The Republic of the Philippines
Department of Agriculture

Data Collection Survey on Agricultural Modernization in the Republic of the Philippines

Final Report

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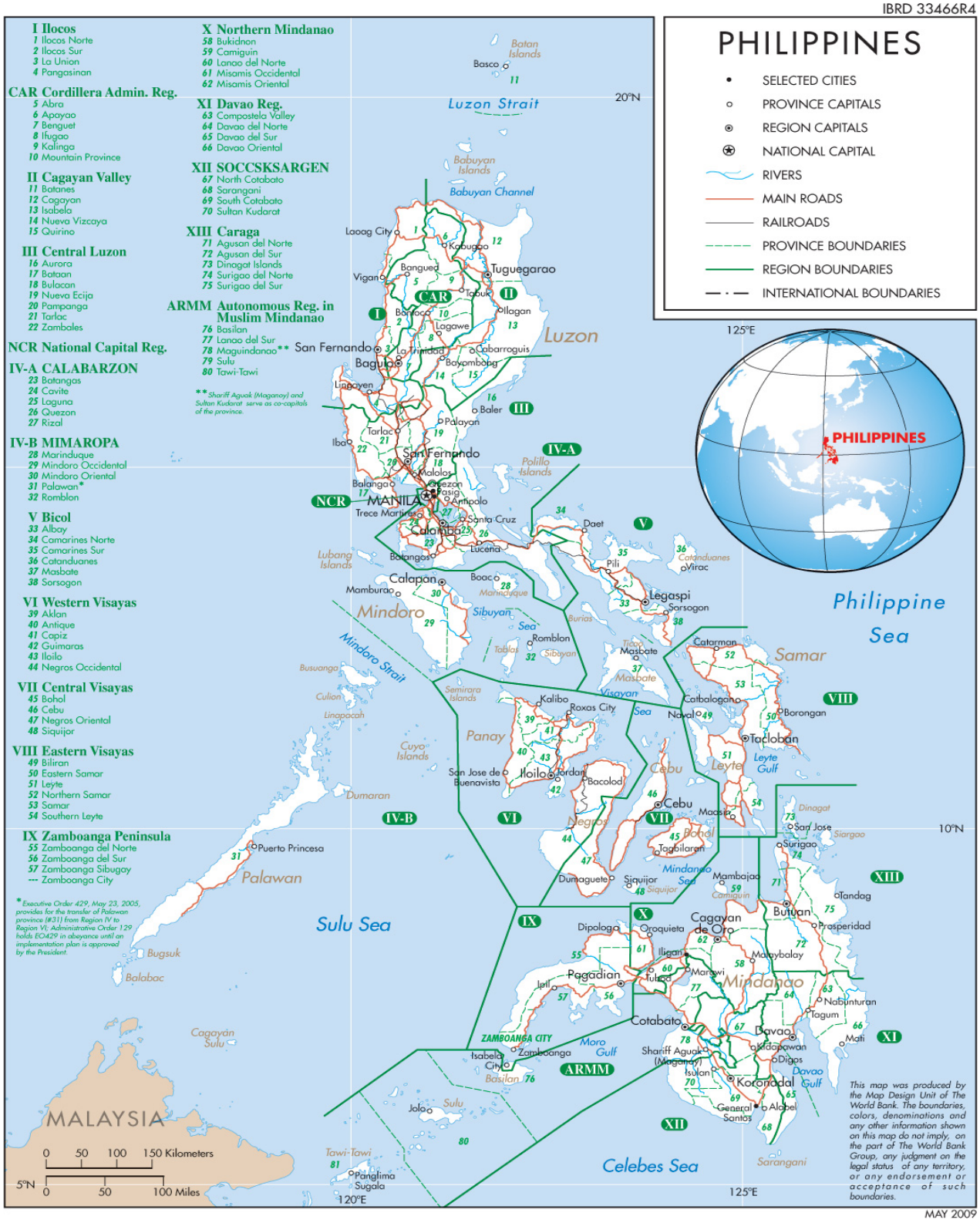
Map of the Philippines



Note: Negros Occidental Province and Negros Oriental Province formed Negros Island Region (Region XVIII), which existed from May 29, 2015 to August 9, 2017 and was then the 18th region of the Philippines.

Source: World Bank 2010. Implementation Completion and Results Report on a loan for Diversified Farm Income and Market Development Project

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1. Objectives and method of the survey

1.1 Background and objectives

1.1.1 Background of the survey

The agricultural sector, including forestry and fishery subsectors in the Philippines, supports the livelihoods of about 30% of the total population whereas its GDP share is limited to 10.3%[1], while over 70% of poor households, namely 21.6% of the population, are engaged in agriculture in rural areas. Accordingly, the sector has to be developed to reduce poverty and address existing economic inequalities in the Philippines and a number of issues need to be addressed to do so. For example, the need to reduce post-harvest loss, given the problems in increasing the labor productivity and efficiency of rice production. Farm households lose substantial profit through post-harvest loss due to manual and inadequately mechanized harvesting and post-harvest practices. The declining trend in agricultural labor supply also makes it increasingly important for farmers to mechanize land preparation, rice seedling transplanting, weed control, harvesting and drying to save on increasing labor costs. According to a study released in 2013 by the Philippine Center for Postharvest Development and Mechanization (PhilMech) the level of agricultural mechanization in the Philippines remains low, averaging 1.23 horsepower per hectare (ps/ha) of agricultural land and lower than elsewhere in Asia, including Japan (average 7 ps/ha), Korea (average 4.11 ps/ha), China (average 4.11 ps/ha) and Vietnam (1.56 ps/ha).

The Philippine government has promoted efforts to modernize and mechanize the agricultural sector by enacting the Agriculture and Fisheries Modernization Act (1997) and the Agriculture and Fisheries Mechanization Law (2013). However, insufficient budgetary allocations and difficulty in implementing the innovative approach have hindered achievement of the objectives. Accordingly, the Philippine Development Plan (2017-2022), formulated by the National Economic Development Authority (NEDA) in 2017, prioritized modernizing and mechanizing agriculture to address poverty, inequality and food insecurity. To implement the development plan the Department of Agriculture has requested support through loan assistance to promote agricultural modernization, particularly by mechanizing rice production, which is the country's key staple.

1.1.2 Survey objectives

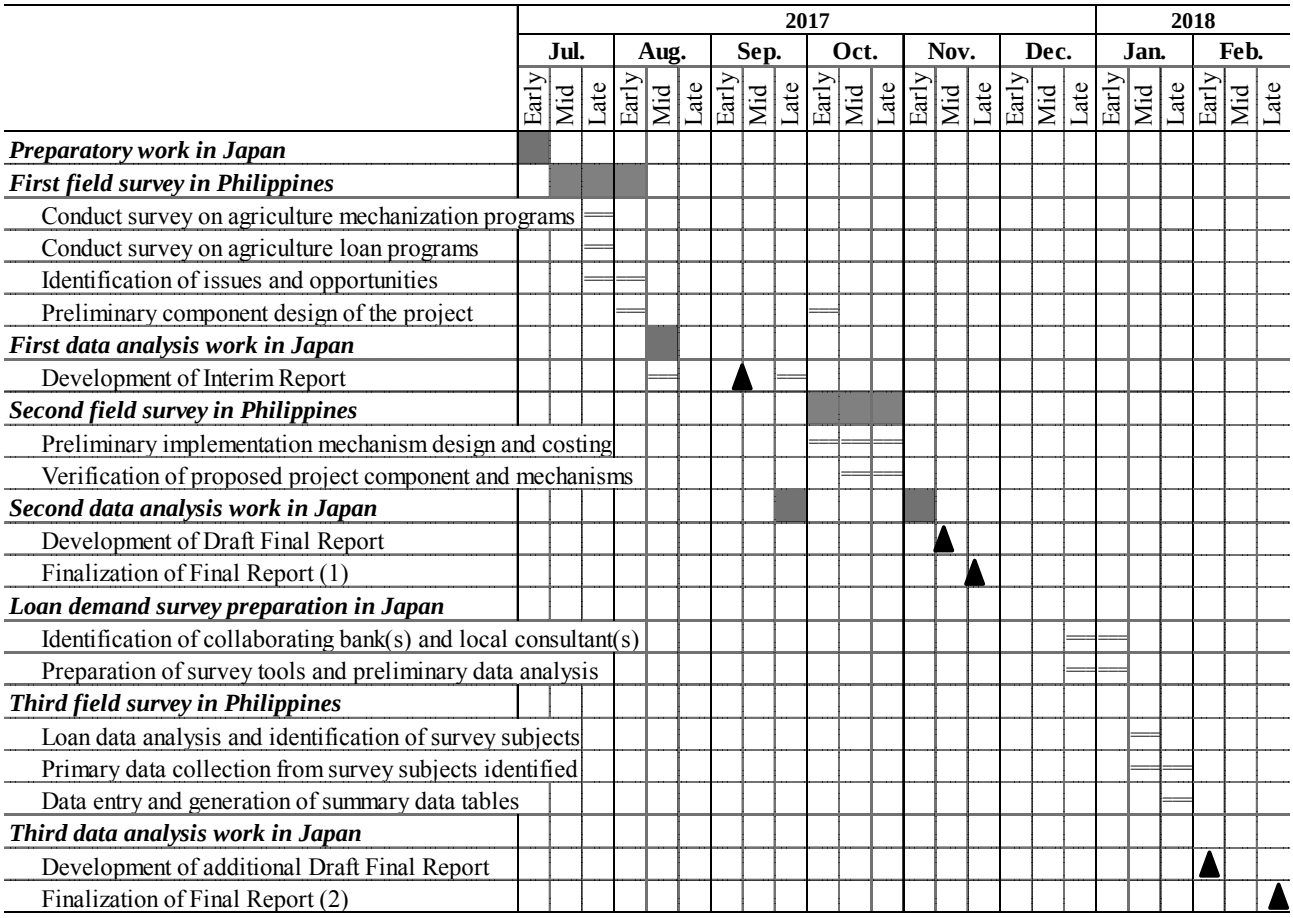
The survey was intended to collect, organize and analyze information on agricultural sector mechanization in the Philippines. Information on existing policies, institutions and support programs to promote agricultural mechanization, particularly for rice and corn production and processing, will be collected and examined to identify issues and possible approaches to refine the originally requested project by the Department of Agriculture. It is expected that the refined project will be a loan cooperation project with components designed to support private-sector-led agricultural mechanization.

1.2 Survey procedures and schedule

Table 1 outlines the survey procedures and schedule of the agricultural policy and financing specialist, with an indicative schedule of the agricultural mechanization specialist. There were three survey periods in the Philippines. Studies on agricultural mechanization and loan programs was carried out to identify issues related to the appropriate roles of the public sector interventions in the agricultural sector, which tends to be the domain of the private sector. During the study period, preliminary discussions on proposed justifications of the refined project concepts and component structure were carried out with the relevant divisions of Department of Agriculture based on information collected either through filed observations of machinery users and secondary sourced datasets. This final report explains the findings and results of analysis carried out in the survey.

[1] 2015. Philippine Statistics Authority

Table 1: Outline of survey procedures and schedule



Source: Survey Team

2. Establishment and examination of hypotheses based on a literature survey

2.1 Establishment of an analytical framework and hypotheses to guide the Data Collection Survey

The objectives of section 2 are: 1) to define the key concepts of agriculture modernization and mechanization, 2) to establish three hypotheses as guides to organize the collected information and the implications drawn for justification and development of a Yen-Loan-supported mechanization promotion project, 3) to report the results of a literature survey to examine the relevance of the hypotheses to the study findings. For an easier understanding of the structure of this report a brief summary of the literature survey relevant to the structure of sections 3, 4, 5, and 6 is provided in subsection 2.1.3.

2.1.1 Agriculture modernization and mechanization

Agricultural modernization, as defined in this survey, is a series of the following processes: a rise of agricultural productivity per worker that secures higher income for all agriculture participants, a labor shift from agriculture to other sectors, rural accumulation of capital based on the increased agricultural productivity, and integration of the agriculture sector with other sectors through factor inputs and product markets. Agriculture mechanization is an agriculture production and processing business chosen by private sector agriculture participants in the processes of modernization.

2.1.2 Analytical framework and hypotheses and their linkages to the structure of this report

(1) Analytical framework and three hypotheses of private sector players

Figure 1 shows the analytical framework with the three (3) hypotheses established for examination and analysis of the survey. The analytical framework encompasses three elements: private sector players, public sector players, and the impact of the interactions between the two players measured as increased value added (economic growth). The three hypotheses are established to describe behaviors of the private sector players. Hypothesis 1 represents the behavior of private sector agriculture production and processing businesses, including farming households. Hypothesis 2 represents characteristics of agriculture labor and labor markets. Hypothesis 3 represents characteristics of the capital market, including accumulated capital.

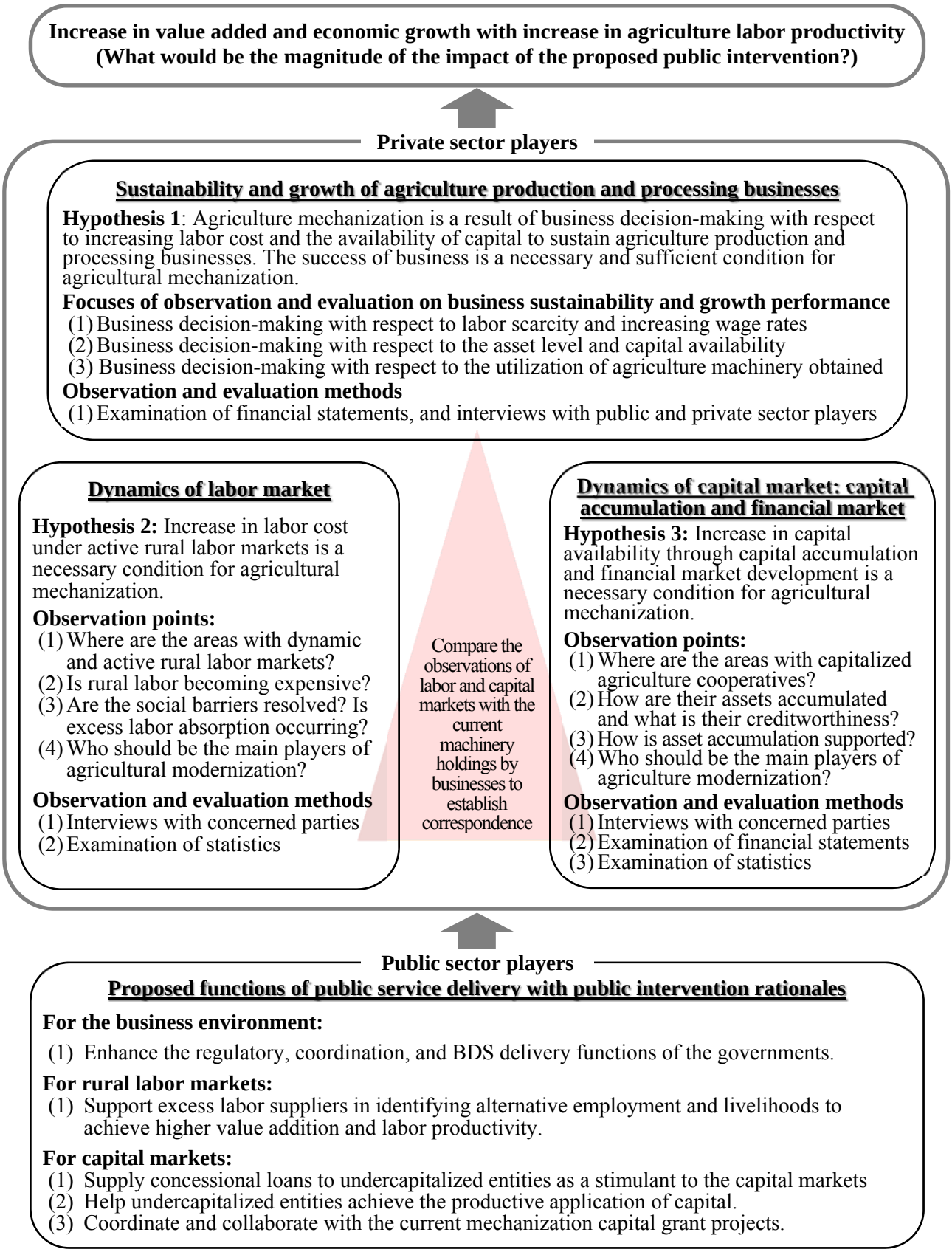
The hypotheses are:

Hypothesis 1: Agriculture mechanization is a result of business management with respect to increasing labor cost and the availability of capital to sustain agriculture production and processing businesses. The success of business is a necessary and sufficient condition for agricultural mechanization.

Hypothesis 2: Increasing labor cost under active rural labor markets is a necessary condition for agricultural mechanization.

Hypothesis 3: Increasing capital availability through capital accumulation and from financial market is a necessary condition for agricultural mechanization.

Past experience introduced in section 2.2 suggests that progress in agricultural mechanization will be contingent on all necessary factors represented by hypotheses being considered and addressed to ensure the success of public interventions. The figure also indicates that agricultural mechanization is not an independent phenomenon, but rather an inter-sectoral phenomenon linked through labor and capital markets. Accordingly, a mechanization project will either fail or not contribute to an overall increase in added value if it neglects to consider, for example, alternative and productive applications of excess labor created by the project.



Source: Survey Team

Figure 1: Analytical framework with the three hypotheses established

(2) Analytical framework and hypotheses as guides to the report structure

Table 2 summarizes the guiding function of the analytical framework and hypotheses established in this section. Based on the analytical framework and focused information collection preliminary justification of the Yen-Loan-supported project and its expected impacts were examined.

Section 2 presents the analytical framework and associated hypotheses established and applied to carry out the simple literature review. Section 3 introduces the results of the field survey focusing on the core legal instruments for public service delivery for promotion of agriculture mechanization. Section 4 outlines a focused situation analysis of private and public-sector players and the dynamics of labor and capital markets based on identified issues and lessons learned extracted under the analytical framework described in section 2. Section 5 describes the justifications and component structure of the proposed Yen-Loan-supported project based on the justifications established under the analytical framework and hypotheses. Section 6 presents preliminary economic and financial analyses performed based on the information collected, assembled, and analyzed under the framework of analysis.

Table 2: Analytical framework and hypotheses as guides to the report structure

Report structure in the form of a table of contents	Analytical framework and hypotheses as guides to the report structure
2. Establishment and examination of hypotheses based on a literature survey	
2.1 Establishment of an analytical framework and hypotheses to guide the Data Collection Survey	• Establishment of an analytical framework and three hypotheses as guides to the report structure
2.2 Examination of the relevance of the three hypotheses based on the literature review	• Establishment of the relevance of the three hypotheses to the past experience reported and analyzed by researchers for the examination of collected information in the Philippines
2.3 Summary of identified issues for implementation of the focused survey in the Philippines	• Explanation of the main issues and lessons learned identified for implementation of the focused survey in the Philippines
3. Agricultural sector modernization and mechanization policies	• The section describe the legal bases for public sector support for agricultural mechanization
4. Situation analysis of agricultural mechanization in the Philippines	
4.1 Selection of field survey sites	• To compare the performance of cooperatives and associations (Hypothesis 1), and differences in the labor market (Hypothesis 2) and capital markets (Hypothesis 3)
4.2 Status of the agriculture machinery market	• To introduce a key observation on the current status of agriculture machinery markets • To establish the reference market size for comparison and the setting of future market trend scenarios
4.3 Examination of agricultural labor markets	• Apply agriculture labor market Hypothesis 2 to describe and examine labor market information collected in the Philippines • An explanation of findings regarding the observation points set in the analytical framework related to labor markets
4.4 Examination of asset accumulation, financial markets and agricultural support loan products	• Apply agriculture labor market Hypothesis 3 to describe and examine capital and financial markets information collected in the Philippines • An explanation of findings regarding the observation points set in the analytical framework related to capital markets
4.5 Characteristics of farming households with Japanese-brand combine harvesters	• Apply agriculture production and processing business Hypothesis 1 to describe and examine the performance of farming households with a combine harvester(s) • An explanation of findings regarding the observation points set in the analytical framework related to business operations.
4.6 Machinery-dealer-sales activities as a factor determining agricultural mechanization	• Apply agriculture production and processing business Hypothesis 1 to describe the performance of machinery dealers
4.7 Identification of actors of agricultural mechanization as project target groups	• Apply agriculture labor market Hypothesis 3 to determine target group selection criteria based on capital accumulation status.
5. Proposed agriculture mechanization promotion project to be supported by a Yen Loan scheme	• Based on the issues identified in the analytical framework and three hypotheses, the proposed components of the Yen Loan

	project are established as countermeasures to the identified issues.
6. Preliminary economic and financial analyses of the proposed project	• Preliminary economic and financial analyses are to be performed on the reference market size established in section 4 and the component structure proposed in section 5.
7. Way forward	• Recommendation regarding further information collection and analyses to confirm potential financial needs and technical gaps of targeted loan borrowers.

Source: Survey Team

2.2 Examination of the relevance of the three hypotheses based on the literature survey

2.2.1 Japanese experience: Agricultural structural adjustment policy since 1961

The experience and policy implications drawn from the Japan's long-lasting agriculture sector structural adjustment policies and their implementation are useful to understand the current status of the agriculture sector in the Philippines. As shown in Table 3, the Agriculture Structural Adjustment Policy and Agricultural Management and Structure Improvement Policy have been implemented based on the Agriculture Basic Act (1961) and Food, Agriculture and Rural Areas Basic Act (1999), respectively. The latter policy was formed and implemented based on lessons learned from the implementation of the former policy.

A large number of measures and budgets were allocated over the course of six (6) implementation phases from 1962 to 2000. During the period from the mid-1960s to mid-1970s, for example, more than 10% of the national budgets were allocated to the implementation of the policy[2]. The results of the implementation, however, were mixed. While massive improvements in agricultural infrastructure such as feeder roads, irrigation systems, and farmland consolidation were achieved, the rates of food self-sufficiency declined, the farmers themselves aged, cultivated areas and the vitality of rural areas both declined, and production and processing facilities were underused (Table 3). The Agricultural Management and Structure Improvement Policy was established in 2001 to address these issues by emphasizing the promotion of business-oriented agriculture operations, further improvements in agriculture infrastructure, and consolidation of agricultural land to expand the farm management size.

The three hypotheses established for the study are consistent with the brief overviews of the Japanese experience of the agricultural sector adjustment and modernization efforts shown in Table 3.

Relevance of Hypothesis 1: Agriculture mechanization is a result of business decision-making with respect to increasing labor cost and availability of capital.

The Agriculture Structural Adjustment Policy strengthened agricultural cooperatives in providing financial and trading services that enabled farmers to capitalize their production assets by obtaining loans from the cooperatives. The policy also promoted the out-migration and drainage of labor from the agriculture/rural sector and measures to increase labor productivity. These changes resulted in higher wage rates and higher capital availability perceived by the farming business operators who opted to mechanize their operations. The special occasion particular to the Japanese farmers has been the large proportion of part-time farmers who were able to source financial resources for farming from their regular off-farm employment. This obscured the profitability of the agricultural businesses and compromised their efficiency.

Due to heavy subsidies (50% of project/facility costs were usually provided by the government) and the tendency of the beneficiaries to pay less attention to prudent management, a large number of subsidized production and processing facilities were underutilized (an audit carried out in 2002, for example, reported underutilization of 43% of the selected facilities). Based on this lesson learned, the focuses of the Agricultural Management and Structure Improvement Policy were shifted to the enhancement of agriculture business management capacity through measures such as cost and benefit analysis, annual business evaluations, training to produce certified business farmers, consolidation and enlargement of farm management size, introduction

[2] Iwamoto. 1999. Agricultural policy framework after the World War II and the new agriculture basic law. Journal of Agricultural Economics. Vol. 71, 3.

of numerical targets and public service delivery evaluations, and market-oriented production and processing cluster development. The policy explicitly recognizes the importance of management capacity to align the signals of labor and capital markets for sustaining and growing agricultural businesses in order to further modernize the agriculture sector in Japan.

Relevance of Hypothesis 2: Increase in labor cost under active rural labor markets is a necessary condition for agricultural mechanization.

In this report, an increase in labor cost also means an increase in labor scarcity in the theoretical framework of the rural labor market. The reported observations regarding the Japanese cases are also consistent with Hypothesis 2, that is, that labor scarcity is a factor contributing to agricultural mechanization. The implementation of Agricultural Structural Adjustment since 1962 significantly accelerated the flow of the labor force from the agriculture/rural sector to industrial and service sector. It also increased labor productivity and the number of part-time farmers. The period of rapid agriculture mechanization corresponds to the period of the rapid labor shift and rise in labor cost in the early 1970s to mid-1980s. In the 1990s, however, a newfound recognition of over-depopulation as a serious issue in the agriculture/rural sector prompted the government to establish countermeasures under the Agricultural Management and Structure Improvement Policy. The policy prescribed various measures to reverse the population drainage from the agriculture/rural sector and nurture full-time and skilled business farmers.

Relevance of Hypothesis 3: Increase in capital availability through capital accumulation and financial market development is a necessary condition for agricultural mechanization.

In this report, capital accumulation means the accumulation of liquid or illiquid assets. Liquid and illiquid assets are treated as equal concepts, as farmers possessing either gain the ability to mobilize financial capital in the form of, for example, loans. The measures under the two policies significantly contributed to the improvement and accumulation of agriculture infrastructure and assets in the form of feeder roads, irrigation systems, and consolidated farmlands. They also contributed to the accumulation of financial, production, and processing assets through subsidies and concessionary loans. The observation that the capital accumulation, although heavily subsidized, contributed to the rapid agriculture mechanization in the early 1970s to mid-1980s, is consistent with Hypothesis 3. As mentioned earlier, the high prevalence of part-time farming, a condition specific to Japan, also induced part-time farmers to finance mechanization from their incomes earned from off-farm employment.

Table 3: Comparison between the two agriculture sector policies in Japan

Polices	Agriculture Structural Adjustment Policy	Agricultural Management and Structure Improvement Policy
A. Characteristics of policies		
Legal base	Agriculture Basic Act (1961)	Food, Agriculture and Rural Areas Basic Act (1999)
Period	1962~2000 (dividing into 6 phases)	2000~ ongoing
Policy goal	• Vitalization of rural/agriculture sector	• Nurture and support agriculture business management and development
Program management	• No numerical targets or evaluation requirements	• Identification of clear national and regional numerical targets and evaluation requirement
Attention to costs	• Cost estimation based on standard project cost	• Cost sensitive management with attention to cost and profit, and annual business evaluation
Subjects of government support	• Production infrastructure (feeder roads, irrigation, and farmland consolidation) • Production and processing facilities including agricultural machinery • Social infrastructure (community centers, water supply and sewerage systems, etc.) • Rice production adjustment (i.e. reduction)	• Measures to identify capable organizations in order to develop and sustain profitable agriculture businesses • Measures to strengthen management capacity for the development of production and processing clusters • Production infrastructure • Production and processing facilities
B. Results/issues/measures		

Socioeconomic trends	(Overall issues) • Reduction in food self-sufficiency rate • Aging of farmers • Reduction in cultivated areas • Decline in vitality of rural areas	(Overall measures) • Promotion of business-oriented agriculture operations • Further improvement of agriculture infrastructure • Consolidation of agricultural lands to expand the farm management size
Business management	(Results/issues) • Strong cooperatives providing financial and trading services. • Large number of underutilized subsidized production and processing facilities (an audit carried out in 2002 reported that 43% of the facilities audited were underutilized.) • Less attention to the business management of agriculture production, particularly by corporations. • Prevalence of the part-time farming households with non-agriculture off-farm employment contributed their income growth keeping small-scale farming structure unchanged.	(Measures) • Selection of capable organizations focused on the application of cost and profit management and business monitoring and evaluation criteria • Training to produce certified business farmers and farming corporations • Consolidation agricultural land to expand the farm management size • Introduction of numerical targets and public service delivery evaluation • Market-oriented production and processing cluster development with large capital investment
Labor market	(Results/issues) • Accelerated flow of the labor force from the agriculture/rural sector to urban sector. • Increased labor productivity and increased number of part-time farmers. • Over-depopulation in agriculture/rural sector and insufficient number of farming successors.	(Measures) • Efforts to reverse the population drainage from the agriculture/rural sector to urban sector • Nurturing of full-time, skilled business farmers rather than part-time farmers
Capital accumulation and market	(Results/issues) • Improvement and accumulation of assets in the form of agricultural infrastructure • Accumulation of financial, production, and processing assets by obtaining concessional loans, subsidies, and incomes from off-farm employment	(Measures) • Ongoing improvement and accumulation of agricultural infrastructure • Ongoing provision of concessional loan services and subsidies with the application of stricter selection criteria to secure sustainable businesses
C. Implications to agricultural mechanization in the Philippines		
	• There has been almost no free provision (i.e. 100% subsidized) of machinery or production facilities under the policy. • Most of the subsidies (50% of project costs) or subsidized loans (the lowest interest rate is 0%) are provided to production and processing projects. Only in very few cases has the introduction of standalone agriculture machinery been supported. • Nearly half of subsidized projects are not performing. Hence, close attention must be paid to business management of agriculture businesses.	• More support should be given to improve the business management skills of cooperatives, corporations, and individual farmers to enable them to generate profits from the use of agriculture machinery and thereby repay their loans and retain earnings for future replacement. • Prevent over-drainage of the agriculture/rural sector labor by generating rural agriculture service employment.

