing method are considered to be effective which are "Word of Mouth", "Business-To-Business Partnership" and "Develop customer database". The farmers mainly receive information through the world of mouth. During the pilot program, the rental inquiry mainly came by the word of mouth that the existing client introduce the service to the new ones. Preparation of the tools to support the word of mouth would be effective. In addition, the network will be expanded by coordinating the government, international organizations and NGOs. The "Business-To-Business" approach helps to expand the client base without allocating human resources to develop a client base. Finally, the client information will be collected by developing the database so that the service can be efficiently run in the next season.

# 5. Financial Feasibility

The business model is estimated to be financially feasible. The agricultural machinery sales will produce annual profitability rate of 16.6%. The agricultural machinery rental business is estimated to produce 25.6% of return and finance and vocational training program will also gain certain margin from the business.

## 5.1. Tractor Sales

In 2012, the annual sales of the tractor were 2,175 units according to MAFF. The growth of the annual sales has doubled during the 5 years. The growth of the sales is estimated to keep up on the level. The estimate shows the annual sales will reach to about 7,000 units per year as the percentage of the Cambodia farmers who own the tractors will reach to the same level as the average in Asia.

Considering if 50% of the tractor sales are secondhand machines, the annual volume of the secondhand agricultural machines is estimated to be 52.5 million US Dollars. If the business takes up 1% of the annual volume. The total annual income is estimated to be 525,000 US Dollar. During the pilot program, the profit rate per machine is 16.6% including the machines' original price, logistics cost and cost for the sales staff. Under such estimate, the annual profit will be 87,150 US Dollars.

## 5.2. Tractor Rental and Lease

The total estimated agricultural land cultivated by the machinery is 1.7 million hectors in Cambodia according to the research in 2013 by MAFF. If the 50% of the machine cultivated land uses the machines by rental. The total demand of the machine rental would be 850,000 hectors. As the market price of the rental is about 40 US Dollars per hector, the total demand of the machinery rental is estimated to be 34 million US Dollars every year.

The profit rate of the tractor rental program before depreciation is estimated to be 25.6% based on the result from the pilot project. Under the estimate that the business will occupy 1% of the total rental demand, the total cultivated land by the business will be 8,500. The depreciation will be 30,000 per annum if the business owns 20 machines to fill up the demand with depreciation period of 10 years.

In total, the estimated profit of the machine rental program would be 58,000 US Dollars per year after depreciation. The return of the rental business is not as much thus it should explorer other approaches to make it more profitable. It is important to reduce the occupancy rate of the machines by reducing the off-seasons by diversifying target crops to non-rice products.

As per the financial feasibility of the leasing program, it would produce some returns from the interest incurred on the lease. The insolvency rate shall be less than 1% as the machines can be collected if the client fails to repay. If 80% of the machine buyers uses leasing services under 15% annualized interest rate for 3 years, the interest income from the machines during the leasing period would be 134,400 US Dollars. The profit minus the staff in charge of evaluation and collection would be 42,240 US Dollars.

## 5.3. Vocational Training

The vocational training program would not make as much profit from its programs. It shall be positioned as the support program to help identifying skilled mechanics or training to the customers. The survey to the participant of the pilot training program answered that they are willing to pay for 40-60 US Dollars to participate the program. If the training is offered at

60 USD with 15 participates for 3 months on the weekend, the return would be 300 US Dollars.

# 6. Contribution Towards Development

The business model will contribute to improve agricultural productivity and lift up the farmer's income through promoting agricultural mechanization. During the pilot program, the following impacts was realized;

## 6.1. Improvement in rice yield

The survey showed that the average total yield has improved by 1.4 ton and yield per hector has improved by 0.3 ton. The total yield of the farmers who have rent the tractor from the pilot program was average 4.6 ton before the pilot. It has become 6.0 ton in the next season after having access to the tractors through rental. Also, average yield per hector raise from 2.1 ton before and 2.4 ton after the pilot.

## 6.2. Improvement in the farmer's income

The improvement in the income of the farmers has seen during the pilot program with total of +342 USD compared to the pre-pilot period. The average income of the farmers was 1,413 USD at the pre-pilot period. It has increased to 1,754 USD after the pilot. The income has lifted up both in the farming income and in the other additional income.

The improvement in the farming income is mainly contributed from the gain of the total yield. In addition, the farmers were able to spend more time to work as construction labor, running grocery stores or machinery maintenance. One third of the improved income comes from the non-farming income. It means that agricultural mechanization will save time for the farmers and help to gain additional income from non-farming activities

## 6.3. Indirect impact

Three other contributions were considered. First, it will create employment opportunities as it requires operators and mechanics to take care of the machines by promoting agricultural mechanization. Those types of job require specific knowledge and experience thus the stability and income level of such employment tends to be better than the other labor-type jobs. Second, the agricultural mechanization will support the policy development of MAFF, especially in agricultural extension services. Third, the model will contribute to reduce the pollution by using under-conditioned machines by training skilled mechanics who can make sure the condition of the machines.

# 7. Conclusion

This study which aims to promote agricultural mechanization in Cambodia is concluded that the business model would be feasible financially and create benefit to improving agricultural yields and farmer's income. The business model considered following 3 components in promoting agricultural machinery.

## 7.1. Secondhand machinery

The demand for the secondhand machinery is high. Compared to the new machinery, the high-quality secondhand machinery helps farmers to ease access as the cost of the secondhand machinery is much lower than the new.

## 7.2. Vocational training for mechanics

The study revealed that there are currently only few formal training opportunities provided for the repair and maintenance of the agricultural machinery. Although the demand for the repair and maintenance is high, the repair shops tend to have not capacitated to respond to the demand. In addition, the farmers lack the knowledge and habit to implement daily maintenance. Lack of daily maintenance leads the easier breakdown of the machines.

## 7.3. Finance

The access to the agricultural machines would be promoted through incorporating finance scheme such as rental or leasing. The pilot program has shown that there is demand from the farmers to rent that tractors and pay the rental fee back after the harvest. Although it has not test during the pilot period, the leasing has shown high interest from the farmers.

Based on the feasibility study, the potential of the business model is valid. The business will be implemented by working with the cooperatives and farmers' groups that RJG provide leasing to those groups with mechanical trainings and they will implement the rental service to the designated farmers.

## 7.4. Collaboration with JICA

The business and impact can be enhanced through working with relative JICA projects. The part of JICA' agricultural development projects focus on improving technical capacity of the farmers and improving agricultural productivity. Currently, JICA implement capacity building project for the agricultural cooperatives in Cambodia. Such project directly overlaps with the business model as it works with the cooperatives as well. The cooperative's management capacity would be improved by operating rental service and strengthen technical capacity of the farmers through the maintenance training.