Sources: (1) Ministry of Internal Affairs and Communications, Government of Japan. 2004. Assessment and monitoring of the implementation of the Agricultural Management and Structure Improvement Policy. (in Japanese) (2) Maruhashi and Kumagaya. 2002. Quantitative analysis of the dynamics of projects supported under Agricultural Structural Adjustment program. (in Japanese) (3) Board of Audit, Government of Japan. 2002. Audit results of agricultural and livestock processing facilities established under the Agricultural Structural Adjustment program. (in Japanese) (4) Department of Agriculture, Kanagawa Prefecture, Japan. 2014. Introduction to agriculture business concessionary loans. (in Japanese) (5) Shogakkan. 1993. Encyclopedia Nipponica. Noghyokozokaizenjigyo. (in Japanese)

2.2.2 Asian and African experience

Relevance of Hypothesis 1: Agriculture mechanization is a result of business decision-making with respect to increasing labor cost and availability of capital.

The hypothesis states that agriculture business entities adopt agriculture mechanization when it becomes profitable with respect to rising labor costs and the availability of low-cost finance or accumulated capital.

This also assumes that the businesses are skillfully managed, sustainable, and at best growing, and that if the merchandised business of both the service providers and service users is sustainable, this is a necessary and sufficient condition for progress of agricultural mechanization.

Soni and Ou (2010) reported that the stage of agricultural mechanization differs among individual countries in Asia (Table 4). The table shows how agricultural mechanization generally starts with the mechanization of plowing, land preparation, and threshing work with small-scale, low-horsepower tilling and threshing machines with simple configurations. This level of agricultural mechanization is commonly observed in countries involved in mid-level agricultural mechanization, such as the Philippines, Thailand, and Vietnam, where farming households are usually the business units responsible for mechanization. Mechanization is selected by the households as a business decision to increase labor productivity and sustainability and expand farming operations.

Table 4: Farm mechanization in selected Asian countries

Country	Mechanization by production process					Machinery produce	Level of mechanization (% of machinery application)
	Land preparation	Planting	Threshing	Harvesting	Overall		
China	60%	35%	high	30%	42%	extensively	high (20%<)
India	30%	10%	60%	20%	25-30%	extensively	high (20%<)
Republic of Korea	high	high	high	high	>70%	extensively	high (20%<)
Philippines	13.2%	0.2%	69%	low	medium	few	middle (10%< <20%)
Thailand	high	medium	medium		medium	middle	middle (10%< <20%)
Vietnam	72% (rice)	20%	100%		medium	middle	middle (10%< <20%)
Bangladesh	80%	low	over 80%	low	low	near nil	low (<10%)
Cambodian	low	low	low	low	<10%	near nil	low (<10%)
Indonesia	low	low	low	low	low	near nil	low (<10%)
Nepal		low	low		low	near nil	low (<10%)
Sri Lanka	low	low	low	low	low	near nil	low (<10%)

Source: Soni, Peeyush and Yinggang Ou., 2010.

In China and India, where agricultural mechanization has advanced to a high level (see Table 4), agricultural labor has been shifting to engage secondary and tertiary industries. In the South Korea, a country with a high level of agricultural mechanization, the shift in labor is already in its final stages. The low percentage of the South Korean population engaged in farming (5.5% in 2008) suggests that the presence of an active and dynamic local labor markets is key to advancing agricultural mechanization. The incentive to boost labor productivity and return on capital investment is a catalyst behind agricultural mechanization. To advance agricultural mechanization, the labor saved can be engaged in other labor market production activities. If the saved labor can engage in secondary and tertiary industries with higher labor productivity, agricultural mechanization will spearhead economic development.

The transfer of business resources from the public sector to agricultural households and organizations without compensation or with high subsidies is best avoided from the perspective of improving business sustainability and productivity. Previous agricultural machinery lending projects launched by the Thai government were unable to achieve project sustainability and have thus been considered failures. Conversely, the delivery of public goods via the following public services has advantages: setting standards for agricultural machinery to encourage fair competition in agricultural equipment markets; reducing the nationwide weather risk through agricultural insurance; facilitating the supply of agricultural machinery; providing business and technical guidance on agricultural businesses, and demonstrating new production systems that incorporate agricultural machinery to alleviate farm management risks (Soni and Ou 2010).

The above stylized mechanization progress is consistent with findings reported by a number of studies. According to Pingali (2007), for example, the demand for mechanized threshing emerges in two phases. First, crops are harvested manually and then threshed using pedal- or engine-powered machines; once demand for mechanized harvesting emerges, combine harvesters are adopted and take over threshing operations. Demand for mechanized threshing occurs when harvested volumes increase due to higher yields and when multiple cropping creates a labor bottleneck between the harvest period and the next planting season, even when wages

are low (Diao 2016; Pingali 2007). This study also found that in rare cases, the labor scarcity due to seasonality triggers agricultural mechanization business decision-making even without rises in wages.

As the mechanization step summarized in Table 4 reaches middle to high levels, mechanization agriculture hire service business emerges. The profits and labor productivity of service-providing businesses can be assumed to be rising, in view of the recent rapid growth of such businesses in Thailand, Nepal, the Philippines, and other Asian and African countries. On the other hand, the agriculture labor productivity of service consumer agriculture farms and businesses is also reported to be rising. A study of mechanization in Nepal reported significantly increased returns to scale in agricultural production among tractor-hiring or tractor service user farm households not owning tractors, and the findings are robust under various alternative model specifications (Takeshima 2015). Such households included power-intensive mechanizers, intensive labor hirers, and fertilizer-based intensifiers.

It is also important to note that public interventions are likely to distort and discourage market-oriented private sector business decision-making on agricultural mechanization if the interventions are not designed well with due consideration of the market environment and expected reactions. Drawing from major lessons learned from the past, FAO has reported that the successful development of farm mechanization has rarely been driven by the government's direct involvement in machinery supply, development, (grant subsidy) financing, or the offering of mechanization hire services (FAO 2011; Houssou et al. 2013).

Relevance of Hypothesis 2: Labor cost increase under active rural labor markets is a necessary condition for agricultural mechanization.

The hypothesis states that labor scarcity is a necessary condition for agricultural mechanization. It is generally argued that demand for mechanized harvesting increases when a sharp rise in rural wages is observed and more farmers can afford to invest in machines (Dial et al. 2016). Hence, mechanized harvesting is rarely profitable in low-wage areas (Binswanger 1986). The affordability of a machine is relevant to Hypothesis 3 of capital availability.

An example of close linkages between labor cost increases and the progress of mechanizations is reported from a series of studies on cases in Nepal. In the Terai of Nepal, real wages increased by about 50 percent between 1995 and 2010 in parallel with a process of growing mechanization. The increase in real wages therefore partly explains the growth in mechanization in the Terai, but the wage effects seem to differ between the Terai and other zones (Takeshima et al. 2015). Before the onset of recent rapid mechanization with combine harvesters and the like in the Philippines, there were predictions of agricultural mechanization based on the assumption of rural labor drainage. The further advancement of the stages of agricultural mechanization was almost certain in the Philippines in the near future, as population growth rates were falling and rural labor was being drawn away from farms through increased urbanization and industrialization (Bell 1998). Genma (2012) also reported that farm business decision-making at the time of the labor shift from the agriculture sector to growing urban sector due to the increasing contribution of the latter to GDP growth was impelled by agricultural mechanization.

Another important point to note is the absence of any benefit from labor-saving mechanization in terms of land productivity. Without an increase in land productivity, one cannot expect labor-saving mechanization to significantly increase total production or value addition in the sector, keeping the total size of cropland and market output prices constant. An insightful statement expressed more than 30 years ago is instructive to add here: "Mechanization became important only when the expanding industrial sector forced real labor wages to increase. When labor and draft animals become more expensive relative to machinery, farmers will mechanize to reduce production costs. High land productivity becomes less important if farmers can supplement income through attractive off-farm activities; they may stop farming altogether, enabling other farmers to take over their land and take advantage of economies of scale. Not surprisingly, cropping intensities declined in East Asia when wage costs increased but investment in mechanization increased rapidly" (IRRI 1986).

Relevance of Hypothesis 3: Increase in capital availability through capital accumulation and financial market development is a necessary condition for agricultural mechanization.

This Hypothesis implies that once agriculture-business-decision makers recognize the scarcity of labor and

increase in wage rates, they consider the introduction of intensive capital for a higher level of mechanization, for example, high-price tractors and combine harvesters. Capital constrained capital-poor farm businesses are unable to opt for mechanization unless they can obtain subsidies or loans; likewise, they are also probably unable to optimize the returns of the capital investment in the form of mechanization. Therefore, the policy implications of Hypothesis 3 are ways to increase returns to capital investment and appropriate distributions of increased value addition or increased economic growth due to agricultural mechanization.

Regarding the effective and efficient application of capital for its maximum returns, the perceived ownership of production capital by agricultural production and processing businesses matters. Based on observations in Nigeria, Takeshima et al. (2014) reported that owner-operators who buy tractors from the private market or from private individuals are more efficient than those who receive tractors through government programs, providing services to a greater area at lower costs, including during the off-peak season. This finding clearly indicates that a higher level of capital contributions from businesses make the capital more productive. It may also be helpful, in considering the high returns of capital, to note the following: providing access to a wider range of tractor horsepower may improve efficiency over diverse soil types; similar to some Asian countries in the 1980s, tractor operations are mostly concentrated in the owners' local home areas, though a fraction form groups and serve in distant locations to earn greater revenues.

Well-capitalized farmers, businesses, and individuals are able to procure high-priced machinery. Tractor owners in Nepal, for example, consist of large land owners, intensive labor hirers, and cash crop (sugarcane) growers. The first two are often large-scale commercial rice producers (Takeshima et al. 2015). Although not well capitalized, willing and capable candidates to become farm service providers must be identified and financially supported to diversify and increase the competitiveness of the production and processing service markets.

Although limited to household-scale mechanization by power tiller introductions, the past experiences in the Philippines are insightful. At the outset, the preference of farmers for smaller, low-cost types of farm machinery and equipment became readily evident. In the 1970s, the power tiller was increasingly adopted as an important farm input in Philippine agriculture. According to a study conducted in 1974, 52% of farmers were using power tillers and another 25% were willing to purchase. The most important factor responsible for the rapid increase in power tiller usage was capital support provided by the CB-IBRD Loan Fund. The boom in sales, particularly among tractors and power tillers, came simultaneously with the release of the first three CB-IBRD loans (in amounts of $5M, $12.5M, and $30M). Similarly, the drop in sales in 1976 resulted from the exhaustion of the third loan (IRRI 1978).

2.2.3 Implications from the experience of projects supported by development partners

Table 5 presents the findings from an examination of the characteristics, results, and associated information regarding selected development-partner-supported. The results of a web search suggested that projects supporting the free distribution of agriculture machinery to private sector players (Project A in Indonesia and Project D in Bhutan, shown Table 5) are uncommon. The technical cooperation projects found were public sector regulatory and extension service enhancement projects, particularly those supported by JICA (projects B in Mexico, C in Morocco, E in Madagascar, and F in Bhutan, shown in Table 5). Many of these projects are associated with agriculture machinery provision to the governments concerned through grant aid and KR2 schemes. Other incidences of grant aid and KR2 provisions of agricultural machinery were also found. In many cases, the direct provision of agriculture machinery or loans to procure agriculture machinery by public and/or private sector beneficiaries are not explicitly indicated in the project names. Examples of such projects are projects G and H supported by the Work Bank in the Philippines (shown in Table 4).

Relevance of Hypothesis 1: Agriculture mechanization is a result of business decision-making with respect to increasing labor cost and availability of capital.

The hypothesis states that agriculture business entities adopt agriculture mechanization when it becomes profitable with respect to rising labor costs and availability of low-cost finance or accumulated capital. This also assumes that the businesses are skillfully managed, sustainable, and at best growing, and that if the merchandised business is at least sustainable this is a necessary and sufficient condition for agriculture mechanization.

Project A in Table 4 exhibits a typical case of the incentive mismatch commonly observed in free production capital/asset distribution schemes. Free production capital recipients have difficulty in considering the value of capital, which depreciates and needs to be replaced in the future from accumulated profits. As a result, the recipients tended to underutilize the provided assets, as evinced by the small values of the total asset turnover ratio. The case is also an example of a project designed and implemented without much consideration or analysis of the social, economic, and political contexts to which the service providers and beneficiaries also respond. On the other hand, recently formulated projects G and H were designed to secure the ownership of the subsidized production assets by proponents and to strengthen their business management skills to maintain high utilization of the assets with minimum costs. The proponents are required to provide their share of investment to secure their ownership and to form business alliances with registered and established small- or medium-size enterprises to nurture business confidence. The enhancement of the planning and BDS delivery capacities of the public sector institutions also falls within scope of the projects.

Regarding the improvement of a conducive business environment for private sector players in promoting agriculture mechanization, the regulatory and extension services of the public sector need to be enhanced. Projects B, C, E, and F are examples of public sector service delivery enhancements. Well-addressed training is needed to increase the supply of qualified machinery engineers and operators. Likewise, the recognition of well-established official certification systems can secure fair and competitive machinery and machinery service markets. The examples apply demand-driven income generation by the testing and machinery training centers in the varying stages of agricultural mechanization. If the stage is too early to draw sufficient income from the labor market, government support is a key for their sustainable operation.

Relevance of Hypothesis 2: Increase in labor cost under active rural labor markets is a necessary condition for agricultural mechanization.

The hypothesis states that labor scarcity is a necessary condition for agricultural mechanization. This should suggest that one of the justifications established for the projects in Table 5 must be labor scarcity in rural areas. The literature survey results introduced in the preceding section confirmed this argument. In the justifications for the projects, however, little was mentioned about labor scarcity relative to the size of production potential. One exception is Project F, which touched upon the fact that the outmigration of the young generation from rural areas leads to labor scarcity and the aging of farmers in the agricultural sector. Projects G and H, on the other hand, assessed that labor market conditions conducive to agriculture mechanization are the responsibility of proponents willing to participate in the projects to obtain financial and technical support.

Relevance of Hypothesis 3: Increase in capital availability through capital accumulation and financial market development is a necessary condition for agricultural mechanization.

The hypothesis states that the availability of low-cost finance or accumulated capital is a necessary condition for agricultural mechanization. This, like rising labor cost, should suggest that one of the justifications established for the projects in Table 5 must be the availability of low-cost capital for mechanization in rural areas. The project justifications, however, do not articulate the capital availability for machinery purchase and maintenance by private sector entities. Evidence from the implementation of Project A, meanwhile, suggested that inefficient management of cooperatives failed to raise and accumulate sufficient capital necessary for replacement of government-provided machinery. For Project F, the government adopted small-scale agriculture mechanization by relatively well-capitalized farmers in the southern flat regions. Projects G and H made free capital injection available to proponents of business projects. Maximums of 80% and 60% of the total capital requirements estimated by the proponents will be provided at no cost to Project G and Project H, respectively, albeit with various risk management, transparency, and governance conditionalities. To secure the ownership of the business projects, the proponents are responsible for financing the rest of the required capital investment.

Table 5: Examples of donor-supported projects with agricultural mechanization components

Project name, country, and duration Nature of the project (Projects are in chronological order)	Management of beneficiary organizations	Labor market implications	Capital market implications
A. (1984-1992) Rice post-harvest capacity development through an agricultural machinery distribution project in Indonesia[3]			
Then OECF supported a Yen Loan project to provide rice thrasher, dryers, and milling machinery to village cooperatives free of charge	• Underutilization of the provided machinery due to limited management capacity and economic incentives	• No pre or post labor market or socioeconomic assessment was conducted	• Financial constraints remained due to limited contribution to asset and capital development of village cooperatives.
B. (1999-2004) Agricultural machinery testing and evaluation center capacity development project in Mexico[4]			
JICA supported a technical cooperation project to establish agricultural machinery testing standards and testing centers. Under development of the testing centers impedes agriculture mechanization.	• Due to a condition imposed on certified machinery purchase under the agricultural machinery subsidy program the center functioned as a certifying agent	• Mechanization demand from small to medium-size farmers due to scarcity of rural labor is assumed.	• Rural capital accumulation enabling possession of large agricultural machinery is assumed.
C. (2000-2005) Agricultural mechanization training center project in Morocco[5]			
Technical cooperation project to strengthen the training programs of an agriculture mechanization training center. The main focus was to improve the quality of the training of extension workers.	• Sustainable management of the center was dependent on government's budgetary allocation and the cost recovery efforts of the center.	• Mechanization demand from small to medium-size farmers due to scarcity of rural labor is assumed.	• Rural capital accumulation enabling possession of large agricultural machinery is assumed.
D. (2005-2011) Agriculture Sector Support Project in Bhutan			
The EU supported a project to establish rice milling plants and introduce processing technologies to achieve high value added and increases in farmer productivity.	• Sustainable management of the center was dependent on government's budgetary allocation and the cost recovery efforts of the center.	• Mechanization demand from small to medium-size farmers due to scarcity of rural labor is assumed.	• Rural capital accumulation enabling possession of small agricultural machinery is assumed.
E. (2007-2009) Antsirabe agricultural mechanization training center project in Madagascar[6]			
JICA supported a grant aid cooperation project to rehabilitate the Antsirabe agricultural mechanization training center. New training buildings were constructed and machinery was provided.	• Technical assistance was provided to the public agricultural mechanization center • Insufficient allocations of financial resources. • Operational costs are covered by fee-based training and mechanized service provisions.	• Mechanization demand from service providers and farmers due to rural labor scarcity is assumed.	• Replacement is an issue due to low profits and accumulation of a capital base for training center funds reserved for the future. • Rural capital accumulation enabling possession of small agricultural machinery is assumed.
F. (2008-2017) Strengthening Farm Mechanization Project Phases 1 and 2 in Bhutan[7]			
JICA supported a technical cooperation project to establish	• Technical assistance was provided to a	• Outmigration of young generation from rural	• The government targets adoption of agriculture

[3] JICA. 2002. Summary of ex-post evaluation report of the project of rice post-harvest capacity development through agricultural machinery distribution in Indonesia (1984-1992)

[4] JICA. 2003. Summary of project ending evaluation report for project of agricultural machinery testing and evaluation center capacity development project in Mexico.

[5] JICA. 2004. Summary of project ending evaluation report for agricultural mechanization training center project in Morocco.

[6] JICA Madagascar Office. 2014. Summary of ex-post evaluation of Antsirabe agricultural mechanization training center project in Madagascar.

[7] JICA. 2013. Summary of project pre ex-ante evaluation report of Strengthening Farm Mechanization Project Phase 2 in Bhutan.

agricultural machinery testing standards, model mechanized service provision, and extension of mechanization. Under 2KR and grant aid schemes 2,600 hand tractors, tractors, trans planters, and thrashers were provided.	public agricultural mechanization center.	areas causing labour scarcity in the agriculture sector • Progress of aging	mechanization by the capitalized farmers in the southern flat areas. • The project targets the development of less capitalized farmers as organized service providers.
G. (2014-2021) Philippine Rural Development Project in the Philippines[8]			
The World Bank supported a project loan and Global Environment Facility (GEF) grant project. Rural agri-fishery enterprises receive a maximum of 80% of project costs as grant subsidy to finance production assets including agricultural machinery. The rest is financed by the proponents.	• Emphasis on the business management capacity of rural agri-fishery enterprises as grant subsidy recipients, and BDS support from private sector businesses, DA, and local government units.	• Assessment of labor market conditions conducive to agriculture mechanization is the responsibility of proponents willing to participate in the project.	• The project will provide a maximum of 80% of project costs for proponents to finance and capitalize production assets including agricultural machinery.
H. (2014-2021) Inclusive Partnerships for Agricultural Competitiveness Project in the Philippines[9]			
The World Bank supported a project loan. Farmers' organizations and registered agribusinesses in Agrarian Reform Community clusters jointly receive a maximum of 60% of project costs as grant subsidy to finance production assets including agricultural machinery. The rest is financed by the proponents.	• Emphasis on the business management capacity of farmers' organizations jointly with registered agribusinesses as grant subsidy recipients, and BDS support from private sector businesses.	• Assessment of labor market conditions conducive to agriculture mechanization is the responsibility of proponents willing to participate in the project.	• The project will provide a maximum of 60% of project costs for proponents to finance and capitalize production assets, including agricultural machinery.

Source: Compiled by Survey Team

2.3 Summary of identified issues for focused information collection in the Philippines

In relation to Hypothesis 1 the literature review yields a number of points applied to watch conducting a focused assessment of the players engaged in the progress of mechanization in the Philippines.

Related to Hypothesis 1: Agriculture mechanization is a result of business decision-making with respect to increasing labor cost and availability of capital.

(1) Examination of the financial statements of large-, medium-, and small-scale cooperatives to compare their performance in providing mechanized production and processing services.

(2) Market distortion effects of subsidized grant and loan mechanization programs on the performance of agricultural businesses.

(3) Selection biases of subsidized grant and loan mechanization programs and projects on the performance of agricultural businesses.

(4) Impact of deprivation of rights of grant-machinery-provision beneficiaries in selecting the optimal brands and specifications of agricultural machinery.

(5) Stage of agricultural mechanization in the Philippines in comparison to other Asian countries.

[8] World Bank. 2014. Project appraisal document on a proposed loan to the Republic of the Philippines for a Philippine Rural Development Project. Washington D.C.

[9] World Bank. 2017. Project appraisal document on a proposed loan to the Republic of the Philippines for an Inclusive Partnerships for Agricultural Competitiveness Project. Washington D.C.

(6) Relationship between the progress of mechanization and delivery of public goods via public services such as the setting of standards for agricultural machinery, facilitation of the supply of agricultural machinery, and provision of BDSs.

(7) Profitability and agricultural mechanization, and costs of labor and machinery.

Related to Hypothesis 2: ***Increase in labor cost under active rural labor markets is a necessary condition for agricultural mechanization.***

(1) Relationships between the progress of mechanization and out-migration, drainage of labor from agriculture and rural sectors, and wage rates.

(2) Trend of real rural labor wage rates and its correspondence to the agricultural mechanization status.

(3) Identification of social barriers and estimation of its magnitude.

(4) Absorption of excess labor and its correspondence to the agricultural mechanization status.

(5) Main players of value added generation (economic growth) and agricultural modernization.

Related to Hypothesis 3: ***Increase in capital availability through capital accumulation and financial market development is a necessary condition for agricultural mechanization.***

(1) Correspondence between the progress of mechanization, and selected proxies of asset accumulation and business management capacity.

(2) Contribution of the current mechanization programs for the capital accumulation of beneficiaries.

(3) Correspondence between asset accumulation, and the mechanization level, management capacity and creditworthiness of agricultural cooperatives.

(4) Government interventions for the asset accumulation of farmers and cooperatives.

(5) Main players in agricultural mechanization.

3. Agricultural sector modernization and mechanization policies

Two key laws mandate the government to implement various measures and a project to achieve agriculture modernization and mechanization, based on which the proposed loan project will be legally justified. They are the Agriculture and Fisheries Modernization Act of 1997 (AFMA or RA No. 8435) and the Agricultural and Fisheries Mechanization (AFMech) Law of 2013 (RA No. 10601). They also set out the visions and policies followed by the government. From the time the AFMA was established in 1997 to the establishment of the AFMech Law in 2013, increasing recognition of the roles of private sector players in modernizing the agricultural sector has emerged (i.e. increased labor productivity and return on capital in the agricultural sector) and subsequent mechanization of agricultural production and processing activities.

3.1 Agriculture and Fisheries Modernization Act of 1997

The Agriculture and Fisheries Modernization Act of 1997 (AFMA) prescribes measures to modernize agriculture and fisheries sectors to enhance profitability and prepare them for the challenges of globalization by appropriating the required funds and delivering public services. The measures specified in AFMA tend to be focused on developing rural infrastructure, including market and irrigation facilities, establishing regulatory frameworks and standards and developing the capacity of public sector organizations, including research institutions. Only one closure (section 59) is dedicated to agricultural machinery in AFMA, indicating less emphasis on mechanization at the time of AFMA establishment in 1997. These tendencies were articulated by a comprehensive AFMA review carried out in 2007. The principles of AFMA are pro-poor principles and were established to secure equal access to social, economic and natural resources to benefit poor farmers and fisher folk.

The agriculture and fishery sector principles defined in AFMA include: a) poverty alleviation and social equity, b) food security, c) rational use of resources, d) global competitiveness, e) sustainable development, f) people empowerment; and g) protection against unfair competition.

To materialize these principles, the AFMA objectives are set. Here, objective d) is particularly relevant to promoting private-sector-led mechanization and its full text is: d) to encourage horizontal and vertical integration, consolidation and expansion of agriculture and fisheries activities, group functions and other services by organizing cooperatives, farmers' and fisherfolk's associations, corporations, nucleus estates and consolidated farms and enable these entities to benefit from economies of scale, afford them a stronger negotiating position, pursue more focused, efficient and appropriate research and development efforts and enable them to hire professional managers.

In 2007, an AFMA review report was published after two years of public consultation and study on the results of measures undertaken under AFMA, which emphasizes the importance of private sector investment as an engine of economic growth and recommends that the government amend relevant AFMA closures to establish a policy environment that delivers a good private sector investment climate. The report also urges the government to fast-track the passage of the agricultural and fishery mechanization law then proposed by the National Agriculture and Fisheries Commission-Agriculture and Fisheries Mechanization Commission; acknowledging agricultural mechanization is a vital component of the agricultural and fishery modernization process. In terms of government financial resources allocated to measures under AFMA, the report insists that even more than annual budget allocations of PHP 15 billion have never sufficed to achieve AFMA objectives and has insisted on allocating at least 20 billion every year.

3.2 Agricultural and Fisheries Mechanization Law of 2013

In 2013, the Agricultural and Fisheries Mechanization (AFMech) Law was approved with a preparatory period of four (4) years. In 2016, the Bureau of Agricultural and Fisheries Engineering (BAFE) was established and several Memorandum Orders were issued the same year to regulate procedures for providing free agricultural machinery to private sector entities. The AFMech Law has the structure shown in Box 1.

Box 1: Articles and sections of Agricultural and Fisheries Mechanization Law of 2013

Section 1. Title.

Article I: Declaration of Policy, Definition of Terms and Coverage

Section 2. Declaration of Policy.
Section 3. Definition of Terms.
Section 4. Scope and Application.

Article II: The National Agri-fishery Mechanization Program

Section 5. The National Agri-fishery Mechanization Program.
Section 6. Program Implementation.

Article III: Research, Extension and Human Resource Development

Section 7. Unified National Research and Development (R&D) and Extension Agenda.
Section 8. Agri-fisheries Mechanization RDE Network.
Section 9. Agri-fisheries Machinery and Equipment Service Centers.
Section 10. Agri-fisheries Mechanization and Engineering Resource Network.
Section 11. Research Grants.
Section 12. Training and Scholarship Program.
Section 13. Manpower Complement.
Section 14. Skills Certification of Agricultural Machinery Technicians and Operators.

Article IV: Local Assembly, Manufacture, Supply and After-sales Service

Section 15. Local Assembling and Manufacturing.
Section 16. Incentives for Local Manufacturers and Assemblers of Agri-fisheries Machinery. –
Section 17. After-Sales Service.

Article V: Testing and Evaluation, Standardization and Accreditation

Section 18. Testing and Evaluation.
Section 19. Registration of Ownership of Agricultural and Fishery Machinery and Equipment.
Section 20. Registration of Manufacturers, Fabricators, Assemblers and Importers.
Section 21. Standards Development and Enforcement.
Section 22. Classification and Accreditation of Assemblers, Manufacturers, Importers, Suppliers,

Article VI: Institutions

Section 23. Agricultural and Fisheries Mechanization Committee.
Section 24. Strengthening the DA Agricultural and Fishery Engineering Groups. (i.e. BAFE establishment)
Section 25. Philippine Center for Postharvest Development and Mechanization (PHILMech).
Section 26. Bureau of Agriculture and Fisheries Product Standards.
Section 27. Agricultural Machinery Testing and Evaluation Centers (AMTEC).

Article VII: Responsibilities of the Local Government Units

Section 28. Implementation by the LGUs.
Section 29. Strengthening the Agricultural Engineering Groups of the LGUs.

Article VIII: Prohibited Acts, Penalties and Sanctions

Section 30. Prohibited Acts.
Section 31. Penalties.
Section 32. Sanctions.

Article IX: Miscellaneous Provisions

Section 33. Agricultural and Fisheries Mechanization Programs at the Local Levels.
Section 34. Contiguous Farming. (Formation of minimum of 50 ha cluster for synchronized farming)
Section 35. Use of Renewable Energy.
Section 36. Infrastructure Support.
Section 37. Implementing Rules and Regulations.
Section 38. Funding.
Section 39. Congressional Oversight Committee.
Section 40. Separability Clause.
Section 41. Repealing Clause.
Section 42. Effectivity Clause.

Related laws and regulations

Article 39 of Executive Order No. 226
Philippine Agricultural Engineering Act of 1996 (Republic Act No. 8559)
Agriculture and Fisheries Modernization Act of 1997 (Republic Act No. 8435)
Local Government Code of 1991 (Republic Act No. 7160)
Consumer Act of the Philippines (Republic Act No. 7394)
Anti-Graft and Corrupt Practices Act (Republic Act No. 3019)

Source: Agricultural and Fisheries Mechanization Law of 2013

The AFMech Law declares the agricultural mechanization policy, which should be benchmarked to justify the objectives of the proposed loan project. The law includes key closures to define the institutional arrangements of the project. The policy is a set of objectives of the Law, including to:

(a) Promote the development and adoption of modern, appropriate, cost-effective and environmentally safe agricultural and fisheries machinery and equipment to enhance farm productivity and efficiency to achieve food security and safety and increase farmers' income;

(b) Provide an environment conducive to local assembling and manufacturing of engines, machinery and equipment for agricultural and fisheries production, processing and marketing;

(c) Ensure the quality and safety of machinery and equipment locally manufactured or imported by strengthening regulations by developing and enforcing machinery and machine performance standards, regular testing and evaluation, registration and accreditation and classification of suppliers, assemblers and manufacturers to ensure compliance with prescribed quality standards;

(d) Strengthen support services such as credit faculties, research, training and extension programs, rural infrastructures, post-harvest facilities and marketing services;

(e) Unify, rationalize and strengthen the implementation and coordination of activities and mechanisms on agricultural and fisheries mechanization programs and projects; and

(f) Deliver integrated support services to farmers, fisherfolk and other stakeholders and help them viably operate and manage their agricultural and fisheries mechanization projects.

4. Situation analysis of agricultural mechanization in the Philippines

Subsection 4.1 of this section presents the selection of field survey sites to compare the performance of cooperatives and associations (for the Hypothesis 1 examination), differences in labor markets (for the Hypothesis 2 examination) and capital markets (for the Hypothesis 3 examination). Subsection 4.2 presents the establishment of the reference market potential and one of the key observations of the status of the agriculture machinery market as bases for comparison and for setting scenarios for future market trends.

Subsection 4.3 presents the results of the examination of agriculture labor markets by applying Hypothesis 2 to describe and examine labor market information collected in the Philippines. The first part of the subsection summarizes the findings corresponding to the observation points. In the same manner, subsection 4.4 presents the results of the examination of asset accumulation, financial markets, and agricultural support loan products by applying Hypothesis 3. The first part of the subsection summarizes findings on the observation points set in the analytical framework related to capital markets. Finally, subsection 4.5 presents the results of the examination of the performance of subsidized agricultural machinery provision by the DA by applying Hypothesis 1.

4.1 Selection of field survey sites

4.1.1 Mechanization stage model

(1) Rice production

When selecting the field survey sites, the mechanization stages for rice production were stylized and modeled based on the literature survey, with a model of the mechanization stages summarized in Table 6. Low Level Mechanization Stage is characterized by the domination of small rice farming households mechanized land preparation work with hand tillers and harvesting and threshing with threshers. In other words, the stage is characterized by the widespread use of economical hand tillers with small optimal operation area and low-cost threshers requiring labor-intensive operation. The main players involved in mechanization at this stage are small farming households.

Table 6: Production and processing operations and future mechanization potential

Production and processing operations	Machinery		Small farming households			Cooperatives/ associations/large farming households			Small, medium and large businesses, including millers and traders		
	Type	Optimal operation area	Current demand	Future potential demand		Current demand	Future potential demand		Current demand	Future potential demand	
				Replace-ment	New		Replace-ment	New		Replace-ment	New
Production operations											
Land preparation	Hand tiller	5 ha[*1]	xx	x							
	Tractor	50 ha				x	x	xx	x	x	xx
Transplanting	Planting machine	50 ha						xx			xx
Harvesting	Thresher	10 ha[*1]	xx	x							
	Combine harvester	50 ha				x	x	xx	x	x	xx
Post-harvest operations											
Drying	Large dryer	1000 ha				x	x	xx	xx	xx	xx
Milling	Large milling plant	1000 ha				x	x	xx	xx	xx	xx

Note: 1) Optimal operation areas for hand tiller and threshers will be confirmed.
Source: Survey Team

The High-Level Mechanization Stage of rice production is characterized by the wide use of tractors and combine harvesters by cooperatives, associations and large farming households. In this stage mechanization of rice transplanting could be initiated by introducing planting machines (as is happening in Nueva Ecija Province). The technical hurdle to mechanizing rice transplanting is higher than that to mechanize harvesting

by combine harvester, so it will occur after mechanizing rice harvesting. Given the cost of high-quality tractors, combine harvesters and planting machines (more than a million PHP) and their large minimum optimal operation area (around 50 ha), the main players at this stage to drive mechanization are cooperatives, associations and large farming households with significant accumulated capital and creditworthiness. They provide farming services to landed and tenant/leasehold farming households and their service provision paves the way to form rice paddy clusters with areas exceeding 50 ha for synchronized farming.

The Medium-Level Mechanization Stage of rice production is the early stage of adoption of tractors and combine harvesters for rice production. This is when the social, economic and financial environment is just ready for rapid expansion of the farming service businesses with tractors and combine harvesters.

(2) Rice processing (rice milling)

The nature of rice processing or rice milling mechanization differs from that of rice production. Currently in the Philippines, small-, medium- and large-scale rice mills and millers exist and function to meet household-, local-, regional- and national-level demand for milled rice. Such rice mill businesses are dominated by large- and medium-sized cooperatives and small, medium and large business enterprises. According to the literature survey, adding value by differentiating rice quality and branding is not widely practiced in the country and the bulk of unhulled rice is purchased by millers at a unit price to meet the minimum quality. Such pricing practices of millers and non-differentiating consumer behavior in the rice market do not give farmers any incentive to select, produce, process and market high-quality rice varieties. To increase the labor productivity in the sector, there is a need to acknowledge high quality and value added by consumers in the rice market. Accordingly, the introduction of rice milling systems, plants and machinery to materialize quality differentiation must be piloted and promoted.

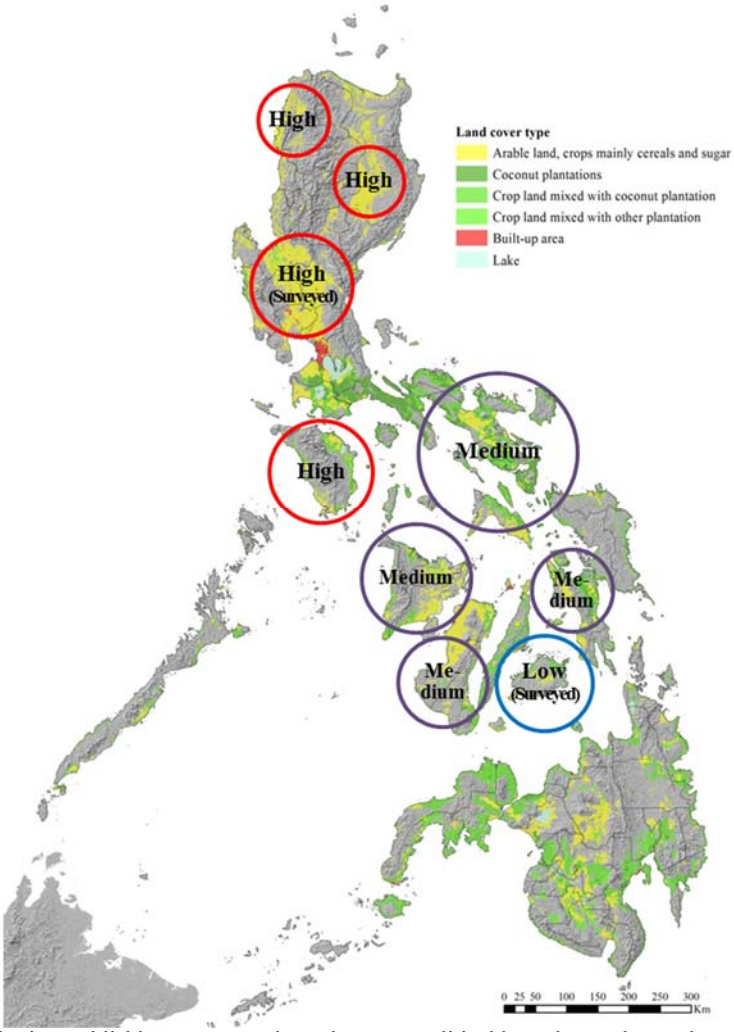
Based on the above findings, for rice drying and milling, the Low- and High-Quality Mechanization Stages are defined. In the Low-Quality Mechanization Stage, mechanized drying and milling processes do not suffice to reflect the quality of unhulled rice against that of milled rice. Conversely, in the High-Quality Mechanization Stage, these processes do suffice for this purpose.

4.1.2 Identifying high, medium, and low-performing agricultural mechanization areas

To select two sites for the field survey, the mechanization stages of rice combine harvesters are examined based on professional opinions and information provided by the DA and interviews with private sector agricultural machinery suppliers. The current significant geographical variation in the adoption of rice combine harvesters is considered a good indicator to determine the performance of agricultural mechanization.

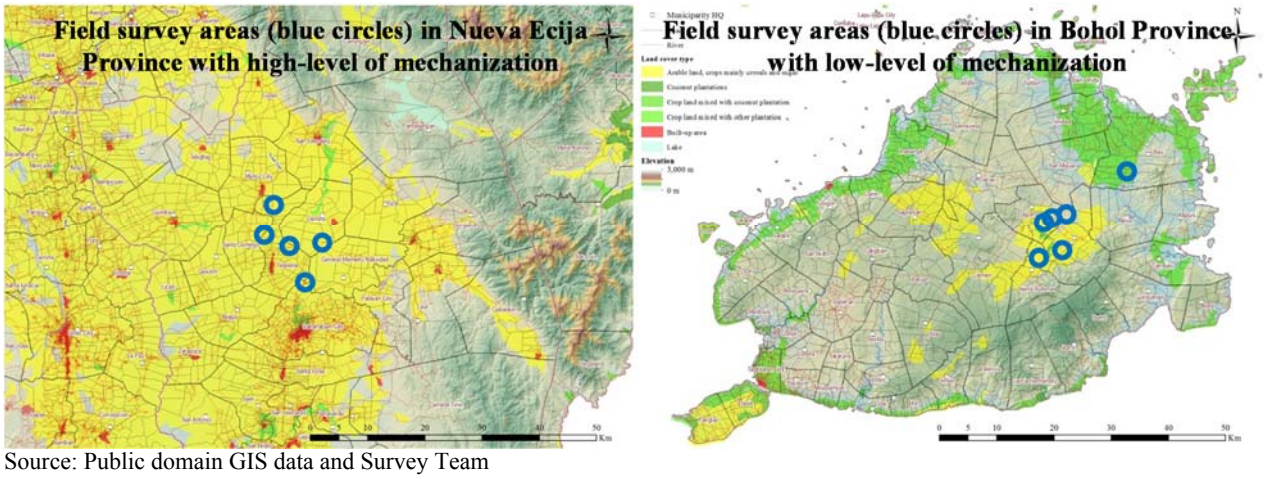
Figure 2 shows the geographical extent of land use types and known performance of agricultural mechanization. Rice is grown particularly in yellow-colored areas and to a lesser extent in light-green areas. Regions I (Ilocos), II (Cagayan Valley), III (Central Luzon), and IV-B (Mimaropa) are areas at a High-Level Mechanization Stage. Region V (Bicol), Iloilo Province in Region VI (Western Visayas), Negros Occidental and Negros Oriental Provinces in Region VII (Central Visayas), and Leyte Province in Region VIII (Eastern Visayas) are at a Medium-Level Mechanization Stage. Bohol Province in Region VII (Central Visayas) is at a Low-Level Mechanization Stage. Based on these results, Nueva Ecija Province in Region III and Bohol Province in Region VII are selected as survey areas at High- and Low-Level Mechanization Stages, respectively. Because of the difficulty in establishing correspondence between political boundary polygon data and Philippine Standard Geographic Code (PSGC) due to the recent change in the boundaries and province names in Mindanao, the assessment of agricultural mechanization performance in Mindanao was not exercised.

It was said that the use of high-capacity combine harvesters has recently soared and become commonplace in Nueva Ecija Province, although such use has not been observed in Bohol Province. Government officials and private sector players all agreed that the use of rice combine harvesters in Iloilo Province has just begun and their adoption is also expected to soar. To compare crop production intensities among these provinces, the average planted areas of irrigated and rain-fed rice, white and yellow corn, sugar cane and cassava observed over the past three decades and their percentages as proportions of the total area of each province are shown for comparison in Annex 1 and Annex 2, respectively.



Note: Because of the difficulty in establishing correspondence between political boundary polygon data and Philippine Standard Geographic Code (PSGC) due to the recent change in the boundaries and province names in Mindanao, the assessment of agricultural mechanization performance in Mindanao was not exercised.
Source: Public domain GIS data and Survey Team

Figure 2: Distribution of crop production areas and known performance of agricultural mechanization



Source: Public domain GIS data and Survey Team

Figure 3: Field survey locations in Nueva Ecija and Bohol provinces

Figure 3 shows detailed geographical representations of field survey areas in Nueva Ecija and Bohol provinces.

While the former is characterized by flat, contiguous and well-irrigated croplands dominated by rice paddies, the characteristics of the latter include gently undulating small-scale contiguous croplands, mainly comprising rice paddies and cornfields. Mixed croplands are also common in the province. As indicated in Table 7, most farming households in Nueva Ecija are landed farmers (68%) whereas most of those in Bohol Province are tenants (67%). Farming households under any land-holding statuses can be net suppliers of agricultural labor in participating labor markets depending on the magnitudes of labor requirement of their operating lands and labor supply capacity of the households.

Table 7: Agriculture land-holding status of farmers in Nueva Ecija and Bohol provinces

Agriculture land-holding status[*1]	Nueva Ecija Province	Bohol Province
Owner	68%	38%
Tenant[*2]	8%	67%
Lessee[*2]	18%	1%
Amortizing/partially owned	10%	0%
Common/owned by parents	0%	10%

Note: 1) Total percentages of all land-holding status in each province exceed 100% due to duplicated land-holding status of households. 2) Tenants are farming households under sharecropping arrangements with their landlords and lessees are farming households under fixed lease fee arrangement with their landlords.
Source: 2018 PhilMech study

The types of survey subjects and information collection methods applied to the field survey are summarized in Table 9. To collect information from beneficiaries of agricultural machinery, free provision by the DA of three (3) cooperatives and six (6) cooperatives are selected in Nueva Ecija and Bohol provinces, respectively. For survey of beneficiaries of Sikat Saka loans, six (6) irrigators' association members were selected in Nueva Ecija Province and eight (8) in Bohol Province.

Table 8: Survey subjects and information sources

Types of survey subjects	Nueva Ecija Province	Bohol Province	Information collection method
1) Beneficiaries of rice mills, tractors, combine harvesters, hand tractors and other machines provided by DA free of charge			
Large cooperatives	3	1	Interviews and financial statements
Medium and small cooperatives and associations	0	5	Interviews and financial statements
2) Beneficiaries of agricultural production loans			
ACPC Sikat Saka borrowers[*1]	6 HHs	8 HHs	Questionnaire and interviews
3) Government and banking organizations			
DA and Irrigation offices	1	2	Interviews and documents
Land Bank branch	1	0	Interviews and documents

Note: 1) Sikat Saka borrowers are members of Irrigators' Associations which endorse the creditworthiness of borrowers.
Source: Survey Team

4.2 Status of agriculture machinery market

4.2.1 Examination of agricultural machinery market potential

To assess and compare information collected from various parts of the country, there is a need to establish a nationwide set of uniform measurements or estimate the agricultural machinery market potential nationwide. Since no statistics for agricultural machinery possessed or sold in the markets are currently available[10], the market potential of combine harvesters for rice and corn production was approximated using their average harvested areas for the period 2007-2016[11] (see Annex 1 and Annex 2). The province-wise average harvested

[10] AFMech Law of 2013 is the first law mandating official registration of agricultural machinery by their manufacturers, distributors and owners. The Law was effected recently in 2017, so official agricultural machinery statistics are not yet available.
[11] To eliminate the stochastic element of annual production area measurements caused by the stochastic nature of weather conditions, decade-averages are used for calculation.

areas in ha are divided by an assumed optimal contiguous production management size of 50 ha[12] to derive the reference mechanization potential of combine harvesters. It is assumed that a type of combine harvester can be used for rice and corn harvesting. The reference mechanization potential is a set of theoretically estimated numbers of combine harvesters, assuming all average harvested areas of rice and corn are harvested at optimal efficiency (i.e. 50 ha per combine harvester), regardless of the physical and socioeconomic conditions of the area.

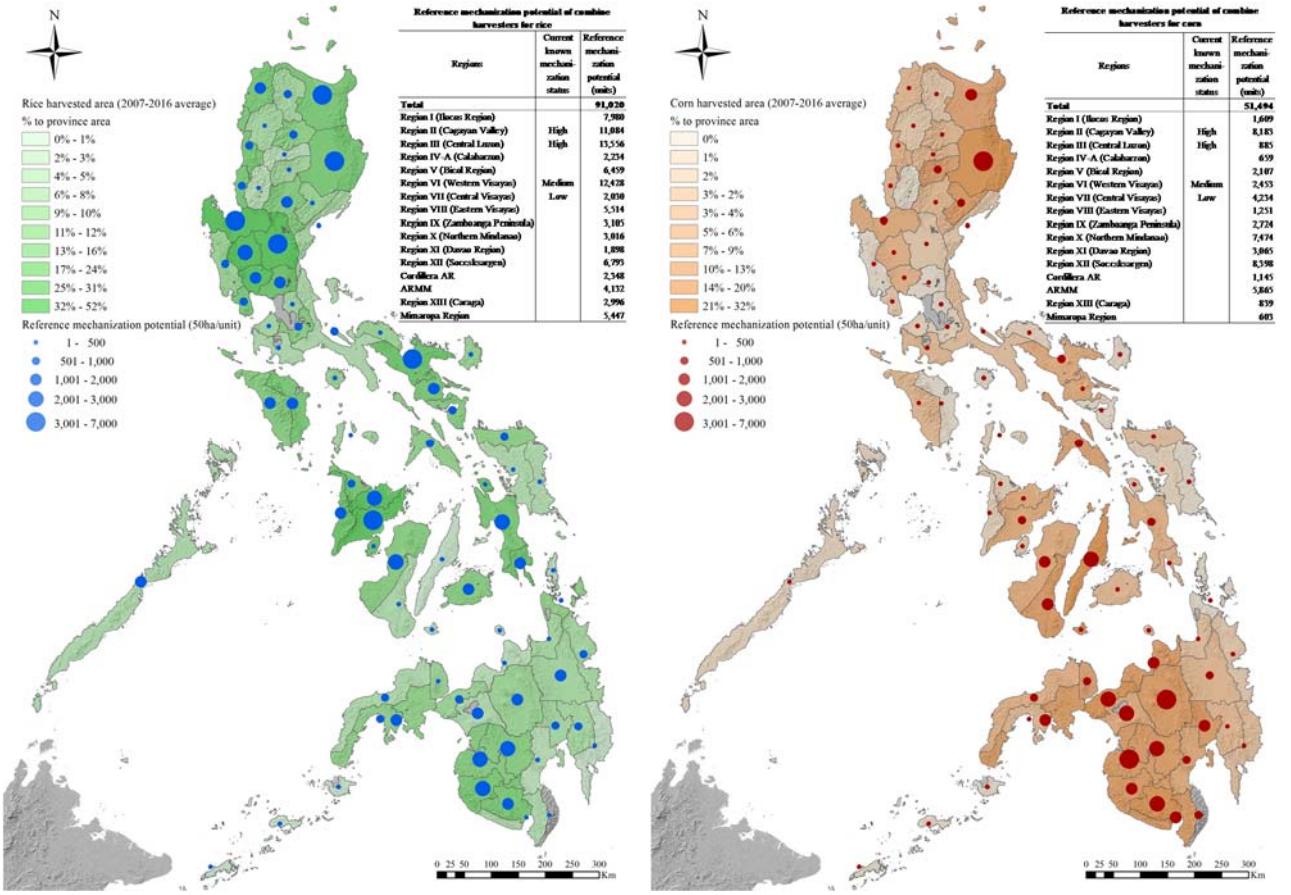
To calculate realistic estimates from the reference mechanization potential, an estimation factor of 50% is established by referring to scattered but essential information on actual sales and market prospects combine harvesters obtained from key private sector players in the Philippines. Collective sales of well recognized main brands over the last five years mainly in Regions II and III (Cagayan Valley and Central Luzon) totaled 6,600 with the expectation that in a few years (say five) the market for new sales would be saturated there. Annual sales of the brand in 2016 were approximately 1,500, which means an additional 7,500 sales are expected before market saturation. This means an estimated market size of 14,100 combine harvesters in both regions. Since the total reference mechanization potential in the regions is 24,640 combine harvesters (11,084 and 13,556 for Regions II and III respectively) and the estimated market size is 14,500, the estimation factor is calculated at 59%. Based on this result and to reduce the risk of overestimation, an estimation factor of 50% is adopted for further discussion. Region-wise summaries of the reference mechanization potential calculation, estimated new purchase market size in terms of total combine harvesters and USD values are presented in Table 22, while similarly, province-wise summaries are presented in Annex 3. The geographical extent of the reference mechanization potential for rice and corn is separately shown in Figure 4. This figure also indicates the production potential of both crops.

Table 9: Reference mechanization potential and estimated purchase market size

Regions	Current known mechani-zation status	Average area harvested in 2007-2016 (ha)			Reference mechanization potential			Estimated new purchase market size	
		Rice	Corn	Total	Rice	Corn	Total	Units to be sold	USD'000 value
		a	b	c=a+b	d=a/50ha	e=b/50ha	f=c/50ha	g=f*50%	h=g*price
Philippines total		**4,550,994**	**2,574,693**	**7,125,687**	**91,020**	**51,494**	**142,514**	**71,257**	**1,425,137**
Region I (Ilocos Region)		398,996	80,429	479,425	7,980	1,609	9,589	4,794	95,885
Region II (Cagayan Valley)	High	554,216	409,165	963,381	11,084	8,183	19,268	9,634	192,676
Region III (Central Luzon)	High	677,775	44,272	722,047	13,556	885	14,441	7,220	144,409
Region IV-A (Calabarzon)		111,711	32,959	144,670	2,234	659	2,893	1,447	28,934
Region V (Bicol Region)		322,930	105,327	428,257	6,459	2,107	8,565	4,283	85,651
Region VI (Western Visayas)	Medium	621,404	122,664	744,068	12,428	2,453	14,881	7,441	148,814
Region VII (Central Visayas)	Low	101,520	211,696	313,216	2,030	4,234	6,264	3,132	62,643
Region VIII (Eastern Visayas)		275,719	62,566	338,284	5,514	1,251	6,766	3,383	67,657
Region IX (Zamboanga Peninsula)		155,246	136,217	291,463	3,105	2,724	5,829	2,915	58,293
Region X (Northern Mindanao)		150,796	373,678	524,474	3,016	7,474	10,489	5,245	104,895
Region XI (Davao Region)		94,913	153,230	248,143	1,898	3,065	4,963	2,481	49,629
Region XII (Soccsksargen)		339,671	419,924	759,595	6,793	8,398	15,192	7,596	151,919
Cordillera AR		117,377	57,226	174,603	2,348	1,145	3,492	1,746	34,921
ARMM		206,598	293,243	499,840	4,132	5,865	9,997	4,998	99,968
Region XIII (Caraga)		149,793	41,967	191,760	2,996	839	3,835	1,918	38,352
Mimaropa Region		272,329	30,131	302,461	5,447	603	6,049	3,025	60,492

Note: 1) The optimal working area of a combine harvester is assumed at 50 ha per unit combine harvester. 2) The same combine harvester is used to harvest rice and corn. 3) The new purchase market estimation parameter is established at 50% based on the sale performance of a private company in the Philippines. 4) The price of a combine harvester is set at USD20,000/unit.
Source: Philippine Statistics Authority and Survey Team

[12] See section 34 of the AFMech Law of 2013.



Source: Public domain GIS data, Philippine Statistics Authority and Survey Team

Figure 4: Average harvested areas and reference mechanization potential for rice and corn harvesters

The results indicate the size of the nationwide new purchase market at 71,257 combine harvesters with a total value of USD 1,425 million assuming a unit price of USD 20,000 (i.e. approximately PHP 1 million). The value is assumed to be generated before the market reaches nationwide saturation. The time needed to reach saturation will be discussed during the second field survey in the Philippines to examine the possible impact of implementation of the proposed project.

Using the identified reference mechanization potential of combine harvesters and tractors, rice transplanting machines, large-scale rice mills and the resulting estimation of market size can be achieved. For tractors, they can be used for rice and corn production operations and the optimal operation area is the same as for rice (i.e. 50 ha), while the estimated new market size for tractors in terms of number of units is the same as for units of combine harvesters (i.e. 71,257). Rice transplanting machines are used in irrigated paddies. Since 43% of the rice and corn production area is irrigated and its optimal operation area is assumed at 50 ha, the estimated nationwide new market size is approximately 30,600 units of rice transplanting machines.

According to expert opinion, a large-scale rice mill capable of meeting the quality differentiation requirement would require investment within the range of USD 5 to 10 million. The optimal contiguous rice farming area for such rice mill is said to be 1,000 ha. Dividing the average rice harvesting areas by this factor of 1,000 ha and applying an estimation factor of 50%, the market size of large-scale rice mills for the High-Quality Mechanization Stage is estimated at 2,276 units.

4.2.2 Holdings of agricultural machinery in 2014 and market trends

Data on the agriculture machinery holdings and sale data in comparisons with the reference mechanization potential revealed the following: 1) the holding of 4-wheel tractors is found in all regions, and data on the same is used to determine the high-performing regions; 2) the use of combine harvesters in 2014 was initially low but rapidly increased afterwards, and as of 2017 combine harvesters are ready for adoption in the middle-

performing areas; 3) the use of rice transplanters was almost nil in 2014, but as of 2017 rice transplanters are ready for adoption in the areas with high mechanization potential.

So far there are no well-established measurements, statistics, or estimations of the agricultural machinery holdings by private sector enterprises. The agricultural machinery holding information provided by the city and municipality local government units and consolidated by PhilMech in 2014 is therefore precious information for understanding the status of mechanization and estimating the potential growth of the agricultural machinery markets (see Table 10). By comparing the data in Table 10 with the tractor, combine harvester, and rice transplanter sales data obtained from the two major Japanese manufacturers in the Philippines shown in Table 11, we find, for example, that the total number of combine harvesters in 2014 is underestimated in the PhilMech data. The PhilMech data indicates that 682 combine harvesters are possessed in 2014, whereas the cumulated sale of combine harvesters reported by the two manufacturers is 2,900 in 2014. A similar tendency is observed in the holdings of rice planters: the PhilMech data indicates 60 in 2014, whereas the cumulated sales of the two Japanese manufactures is 450. Given that the combine harvesters and rice transplanters are almost exclusively supplied by the two Japanese manufacturers, their cumulated numbers are more reliable descriptions of the numbers of combine harvesters and rice transplanters held. In spite of the differences in the numbers of combine harvesters and rice transplanters between the two sources of information, the holdings are small compared to both the potential market and to the reference mechanization potential of combine harvesters (2,900 units make up only 4% of the reference mechanization potential of combine harvesters, 71,257 units) and rice transplanters (450 units make up only 1.5% of the reference mechanization potential of rice transplanters, 30,600 units).

Regarding the 4-wheel tractor holdings, numerous Japanese, European, American, and Chinese brands supply tractors in a competitive market. As a consequence, the cumulative sale of Japanese brands in 2014 (1,800) is far smaller than the total holdings in the same year reported by PhilMech (12,016). The total 4-wheel holdings of 12,016 makes up 16.9% of the reference mechanization potential, 71,257 units. The use of 4-wheel tractors is becoming popular and can be observed in all regions, and the following six the regions are determined to be high-performing regions in agricultural mechanization (Table 10): Regions I, II, III, IV-B, VII, and X.

Table 10: Status of mechanization in December 2014

Regions	Reference mechani-zation potential	4-wheel tractor (High-performing regions are shaded in gray)		Rice trans-planter		Combine harvester		Mobile flash dryer		Rice Mill (rubber roll, multi-pass)		Rice Mill (rubber roll, single-pass)		Village Type Dryer	
	a	b	c=b/a	d	e=d/a	f	g=f/a	h	i=h/a	j	j=j/a	k	l=k/a	m	n=m/a
Total	71,257	12,016	16.9%	60	0.1%	682	1.0%	74	0.1%	975	1.4%	12,552	17.6%	23	0.0%
Region I	4,794	6,361	132.7%			26	0.5%	11	0.2%	67	1.4%	1,966	41.0%		
Region II	9,634	813	8.4%	11	0.1%	367	3.8%	1	0.0%	121	1.3%	1,881	19.5%		
Region III	7,220	3,264	45.2%	45	0.6%	198	2.7%	27	0.4%	370	5.1%	1,453	20.1%		
Region IV-A	1,447	29	2.0%			2	0.1%	3	0.2%	6	0.4%	498	34.4%	23	1.6%
Region IV-B	3,025	419	13.9%			78	2.6%	3	0.1%	95	3.1%	1,406	46.5%		
Region V	4,283	33	0.8%	2	0.0%			1	0.0%	21	0.5%	1,397	32.6%		
Region VI	7,441	88	1.2%	1	0.0%	2	0.0%			96	1.3%	1,020	13.7%		
Region VII	3,132	282	9.0%					9	0.3%	25	0.8%	629	20.1%		
Region VIII	3,383	34	1.0%							34	1.0%	172	5.1%		
Region IX	2,915	14	0.5%					13	0.4%	9	0.3%	342	11.7%		
Region X	5,245	341	6.5%					1	0.0%	56	1.1%	207	3.9%		
Region XI	2,481	30	1.2%			2	0.1%			26	1.0%	244	9.8%		
Region XII	7,596	268	3.5%					1	0.0%	5	0.1%	575	7.6%		
Region XIII	1,918	19	1.0%	1	0.1%	2	0.1%	3	0.2%	34	1.8%	260	13.6%		
CAR	1,746	21	1.2%			5	0.3%	1	0.1%	8	0.5%	389	22.3%		
ARMM	4,998									2	0.0%	113	2.3%		

Note: High-performing regions are shaded in gray.
Source: PhilMech

Table 11: Numbers of units sold in the Philippines by Japanese brand machinery suppliers

Machinery	Brand		~2010	2011	2012	2013	2014	2015	2016	2017
Combine harvester	Brand A	Annual	100	100	450	800	1,450	1,700	2,000	No data
		Cumulated	100	200	650	1,450	2,900	4,600	6,600	6,600
	Brand B	Annual						300	400	500
		Cumulated						300	700	1,200
	Total	Annual	100	100	450	800	1,450	2,000	2,400	500
		Cumulated	100	200	650	1,450	2,900	4,900	7,300	7,800
	Growth rate			100%	225%	123%	100%	69%	49%	7%
Tractor	Brand A	Annual	300	100	250	450	700	850	1,950	No data
		Cumulated	300	400	650	1,100	1,800	2,650	4,600	4,600
	Brand B	Annual						50	200	400
		Cumulated						50	250	650
	Total	Annual	300	100	250	450	700	900	2,150	400
		Cumulated	300	400	650	1,100	1,800	2,700	4,850	5,250
	Growth rate			33%	63%	69%	64%	50%	80%	8%
Rice transplanter	Brand A	Annual	320	10	30	50	40	70	80	No data
		Cumulated	320	330	360	410	450	520	600	600
	Brand B	Annual								
		Cumulated								
	Total	Annual	320	10	30	50	40	70	80	
		Cumulated	320	330	360	410	450	520	600	600
	Growth rate			3%	9%	14%	10%	16%	15%	

Note: Fifty percent (50%) of Brand A tractors sold in 2015 were purchased by the government.
Source: Compiled by Survey Team

Since 2014 mechanized harvesting and thrusting by combine harvesters has been rapidly adopted in Regions I, II, and III. The difference between 2014 and 2017 is approximately 6,700 units in the PhilMech data versus 4,400 units in the manufacturing data. In either case, the increase in the adoption of combine harvesters is considered to be very fast. A rapid increase in the sale of combine harvesters is said to be expected in Region VI.

Rice transplanter uses are in the initial stage of adoption by farmers due to rapid increases in agriculture labor wage rates in all regions. Regions II and III are reported to be ready to introduce large rice transplanters (riding type), while farmers and farm workers in Region VII are ready to adopt small rice transplanters (walk-behind type).

4.2.3 Performance of subsidized agricultural machinery provision by the DA

In this section, a brief explanation of the annual budget allocated to agricultural mechanization programs and the business performances of agricultural machinery provided to selected beneficiaries are reported. A simple performance assessment was conducted based on an anecdotal collection of financial statements of cooperatives in the field survey areas (Table 8).

A high volume of subsidized agricultural machinery has been provided to the organized beneficiaries, including agricultural cooperatives, associations and other types of registered organizations free of charge under, for example the Rice Program, Corn Program, Village-type Corn Post-harvest Processing Center Program, High-Value Crop Development Program, Organic Agriculture Program and Livestock Program. Table 12 gives an overview of the allocated budget to these programs on a national level to procure and provide agricultural machinery. Table 13 summarizes the agricultural machinery distributed by Region VII Regional Office of DA located in Cebu. The table covers distributed machinery to Bohol, Cebu, Negros Oriental and Siquijor Provinces.

The shaded budget line in the table, amounting to more than USD 270 million, represents the allocation to

these programs. Although the budget includes allocations to rural infrastructure development projects, the overall allocation to programs of free machinery provision is considerable. Machinery provisions are processed according to Memorandum Orders No. 25 and 26 Series of 2016m which do not conform to other procurement-related regulations. However, these regulations are almost silent regarding post provision monitoring and assessment. The comparative size of government provisions against agricultural machinery markets can be inferred by comparing the estimated new purchase market size of combine harvesters in Bohol Province presented in Annex 3 and the total number of (combine harvester equivalent) tractors provided in the same Province over the past decade, as shown in Table 13. The estimated new purchase market size of combine harvesters in Bohol Region is 876 and the total number of tractors provided is 45, namely around 5%. This means that the remaining 95% tractor demand should be met by private sector suppliers. However, public provision of the 5% market demand may have delayed the private-sector-led development of supply chains.

Table 12: FY 2017 general appropriations of the Department of Agriculture

Programs/Activity/Projects	FY 2017 General Appropriations Act		
	(PhP '000)	(USD '000)	(%)
Department of Agriculture	**51,229,659**	**999,557**	**100%**
Department of Agriculture (Net of Corporations)	**45,947,043**	**896,487**	**90%**
Office of the Secretary	**35,759,647**	**697,717**	**70%**
General Administration and Support Services	1,832,691	35,758	4%
Support to Operations	840,326	16,396	2%
Operations	33,086,630	645,563	65%
Technical and Support Services Program	15,183,912	296,258	30%
Production Support Services	7,175,209	139,998	14%
Market Development Services	396,238	7,731	1%
Extension Support, Education and Training Services	4,910,580	95,812	10%
Research and Development	2,701,885	52,717	5%
Agricultural Machinery, Equipment, Facilities	13,884,718	270,909	27%
Agriculture and Fishery Policy Program	71,046	1,386	0%
Agriculture and Fishery Regulatory Support	1,028,308	20,064	2%
Irrigation Network Services	0	0	0%
Farm-to-Market Road	0	0	0%
Foreign Assisted and Locally Funded Program	2,918,646	56,947	6%
Attached Agencies	**9,462,778**	**184,631**	**18%**
Agricultural Credit Policy Council	811,203	15,828	2%
Bureau of Fisheries and Aquatic Resources	6,989,829	136,381	14%
National Meat Inspection Services	393,218	7,672	1%
Philippine Carabao Center	419,810	8,191	1%
PhilMech	308,650	6,022	1%
Philippine Council for Agriculture and Fisheries	181,611	3,543	0%
Philippine Fiber Industry Development Authority	358,457	6,994	1%
Automatic Appropriations	**724,618**	**14,138**	1%
Budgetary Support to Government Corporations	**5,282,616**	**103,071**	**10%**
National Dairy Authority	199,945	3,901	0%
National Tobacco Administration	386,250	7,536	1%
Philippine Crop Insurance Corporation	2,500,000	48,778	5%
Philippines Rice Research Institute	561,000	10,946	1%
Philippine Fisheries Development Authority	224,800	4,386	0%
Sugar Regulatory Administration	1,410,621	27,523	3%

Source: The Department of Agriculture, the Government of the Philippines.

Large-scale free transfer of private assets or private goods by the government to private sector players should distort markets for agricultural machinery and result in a decline in the financial and economic efficiencies of the private goods provided. The fact that the government provides machinery free of charge precludes its ability to choose the best recipients capable of generating returns to cover the sustainable use of the machinery provided and also presents the advantage of choosing the specifications and brands optimal to their business objectives.

Table 13: Agricultural machinery provided by Region VII Regional Office of DA over the past decade

Program / Machinery / Province	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	TOTAL
Rice Program											
4WD-Tractor				**1**		**1**	**7**	**3**	**5**	**4**	**21**
Bohol				1		1	7	1	3		13
Cebu								2	1		3
Negros Oriental									1		1
Hand Tractor				**39**	**57**	**39**	**59**	**3**	**15**	**52**	**264**
Bohol				18	41	27	51	2	11		150
Cebu				6	4	9	6	1	2		28
Negros Oriental				13	10				1		24
Siquijor				2	2	3	2		1		10
Rice Thresher w/Blower		**11**		**27**	**24**	**20**	**57**	**22**	**16**	**33**	**210**
Bohol		2		14	18	14	47	10	10		115
Cebu		3		4	2	6	9	12	4		40
Negros Oriental		4		8	3				2		17
Siquijor		2		1	1		1				5
Floating Tiller				**13**	**5**	**37**	**25**	**13**	**10**	**31**	**134**
Bohol				6	1	29	18	13	6		73
Cebu				2	2	4	5		2		15
Negros Oriental				4	1				1		6
Siquijor				1	1	4	2		1		9
Walk Behind Transplanter									**3**	**5**	**8**
Bohol									3	5	8
Flatbed Dryer	**12**	**10**		**3**	**20**	**12**	**4**	**1**	**4**		**66**
Bohol	12	10			8	10	3	1	3		47
Cebu				1	2	2			1		6
Negros Oriental				2	10		1				13
Biodeg. Shredding Machine		**5**									**5**
Bohol		2									2
Cebu		2									2
Negros Oriental		1									1
Drum Seeder							**21**	**11**	**20**	**5**	**57**
Bohol							10		10		20
Cebu							3	11	3		17
Negros Oriental							5		5		10
Siquijor							3		2		5
Hauling Truck								**3**			**3**
Cebu								3			3
Power Sprayer								**10**			**10**
Cebu								10			10
Corn Program											0
4WD-Tractor	**1**	**3**	**4**	**4**	**4**	**6**	**1**	**8**	**9**	**8**	**48**
Bohol	1	1	1	4	1	1		3	3	3	18
Cebu					1	4		2	2	2	11
Negros Oriental		2	3		2	1		2	3	2	15
Siquijor							1	1	1	1	4
Farm Mechanization Tractor Pool							**4**				**4**
Bohol							1				1
Cebu							1				1
Negros Oriental							1				1
Siquijor							1				1
Hauling Track							**2**				**2**
Cebu							2				2
STW	**7**										**7**
Bohol	3										3
Cebu	1										1
Negros Oriental	2										2

Program / Machinery / Province	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	TOTAL
Siquijor	1										1
Village Type Corn PC		**3**	**2**	**4**	**3**	**1**					**13**
Bohol		3		4	1						8
Cebu			1			1					2
Negros Oriental			1		2						3
Cassava Granulator			**3**		**16**	**12**	**2**	**6**	**9**	**7**	**55**
Bohol			1		2	3		2	3	4	15
Cebu			1		2	4	1	2	3	1	14
Negros Oriental					1	5	1	2	3	2	14
Siquijor			1		11						12
Cassava Granulators cum shredder							**12**				**12**
Bohol							4				4
Cebu							4				4
Negros Oriental							4				4
Mini Corn Mill			**5**		**17**	**17**	**20**	**6**	**17**	**12**	**94**
Bohol			3		2		5	2	8	3	23
Cebu			1		2	11	10	1	1	3	29
Negros Oriental					2	5	5	3	7	6	28
Siquijor			1		11	1			1		14
Cassava Grater						**3**	**6**	**6**	**9**	**5**	**29**
Bohol						1	2	1	2	2	8
Cebu							2	2	2	2	8
Negros Oriental						2	1	2	3	1	9
siquijor							1	1	2		4
Cassava Dryer						**1**					**1**
Cebu						1					1
Cassava Chipper							**1**	**6**	**8**	**16**	**31**
Bohol								2	2	4	8
Cebu							1	3	3	1	8
Negros Oriental									3	11	14
Siquijor								1			1
Cassava Pulverizer Motorized							**2**		**10**	**5**	**17**
Bohol							1		3	2	6
Cebu							1		2	2	5
Negros Oriental									3	1	4
Siquijor									2		2
Corn Sheller							**2**	**6**	**12**	**17**	**37**
Bohol								2	3	3	8
Cebu							2	2	4	4	12
Negros Oriental								1	4	10	15
Siquijor								1	1		2
Village Type Dryer with Warehouse							**1**				**1**
Negros Oriental							1				1
Cassava Digger								**2**		**1**	**3**
Bohol								1			1
Cebu								1		1	2
Combine Harvester								**4**			**4**
Bohol								2			2
Negros Oriental								2			2
HVCDP Program											0
4WD Tractor				**1**	**4**	**8**		**5**	**3**	**2**	**23**
Bohol				1	3	5		2	2		13
Cebu						2		3	1	1	7
Negros Oriental										1	1
Siquijor					1	1					2
Cultivator/Tiller				**4**	**9**	**4**		**15**	**28**	**21**	**81**

Table 13: Agricultural machinery provided by Region VII Regional Office of DA over the past decade (cont.)

Program / Machinery / Province	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	TOTAL
Bohol						1		3	7	3	14
Cebu				2	7	3		4	9	9	34
Negros Oriental				1	1			3	7	6	18
Siquijor				1	1			5	5	3	15
Hauling Truck						**1**	**7**			**2**	**10**
Cebu						1	2			2	5
Negros Oriental							3				3
Siquijor							2				2
Soybean Thresher/Sheller				**1**							**1**
Cebu				1							1
Coffee Grinder					**1**						**1**
Cebu					1						1
Vegetable dehydrator					**7**						**7**
Cebu					4						4
Siquijor					3						3
Fruit Dehydrator						**2**					**2**
Bohol						1					1
Cebu						1					1
Fruit juicer / extractor						**2**					**2**
Bohol						1					1
Cebu						1					1
Banana Chipper					**1**	**2**		**6**	**17**		**26**
Bohol						1		2	2		5
Cebu					1	1		3	2		7
Negros Oriental								1	13		14
Banana Fryer									**2**		**2**
Cebu									2		2
Peanut Sheller					**1**			**6**	**15**		**22**
Bohol								2	1		3
Negros Oriental								3	14		17
Siquijor					1			1			2
Peanut Grinder						**1**		**1**			**2**
Bohol								1			1
Siquijor						1					1
Cacao Grinder								**2**	**12**	**10**	**24**
Cebu									7	4	11
Negros Oriental									5	3	8
Siquijor								2		3	5
Cacao Roaster								**2**	**6**		**8**
Bohol									1		1
Cebu									5		5
Siquijor								2			2
Cacao Cracker w/ Nib Hull Separator								**2**			**2**
Bohol								2			2
Coffee Dehuller								**5**	**15**		**20**
Cebu									1		1
Negros Oriental								5	14		19
Coffee Grinder								**14**	**6**	**10**	**30**
Bohol								1		1	2
Cebu								10		4	14
Negros Oriental								1	6	3	10
Siquijor								2		2	4
Mungbean Thresher								**7**	**1**		**8**
Bohol								2	1		3
Cebu								1			1
Negros Oriental								2			2

Program / Machinery / Province	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	TOTAL
Siquijor								2			2
Vegetable Packaging Equipment					**1**						**1**
Cebu					1						1
Banana Process. Eq.	**4**										**4**
Bohol	1										1
Cebu	1										1
Negros Oriental	1										1
Siquijor	1										1
Peanut Process. Eq.	**1**										**1**
Negros Oriental	1										1
Power Prunner	**3**					**30**				**118**	**151**
Bohol	1					5				28	34
Cebu	1					14				40	55
Negros Oriental	1					6				30	37
Siquijor						5				20	25
Power Sprayer	**30**	**20**				**30**		**40**	**45**	**50**	**215**
Bohol	7	10				5		9	3	10	44
Cebu	12	10				15		22	17	15	91
Negros Oriental	6					5		4	25	15	55
Siquijor	5					5		5		10	25
Shredding Machine					**2**	**1**		**1**			**4**
Bohol						1		1			2
Cebu					2						2
Negros Oriental											0
Siquijor											0
Tablea Maker								**1**			**1**
Bohol								1			1
Dough Maker									**1**		**1**
Bohol									1		1
Hot Cake Maker									**10**		**10**
Bohol									10		10
Multi Stand Food Mixer									**10**		**10**
Bohol									10		10
Rootcrop Chipper/Vegetbale Cutter									**1**		**1**
Cebu									1		1
Tramline										**1**	**1**
Negros Oriental										1	1
Organic Agriculture											0
Incubator									**6**	**10**	**16**
Rice cutter									**5**	**2**	**7**
Hand tractor									**8**	**5**	**13**
Power sprayer									**10**	**3**	**13**
Feedmill									**4**		**4**
Vermi tea brewer									**45**		**45**
Rice thresher									**2**		**2**
Cold storage									**2**		**2**
Paddy huller									**1**		**1**
Floating Tiller										**2**	**2**
Livestock											0
Forage chopper										**3**	**3**
Bohol										2	2
Cebu										1	1
4WD Tractor (90hp)										**1**	**1**
Bohol										1	1

Source: Region VII Regional Office of the Department of Agriculture.

Examples of such inefficiencies are interpreted from the summarized financial statements of the surveyed cooperatives and irrigators' associations presented in Table 30 and Table 31. As for the two large cooperatives A and B receiving a set of rice mill facilities, tractors, combine harvesters and dryers from the DA, the values of these donated properties are not recorded in the statements. Based on comparisons with the summarized financial statements for cooperative C, which cites the amount of donated machinery, at least 30% of the stated values of machinery, tools and equipment are assumed at the values of donated machinery by the DA. Following this assumption the values of donated machinery are PHP 7.6 million and PHP 7.0 million for cooperatives A and B, respectively. Against these estimated asset values, the reported gross revenues from service operations are PHP 39 thousand and PHP 863 thousand respectively. Overall, more than 80% of gross revenues are used to cover expenses, the annual turnover of PHP 7.6 million production asset yielded a net surplus of about PHP 8 thousand (0.1% of the asset value) for cooperative A and the annual turnover of PHP 7.0 million production asset yielded a net surplus of about PHP 173 thousand (2.5% of the production asset value) for cooperative B. These results indicate that even for these two well-performing cooperatives the donated properties are not commercially utilized. For cooperative C, which emphasizes the provision of production and processing services to a greater extent, annual turnover of the donated assets are estimated at 4.5%. Even in this best case scenario among the three cooperatives, it will take more than 20 years to recover the cost of investment if the machinery is assumed to be purchased by the cooperative.

Cooperative D operates a large-scale mill donated by KOICA currently owned by the DA to operate milled rice production and provide local milling services. Here, the ownership of the mill and its business operation responsibility are separate and cooperative D's incentive to run the mill efficiently is likely to be adversely affected by this arrangement. Another problem is the lack of sufficient running capital to purchase enough unhulled rice for year-round operation of the mill. Assuming that the asset value of KOICA mill is USD 5 million (i.e. PHP 250 million), the one-year turnover of this asset yielded PHP 416 thousand (0.2% of the asset value) in 2016. The extent to which the agricultural machinery is underutilized worsens as the size of the cooperative declines. For cooperative E and the irrigators' association of F presented in Table 31, very little net surplus has been generated, despite them receiving milling facilities and other agricultural machinery.

These cooperatives and irrigators' associations did not incur an overall loss, generated a net profit and their businesses look fine. However, if their management of freely provided machinery is examined from the perspective of generating added value and returns on investment, the overall performance of the free provision fails to meet its objective of agricultural sector development.

Overall, subsidized or free provision of initial capital to private sector business entities has the following issues:

- High selection cost to find enabling candidates for subsidy provisions from a business sustainability perspective. Conversely self-selection for loan applications incurs a lower selection cost.
- Low awareness of efficient initial capital application, its returns and depreciations. Conversely, loan applicants are aware of the effective application of initial capital.
- Deprive optimal selection of machinery specifications and brands from candidates' business decision-making. Conversely loan applicants are given the rights to optimize business decision-making due to taking business risks.
- Free provision of initial capital results in market distortion and inefficiency when it comes to creating added value. Accordingly, the loan scheme needs to be applied for this project.

4.3 Examination of agricultural labor markets

The results of agricultural labor markets examinations are summarized as answers to the questions set under the observation points of Hypothesis 2 in the analytical framework.

(1) Where are the areas with dynamic rural labor markets?

The observation reported in sections 4.3.1 and 4.3.2 suggests that there has been a nationwide phenomenon of high rural labor market activity since at least 2010. This is inferred by the movement of population from rural to rural centers and from rural to urban centers, out-migration from the agriculture/rural sector, wage hikes for agricultural labor, and the aging of farmers. Therefore, labor scarcity is considered to be met as a necessary condition for the advancement of agriculture mechanization.

(2) Where the labor goes out and why?

Labor movement within a province (rural to rural centers) and out-migration between provinces (rural to urban areas) in both the high- and low-performing areas are inferred from the data analysis. The high-performing areas tend to absorb the rural labor in their rural centers. Higher non-agriculture sector wage rates are drivers of rural labor market dynamics.

(3) Is rural labor becoming expensive?

Rice (palay) production real wage rates are high in high-performing regions. Real wage growth after 2013 has been significantly higher than that in the preceding period in all regions.

(4) Are the social barriers resolved?

Landed farmers or tenant farmers in the study areas of Nueva Ecija Province preferred to use services from organized or independent agriculture labor for manual transplanting at PHP 6,000/ha over mechanized transplanting services of agriculture cooperatives to be provided at PHP 3,500/ha. The landed farmers or tenant farmers stated that if the cost of the manual transplanting reached PHP 7,000/ha they would use services of cooperatives at PHP 3,500/ha. Therefore, PHP 7,000/ha is a point where the social barrier for mechanization of rice planting resolves.

In addition, the financial analysis of a service provider business indicates that without free provision of rice transplanters, the market-based service fee should be around 7,000 PHP/ha, a level that happens to match the threshold value (7,000 PHP/ha.) for mechanization. The cooperative obtained a rice transplanter from the Department of Agriculture provides rice transplanting service at 3,500 PHP/ha, a level lower than the market rate of 7,000 PHP/ha by 3,500 PHP/ha. The limited number of rice transplanters freely distributed by the government distorts the rice transplanting service markets sporadically.

(5) Who will be the main actors of agricultural modernization in rural labor markets?

The following are three main contributors in the labor markets to the generation of the project impacts from, for example, combine harvester mechanization. The biggest contributors are the suppliers in C.

A. Labor deficit farmers applying mechanized harvesting/threshing will no longer bear the social costs and will reduce their post-harvest loss by, say, 5%. They will contribute to a slight increase in net value added.

B. Excess/displaced/saved labor suppliers (labor surplus farm workers and farmers) who become combine harvester service providers will contribute to a slight increase in net value added.

C. Excess/displaced/saved labor suppliers who create alternative employment or livelihood without reducing the employment or livelihood opportunities of others.

4.3.1 Labor market dynamics and labor scarcity

(1) Population dynamics

The results of the literature survey suggest that mechanization is a labor-saving process and closely linked to the dynamics of labor markets across sectors and change in the population structure. The mechanization is induced by the labor scarcity situation and simultaneously induces a labor shift from the agricultural sector to other sectors with higher labor productivity. Accordingly, observations of national, local and household level population dynamics are essential to understand current and future agricultural mechanization trends. Since mechanization involves hidden changes in social arrangements and labor markets involving conflicting stakeholders[13], the socioeconomic issues associated with mechanization need to be identified and addressed properly when designing the proposed project.

The national population trends are presented in Figure 5, while trends in both Nueva Ecija and Bohol provinces are presented in Figure 5 and 6 and Table 14. Although the national population and agricultural sector population are still gradually increasing, the geographical trends vary significantly. In many barangays,

[13] A respondent said that combine harvesters were once considered enemies of agricultural labor in the Central Luzon area.

particularly in mountainous areas, the recent decline in population is very significant. Conversely, barangays where the population has declined are bordered with barangays and municipalities where it is growing, reflecting rapid shifts in population from rural areas to nearby urban centers.

Regarding the situation of Nueva Ecija Province identified as a high-performing-agriculture mechanization area, declining trend of young working and schooling population, aging heads of farming households, and rapid intergenerational changes in livelihoods are evident. Although the number of barangays showing a decline in population is smaller than that of barangays in Bohol Province (comparing the left and right hand sides in Figure 6), the population structure shown in Figure 5 and the significant change in occupation preference of among the generation of children (only 47% of whom would choose to be farmers) shown in "(b) Occupations of current and past HH members" section in Table 14 point to the ongoing scarcity of agricultural labor. The large outstanding borrowing from commercial banks of two farmers shown in "(d) Access to financial market" in Table 14 should suggest a higher level of capital accumulation in Nueva Ecija Province than that in Bohol Province, where no farmers can obtain loans from commercial banks. Accordingly, although the observations are anecdotal, it can be said more of the non-farming population is absorbed locally in Nueva Ecija Province and the decline in barangay population is less significant than that in Bohol Province. In Bohol Province, there is also a significant change in second-generation occupations (43% of the second generation selected non-agricultural livelihood), but due to small rural capital accumulation, this portion of the population cannot be absorbed within the Province, resulting in out-migration from the Province.

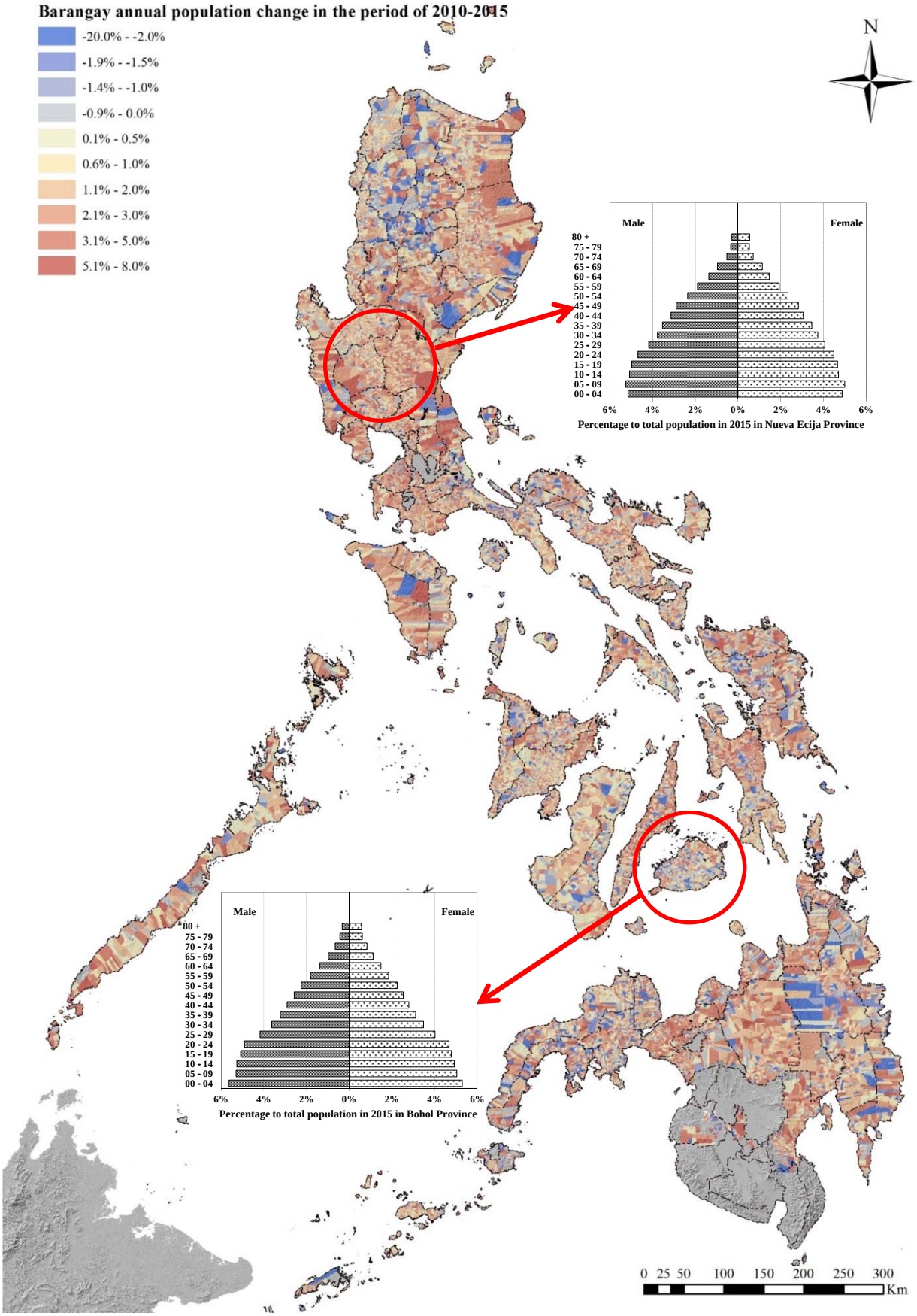
Two simultaneous impacts from mechanization can be anticipated in high-performing mechanization areas: the non-agricultural sector absorbs the excess labor created by mechanization with high labor productivity, and mechanized farming improves the labor productivity of landed and land leasing farmers.

(2) Inter-sectoral dynamics of employment

Table 15 shows the numbers and growth of employed persons by region and sector in the period of 2011-2016. The primary sector employment consisting mainly agriculture employment was decreased significantly in the all regions in the period. The data in the table indicates that decline in primary sector employment is mainly shifted to the tertiary (service) sector followed by the secondary (industry) sector. However, due to small initial share of the secondary sector employment in 2011 the percentage increases in the sector is larger than that of the tertiary sector. This also indicates the rapid growth of the service sector and sluggish development of industrial sector in the Philippines. The decreases in the primary sector employment are large in Regions I, IV-A, and CAR, are moderate in Regions II, III, IV-B, VII, VIII, X, and XIII, and are small in Regions V, VI, IX, XI, XII, and ARMM.

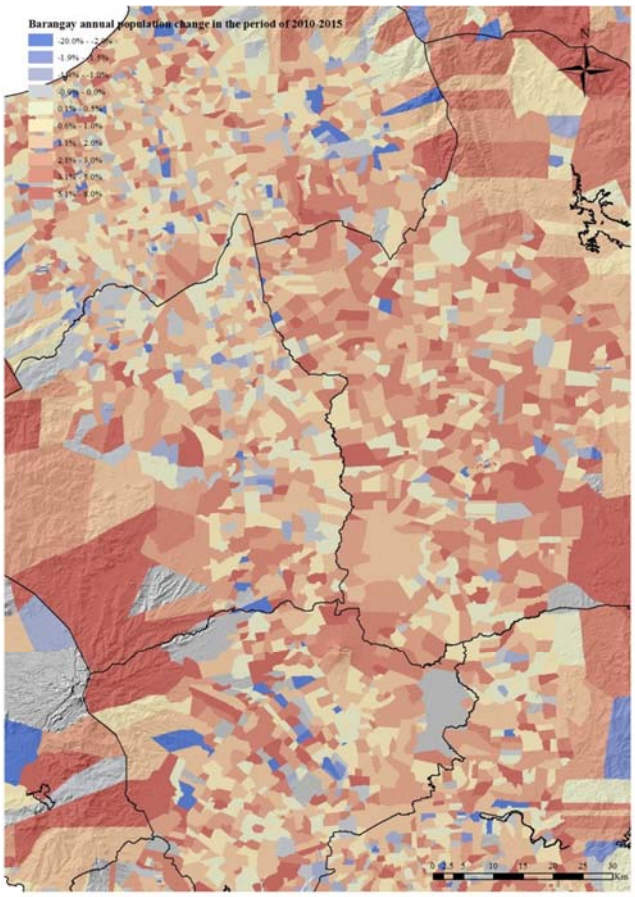
The high-performing mechanization areas in terms of 4-wheel tractor holdings are Regions I, II, III, IV-A, VII, and X, and are all in the high and medium agriculture employment decreasing areas. Since labor scarcity usually results in high wage rates the observations are consistent with the hypothesis 2 of high agriculture labor wage rate is a necessary condition for agricultural mechanization advancement.

The initial labor share of agriculture sector labor varies significantly among the six high-performing mechanization areas. The highest share of the agriculture labor in 2011 is observed in 57% in Region II, and the lowest of 21% is shown in Region III. This also indicate that performance of mechanization is not largely relies on the initial sectoral shares of labor force but their changes (i.e. decline in the agriculture labor) over a time.

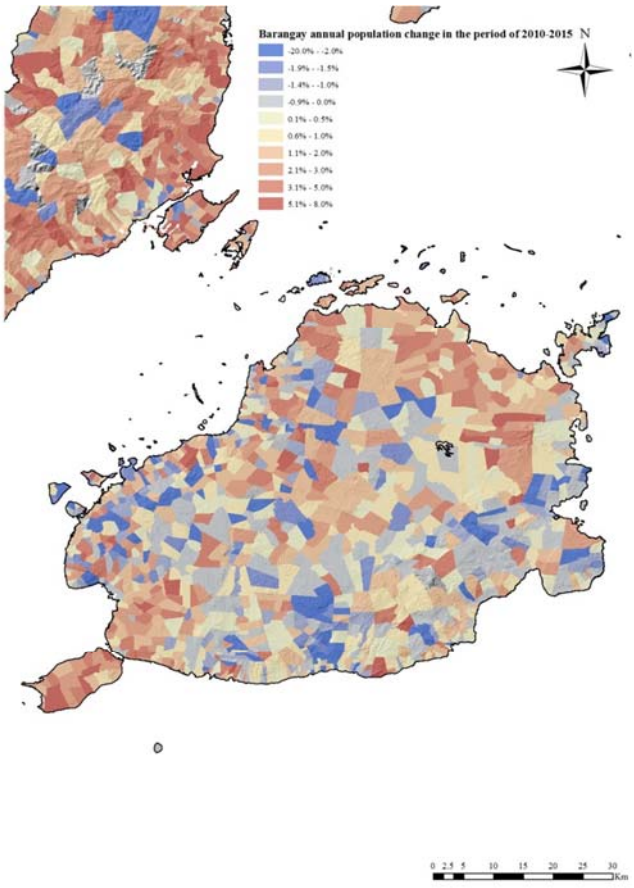


Note: Because of the difficulty in establishing correspondence between political boundary polygon data and Philippine Standard Geographic Code (PSGC) due to the recent change in the boundaries and province names in Mindanao, the annual population change rates in several provinces shown as gray areas in Mindanao were not calculated.
Source: Philippine Statistics Authority and Survey Team

Figure 5: Nationwide annual population change during period 2010-15



Annual population change rate in Nueva Ecija Province and other Central Luzon areas



Annual population change rate in Bohol Province

Source: Philippine Statistics Authority and Survey Team

Figure 6: Annual population change during period 2010-15 in Nueva Ecija and Bohol provinces

Table 14: Characteristics of interviewed households under Sikat Saka product in two provinces

Items	Nueva Ecija Province	Bohol Province
Number of households (HHs) interviewed	6 HHs	8 HHs
(a) Agriculture land holding		
Own agricultural land	6/6 HHs (100%)	6/8 HHs (75%)
Maximum size	12.0 ha	10.0 ha
Average size	4.1 ha	3.1 ha
Minimum size	1.5 ha	0.5 ha
Leased agricultural land	1/6 HH (17%)	5/8 HHs (63%)
Maximum size	2.0 ha	4.0 ha
Average size	2.0 ha	2.1 ha
Minimum seize	2.0 ha	0.6 ha
(b) Occupations of the current and past HH members	36 total members	50 total members
Grandparent/parent generation in labor market	13 members (100%)	16 members (100%)
Agriculture	13 members (100%)	15 members (94%)
Non-agriculture (domestic)	0 members (0%)	1 members (6%)
Non-agriculture (overseas)	0 members (0%)	0 members (0%)
Children generation in labor market	15 members (100%)	21 members (100%)
Agriculture	7 members (47%)	12 members (57%)
Non-agriculture (domestic)	7 members (47%)	6 members (29%)
Non-agriculture (overseas)	1 members (6%)	3 members (14%)
Children generation not in labor market	8 members (100%)	13 members (100%)
Student/preschool children	8 members (100%)	13 members (100%)

(c) Daily wage rates in Province reported		
Agricultural labor		
High	PHP 400/day	
Medium	PHP 350/day	
Low	PHP 300/day	
Non-agricultural labor		
Domestic aid	PHP 150/day	
Technician (in other province)	PHP 2,000/day	
12 seater driver (Nueva Ecija Province)	PHP 5,500/day	
Overseas (Dubai)	PHP 8,000/day	
(d) Access to financial market		
ACPC/Land Bank Sikat Saka product (9-15%/year)	Six (6) observations	Eight (8) observations
Maximum outstanding loan	PHP 250,000	PHP 250,000
Average outstanding loan	PHP 123,500	PHP 133,625
Minimum outstanding loan	PHP 40,000	PHP 60,000
Commercial banks/cooperatives/traders (7-10%/year)	Four (4) observations	Eight (7) observations
Maximum outstanding loan	PHP 5,500,000*1	PHP 100,000
Average outstanding loan	PHP 1,782,500	PHP 45,000
Minimum outstanding loan	PHP 10,000	PHP 25,000
(e) Rice production and processing service prices		
Transplanting (manual contract/ha)	Two (2) observations	Six (6) observations
Maximum price/ha	PHP 7,000/ha	PHP 7,800/ha
Average price/ha	PHP 6,500/ha	PHP 5,661/ha
Minimum price/ha	PHP 6,000/ha	PHP 4,833/ha
Harvesting/threshing (manual/thresher contract/ha)	Two (2) observations	Seven (7) observations
Maximum price/ha	In-kind 1/10 (PHP ?/ha)	In-kind 1/7 (PHP 11,902/ha)
Average price/ha	In-kind 1/10 (PHP ?/ha)	In-kind 1/7 (PHP 10,263/ha)
Minimum price/ha	In-kind 1/10 (PHP ?/ha)	In-kind 1/7 (PHP 9,714/ha)
Harvesting/threshing (combine harvester contract/ha)	(Info. not available)	(Info. not available)
Maximum price/ha		
Average price/ha		
Minimum price/ha		
Sun drying	(Info. not available)	Five (4) observations
Maximum price/ha harvest		PHP 1,250/ha
Average price/ha harvest		PHP 788/ha
Minimum price/ha harvest		PHP 500/ha
Flatbed drying	(Info. not available)	Five (3) observations
Maximum price/ha harvest		PHP 2,700/ha
Average price/ha harvest		PHP 2,283/ha
Minimum price/ha harvest		PHP 1,650/ha

Note: 1) Annual interest rate of this loan is 10%.
Source: Survey Team

Table 15: Numbers and growth of employed persons by region and sector

Region	Economic sector	2011		2012		2013		2014		2015		2016		2011/2016
		'000 person	% of total	'000 person	% of total	'000 person	% of total	'000 person	% of total	'000 person	% of total	'000 person	% of total	growth rate in %
		a	b	c	d	e	f	g	h	i	j	k	l	m=(k-a)/a
Philippines	Total	37,106	100%	37,555	100%	38,175	100%	38,453	100%	39,177	100%	40,954	100%	10%
	Primary sector	12,097	33%	11,604	31%	11,796	31%	11,574	30%	10,970	28%	11,156	27%	-8%
	Secondary sector	5,492	15%	5,746	15%	5,803	15%	5,960	16%	6,347	16%	7,105	17%	29%
	Tertiary sector	16,623	45%	17,313	46%	17,866	47%	18,111	47%	18,883	48%	19,902	49%	20%
	Domestic work, etc.	2,894	8%	2,854	8%	2,749	7%	2,807	7%	3,017	8%	2,791	7%	-4%
Region I (Ilocos Region)	Total	2,007	100%	1,937	100%	1,971	100%	2,007	100%	2,007	100%	2,037	100%	1%
	Primary sector	783	39%	682	35%	668	34%	684	34%	642	32%	612	30%	-22%
	Secondary sector	227	11%	244	13%	258	13%	249	12%	259	13%	331	16%	46%
	Tertiary sector	865	43%	874	45%	881	45%	921	46%	951	47%	965	47%	12%
	Domestic work, etc.	130	7%	139	7%	168	9%	155	8%	157	8%	129	6%	-1%
Region II (Cagayan Valley)	Total	1,462	100%	1,415	100%	1,471	100%	1,470	100%	1,481	100%	1,487	100%	2%
	Primary sector	839	57%	781	55%	843	57%	807	55%	806	54%	778	52%	-7%
	Secondary sector	102	7%	116	8%	100	7%	109	7%	121	8%	140	9%	36%
	Tertiary sector	456	31%	457	32%	453	31%	482	33%	486	33%	506	34%	11%
	Domestic work, etc.	63	4%	64	5%	74	5%	69	5%	68	5%	63	4%	0%
Region III (Central Luzon)	Total	3,778	100%	3,911	100%	4,028	100%	4,076	100%	4,130	100%	4,378	100%	16%
	Primary sector	774	21%	810	21%	834	21%	807	20%	719	17%	703	16%	-9%
	Secondary sector	714	19%	759	19%	810	20%	827	20%	809	20%	984	22%	38%
	Tertiary sector	1,938	51%	2,010	51%	2,066	51%	2,120	52%	2,272	55%	2,387	55%	23%
	Domestic work, etc.	344	9%	332	9%	318	8%	318	8%	322	8%	304	7%	-11%
Region IV-A (Calabarzon)	Total	4,579	100%	4,693	100%	4,869	100%	5,118	100%	5,050	100%	5,521	100%	21%
	Primary sector	719	16%	652	14%	682	14%	706	14%	576	11%	489	9%	-32%
	Secondary sector	1,131	25%	1,178	25%	1,266	26%	1,295	25%	1,374	27%	1,517	27%	34%
	Tertiary sector	2,308	50%	2,483	53%	2,566	53%	2,713	53%	2,697	53%	3,053	55%	32%
	Domestic work, etc.	412	9%	375	8%	355	7%	399	8%	404	8%	462	8%	12%
Region IV-B (Mimaropa Region)	Total	1,263	100%	1,233	100%	1,246	100%	1,310	100%	1,282	100%	1,221	100%	-3%
	Primary sector	647	51%	618	50%	624	50%	633	48%	574	45%	597	49%	-8%
	Secondary sector	116	9%	115	9%	136	11%	155	12%	168	13%	155	13%	34%
	Tertiary sector	432	34%	438	36%	425	34%	459	35%	456	36%	414	34%	-4%
	Domestic work, etc.	67	5%	62	5%	61	5%	63	5%	86	7%	54	4%	-19%
Region V (Bicol Region)	Total	2,078	100%	2,246	100%	2,276	100%	2,269	100%	2,341	100%	2,301	100%	11%
	Primary sector	833	40%	865	39%	824	36%	842	37%	850	36%	802	35%	-4%
	Secondary sector	270	13%	314	14%	323	14%	324	14%	342	15%	399	17%	48%
	Tertiary sector	833	40%	928	41%	979	43%	955	42%	1,002	43%	966	42%	16%
	Domestic work, etc.	141	7%	139	6%	148	7%	150	7%	150	6%	134	6%	-5%
Region VI (Western Visayas)	Total	3,079	100%	3,026	100%	2,964	100%	3,183	100%	3,205	100%	3,299	100%	7%
	Primary sector	1,250	41%	1,104	37%	1,070	36%	1,206	38%	1,135	35%	1,189	36%	-5%
	Secondary sector	283	9%	348	12%	332	11%	363	11%	362	11%	411	12%	45%
	Tertiary sector	1,293	42%	1,316	44%	1,310	44%	1,340	42%	1,381	43%	1,413	43%	9%
	Domestic work, etc.	256	8%	263	9%	252	9%	274	9%	330	10%	286	9%	12%
Region VII (Central Visayas)	Total	2,953	100%	2,890	100%	2,992	100%	3,109	100%	3,135	100%	3,183	100%	8%
	Primary sector	910	31%	812	28%	936	31%	877	28%	809	26%	977	31%	7%
	Secondary sector	558	19%	575	20%	524	18%	588	19%	608	19%	610	19%	9%
	Tertiary sector	1,217	41%	1,246	43%	1,308	44%	1,393	45%	1,464	47%	1,374	43%	13%
	Domestic work, etc.	266	9%	254	9%	224	8%	249	8%	257	8%	222	7%	-16%
Region VIII (Eastern Visayas)	Total	1,728	100%	1,770	100%	1,819	100%	1,041	100%	1,769	100%	1,858	100%	8%
	Primary sector	750	43%	752	43%	800	44%	465	45%	646	37%	695	37%	-7%
	Secondary sector	175	10%	186	11%	186	10%	120	12%	253	14%	247	13%	41%
	Tertiary sector	691	40%	706	40%	724	40%	393	38%	743	42%	772	42%	12%
	Domestic work, etc.	116	7%	127	7%	109	6%	62	6%	131	7%	144	8%	25%
Region IX (Zamboanga Peninsula)	Total	1,414	100%	1,360	100%	1,405	100%	1,435	100%	1,382	100%	1,505	100%	6%
	Primary sector	689	49%	636	47%	656	47%	610	43%	593	43%	708	47%	3%
	Secondary sector	153	11%	150	11%	148	11%	152	11%	152	11%	161	11%	6%
	Tertiary sector	488	35%	490	36%	521	37%	596	42%	558	40%	568	38%	16%
	Domestic work, etc.	85	6%	83	6%	80	6%	77	5%	79	6%	68	5%	-20%
Region X (Northern Mindanao)	Total	1,913	100%	1,974	100%	1,898	100%	1,966	100%	1,909	100%	1,998	100%	4%
	Primary sector	782	41%	799	41%	744	39%	824	42%	672	35%	711	36%	-9%
	Secondary sector	214	11%	225	11%	218	12%	228	12%	237	12%	259	13%	21%
	Tertiary sector	773	40%	801	41%	816	43%	794	40%	863	45%	893	45%	16%
	Domestic work, etc.	142	7%	148	8%	118	6%	126	6%	137	7%	135	7%	-5%
Region XI (Davao Region)	Total	1,793	100%	1,900	100%	1,874	100%	1,914	100%	1,897	100%	2,041	100%	14%
	Primary sector	733	41%	724	38%	705	38%	691	36%	603	32%	688	34%	-6%
	Secondary sector	226	13%	238	13%	227	12%	245	13%	266	14%	306	15%	35%
	Tertiary sector	719	40%	808	43%	828	44%	852	45%	893	47%	924	45%	29%
	Domestic work, etc.	111	6%	129	7%	112	6%	122	6%	133	7%	122	6%	10%
Region XII (Soccsksargen)	Total	1,685	100%	1,691	100%	1,652	100%	1,712	100%	1,714	100%	1,865	100%	11%
	Primary sector	822	49%	840	50%	811	49%	806	47%	785	46%	770	41%	-6%
	Secondary sector	143	9%	137	8%	135	8%	152	9%	177	10%	223	12%	56%
	Tertiary sector	625	37%	638	38%	624	38%	673	39%	670	39%	797	43%	27%
	Domestic work, etc.	93	6%	78	5%	81	5%	82	5%	77	5%	75	4%	-19%
Region XIII (Caraga)	Total	1,002	100%	1,042	100%	1,133	100%	1,118	100%	1,071	100%	1,079	100%	8%
	Primary sector	380	38%	362	35%	399	35%	404	36%	352	33%	353	33%	-7%
	Secondary sector	164	16%	177	17%	191	17%	183	16%	196	18%	166	15%	1%
	Tertiary sector	407	41%	442	42%	460	41%	459	41%	457	43%	500	46%	23%
	Domestic work, etc.	51	5%	61	6%	82	7%	70	6%	65	6%	60	6%	17%
CAR (Cordillera Adm. Region)	Total	737	100%	730	100%	728	100%	749	100%	750	100%	758	100%	3%
	Primary sector	363	49%	349	48%	342	47%	367	49%	361	48%	316	42%	-13%
	Secondary sector	88	12%	88	12%	91	13%	84	11%	85	11%	116	15%	32%
	Tertiary sector	252	34%	264	36%	267	37%	272	36%	280	37%	299	39%	19%
	Domestic work, etc.	35	5%	28	4%	27	4%	25	3%	26	3%	28	4%	-21%
ARMM	Total	1,138	100%	1,184	100%	1,198	100%	1,229	100%	1,222	100%	1,182	100%	4%
	Primary sector	790	69%	809	68%	842	70%	814	66%	829	68%	746	63%	-5%
	Secondary sector	39	3%	40	3%	31	3%	39	3%	50	4%	60	5%	54%
	Tertiary sector	299	26%	316	27%	314	26%	363	30%	335	27%	360	30%	20%
	Domestic work, etc.	11	1%	18	2%	11	1%	11	1%	10	1%	16	1%	44%

Note: High-performing mechanization areas in terms of 4-wheel tractor holdings are shaded in gray. Note: High performing regions are shaded in gray.

Source: Philippine Statistics Authority and Survey Team.

4.3.2 Real wage rate or labor productivity and progress of mechanization

One of the main driving forces of labor markets is the large difference in wage rates between urban (industrial and service sectors) and rural (agricultural) sector employment. Table 16 shows the average nominal daily basic pay of wage and salary workers. In all three years the agriculture wage rates are half of the industry and service sector wage rates attracting young labor in rural areas. High-level school attendance rates also result in labor market participants with higher qualifications for jobs in the industrial and service sectors.

Table 16: Average nominal daily basic pay of wage and salary workers

Economic sectors	2012		2013		2014	
	PHP/ day	% to all sectors	PHP/ day	% to all sectors	PHP/ day	% to all sectors
All sectors	333.8	100%	349.2	100%	367.4	100%
Agriculture	166.7	50%	170.3	49%	185.3	50%
Non-agriculture	366.9	110%	383.0	110%	397.7	108%
Industry	328.5	98%	337.1	97%	343.7	94%
Services	383.5	115%	403.0	115%	422.2	115%

Source: Philippine Statistics Authority, Labor Force Survey.

The recent high increase in agriculture wage rates should contribute to the recent expansion of rapid adoption of tractors and combine harvesters in high-performing mechanization areas. Table 17 shows the recent changes in the real wage rate of rice production. The real wage rates and their growth rates are generally higher in the high-performing mechanization regions (shaded regions in the table) than in the other regions. The wage growth between 2014 and 2015 is high and positive in all regions, reflecting the recent steady economic performance of the country. Given the good economic performance of the Philippines in 2016 and 2017, the growth of wage rates in both years should be comparable to the rates in 2015, reflecting the rapid wage hikes in rural areas in recent years.

Table 17: Palay (rice) real wage rate index and growth rates

Regions	Average daily wage rate in 2006	Palay: Real wage rate index (2006=100)						Palay: Real wage rate index growth rate					
		2010	2011	2012	2013	2014	2015	2010	2011	2012	2013	2014	2015
Philippines	171.87	107.9	109.0	110.8	112.6	115.2	122.0		1.0%	1.7%	1.6%	2.3%	5.9%
Region I	189.91	118.4	119.5	123.5	124.4	125.7	133.1		0.9%	3.3%	0.7%	1.0%	5.9%
Region II	178.01	105.8	111.8	120.3	129.1	141.7	148.4		5.7%	7.6%	7.3%	9.8%	4.7%
Region III	221.29	106.8	105.1	106.1	117.8	118.3	122.0		-1.6%	1.0%	11.0%	0.4%	3.1%
Region IV-A	206.55	114.9	113.5	113.5	113.0	114.9	117.7		-1.2%	0.0%	-0.4%	1.7%	2.4%
Region IV-B	181.88	109.9	106.5	105.7	110.3	109.0	111.2		-3.1%	-0.8%	4.4%	-1.2%	2.0%
Region V	157.66	107.2	109.5	108.1	113.5	114.3	118.8		2.1%	-1.3%	5.0%	0.7%	3.9%
Region VI	162.41	104.6	103.4	100.8	103.0	104.8	107.4		-1.1%	-2.5%	2.2%	1.7%	2.5%
Region VII	128.67	116.0	115.8	113.4	123.7	122.7	126.7		-0.2%	-2.1%	9.1%	-0.8%	3.3%
Region VIII	140.68	99.5	99.2	98.8	99.2	101.8	110.6		-0.3%	-0.4%	0.4%	2.6%	8.6%
Region IX	153.35	105.9	108.8	112.4	110.8	109.9	114.9		2.7%	3.3%	-1.4%	-0.8%	4.5%
Region X	162.04	103.9	104.8	103.6	102.4	108.0	113.9		0.9%	-1.1%	-1.2%	5.5%	5.5%
Region XI	166.84	101.7	105.4	107.9	107.8	112.6	117.3		3.6%	2.4%	-0.1%	4.5%	4.2%
Region XII	161.81	107.7	111.2	115.3	114.9	117.9	124.1		3.2%	3.7%	-0.3%	2.6%	5.3%
Region XIII	169.06	106.6	108.7	107.3	106.3	109.9	115.5		2.0%	-1.3%	-0.9%	3.4%	5.1%
CAR	169.47	103.5	105.5	105.3	114.5	117.3	118.3		1.9%	-0.2%	8.7%	2.4%	0.9%
ARMM	175.62	96.8	99.7	99.7	103.3	106.1	109.0		3.0%	0.0%	3.6%	2.7%	2.7%

Note: High-performing mechanization areas in terms of 4-wheel tractor holdings are shaded in gray.
Source: Philippine Statistics Authority and Survey Team.

Table 18: Labor productivity by region and sector at constant 2000 prices

Region	Economic sector	2011		2012		2013		2014		2015		2016		2010/2016 growth rate
		PHP value	% to average	PHP value	% to average	PHP value	% to average	PHP value	% to average	PHP value	% to average	PHP value	% to average	
		a	b	c	d	e	f	g	h	i	j	k	l	m= (k-a)/a
Philippines	Average	158,911	287%	167,692	290%	177,098	296%	185,389	304%	196,179	308%	198,215	309%	25%
	Primary sector	55,420	100%	57,800	100%	59,734	100%	60,910	100%	63,728	100%	64,218	100%	16%
	Secondary sector	342,486	618%	353,725	612%	373,769	626%	387,752	637%	405,643	637%	385,298	600%	13%
	Tertiary sector	172,033	310%	180,875	313%	187,988	315%	196,075	322%	204,753	321%	204,503	318%	19%
Region I (Ilocos Region)	Average	93,018	147%	103,184	145%	108,022	138%	111,819	139%	117,765	142%	129,380	149%	39%
	Primary sector	63,483	100%	71,206	100%	78,277	100%	80,347	100%	82,683	100%	86,544	100%	36%
	Secondary sector	196,967	310%	191,346	269%	194,233	248%	201,510	251%	220,453	267%	232,117	268%	18%
	Tertiary sector	90,861	143%	102,758	144%	103,394	132%	107,113	133%	111,377	135%	122,745	142%	35%
Region II (Cagayan Valley)	Average	72,010	142%	78,027	142%	81,427	148%	86,946	145%	88,918	150%	93,705	149%	30%
	Primary sector	50,732	100%	54,992	100%	54,898	100%	60,003	100%	59,468	100%	62,970	100%	24%
	Secondary sector	108,233	213%	119,519	217%	143,887	262%	137,970	230%	142,930	240%	135,376	215%	25%
	Tertiary sector	99,856	197%	108,218	197%	111,468	203%	116,105	193%	119,710	201%	123,005	195%	23%
Region III (Central Luzon)	Average	142,719	132%	151,196	121%	153,375	120%	162,398	118%	171,193	111%	176,426	100%	24%
	Primary sector	108,007	100%	125,124	100%	127,941	100%	137,803	100%	153,563	100%	176,105	100%	63%
	Secondary sector	319,984	296%	328,771	263%	310,889	243%	348,144	253%	368,252	240%	362,096	206%	13%
	Tertiary sector	98,663	91%	102,635	82%	108,718	85%	107,980	78%	111,118	72%	109,179	62%	11%
Region IV-A (Calabarzon)	Average	219,872	241%	230,968	243%	241,840	227%	241,391	249%	256,106	230%	240,013	178%	9%
	Primary sector	91,298	100%	95,243	100%	106,645	100%	96,965	100%	111,147	100%	134,637	100%	47%
	Secondary sector	543,651	595%	562,673	591%	570,739	535%	574,442	592%	606,244	545%	534,795	397%	-2%
	Tertiary sector	119,095	130%	124,925	131%	130,919	123%	130,242	134%	136,206	123%	126,891	94%	7%
Region IV-B (Mimaropa Region)	Average	83,133	195%	87,618	201%	89,173	202%	92,811	205%	94,335	196%	100,287	211%	21%
	Primary sector	42,737	100%	43,618	100%	44,219	100%	45,364	100%	48,147	100%	47,510	100%	11%
	Secondary sector	276,977	648%	290,600	666%	257,357	582%	274,478	605%	261,165	542%	246,688	519%	-11%
	Tertiary sector	85,015	199%	90,159	207%	94,940	215%	92,446	204%	95,235	198%	107,817	227%	27%
Region V (Bicol Region)	Average	55,543	160%	55,798	155%	59,685	155%	61,775	157%	65,507	173%	70,516	180%	27%
	Primary sector	34,617	100%	36,091	100%	38,622	100%	39,344	100%	37,900	100%	39,160	100%	13%
	Secondary sector	77,458	224%	76,990	213%	83,690	217%	84,112	214%	99,247	262%	103,539	264%	34%
	Tertiary sector	67,799	196%	65,931	183%	69,247	179%	72,390	184%	75,963	200%	83,170	212%	23%
Region VI (Western Visayas)	Average	78,581	146%	85,834	150%	88,646	156%	88,263	173%	95,619	184%	101,031	186%	29%
	Primary sector	53,970	100%	57,130	100%	56,664	100%	50,901	100%	51,993	100%	54,291	100%	1%
	Secondary sector	115,112	213%	138,223	242%	148,746	263%	150,672	296%	189,737	365%	188,223	347%	64%
	Tertiary sector	90,404	168%	95,852	168%	98,309	173%	101,603	200%	105,466	203%	110,018	203%	22%
Region VII (Central Visayas)	Average	125,371	392%	135,996	417%	144,322	445%	147,810	480%	150,202	474%	162,407	540%	30%
	Primary sector	31,959	100%	32,593	100%	32,464	100%	30,811	100%	31,715	100%	30,077	100%	-6%
	Secondary sector	243,745	763%	260,879	800%	289,769	893%	296,120	961%	292,197	921%	327,486	1089%	34%
	Tertiary sector	139,641	437%	149,472	459%	156,032	481%	157,902	512%	161,562	509%	175,057	582%	25%
Region VIII (Eastern Visayas)	Average	89,425	204%	80,982	198%	81,800	219%	140,169	267%	151,558	264%	96,172	256%	8%
	Primary sector	43,732	100%	40,924	100%	37,330	100%	52,420	100%	57,433	100%	37,603	100%	-14%
	Secondary sector	406,367	929%	314,437	768%	333,246	893%	544,421	1039%	519,783	905%	307,365	817%	-24%
	Tertiary sector	67,365	154%	69,790	171%	68,597	184%	138,267	264%	144,452	252%	82,184	219%	22%
Region IX (Zamboanga Peninsula)	Average	82,183	188%	94,907	214%	98,335	219%	104,515	217%	113,902	225%	107,213	249%	30%
	Primary sector	43,621	100%	44,390	100%	44,933	100%	48,161	100%	50,568	100%	43,101	100%	-1%
	Secondary sector	227,673	522%	306,906	691%	309,258	688%	341,211	708%	384,661	761%	375,686	872%	65%
	Tertiary sector	90,362	207%	98,028	221%	102,716	229%	102,765	213%	109,071	216%	103,814	241%	15%
Region X (Northern Mindanao)	Average	116,205	165%	121,499	175%	129,441	165%	133,213	180%	142,669	166%	152,419	166%	31%
	Primary sector	70,251	100%	69,618	100%	78,618	100%	74,011	100%	85,878	100%	91,574	100%	30%
	Secondary sector	364,507	519%	362,636	521%	370,361	471%	372,049	503%	386,977	451%	388,274	424%	7%
	Tertiary sector	102,839	146%	111,210	160%	112,241	143%	123,118	166%	123,935	144%	131,659	144%	28%
Region XI (Davao Region)	Average	123,524	213%	128,692	213%	139,031	242%	144,578	250%	158,136	246%	165,189	282%	34%
	Primary sector	58,012	100%	60,313	100%	57,504	100%	57,813	100%	64,376	100%	58,623	100%	1%
	Secondary sector	275,611	475%	281,315	466%	330,141	574%	351,052	607%	385,247	598%	405,689	692%	47%
	Tertiary sector	139,245	240%	140,437	233%	148,735	259%	150,890	261%	156,637	243%	166,830	285%	20%
Region XII (Soccsksargen)	Average	94,718	161%	101,590	168%	109,528	174%	113,412	170%	115,708	174%	115,049	183%	21%
	Primary sector	58,686	100%	60,369	100%	62,952	100%	66,534	100%	66,547	100%	62,932	100%	7%
	Secondary sector	346,149	590%	389,641	645%	447,021	710%	427,577	643%	407,608	613%	367,376	584%	6%
	Tertiary sector	84,535	144%	91,478	152%	97,464	155%	98,963	149%	103,209	155%	99,434	158%	18%
Region XIII (Caraga)	Average	69,616	171%	75,024	175%	77,968	171%	83,411	182%	88,450	207%	91,178	222%	31%
	Primary sector	40,613	100%	42,876	100%	45,503	100%	45,932	100%	42,729	100%	41,056	100%	1%
	Secondary sector	139,211	343%	157,619	368%	163,351	359%	175,215	381%	189,513	444%	209,654	511%	51%
	Tertiary sector	69,875	172%	71,865	168%	73,738	162%	78,977	172%	85,440	200%	91,620	223%	31%
CAR (Cordillera Administrative Region)	Average	166,767	466%	162,642	436%	169,533	445%	171,128	481%	176,348	508%	178,631	495%	7%
	Primary sector	35,773	100%	37,265	100%	38,066	100%	35,580	100%	34,681	100%	36,086	100%	1%
	Secondary sector	739,977	2069%	679,400	1823%	663,073	1742%	777,930	2186%	751,310	2166%	619,399	1716%	-16%
	Tertiary sector	162,487	454%	153,359	412%	163,935	431%	169,398	476%	176,223	508%	177,172	491%	9%
ARMM	Average	41,465	110%	38,647	113%	40,110	112%	39,219	117%	40,177	119%	44,520	115%	7%
	Primary sector	37,660	100%	34,176	100%	35,868	100%	33,656	100%	33,684	100%	38,552	100%	2%
	Secondary sector	89,000	236%	76,235	223%	72,057	201%	108,277	322%	72,393	215%	57,143	148%	-36%
	Tertiary sector	46,560	124%	46,310	136%	47,014	131%	46,540	138%	52,946	157%	55,379	144%	19%

Note: High-performing mechanization areas in terms of 4-wheel tractor holdings are shaded in gray.
Source: Philippine Statistics Authority and Survey Team.

For regional comparison of the linkages between wage rates and the progress of agricultural mechanization Table 18 shows change in labor productivity in the period of 2011-2016. In this case labor productivity expressed as per worker annual value addition is considered as a proxy of prevailing wage rates. In the period in all regions the agriculture wage rates are consistently and significantly lower than wage rates of workers in other sectors. The only exceptions are the observations of tertiary sector in Regions III in 2015 (72%) and 2016 62%), and Region IV-A in 2016 (94%) indicating very high comparative agriculture productivity in the occasions. The table indicates that high to medium initial labor productivity in 2011, their large increases occurred in the period, and relatively smaller differences in labor productivity between agriculture and non-agriculture sectors are characteristics of the high-performing mechanization area. The high-performing mechanization areas of Regions I, II, and X show these characteristics, and this should be consistent with factors associated with the hypothesis 2.

4.3.3 Social cost for mechanization in Nueva Ecija

This section introduces an example of revealed social cost for mechanization observed in Nueva Ecija Province, for guidance in the design of project components. Mechanization and generation of excess labor occur simultaneously. Agricultural mechanization cannot be expected to yield significant value addition or contribute to the economic growth of the country unless alternative uses of the excess labor are secured.

In terms of an increase in labor productivity, landed farmers and tenant farmers applying employed agricultural labor for their production practices are immediate beneficiaries of agricultural mechanization. Conversely, those engaged in agricultural labor, the services of whom are replaced by agricultural machinery, may lose out if unable to find alternative employment with equivalent or superior labor productivity to the agricultural work they replaced. Observations in Nueva Ecija suggest that manual work is not replaced by mechanized operation purely based on financial calculations of farming operations. The employment relationship is also a way to realize social safety networks and collective risk management and understanding how best to determine such social value is important to develop the required loan project component.

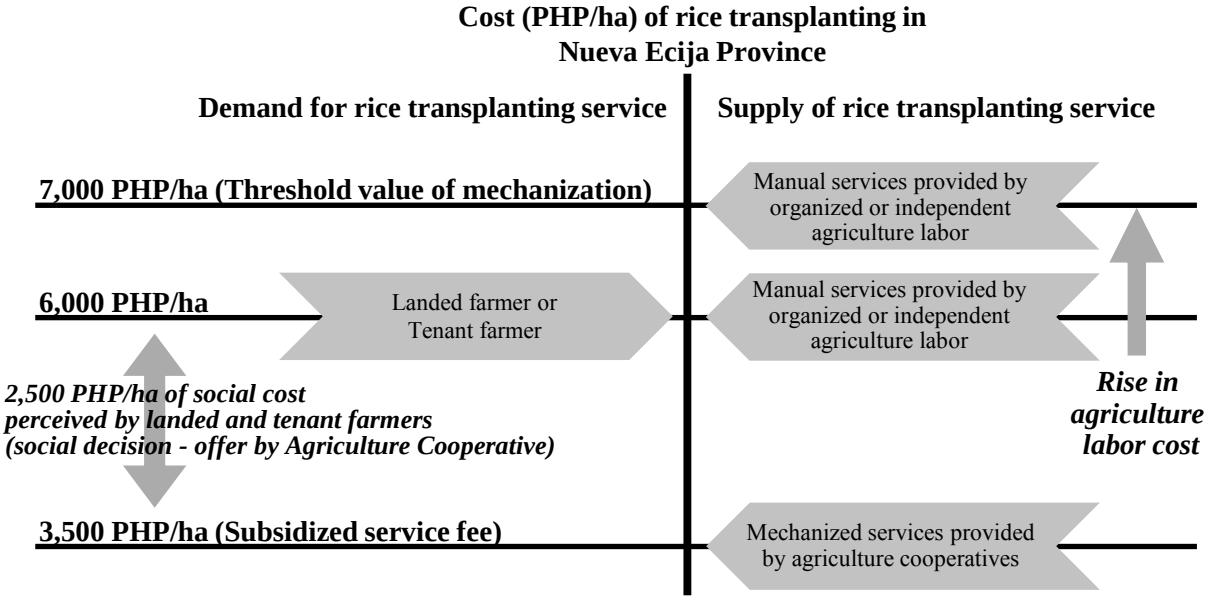
In Nueva Ecija Province, it transpired that a farming household prefers to use a manual transplanting services provided by organized agricultural labor at a cost of PHP 6,000/ha over mechanized transplanting services provided by an agriculture cooperative and costing PHP 3,500/ha (Table 19). The farming household stated that it would use the low-cost services of the cooperative if the cost of the manual transplanting were to exceed PHP 6,000/ha and reach PHP 7,000/ha. It was said that the organized agricultural labor was ready to accept a shift in the transplanting service provider from organized labor to cooperatives due to the high opportunity cost of transplanting work. Accordingly, it can be said social cost is a cost sufficient to avoid social tension between the beneficiaries of mechanization and the labor saved as a result of mechanization.

Table 19: Rate of services as of July 2017

Production operation	Rate of services
Land preparation	
Ploughing	PHP 3,000.00/ha
Tilling	PHP 3,000.00/ha
Lazar leveling	PHP 4,000.00/ha
Heavy equipment works	PHP 5,000.00/hour
Transplanting	
Rice transplanter	PHP 3,500.00/ha
Harvesting	
Rice combine harvester	PHP 10% of harvested paddy
Hauling	
10-30 km	PHP 0.30/km
30-50 km	PHP 0.50/km
Drying	PHP 1.00/kg of paddy

Source: Bagong Buhay ng Mabini Multi-Purpose Cooperative, Nueva Ecija.

A schematic representation of such statements is shown in Figure 7. If the farming household has no social relationships with the organized agricultural labor, the household should opt to use the services of the cooperative at PHP 3,500/ha (subsidized price) to save PHP 2,500/ha. This difference is defined as a social cost when mechanizing rice transplanting in Nueva Ecija. The cost should vary depending on the location and the physical and socioeconomic circumstances of the specific agricultural production and processing practices selected for mechanization.



Source: Survey Team

Figure 7: Measurement of social cost associated with rice transplanting mechanization in Nueva Ecija

In addition, the financial analysis of a service provider business indicates that without free provision of rice transplanters, the market-based service fee should be around 7,000 PHP/ha, a level that happens to match the threshold value (7,000 PHP/ha) for mechanization. The cooperative that obtained a rice transplanter from the Department of Agriculture provides rice transplanting service at 3,500 PHP/ha, a level lower than the market rate of 7,000 PHP/ha by 3,500 PHP/ha. The limited number of rice transplanters freely distributed by the government distorts rice transplanting service markets sporadically.

4.4 Examination of rural asset accumulation and agricultural support loan products

The observation shows a positive correlation between the levels of asset accumulation and high-performing mechanization areas, so the labor scarcity examined in the previous section and the asset accumulation examined in this one are prerequisites for agricultural mechanization. Although the scope is limited to the asset accumulation of agricultural cooperatives, examinations of rural asset accumulation and agricultural support loan products as drivers of asset accumulation are summarized as answers to the questions set under the observation points of Hypothesis 3 in the analytical framework.

(1) Where are the areas with capitalized agricultural cooperatives located?

There is a clear correspondence between the locations of the capitalized agriculture cooperatives and cooperative members and the high-performing mechanization areas.

(2) At what magnitudes do the banks assess their creditworthiness?

The credit lines are set by the Land Bank of the Philippines for large and medium cooperatives classified by their levels of asset accumulation. This observation confirms that asset accumulation is positively correlated with the assessed creditworthiness, and accordingly also with the capacity to mobilize loan funds and financial resources. The Land Bank of the Philippines sets the credit lines for large and medium cooperatives at approximately 40% of their asset values.

(3) How is asset accumulation supported?

The DA's wide-ranging production-asset-formation-grant-support programs targeting associations and large-, medium-, small-, and micro-seized cooperatives have been active since the late 1990s, contributing significantly to the formation of production assets. The assets provided by the DA, however, are still under-utilized. The enhancement of the production management capacities of the beneficiaries will increase the effectiveness and productivity of the programs (see section 4.5).

4.4.1 Examination of asset accumulation of rural organizations

In this section the asset values of the agriculture cooperatives are as benchmarks for capital accumulation in rural organizations (i.e. cooperatives, corporations and associations). Of the 25,000 cooperatives examined, 3,086 are identified as agricultural cooperatives engaged in the following: 1) trading agricultural inputs and output, 2) providing production and consumption credits to their members and 3) delivering mechanized production and processing services to cooperative members (mainly farmers). According to anecdotal observations, trading and credit services are the major sources of income for the cooperatives, while a limited portion of incomes comes from providing agricultural production services.

Table 20 presents the distribution of agricultural cooperatives by asset size, and the total asset values of the cooperatives by asset category and by region. The distribution of cooperative numbers by asset category is skewed to the small-asset cooperatives (57% of the total). On the other hand, the asset distribution is skewed toward the large-sized cooperatives (67% of the total). The total assets amount to about PHP 59 billion (approximately USD 1.2 billion), and a significant amount of the total is kept by large and medium-size category cooperatives.

Table 21 shows the average asset value per agricultural cooperative and the per member average asset value of agricultural cooperatives, both by cooperative size category. Correspondences are found between the average asset values of the large and medium cooperatives and the high-performing mechanization regions in Regions I, II, VII, and X. While no clear correspondences can be found between the large cooperatives and high-performing areas in Regions III and IV-B, the per cooperative member average asset value of large and small cooperatives in Region III and the average value of large and medium cooperatives in Region IV-B are significantly larger than the other averages (see underlined values in Table 21). We can therefore assume that the per member average asset values correspond with the high-performing mechanization regions in Regions III and IV-B.

Table 20: Numbers and total asset values of agricultural cooperatives by cooperative size categories

Numbers of agricultural cooperatives in 2017

Region	Large PHP mill. >100	Medium PHP mill. 100> >15	Small PHP mill. 15> >3	Micro PHP mill. 3>	Total
Region I	9	25	68	279	381
Region II	10	38	41	76	165
Region III	8	61	143	176	388
Region IV-A	13	31	67	116	227
Region IV-B	6	34	60	104	204
Region V	2	12	29	70	113
Region VI	8	38	84	109	239
Region VII	1	6	10	46	63
Region VIII	6	4	14	38	62
Region IX	4	6	16	40	66
Region X	8	23	69	292	392
Region XI	12	30	49	84	175
Region XII	8	35	55	113	211
Region XIII	2	19	37	106	164
CAR	15	32	53	102	202
NCR	2	7	9	16	34
Total	114	401	804	1,767	3,086
% to the total	4%	13%	26%	57%	100%

Total asset values of agricultural cooperatives in 2017

(PHP Million)

REGION	Large PHP mill. >100	Medium PHP mill. 100> >15	Small PHP mill. 15> >3	Micro PHP mill. 3>	Total
Region I	4,151	808	492	293	5,743
Region II	2,635	1,495	295	58	4,482
Region III	1,651	2,108	1,137	171	5,068
Region IV-A	5,326	1,074	469	142	7,012
Region IV-B	2,077	1,143	435	95	3,750
Region V	290	342	200	58	890
Region VI	2,349	1,364	578	111	4,402
Region VII	1,234	205	56	42	1,537
Region VIII	1,666	113	109	42	1,930
Region IX	577	319	115	35	1,046
Region X	3,463	838	479	232	5,012
Region XI	3,934	1,277	326	92	5,628
Region XII	1,597	1,314	415	106	3,432
Region XIII	758	648	259	104	1,769
CAR	5,107	1,041	379	125	6,651
NCR	345	195	60	16	617
Total	37,159	14,282	5,804	1,723	58,968
% to the total	63%	24%	10%	3%	100%

Source: Cooperative Development Authority and Survey Team

Table 21: Average asset values per cooperative and per member by cooperative size categories

Regions	Average asset values of agricultural cooperatives involving agriculture businesses in 2017 (PHP million)					Per member average asset values of agricultural cooperatives by size categories in 2017 (% to overall average)				
	Asset classes				Average	Asset classes				Average
	Large PHP mill. >100	Medium PHP mill. 100> >15	Small PHP mill. 15> >3	Micro PHP mill. 3>		Large PHP mill. >100	Medium PHP mill. 100> >15	Small PHP mill. 15> >3	Micro PHP mill. 3>	
Region I	461.2	32.3	7.2	1.1	15.1	124%	101%	66%	34%	100%
Region II	263.5	39.3	7.2	0.8	27.2	51%	147%	106%	27%	67%
Region III	206.3	34.6	8.0	1.0	13.1	247%	39%	212%	39%	72%
Region IV-A	409.7	34.7	7.0	1.2	30.9	214%	92%	71%	37%	149%
Region IV-B	346.2	33.6	7.3	0.9	18.4	1461%	232%	99%	39%	285%
Region V	144.9	28.5	6.9	0.8	7.9	75%	193%	90%	33%	92%
Region VI	293.6	35.9	6.9	1.0	18.4	92%	99%	83%	25%	87%
Region VII	1,233.6	34.2	5.6	0.9	24.4	57%	67%	22%	27%	53%
Region VIII	277.7	28.3	7.8	1.1	31.1	73%	70%	77%	24%	70%
Region IX	144.3	53.1	7.2	0.9	15.8	141%	116%	49%	24%	98%
Region X	432.9	36.4	6.9	0.8	12.8	81%	111%	95%	32%	80%
Region XI	327.8	42.6	6.6	1.1	32.2	228%	341%	104%	44%	214%
Region XII	199.6	37.5	7.5	0.9	16.3	120%	190%	114%	52%	133%
Region XIII	379.1	34.1	7.0	1.0	10.8	113%	90%	79%	32%	87%
CAR	340.5	32.5	7.1	1.2	32.9	108%	85%	54%	35%	95%
NCR	172.4	27.9	6.7	1.0	18.1	478%	379%	120%	42%	289%
Average	326.0	35.6	7.2	1.0	19.1	115%	95%	90%	34%	100%
Average PHP value						38,170	31,614	29,779	11,265	33,257
Approximation of Land Bank's credit line (CL) (% to asset value)										
	40%	40%	No CL	No CL						

Note: 1) High-performing agricultural mechanization areas/regions in terms of 4-wheel tractor holdings are shaded in gray. 2) Land Bank provides about 16% of total agricultural production loans. The rest of loans are provided by private banks. 3) High per member asset values in the high performing mechanization regions are underlined.
Source: Cooperative Development Authority and Survey Team

The Land Bank of the Philippines (LBP) provides about 16% of the total agricultural production loans and banks provide the remainder[14]. Given that LBP is meeting a significant amount of the rural credit needs, the credit lines extended to the cooperatives by LBP presumably reflect the levels of creditworthiness of the respective classes of cooperatives. LBP provides credit lines only to large and medium cooperatives, setting their credit lines at about 40% of their asset values on average. This observation confirms that large and medium cooperatives and their equivalents (i.e. corporations and associations with similar asset accumulations) have significant levels of asset accumulation, are assessed as creditworthy, and accordingly have the capacity to mobilize loan funds and financial resources for agricultural mechanization.

4.4.2 Loan products of the Agriculture Credit Policy Council

The Agricultural Credit Policy Council (ACPC) was created in 1986 to assist the Department of Agriculture (DA) in synchronizing all agriculture and fisheries credit policies and programs. The ACPC is managed by the governing council and chaired by the DA with members representing Bangko Sentral ng Pilipinas (BSP), Department of Finance (DoF), Department of Budget and Management (DBM) and National Economic and Development Authority (NEDA).

The mandates of ACPC are:

- Assist the DA in synchronizing all agriculture and fisheries credit policies and programs;
- Review and evaluate the economic soundness of all agriculture and fisheries credit programs;

[14] Philippine Statistics Authority. 2015. Trends in agricultural wage rates October 2015. Manila.

- Implement institutional capacity-building programs and pilot-test innovative financing schemes for marginalized farmers and fisherfolk;
- Conduct an information drive that will promote the establishment of strong and viable farmer's organizations which play a major role in increasing small farmers' credit;
- Collect government-directed agri-credit programs and funds and consolidate them into the Agro-Industry Modernization Credit and Financing Program (AMCFP);
- Oversee the implementation of the AMCFP;
- Accredit debt securities and non-bank rural financial institutions pursuant to the implementation of the Agri-Agra Reform Credit Act.

(1) Loan products and their application to the proposed loan project

The nine (9) ACPC loan products were established under the Agro-Industry Modernization Credit and Financing Program (the AMCFP) to implement the policy set out by the Agriculture and Fisheries Modernization Act of 1997 (R.A. 8435). The guiding principles of the AMCFP are:

- Targeting small farmers and fishers;
- Focusing on proper management and utilization of loan funds;
- Involving active participation of banks;
- Increased participation of the private sector;
- Demand-driven and adoption of market-based interest; and
- With a government focus on providing enabling policy and regulatory environment and support services.

Currently the nine (9) original lending products are undergoing reorganization and consolidation. Table 22 shows the original ACPC loan products under the Agro-Industry Modernization Credit and Financing Program and Table 25 shows their performance as of July 2017. These original products are consolidated into the three new products shown in Table 23. In both sets of products according to specifications, no product specifically focuses on promoting agricultural mechanization. Although the original products are consolidated to the new three products, their management and sales remain in operation.

Regarding the nine (9) original products, interest rates for end users range from 9 to 16% whereas the rates for lending conduits (program partners), range from 3 to 9.5%. The exception is the Calamity Lending Program, for which no interest is charged whereas a 5% service fee is charged by a conduit. The Sikat Saka program employs the variable interest rate method and under this program, the annual interest rate declines to 9% from an upper limit of 15% based on borrowers effective repayment track record.

Table 22: ACPC's original lending products before consolidation in 2017

Lending products	Main feature and performance of products as of December 2016	
(1) Sikat Saka Program (SSP)	Seed fund:	PHP 200 million
	Program partner:	Land Bank of the Philippines (LBP)
	Geographic coverage:	45 provinces
	Eligible borrowers:	Small rice farmers
	Loan purpose:	Rice production loans
	Start of product:	March 2012 (?)
	Loan amount:	Up to 250,000
	Annual interest:	Annual interest rate of 15% (7.5% for a half-year crop season) declined to 9% based on borrowers' performance
	Additional assistance:	PCIC Crop Insurance and technical assistance to borrowers
(2) Agriculture and Fisheries Financing Program (AFFP)	Seed fund:	PHP 3.0 billion fund from the General Appropriation Act
	Program partners:	LBP, People's Credit and Finance Corporation (PCFC), Cooperative Banks and PostBank
	Geographic coverage:	75 provinces with complete Registry System for Basic Sectors in Agriculture (RSBSA)
	Eligible borrowers:	Non-ARB small farmers and fisherfolk registered in RSBSA
	Loan purpose:	Agri-production loans and agri-microfinance loans
	Start of product:	February 2014
	Loan amount:	(TBD)
	Annual interest:	6.5 - 9.5% for MFI partners (wholesale lending) and at 12% for borrowers
	Additional assistance:	Agricultural Credit Guarantee from AGFP to MFI Partners and PCIC Crop Insurance and technical assistance to borrowers
(3) Cooperative	Seed fund:	PHP 400 million (ACPC provide special time deposits to Cooperative Banks

Banks Agri-Lending Program II (CBAP II)	Program partners:	Accredited Cooperative Banks
	Geographic coverage:	Nationwide
	Eligible borrowers:	Small farmers and fisherfolk
	Loan purpose:	Agri-production loans and agri-microfinance loans
	Start of product:	October 2011 (or May 2015?)
	Loan amount:	Based on the lending policies and guidelines of Cooperative Banks
	Annual interest:	3% for Cooperative Banks (Special Time Deposit) and at 15% for small farmers (with interest and service fee)
	Additional assistance:	Agricultural Credit Guarantee from AGFP, PCIC Crop Insurance and technical assistance to borrowers
(4) Value-Chain Financing Program	Seed fund:	PHP 100 million
	Program partners:	PostBank and other accredited partner financial institutions
	Geographic coverage:	Priority provinces of the DA Corn Development Program, initially in the provinces of Zamboanga del Norte and Bukidnon
	Eligible borrowers:	Small corn farmers or groups of small corn farmers (e.g. cooperatives)
	Loan purpose:	Financing of corn value chain activities such as production, marketing and processing
	Start of product:	October 2011 (or May 2015?)
	Loan amount:	(TBD)
	Annual interest:	12% for borrowers
	Additional assistance:	Technical assistance to borrowers
(5) Climate Change Adaptation Financing Program	Seed fund:	PHP 150 million from 2015 General Appropriation Act
	Program partners:	Land Bank and cooperative banks
	Geographic coverage:	Nationwide
	Eligible borrowers:	Small farmers and fisherfolk
	Loan purpose:	To encourage adoption of climate change adaptation practices and technologies
	Start of product:	2015
	Loan amount:	(TBD)
	Annual interest:	(TBD)
	Additional assistance:	Technical assistance to borrowers
(6) Agrarian Production Credit Program (APCP)	Seed fund:	PHP 2 billion and additional PHP 500 million from AFFP
	Program partners:	Agrarian Reform Beneficially Organizations (ARBOs), Peoples Organizations (POs), Farmer Organizations (FOs) other than ARBOs, POs with Agrarian Reform Beneficially (ARB) or ARB household members and other conduits (cooperatives, NGOs, rural banks)
	Geographic coverage:	Nationwide
	Eligible borrowers:	ARBs and ARB household members
	Loan purpose:	Financing of crop production, agri-enterprise and/or livelihood projects
	Start of product:	October 2012
	Loan amount:	(TBD)
	Annual interest:	15% for short-term loan (how long?) 16% for long-term loan (how long?)
	Additional assistance:	Support under the Agrarian Reform Program (TBD)
(7) Calamity Assistance Program	Seed fund:	PHP 300 million
	Program partners:	Accredited financial institution of ACPC
	Geographic coverage:	Nationwide
	Eligible borrowers:	Small farmers and fisherfolk and/or their households members who are existing clients of eligible conduits and affected by natural calamities
	Loan purpose:	Agricultural production loans, agri-micro finance loans and farm/fishery rehabilitation loans
	Start of product:	July 2014
	Loan amount:	50% of the outstanding loan amount
	Annual interest:	0% (5% service fee charged by conduit)
	Additional assistance:	N.A.
(8) Program for Unified Lending to Agriculture (PUNLA)		For details see (1) in Table 23
(9) Survival and Recovery Loan Program (SURE)		For details see (3) in Table 23

Source: PowerPoint presentation prepared by ACPC in May 2017

The features of the one (1) umbrella program and two (2) consolidated lending products under the framework program derived from the previous nine products are shown in Table 23 and Table 24, respectively. Both are still in the process of being finalized and have yet to have available implementation rules and regulations (IRR). Production Loan Easy Access (PLEA) under the umbrella Program for Unified Lending to Agriculture (PUNLA) will be selected for the implementation of the proposed project, with necessary modifications to deliver loans to promote mechanized agriculture. The second consolidated product is the Survival and Recovery Loan Program (SURE) established under PUNLA. This is not a candidate product for project design, as it is specifically developed to address the emergency needs of farmers and fisherfolk.

PLEA intends to widen access to small loans for its target clients and is subject to an annual unified interest rate of 6%. This rate should be competitive in rural areas, given that the average lending rates for commercial banks to finance, for example, combine harvesters, ranged from around 12% to 15% in the year 2017. The target borrowers, however, are poor farmers and fisherfolk, and the upper limits for loans are 150,000 for PUNLA and 50,000 for PLEA. These conditions are not compatible with the features of an expected loan product to mechanize agriculture, where the target borrowers should be relatively well-capitalized cooperatives, associations, corporations and individuals, and where the upper limit of a loan should be around several million pesos for the purchase, for example, of a high-quality combine harvester costing more than 1.5 million pesos (approximately USD 30,000). The lending scheme was discussed with ACPC, which agreed to design a new scheme to match the appropriate terms and conditions for loans for agriculture mechanization. It was also agreed that a detailed design of new loans for production is to be carried out at the time of the feasibility study.

Table 23: ACPC's Program for Unified Lending to Agriculture (PUNLA) established in 2007

Main features of lending framework	
Strategic pillars:	(1) Ensure easy and convenient credit access; (2) Bring down interest rates; (3) Expand credit delivery channels; (4) Ensure sustainability of credit; and (5) Focus on the poorest provinces
Seed fund:	PHP 200 million in 2016 and PHP 500 million in 2017
Program partners:	Cooperatives and farmer organizations (FOs) as lending conduits Type 1: Currently accredited or existing partners of ACPC and/or GFIs Type 2: Not currently qualified as Type 1, but meeting the set requirements
Geographic coverage:	Seven poorest provinces (to be expanded to 14 provinces in future)
Eligible borrowers:	Farmers and fisherfolk classified as poor
Loan purpose:	Agri-fishery production, agri-microfinance for farm, non-farm, or off-farm income-generating activities and farm equipment or work animals acquisition and working capital for trading
Start of product:	2016
Loan amount:	Non-collateralized loan of up to PHP 150,000 per borrower with 1 year maturity. Loan amount to be determined based on the project requirement and repayment capacity of the borrower as evaluated by the lending conduit.
Annual interest:	6%
Additional assistance:	Free PCIC Crop Insurance and capacity-building (training, coaching, credit management system development, etc.) for conduits and borrowers through LGU extension services
Performance expected:	Borrowers: 4,187
Approved credit fund:	PHP 79 million (Expected average loan amount: PHP 19,000/borrower)
Current situation:	Designate Regional/Provincial Focal Person Identification and approval of potential lending conduits

Source: PowerPoint Presentation prepared by Land Bank of the Philippines (date?)

Table 24: ACPC's lending products under PUNLA

Product name	Product features	
(1) Production Loan Easy Access (PLEA)	Seed fund:	To be determined
	Program partners:	Cooperative banks, cooperatives, farmers and fishers organizations and NGOs as lending conduits
	Geographic coverage:	6 pilot areas selected in Surigao del Norte, Nueva Ecija, Lanao del Sur, Cotabato, Bohol, Laguna de Bay Provinces
	Eligible borrowers:	Farmers and fisherfolk classified as poor
	Loan purpose:	Agricultural production and agricultural production-related projects.
	Start of product:	2017 (under preparation)
	Loan amount:	Non-collateralized loans of up to PHP 50,000 (for PLEA 2 up to PHP 1,000,000?) per borrower with 2 years up to 10 years' loan maturity.
	Annual interest:	At 6%
	Additional assistance:	60% subsidy for PCIC Crop Insurance coverage and capacity-building (training, coaching, credit management system development, etc.) for conduits and borrowers through LGU extension services
	Performance expected:	No estimates are made
	Current situation:	Under preparation
(2) Survival and Recovery Loan Program (SURE)	Seed fund:	PHP 100 million and 1,000 million commitment of the President
	Program partners:	Existing partner-financial institutions and/or lending conduits designated by DA/ACPC
	Geographic coverage:	Areas "Under State of Calamity" with considerable damage in agriculture due to natural calamities as determined by the DA and/or LGUs
	Eligible borrowers:	Small farmers and fisherfolk in the areas Under State of Calamity

	Loan purpose:	A quick-response and post disaster support facility with grant and loan assistance
	Start of product:	2017
	Grant/loan amount:	Grant up to PHP 10,000/SFF as survival assistance (released within 5 days) Loan of up to PHP 25,000 as recovery assistance (released within 30 days) One (1) year moratorium on payment of their outstanding loan obligations under ACPC programs
	Annual interest:	At 0% and up to three years to repay Conduits may charge a service fee of up to 3%
	Additional assistance:	N.A.
	Current situation	Under preparation

Source: PowerPoint Presentation prepared by Land Bank of the Philippines (date?)

(2) Performance of the original loan products

The performance information of the original loan products should provide inferences regarding the magnitude and geographical extent of the financial markets for agricultural production and processing. As shown in Table 25 the performance of the original products varies. The loan product-wise average loan sizes vary from PHP 12,000 to 159,000, reflecting the upper limits of a single loan specified for each product. From the perspectives of the number of borrowers and the total disbursed amounts, the performances of the Sikat Saka Program (SSP) and the Agrarian Production Credit Program (APCP) stand out. Although SSP targets 45 out of the 81 provinces listed in Table 26, it was chosen for further information collection since other performing and nationwide products of APCP are tied to the project sites selected under the Agrarian Reform Program.

Table 25: Current performance of ACPC's previous lending products (as of December 2016)

Lending products	Borrowers (persons)	Amount of accumulated loans (million PHP)	Average loan amount per borrower (PHP)
(1) Sikat Saka Program (SSP)	25,343	4,020	159,000
(2) Agriculture and Fisheries Financing Program (AFFP)			
Through Land Bank	3,184	308	98,000
Through PCFC	38,952	481	12,000
(3) Cooperative Banks Agri-Lending Program II (CBAP II)	4,015	290	72,000
(4) Value-Chain Financing Program	383	44	115,000
(5) Climate Change Adaptation Financing Program	0	0	
(6) Agrarian Production Credit Program (APCP)	38,800	3,130	81,000
(7) Calamity Assistance Program	5,924	159	27,000
(8) Program for Unified Lending to Agriculture (PUNLA)	0	0	
(9) Survival and Recovery Loan Program (SURE)	0	0	

Source: PowerPoint Presentation prepared by ACPC in May 2017

Table 26: Province-wise performance of Sikat Saka product (as of March 31, 2017)

(PHP)

Regions and provinces (Underlined provinces are Sikat Saka loan product target provinces. There are 45 target provinces.)	Lending Center	2017 releases (Mill.) a	Cumulative releases (Mill.) b	Outstanding balance (Mill.) c	No. of borrowers (no.) d	Average size of a loan ('000) e=c/d	Past due amount (Mill.) f	Past due rate (%) g=f/c	No. of pending accounts (no.) h
Philippines total		**343.2**	**4,658.8**	**2,188.7**	**12,086**	**181**	**138.0**	**6.3%**	**1,500**
Region I (Ilocos Region)		**2.5**	**65.5**	**9.3**	**423**	**22**	**2.9**	**31.0%**	**59**
Ilocos Norte	Ilocos Sur	0.0	37.4	3.7	225	16	1.7	47.3%	38
Ilocos Sur	Ilocos Sur	0.2	0.3	0.2	13	18	0.0	0.0%	0
La Union	La Union	0.0	1.7	0.9	35	25	0.0	4.9%	2
Pangasinan	Pangasinan	2.3	26.2	4.5	150	30	1.1	24.2%	19
Region II (Cagayan Valley)		**42.8**	**1,015.6**	**213.6**	**2,852**	**75**	**31.2**	**14.6%**	**415**
Batanes									
Cagayan	Cagayan	1.2	22.2	9.2	164	56	9.7	106.1%	155
Isabela	Isabela	33.3	930.9	181.9	2,422	75	21.4	11.8%	260
Nueva Vizcaya	Nueva Vizcaya	8.3	62.5	22.6	266	85	0.0	0.0%	0
Quirino									
Region III (Central Luzon)		**96.4**	**1,678.3**	**294.9**	**2,845**	**104**	**60.7**	**20.6%**	**464**
Bataan	Bataan	0.7	3.0	0.6	15	39	0.0	0.0%	0
Bulacan	Bulacan	4.4	32.5	6.8	64	106	0.3	4.4%	2
Nueva Ecija	Nueva Ecija	47.3	1,202.8	193.9	1,903	102	38.0	19.6%	328
Pampanga	Pampanga	27.5	341.5	71.9	540	133	4.7	6.5%	27
Tarlac	Tarlac	16.3	97.8	21.4	311	69	17.7	82.8%	106
Zambales	Bataan	0.1	0.8	0.4	12	32	0.0	5.8%	1
Aurora									
Region IV-A (Calabarzon)		**0.3**	**7.5**	**2.1**	**28**	**74**	**0.1**	**6.0%**	**2**
Batangas									
Cavite									
Laguna	Laguna	0.0	4.6	1.3	14	90	0.0	0.0%	0
Quezon	Quezon	0.3	2.9	0.8	14	57	0.1	15.5%	2
Rizal									
Region V (Bicol Region)		**1.1**	**16.5**	**5.1**	**81**	**63**	**0.5**	**10.1%**	**8**
Albay	Albay	0.0	0.1	0.1	1	110	0.0	0.0%	0
Camarines Norte	Camarines	1.1	15.5	4.2	65	65	0.3	7.2%	2
Camarines Sur									
Catanduanes									
Masbate	Albay	0.0	0.0	0.0	0		0.0		0
Sorsogon	Albay	0.0	0.9	0.8	15	53	0.2	27.1%	6
Region VI (Western Visayas)		**7.3**	**175.3**	**30.3**	**860**	**35**	**1.1**	**3.5%**	**32**
Aklan	Capiz	0.2	5.1	3.0	61	50	0.5	17.8%	12
Antique	Iloilo	0.0	2.4	0.2	20	8	0.0	22.4%	2
Capiz	Capiz	1.8	19.9	5.4	137	39	0.5	8.7%	16
Iloilo	Iloilo	1.5	118.3	15.8	489	32	0.0	0.0%	0
Negros Occidental	Negros Occidental	3.8	29.6	5.9	153	39	0.0	0.6%	2
Guimaras									
Region VII (Central Visayas)		**15.1**	**152.1**	**47.8**	**567**	**84**	**8.5**	**17.7%**	**101**
Bohol	Bohol	15.1	152.1	47.8	567	84	8.5	17.7%	101
Cebu									
Negros Oriental									
Siquijor									
Region VIII (Eastern Visayas)		**2.9**	**47.0**	**15.6**	**341**	**46**	**1.1**	**6.9%**	**18**
Eastern Samar									
Leyte	Leyte	2.9	45.9	14.5	322	45	1.1	7.4%	18
Northern Samar	Samar	0.0	1.1	1.1	19	56	0.0	0.0%	0
Samar (Western Samar)	Samar	0.0	0.0	0.0	0		0.0		0
Southern Leyte									
Biliran									

Table 26: Province-wise performance of Sikat Saka product (as of March 31, 2017) (cont.)

(PHP)

Regions and provinces (Underlined provinces are Sikat Saka loan product target provinces. There are 45 target provinces.)	Lending Center	2017 releases (Mill.) a	Cumulative releases (Mill.) b	Outstanding balance (Mill.) c	No. of borrowers (no.) d	Average size of a loan ('000) e=c/d	Past due amount (Mill.) f	Past due rate (%) g=f/c	No. of pending accounts (no.) h
Region IX (Zamboanga Peninsula)		**5.3**	**13.5**	**6.2**	**68**	**91**	**0.0**	**0.0%**	**0**
Zamboanga del Norte	Zamboanga del Norte	1.5	3.4	3.8	28	134	0.0	0.0%	0
Zamboanga del Sur	Zamboanga del Sur	1.6	8.0	0.6	26	22	0.0	0.0%	0
Zamboanga Sibugay	Zamboanga del Sur	2.2	2.2	1.9	14	134	0.0	0.0%	0
Region X (Northern Mindanao)		**43.4**	**94.4**	**34.9**	**361**	**97**	**0.0**	**0.0%**	**0**
Bukidnon	Bukidnon	43.4	94.4	34.9	361	97	0.0	0.0%	0
Camiguin									
Lanao del Norte	CDO	0.0	0.0	0.0	0		0.0		0
Misamis Occidental									
Misamis Oriental									
Region XI (Davao Region)		**0.0**	**4.4**	**1.9**	**65**	**29**	**0.0**	**0.0%**	**0**
Davao del Norte	Davao	0.0	4.4	1.9	65	29	0.0	0.0%	0
Davao del Sur	Davao	0.0	0.0	0.0	0		0.0		0
Davao Oriental									
Compostela Valley									
Davao Occidental									
Region XII (Soccsksargen)		**9.4**	**632.8**	**110.3**	**1,630**	**68**	**9.7**	**8.8%**	**126**
Cotabato (North Cotabato)	North Cotabato	9.0	592.7	100.2	1,420	71	9.7	9.7%	126
South Cotabato	South Cotabato	0.0	9.8	2.5	57	44	0.0	0.0%	0
Sultan Kudarat	South Cotabato	0.4	30.3	7.6	153	50	0.0	0.0%	0
Sarangani									
Cordillera Administrative R (CAR)		**12.6**	**61.3**	**26.2**	**178**	**147**	**0.0**	**0.0%**	**0**
Abra									
Benguet									
Ifugao									
Kalinga	CAR	12.6	61.3	26.2	178	147	0.0	0.0%	0
Mountain Province									
Apayao									
ARMM		**0.0**	**29.7**	**6.5**	**112**	**58**	**5.4**	**83.6%**	**89**
Basilan									
Lanao del Sur	CDO	0.0	0.0	0.0	0		0.0		0
Maguindanao	North Cotabato	0.0	29.7	6.5	112	58	5.4	83.6%	89
Sulu									
Tawi-Tawi									
Region XIII (Caraga)		**0.0**	**5.5**	**3.8**	**34**	**112**	**0.0**	**0.0%**	**0**
Agusan del Norte	Agusan del Norte	0.0	5.5	3.8	34	112	0.0	0.0%	0
Agusan del Sur									
Surigao del Norte									
Surigao del Sur									
Dinagat Islands									
Mimaropa Region (Region IV-B)		**104.2**	**659.4**	**1,380.2**	**1,641**	**841**	**16.8**	**1.2%**	**186**
Marinduque									
Occidental Mindoro	Occidental Mindoro	41.1	446.4	109.2	1,146	95	7.6	6.9%	101
Oriental Mindoro	Oriental Mindoro	59.1	136.2	1,254.3	278	4,512	3.4	0.3%	24
Palawan	Palawan	4.0	76.7	16.7	217	77	5.8	34.8%	61
Romblon									

Note: Data of Cagayan Province and Oriental Mindoro seems to be incorrect. The data will be verified.
Source: ACPC

The region-wise and household-level performance of Sikat Saka product in Nueva Ecija Province (for high mechanization) and Bohol Province (for low mechanization) are indicated in Table 26 and Table 14, respectively. By judging the values of the outstanding balance and the number of borrowers shown in Table

26, Regions II (Cagayan Valley), III (Central Luzon) (including Nueva Ecija Province), XII (Soccsksargen) and IV-B (Minaropa)[15] are considered well-performing. These are followed by Regions I (Ilocos), VI (Western Visayas), VII (Central Visayas) (including Bohol Province) and X (Northern Mindanao). On a household level, the performance of arbitrarily selected households using the Sikat Saka product in Nueva Ecija and Bohol provinces is insignificant, as indicated in Section "d) Access to financial market-ACPC/Land Bank Sikat Saka product" in Table 14. Thus, it could be said that among Sikat Saka households, there may be little geographical differences in their financial capability/characteristics, given their uniform performance (equivalent repayment capacity) and the fact that they are closely monitored by associations (e.g. irrigators' associations) and lending centers of the Land Bank.

It should be noted that in these high-performing regions, except VI-B, the default rate is high; ranging from 8.8% in Region XII to 20.6% in Region III, assuming that the information cited under "Past due date" in Table 26 is considered default. The overall default rate, meanwhile, at 6.3% is relatively low, because the low default rate of Region IV-B drives the overall rate significantly down. This information should be considered carefully when designing a loan product for the proposed loan project.

Regarding the transaction cost of the Sikat Saka product, anecdotal evidence collected in Neva Ecija Province (the establishment of a dedicated section with five dedicated staff members in the Nueva Ecija Lending Center for product management) suggests a high transaction cost and resulting high interest rate (15%/year) of the product. Accordingly, increasing the upper limit of loans should be considered when designing loan products for the project.

4.4.3 Loan products of the Land Bank of the Philippines

(1) Geographical distribution of lending capacity of the Land Bank

It is worth reporting an overview of the geographical extent of the Land Bank lending capacity, since it is the 4th largest bank in the Philippines and has networks of lending centers and branches nationwide. Since the Bank was established and owned by the government specifically to help develop the agricultural sector and implement long-lasting agrarian reform objectives, its involvement should enhance the efficiency and effectiveness of the loan service delivery capacity of the proposed loan project. In the second field survey period of this study, further examination will be carried out to propose the best possible institutional arrangements for the proposed project participated in by the Land Bank.

The locations of the Land Bank's Lending Centers and human resources assigned to each Center are summarized in Table 27 and to some extent, the information in the table should infer the geographical extent of the agricultural sector loan demand.[16] The largest number of loan center personnel, 123, is observed in Region III (Central Luzon, followed by 89 in Region IV-A, 86 in region XII (Soccsksargen), 74 in Region VI (Western Visayas), 72 in Region II (Cagayan Valley), 71 in Region IX (Zamboanga Peninsula) and 69 in Region VII (Central Visayas). Relatively high demand for agricultural loans in these regions must be assumed and the level of capital should correlate to the size of lending centers, as represented by their staff numbers.

[15] Data indicated for Oriental Mindoro Province seems excessive and influences the averages of the entire table. Data should be verified by the ACPC.

[16] With additional information (region-wise average credit line of all cooperatives receiving loans from the Bank, etc.) to be obtained in the second field survey period, loan demand will be estimated.

Table 27: Geographical distribution of lending capacity of the Land Bank

Region and province	Lending Center	No. of Personnel	Location
Philippines total		**905**	
Region I (Ilocos Region)		**45**	
Ilocos Norte			
Ilocos Sur	Ilocos Sur	14	Vigan City, Ilocos Sur
La Union	La Union	12	San Fernando City, La Union
Pangasinan	Pangasinan	19	Dagupan City, Pangasinan
Region II (Cagayan Valley)		**72**	
Batanes			
Cagayan	Cagayan	18	Tuguegarao City, Cagayan
Isabela	Isabela	38	Cauayan City, Isabela
Nueva Vizcaya	Nueva Vizcaya	16	Solano, Nueva Vizcaya
Quirino			
Region III (Central Luzon)		**123**	
Bataan	Bataan	20	Dinalupihan, Bataan
Bulacan	Bulacan	19	Malolos City, Bulacan
Nueva Ecija	Nueva Ecija	42	Cabanatuan City, Nueva Ecija
Pampanga	Pampanga	22	City of San Fernando, Pampanga
Tarlac	Tarlac	20	Tarlac City
Zambales			
Aurora			
Region IV-A (Calabarzon)		**89**	
Batangas	Batangas	22	Lipa City, Batangas
Cavite	Cavite	18	Dasmariñas City, Cavite
Laguna	Laguna	17	UPLB, Los Baños, Laguna
Quezon	Quezon	16	Lucena City, Quezon
Rizal	Rizal	16	Cainta, Rizal
Region V (Bicol Region)		**46**	
Albay	Albay	24	Legaspi City, Albay
Camarines Norte			
Camarines Sur	Camarines Sur	22	Naga City, Camarines Sur
Catanduanes			
Masbate			
Sorsogon			
Region VI (Western Visayas)		**74**	
Aklan			
Antique			
Capiz	Capiz	11	Roxas City, Capiz
Iloilo	Iloilo	32	Iloilo City
Negros Occidental	Negros Occidental	31	Bacolod City
Guimaras			
Region VII (Central Visayas)		**69**	
Bohol	Bohol	17	Tagbilaran City, Bohol
Cebu	Cebu	35	Cebu City
Negros Oriental	Negros Oriental	17	Dumaguete City
Siquijor			
Region VIII (Eastern Visayas)		**31**	
Eastern Samar			
Leyte	Leyte	22	Tacloban City
Northern Samar			
Samar (Western Samar)	Samar	9	Calbayog City
Southern Leyte			
Biliran			

Table 27: Geographical distribution of lending capacity of the Land Bank (cont.)

Region and province	Lending Center	No. of Personnel	Location
Region IX (Zamboanga Peninsula)		**71**	
Zamboanga del Norte	Zamboanga del Norte	26	Dipolog City
Zamboanga del Sur	Zamboanga del Sur	18	Pagadian City
Zamboanga Sibugay	Zamboanga City	27	Zamboanga City
Region X (Northern Mindanao)		**62**	
Bukidnon	Bukidnon	32	Malaybalay, Bukidnon
Camiguin			
Lanao del Norte			
Misamis Occidental			
Misamis Oriental	Cagayan de Oro	30	Cagayan de Oro City
Region XI (Davao Region)		**48**	
Davao del Norte			
Davao del Sur	Davao	48	Davao City
Davao Oriental			
Compostela Valley			
Davao Occidental			
Region XII (Soccsksargen)		**86**	
Cotabato (North Cotabato)	North Cotabato	30	Kidapawan City, North Cotabato
South Cotabato	South Cotabato	34	Koronadal City, South Cotabato
	Gen Santos City	22	Gen Santos City
Sultan Kudarat			
Sarangani			
Cordillera Administrative R (CAR)		**10**	
Abra			
Benguet			
Ifugao			
Kalinga	CAR	10	Tabuk City, Kalinga
Mountain Province			
Apayao			
ARMM		**0**	
Basilan			
Lanao del Sur			
Maguindanao			
Sulu			
Tawi-Tawi			
Region XIII (Caraga)		**30**	
Agusan del Norte	Agusan del Norte	30	Butuan City, Agusan del Norte
Agusan del Sur			
Surigao del Norte			
Surigao del Sur			
Dinagat Islands			
Mimaropa Region (Region IV-B)		**49**	
Marinduque			
Occidental Mindoro	Mindoro Occidental	15	San Jose, Mindoro Occidental
Oriental Mindoro	Mindoro Oriental	18	Calapan, Mindoro Oriental
Palawan	Palawan	16	Puerto Princesa City, Palawan
Romblon			

Source: Land Bank of the Philippines

(2) Loan product designed to conform to Agricultural and Fisheries Mechanization Law of 2013

The Land Bank of the Philippines (LB) developed an Agri-Mechanization Financing Program in 2016 and has been piloting it since. Table 28 shows the features of the product. LB mobilized its internal resources to finance the project, and 25 loans had been disbursed as of July 2017. The total disbursement remains small, at less than a million USD. Prospective borrowers must meet a number of conditions to conform to the requirement stipulated in the AFMech Law, as shown in Section (7) in Table 28. Unless public services are delivered efficiently and effectively under the law, the product would lack appeal to private sector players.

Table 28: Land Bank's Agri-Mechanization Financing Program

Product features	Description of features
(1) Objectives	1) To promote the mechanization of the production processes; from planting, harvesting and processing to increase productivity and reduce post-harvest losses 2) To modernize the agricultural sector to prepare for the challenges of globalization and ASEAN integration 3) To enhance farm productivity and efficiency to achieve food security
(2) Eligible borrowers	1) Sole proprietorship 2) Partnership 3) Corporation 4) Cooperative 5) Local Government Unit (LGU)
(3) Eligible cost	Up to 80% of the acquisition cost of the equipment or financing requirement (acquisition of fixed assets, permanent working capital and working capital)
(4) Eligible projects	1) Farm mechanization (production and post-harvest facilities) 2) Tractor services (land preparation, planting and harvesting) 3) Agro-processing 4) Manufacturing, fabrication and assembling 5) Trading and marketing
(5) Credit facilities	1) Short-term loan 2) Term loan line 3) LC/TR 4) Term loan rediscounting
(6) Interest rate	Based on the market rate per client sector (6% to 9%)
(7) Other terms and conditions (conformity to Agricultural and Fisheries Mechanization Law 2013)	1) Machinery and equipment to be sold in the market should have passed the testing and evaluation conducted by the Agricultural Machinery Testing and Evaluation Center (AMTEC) in accordance with the prescribed quality and performance defined by the Philippine Agricultural Engineering Standards (PAES). 2) Manufacturers, fabricators, assemblers and importers and their products must be registered with the Bureau of Agricultural and Fisheries Engineering (BAFE). The borrower shall acquire machinery and/or equipment only from among the registered entities. 3) Assemblers, manufacturers and distributors must be members in good standing of recognized national organization (e.g. AMDA). 4) Dealers and/or distributors of the farm machinery must be capable of providing after-sales services such as repairs and warranties and spare parts must be readily available when needed. 5) The borrower shall undergo training to operate and maintain the facility. 6) Owners must register their agricultural and fishery machinery and equipment with the respective agriculture offices of the LGUs.

Source: Land Bank of the Philippines

Table 29 summarizes the performance of the Agri-Mechanization Financing Program commenced in 2015. There are 34 borrowers, and the total value of approved loans reaches PHP 95 million (approximately USD 2 million), with an average loan size of PHP 2.8 million. The annual interest rates at market rate range from 6% to 9%. Almost all of the borrowers are located in the high-performing mechanization areas of Regions II and III. Small- and medium-scale enterprises dominate as borrowers. Sixty eight percent (68%; 23 cases) of the borrower organizations are small and medium-scale enterprises (SMEs), 26% (9 cases) are agricultural cooperatives, and local government units and private cooperative each account for 3% (1 case).

Table 29: Status report on the Agri-Mechanization Financing Program (as of August 31, 2017)

Lending Center	Borrower ID	Type of Client	Province	Financed Project/Equipment	Approved Loan[*1]		Cumulative Loan		Out standing balance (PHP million)	Remarks
					Amount (PHP million)	Date Approved	Amount (PHP million)	Date Released		
Cagayan	B1	SME	Cagayan	Reaper-Harvester	1.600	04/01/2016	1.600	04/19/2016	1.370	Current
	B2	SME	Cagayan	Reaper-Harvester	1.550	02/29/2016	1.550	03/21/2016	1.240	Current
	B3	SME	Cagayan	Reaper-Harvester	1.200	11/17/2016	1.200	12/06/2016	1.000	Current
	B4	SME	Cagayan	Reaper-Harvester	0.800	03/14/2017	0.800	03/29/2017	0.670	Current
Isabela	B5	SME	Isabela	Combine Harvester	1.500	08/08/2016	1.500	09/06/2016	1.313	Current
	B6	SME	Isabela	Combine harvester / reaper	1.360	11/25/2016	1.360	12/23/2016	1.203	Current
	B7	SME	Quirino	Combine harvester / reaper	1.000	03/29/2017	1.100	04/25/2017	1.020	Current
	B8	SME	Isabela	One combine harvester and One tractor with rotovator	2.000	06/08/2017	2.000	07/17/2017	2.000	Current
Nueva Ecija	B9	Cooperative	Nueva Ecija	Combine Harvester	1.100	05/19/2016	1.100	06/09/2016	0.880	Current
	B10	SME	Nueva Ecija	Acquisition of 1 rice combine harvester with trailer	1.000	12/22/2015	1.000	02/11/2016	0.700	Current
	B11	SME	Nueva Ecija	Acquisition of 1 rice combine harvester with trailer	1.400	11/19/2014	1.400	03/09/2015	0.840	Current
	B12	Cooperative	Nueva Ecija	Partial Financing of acquisition of combine harvester	0.500	02/10/2016	0.500	02/23/2016		Fully Paid 2/23/2017
	B13	LGU	Nueva Ecija	Acquisition of twenty 4-wheel tractors	20.000	03/23/2015	19.980	08/18/2015	17.760	Current
	B14	Cooperative	Nueva Ecija	Acquisition of combine harvester	1.200	09/19/2016	1.200	10/24/2016	0.960	Current
	B15	SME	Nueva Ecija	Acquisition of combine harvester	1.500	02/14/2017	1.500	02/27/2017	1.350	Current
	B16	Cooperative	Nueva Ecija	Acquisition of 2 combine harvesters, 2 four-wheel tractors, and 2 rice transplanters	5.792	02/16/2017	1.200	05/09/2017	1.200	Current
	B17	Cooperative	Nueva Ecija	Combine Harvester	1.239	01/24/2017	1.239	02/22/2017	1.115	Current
	B18	Cooperative	Nueva Ecija	Combine Harvester	0.872	02/07/2017	0.872	02/28/2017	0.785	Current
	B19	SME	Nueva Ecija	Combine Harvester	1.500	03/02/2017	1.500	03/10/2017	1.375	Current
	B20	SME	Nueva Ecija	Combine Harvester	1.490	03/07/2017	1.490	03/23/2017	1.490	Current
	B21	SME	Nueva Ecija	Combine Harvester	1.500	03/13/2017	1.500	03/24/2017	1.500	Current
	B22	SME	Nueva Ecija	Combine Harvester	2.180	03/07/2017	2.180	07/25/2017	2.180	Current
	B23	SME	Nueva Ecija	Combine Harvester	1.440	07/26/2017	1.440	08/10/2017	1.440	Current
	B24	SME	Nueva Ecija	Combine Harvester	1.450	07/28/2017	1.450	08/31/2017	1.450	Current
	B25	SME	Nueva Ecija	Combine Harvester	1.450	07/28/2017				No availment yet
	B26	SME	Nueva Ecija	Combine Harvester	1.480	08/18/2017				No availment yet
	B27	SME	Nueva Ecija	Combine Harvester	1.000	08/08/2017				No availment yet
	B28	Cooperative	Nueva Ecija	Farm/Irrigation Mill Equipment & Machinery	1.000	08/17/2017				No availment yet
	B29	SME	Nueva Ecija	Farm/Irrigation Mill Equipment & Machinery	2.400	08/30/2017				No availment yet
	B30	Cooperative	Nueva Ecija	Farm/Irrigation Mill Equipment & Machinery	0.881	06/30/2017	0.881	08/03/2017	0.881	Current
Tarlac	B31	Cooperative	Tarlac	Harvester	1.240	03/03/2017	1.240	05/23/2017	1.240	Current
Pampanga	B32	Private Corp.	Pampanga	Agricultural Machineries Manufacturing	15.000	02/28/2017	13.875	various	9.985	Current
Laguna	B33	SME	Laguna	Manufacture of Agricultural Machinery and Equipment	1.300	08/31/2016	0.500	01/27/2017		Fully Paid
South Cotabato	B34	SME	Norala, South	Mechanical Driers	14.000	01/12/2017	4.450	02/01/2017	6.525	Current
							2.800	02/10/2017		Current
Total (PHP million)					**94.924**		**74.407**		**63.471**	
Average (PHP million)					**2.792**					

Note: 1) Annual interest rates are set in the range of 6% to 9%
Source: Land Bank of the Philippines

(3) Performance of business loans provided to cooperatives

The financial statements of three large cooperatives in Nueva Ecija Province and one medium- and two small-sized cooperatives in Bohol Province are shown in Table 30 and Table 31, respectively. These cooperatives are selected as receivers of rice milling equipment (plants) from the DA under the Rice Program. (A discussion on the performance of DA provided with machinery and plants is presented in another section) The financial characteristics of the three large cooperatives A, B and C shown in Table 30 are obtaining loans on a large scale (61%, 71% and 41% of total liability, respectively) from LB to finance their two-step loans to farmers and trade/marketing operations (cooperatives A and B) and finance two-step loans and milling and milling service operations (cooperative C). Based on observation of income from credit operations and financing costs, loan interest rates from the LB would be less than 10% and that on loans provided to farmers would be around 15% (to be confirmed). For these large cooperatives, the LB is a major supplier of business loans.

Table 30: Characteristics of cooperatives received free machinery in Nueva Ecija Province

Cooperative	(A) Bagong Buhay ng Mabini Multi-Purpose Cooperative		(B) Bagong Buhay ng Mabini Multi-Purpose Cooperative		(C) Talabutab Norte Multi-Purpose Cooperative	
Year of establishment	2005		1981			
No. of members	265				763	
Farmers/Regular					586	
Associates					177	
No. of employees	12		(no info.)		(no info.)	
Member's agriculture area	(no info.) ha		(no info.) ha		(no info.) ha	
Land Bank's credit line	(no info.) million		(no info.) million		(no info.) million	
Summary of financial statements (Financial year)	**2016**		**2016**		**2015**	
BALANCE SHEET						
Asset	**93,993,281**	**100%**	**153,159,289**	**100%**	**123,207,547**	**100%**
Current assets	41,634,204	44%	113,941,155	74%	59,354,336	48%
Cash and cash equivalents	1,716,827	2%	42,672,132	28%	10,637,916	9%
Loans and other receivables	38,094,256	41%	67,031,869	44%	37,928,223	31%
Inventories	1,795,066	2%	3,737,154	2%	10,728,699	9%
Other current assets	28,054	0%	500,000	0%	59,498	0%
Non-current assets	52,359,078	56%	39,218,134	26%	63,853,211	52%
Financial assets and investment	3,619,000	4%	939,000	1%	5,447,955	4%
Property, plant and equipment	48,740,078	52%	38,279,134	25%	58,405,256	47%
(Machinery, tools, and equipment)	25,356,492	27%	23,465,831	15%	37,535,532	30%
(Other properties and equipment)					16,644,190	14%
(Donated properties and equipment-DA/DAR)					20,891,342	17%
Total liabilities and equity	**93,993,281**	**100%**	**153,159,289**	**100%**	**123,207,547**	**100%**
Liabilities	**66,388,471**	**71%**	**122,167,744**	**80%**	**77,987,129**	**63%**
Current liabilities	66,189,327	70%	118,839,744	78%	60,200,820	49%
(Loans payable: mainly Land Bank)	57,500,000	61%	108,950,000	71%	50,868,102	41%
Non-current liabilities	199,144	0%	3,328,000	2%	17,786,308	14%
Equity	**27,604,810**	**29%**	**30,991,544**	**20%**	**45,220,419**	**37%**
PROFIT AND LOSS STATEMENT						
Revenue	**9,376,442**	**100%**	**14,710,999**	**100%**	**10,621,084**	**100%**
Income from credit operations	4,173,794	45%	8,955,517	61%	2,536,256	24%
Gross revenue from service operations	39,368	0%	863,179	6%	3,612,749	34%
Gross margin from marketing operations	5,087,072	54%	2,504,717	17%		0%
Other income	76,209	1%	2,387,586	16%	4,472,079	42%
Expenses	**7,487,014**	**80%**	**12,426,464**	**84%**	**7,808,414**	**74%**
Financing costs	4,118,527	44%	4,056,440	28%		0%
Selling/marketing costs	651,166	7%	953,103	6%		0%
Administrative costs	2,717,321	29%	7,416,921	50%	7,808,414	74%
(Depreciation)	0	0%	3,004,028	20%	1,274,819	12%
(Salaries and wages, and benefits)	1,366,386	15%	1,220,776	8%	2,816,831	27%
Net surplus before other items	1,889,428	20%	2,284,535	16%	2,812,670	26%
Other items	0	0%	1,727,417	12%		0%
Net surplus	**1,889,428**	**20%**	**4,011,952**	**27%**	**2,812,670**	**26%**

Source: Cooperatives A, B and C, and Survey Team

The financial characteristics of the medium (this is the largest cooperative in Bohol Providence) show that the two small cooperatives shown in Table 31 differ from those of cooperatives A, B and C in Neva Ecija. Although the medium-sized cooperative D has relatively large outstanding loans, there is less borrowing from LBP, indicating loans are covered by its own reserves. Cooperative E obtains loans from LBP to finance its small trading and service provision operations without credit operation. Cooperative E should represent the most common size of cooperative in the Philippines (to be confirmed). Cooperative F should represent a small cooperative with little credibility to obtain loans or without the need for loan services (to be confirmed).

Table 31: Characteristics of cooperatives and associations received free machinery in Bohol Province

	(D) Bohol Farmers' Multi-Purpose Cooperative						(E) San Isidro Multi-Purpose Cooperative		(F) San d Mil Irrigators' Association Inc.	
Year of establishment	2003						1989		2006	
No. of members	1,432						282		139	
Farmers/Regular	120								117	
Associates	1,312								22	
No. of employees	(no info.)						3		0	
Member's agriculture area	(no info.) ha						(no info.) ha		(no info.) ha	
Land Bank's credit line	(no info.) million						1 mill.		(no info.) mill.	
Summary of financial statements	**2016**						**2016**		**2016**	
	Bohol Farmers' Multi-Purpose		Rice Processing Complex		Consolidated					
BALANCE SHEET										
Asset	**41,660,442**	**100%**	**19,017,233**	**100%**	**60,677,676**	**100%**	**6,453,607**	**100%**	**1,258,717**	**100%**
Current assets	28,098,985	67%	18,405,303	97%	46,504,288	77%	362,465	6%	36,329	3%
Cash and cash equivalents	7,666,728	18%	1,369,774	7%	9,036,501	15%	153,650	2%	36,329	3%
Loans and other receivables	20,187,657	48%	6,762,014	36%	26,949,671	44%	102,250	2%		0%
Inventories	244,600	1%	10,242,926	54%	10,487,526	17%	21,096	0%		0%
Other current assets	0	0%	30,590	0%	30,590	0%	85,470	1%		0%
Non-current assets	13,561,458	33%	611,930	3%	14,173,388	23%	6,091,142	94%	1,222,388	97%
Financial assets and investment	6,936,801	17%		0%	6,936,801	11%	1,959,311	30%		0%
Property, plant and equipment	6,624,657	16%	611,930	3%	7,236,587	12%	4,131,830	64%	1,222,388	97%
(Machinery, tools, and equipment)		0%		0%	0	0%	3,794,400	59%		0%
Total liabilities and equity	**41,660,442**	**100%**	**19,017,233**	**100%**	**60,677,676**	**100%**	**6,453,607**	**100%**	**1,258,714**	**100%**
Liabilities	**23,874,975**	**57%**	**104,823**	**1%**	**23,979,798**	**40%**	**5,397,178**	**84%**	**0**	**0%**
Current liabilities	23,574,086	57%	104,823	1%	23,678,909	39%	5,397,178	84%		0%
(Loans payable: mainly Land Bank)	6,603,866	16%	0	0%	6,603,866	11%	5,281,642	82%		0%
Non-current liabilities	300,889	1%	0	0%	300,889	0%	0	0%		0%
Equity	**17,785,467**	**43%**	**18,912,410**	**99%**	**36,697,878**	**60%**	**1,056,429**	**16%**	**1,258,714**	**100%**
PROFIT AND LOSS STATEMENT										
Revenue	**2,849,201**	**100%**	**3,760,791**	**100%**	**6,609,992**	**100%**	**337,647**	**100%**	**87,168**	**100%**
Income from credit operations		0%		0%	0	0%		0%		0%
Gross revenue from service operations	1,237,421	43%	3,222,676	86%	4,460,097	67%	304,014	90%	24,290	28%
Gross margin from marketing operations		0%		0%	0	0%	33,633	10%		0%
Gross margin from marketing operations	1,611,780	57%	538,116	14%	2,149,895	33%		0%	62,878	72%
Expenses	**2,039,788**	**72%**	**3,344,990**	**89%**	**5,384,778**	**81%**	**301,861**	**89%**	**78,089**	**90%**
Financing costs		0%		0%	0	0%		0%		0%
Selling/marketing costs		0%		0%	0	0%	267,105	79%		0%
Administrative costs	2,039,788	72%	3,344,990	89%	5,384,778	81%	34,756	10%	78,089	90%
(Depreciation)		0%		0%	0	0%	0	0%	0	0%
(Salaries and wages, and benefits)	608,372	21%	1,266,459	34%	1,874,831	28%	70,562	21%	0	0%
Net surplus before other items	809,412	28%	415,802	11%	1,225,214	19%	35,786	11%	9,079	10%
Other items		0%		0%	0	0%		0%		0%
Net surplus	**809,412**	**28%**	**415,802**	**11%**	**1,225,214**	**19%**	**35,786**	**11%**	**9,079**	**10%**

Note: Financial statements of the Malingin Irrigation System Farm Service Provider Organization established in 2013 with 71 members and the San Miguel Caluasan Farm Service Provider Organization established in 2013 with 100 members (60% of whom are landless agriculture workers) are not available due to the small size of their operations.
Source: Cooperatives D, E and F, and Survey Team

4.4.4 Performance of agriculture mechanization loans provided by the private sector bank

Over the last five years, Bank A working with Japanese agricultural machinery manufacturer B in the Philippines provided about 3,000 loans to buyers of mainly combine harvesters manufactured by B. The bank loans support 80% to 90% of the costs of procurement with annual interest rates ranging from 12% to 15%, depending on the creditworthiness of the borrower. The loans are repaid in two (2) years divided into 4 installments after the end of the harvesting seasons (i.e., twice a year). The bank has extensive information networks in the rural areas, enabling it to assess applicants quickly and reliably and thereby achieve on-time disbursement of loan funds and a low default rate. In this study, this range of 12% to 15% is considered to be a private sector market interest rate for loans specifically designed to fund the procurement of agriculture machinery.

Since both Bank A's 12%-15% interest rate range and LBP's 6%-9% interest rage range are market interest ranges, the difference in the rates should be deemed to reflect differences in the lending performance and styles of the two banking institutions. LBP's banking operation applies excessively prudent standards to buyers of machinery, requiring high creditworthiness, extensive paperwork, and long approval and processing times. Based on its extensive local knowledge of potential clients, the private bank is able to provide quick and timely loan services that buyers should appreciate, at high interest rates ranging from 12% to 15%.

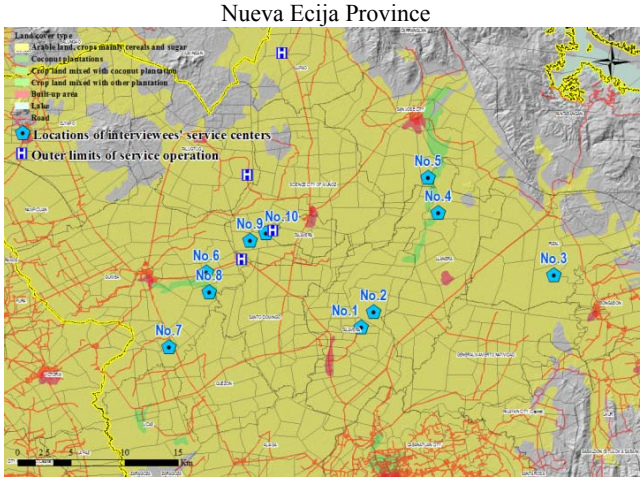
4.5 Characteristics of farming households with Japanese-brand combine harvesters

4.5.1 Additional survey of farming households with Japanese combine harvesters

(1) Selection of survey subjects

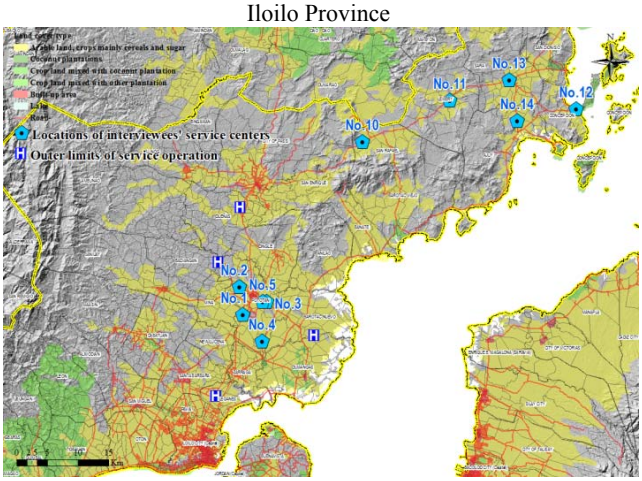
To characterize and compare harvesting service providers with Japanese-brand combine harvesters in Nueva Ecija and Iloilo provinces ten clients each in the former and latter provinces respectively were arbitrarily selected by the Japanese-brand combine harvester distributer handling agricultural machinery for "Brand B" indicated in Table 11. The selected clients were farming households with agricultural service businesses providing rice harvesting services, land preparation services, trading and/or processing. Therefore, they are also considered small enterprises with significant capital investment including at least a combine harvester priced at around PHP 2 million. The geographical locations of their operation centers and the outward limits of the service areas of the single interviewee in Nueva Ecija Province and the other interviewee in Iloilo Province are shown in Figure 8.

Nueva Ecija Province



"Hs" indicate outer limits of harvesting service operation of the interviewee No. 10.

Iloilo Province



"Hs" indicates outer limits of harvesting service operation of the interviewee No. 5.

Source: Survey Team

Figure 8: Locations of interviewees' operation centers and outer limits of service operation

During the first survey period, farmers, cooperatives and associations were visited in Nueva Ecija Province as an area of high-performing agricultural mechanization and Bohol Province as a low-performing area to discuss factors affecting performance. During the second survey period, to analyze the characteristics of private sector

drivers of agricultural mechanization, clients in Nueva Ecija and Iloilo provinces were selected for interview sessions. Since Iloilo Province is considered a medium-performing agricultural mechanization area, other agricultural service businesses are rapidly emerging. Comparing such emerging businesses and businesses in Nueva Ecija elicited a set of guiding principles to formulate the yen-loan-supported project. Since the major known buyers are farmers (25 out of 34 borrowers of agricultural machinery loan products experimented by the Land Bank of the Philippines and almost all the 3,000 clients for Japanese tractors and combine harvesters were farmers and private enterprises) all the 20 selected interviewees were farmers (i.e. small private enterprises).

(2) Overview of the mechanization situation of Nueva Ecija and Iloilo provinces

Based on the following analysis, Nueva Ecija Province is deemed to have an advanced stage of mechanization, as indicated by the high realization (46%) of the reference mechanization potential whereas Iloilo Province is in the early stages of rapidly expanding mechanization, as reflected by the still-low realization (4%) of the reference mechanization potential.

The current mechanization situation can be represented by sales of Japanese-brand combine harvesters against the reference mechanization potential expressed in estimated totals of newly purchased combine harvesters as indicated in Table 9. Since the major market suppliers of rice combine harvesters are almost exclusively Japanese, their sales figures fairly reflect the market situation. The reference mechanization potential of combine harvesters in Regions II and III, where Nueva Ecija Province belongs, is 16,854 units (i.e. the sum of 9,634 units in Region II and 7,220 units in Region III) whereas the cumulative number of Japanese "Brand A" and "Brand B" combine harvesters in 2017 was 7,800 as shown in Table 11. Assuming that most of the units were sold in the two regions based on information provided by the suppliers, 46% (7,800 units/16,854 units) of the reference mechanization potential is assumed to be realized.

Conversely, according to the distributor, approximately 250 units of combine harvesters of "Brand A" and "Brand B" were sold in Capiz Iloilo and Negros Occidental provinces in Region VI, with a total reference mechanization potential for these three regions of 6,052 units, as indicated in Annex 3. Therefore approximately 4% (i.e. 250 units/6,052 units) of the reference mechanization potential is assumed to be realized and it can be said that comparison to the situation of Nueva Ecija Province, the combine harvester market in Iloilo Province has a significant room for growth (i.e. 46% vs. 4%).

4.5.2 Asset accumulation and its dynamics

This infers a shift among farming households in the level of asset accumulation during agricultural mechanization and capitalization. It also infers that mechanization pioneers are likely to belong to the highly capitalized class of farming households in rural areas. As indicated in Table 32, agricultural mechanization by the ten interviewees in Nueva Ecija Province is characterized by their lower range of capital accumulation prior to the purchase of combine harvesters than the range of capital shown in Iloilo Province. The largest landholding class in Nueva Ecija is in the 3-5 ha class whereas the largest landholding class is more than 5 ha class in Iloilo before the purchase of combine harvesters. Only two interviewees operated other businesses in Nueva Ecija Province instead of the six interviewees in Iloilo Province. However, after purchasing combine harvesters, the businesses of interviewees in both provinces expanded similarly in terms of possession of the third business and expansion of the agricultural service business. These observations suggest that mechanization begins with highly capitalized rural farming households as business pioneers and as the agricultural service markets mature and competition intensifies, low-capitalized farming households also end up participating in the markets.

Examples of additional business identified through field observation include: agricultural service business, commodity and/or merchandise trading, agricultural processing business and engagement of professional occupations such as medical doctors, marine engineers, officers and elected civil servants. These additional business operations are likely to indicate established creditworthiness and capital base and the possession of superior business skills necessary in the agricultural service business. The results presented in Table 44 indicate that relatively large capital investment (i.e. about PHP 2 million) to operate, for example, a combine harvester, is a means of entering the agricultural service sector with far higher economic returns. Therefore, moves to determine the project target group must expand this opportunity to less capitalized farmers who would

otherwise miss chances to enter the agricultural service sector amid market-based agricultural mechanization without public sector intervention.

Table 32: Asset of interviewees before and after purchase of combine harvesters

Enterprise no.	Land holding (ha.)	Land holding class	Before purchase of combine harvester		After purchase of combine harvester		4WD tractor		Combine harvester-New	Walk behind trans-planter-New	Truck			
			Agriculture production	Other business	Agriculture production	Other business	New	2nd hand			Small new	Small 2nd hand	Large 2nd hand	
Nueva Ecija Province														
1	3.0	**<=3 ha.**	Ag. prod.		Ag. prod.	Ag. serv.			2		2			
2	3.0		Ag. prod.		Ag. prod.	Ag. serv.		2	1					
3	4.0		(no information)		(no information)			2	1					
4	5.0		Ag. prod.		Ag. prod.	Ag. serv./Trading	1		1					
5	5.0	**3ha.< <=5ha.**	Ag. prod.		Ag. prod.	Ag. serv./Processing	1	1	2					1
6	5.0		Ag. prod.	Ag. serv.	Ag. prod.	Ag. serv.	3	2	3					
7	5.0		Ag. prod.		Ag. prod.	Ag. serv.	1	2	1					1
8	10.2		Ag. prod.		Ag. prod.	Ag. serv./Trading	1	3	2				1	1
9	20.0	**5ha.<**	Ag. prod.		Ag. prod.	Ag. serv.	1		2					1
10	22.0		Ag. prod.	Ag. serv.	Ag. prod.	Ag. serv./Trading			3					
Iloilo Province														
11	4.0	**3ha.< <=5ha.**	Ag. prod.	Trading	Ag. prod.	Ag. serv./Trading	1	1	2	1				1
12	9.0		Ag. prod.		Ag. prod.	Ag. serv.	2		1					1
13	11.0		Ag. prod.		Ag. prod.	Ag. serv.	1		2					1
14	12.0		Ag. prod.	Professional	Ag. prod.	Ag. serv.	5		4	1				2
15	13.0		Ag. prod.	Processing	Ag. prod.	Ag. serv./Trading			2					1
16	18.5	**5ha.<**	Ag. prod.	Professional	Ag. prod.	Ag. serv.	1	1	2				1	
17	25.0		Ag. prod.		Ag. prod.	Ag. serv./Trading	4		4					2
18	36.0		Ag. prod.	Trading	Ag. prod.	Ag. serv.	2		2					1
19	50.0		Ag. prod.	Trading	Ag. prod.	Ag. serv.	2		3					1
20	60.0		Ag. prod.		Ag. prod.	Ag. serv.	4		2					1

Note: "Ag. prod." denotes Agricultural production and "Ag. serv." denotes Agricultural service business.
Source: Survey Team

4.5.3 Labor market and mechanization

(1) Historical perspective

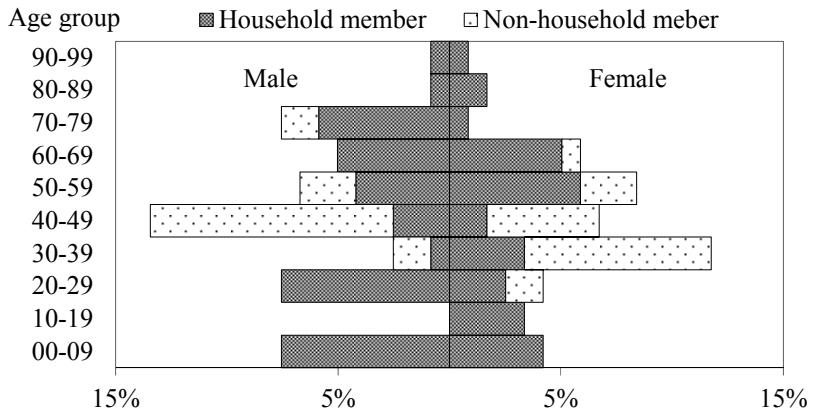
The results of the survey support Hypothesis 2 that increasing labor cost under active rural labor markets is a prerequisite for agricultural mechanization, if we consider that increasing labor cost is another labor market expression of scarce labor availability.

Table 33 and Figure 9 show the current age structure of interviewees' household members that exist after the households were establishment (usually at the time that the household heads got married). There are 119 household members, comprising 62 males and 57 females, with the heads belonging to age classes 50-59 and 60-69. Seventy-seven (77) household members are still members of the current households and 49 have left their households. Forty-nine percent (49%) of current household members are engaged in agricultural production and only 14% of the remaining household members are either engaged in agricultural production. Most of the remaining household members are either engaged in service sector employment or not working. The significant observations include very few household members belonging to the most productive age groups of 30-39 and 40-49 engaged in agriculture and the fact that current agricultural production and service business are carried out by aging households' heads and their spouses and young male household members belonging to the 20-29 age group. The observation indicates the current situation of aging farming households and labor scarcity in the areas surveyed.

Table 33: Household members' working sector by age structure and household membership

Age group	Male									Female									Male and female total								
	Household member				Non-household member					Household member				Non-household member					Household member				Non-household member				
	Not working	Agriculture sector	Service sector	Subtotal	Not working	Agriculture sector	Service sector	Subtotal	Male total	Not working	Agriculture sector	Service sector	Subtotal	Not working	Agriculture sector	Service sector	Subtotal	Female total	Not working	Agriculture sector	Service sector	Subtotal	Not working	Agriculture sector	Service sector	Subtotal	Total
Number of observations																											
00-09	9			9					9	5			5					5	14			14					14
10-19										4			4					4	4			4					4
20-29	9			9					9	1	1	1	3	1		1	2	5	10	1	1	12	1		1	2	14
30-39			1	1			2	2	3	2	2		4	5		5	10	14	2	2	1	5	5		7	12	17
40-49	1	2		3	4	1	8	13	16		2		2	2	1	3	6	8	1	4		5	6	2	11	19	24
50-59	2	3		5		2	1	3	8		6	1	7			3	3	10	2	9	1	12		2	4	6	18
60-69		6		6					6	1	5		6			1	1	7	1	11		12			1	1	13
70-79		7		7		2		2	9		1		1					1		8		8		2		2	10
80-89		1		1					1	1	1		2					2	1	2		3					3
90-99		1		1					1	1			1					1	1	1		2					2
Total	21	20	1	42	4	5	11	20	62	15	18	2	35	8	1	13	22	57	36	38	3	77	12	6	24	42	119
20-59	12	5	1	18	4	3	11	18	36	3	11	2	16	8	1	12	21	37	15	16	3	34	12	4	23	39	73
% to Subtotal																											
00-09	21			21						14			14						18			18					
10-19										11			11						5			5					
20-29	21			21						3	3	3	9	5		5	9		13	1	1	16	2		2	5	
30-39			2	2			10	10		6	6		11	23		23	45		3	3	1	6	12		17	29	
40-49	2	5		7	20	5	40	65			6		6	9	5	14	27		1	5		6	14	5	26	45	
50-59	5	7		12		10	5	15			17	3	20			14	14		3	12	1	16		5	10	14	
60-69		14		14						3	14		17			5	5		1	14		16			2	2	
70-79		17		17		10		10			3		3							10		10		5		5	
80-89		2		2						3	3		6						1	3		4					
90-99		2		2						3			3						1	1		3					
Total	50	48	2	100	20	25	55	100		43	51	6	100	36	5	59	100		47	49	4	100	29	14	57	100	
20-59	29	12	2	43	20	15	55	90		9	31	6	46	36	5	55	95		19	21	4	44	29	10	55	93	
% to Total																											
00-09	8			8					8	4			4					4	12			12					12
10-19										3			3					3	3			3					3
20-29	8			8					8	1	1	1	3	1		1	2	4	8	1	1	10	1		1	2	12
30-39			1	1			2	2	3	2	2		3	4		4	8	12	2	2	1	4	4		6	10	14
40-49	1	2		3	3	1	7	11	13		2		2	2	1	3	5	7	1	3		4	5	2	9	16	20
50-59	2	3		4		2	1	3	7		5	1	6			3	3	8	2	8	1	10		2	3	5	15
60-69		5		5					5	1	4		5			1	1	6	1	9		10			1	1	11
70-79		6		6		2		2	8		1		1					1		7		7		2		2	8
80-89		1		1					1	1	1		2					2	1	2		3					3
90-99		1		1					1	1			1					1	1	1		2					2
Total	18	17	1	35	3	4	9	17	52	13	15	2	29	7	1	11	18	48	30	32	3	65	10	5	20	35	100
20-59	10	4	1	15	3	3	9	15	30	3	9	2	13	7	1	10	18	31	13	13	3	29	10	3	19	33	61

Source: Survey Team



Source: Survey Team

Figure 9: Age structure of household members existed after the establishment of households

The recent rapidly increasing intensity in labor scarcity in Nueva Ecija and Iloilo provinces should be inferred by the observed historical records of 4WD tractors procurement and combine harvester shown in Table 34 and Table 35. Since the interviewees intend to use the machinery for an extended period without thinking of releasing them onto the secondhand market, the current possession of machinery likely to represent their history of mechanization. However, since the interviewees are clients of Brand B combine harvester and the combine harvester market share of Brand B in Nueva Ecija Province is relatively smaller than that of Brand A, but their shares in Iloilo Province are reportedly balanced, any comparison of the two tables should be performed carefully. For example, according to information presented in Table 11 a rapid increase in number of combine harvesters in Nueva Ecija Province presented in Table 34 must commence in 2013, two years earlier than indicated in the table. Additionally, considering the analysis of 46% fulfillment of the reference mechanization potential in Nueva Ecija Province and 4% fulfillment in Iloilo Province as explained in section 4.5.1, the rapid increase in Nueva Ecija Province must commence earlier than 2013. Regardless and as a minimum, at least it can be said that the rapid harvesting-service-market response to rural labor scarcity commenced more than five years ago in Nueva Province and three years ago in Iloilo Province.

Table 34: History of 4WD tractor and combine harvester purchases in Nueva Ecija Province

Machinery	Year	Before 2000	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total	% to total	% to sub total
4WD tractor		**6**	**1**							**1**						**1**	**1**	**3**	**2**	**6**	**20**	**100%**	
(% to total)		30%	5%							5%						5%	15%	10%	30%	100%			
New purchase																**1**	**1**			**6**	**8**	**40%**	**100%**
(% to total)																13%	13%			75%	100%		
Japanese brand																1	1			5	7	35%	88%
(% to total)																14%	14%			71%	100%		
Non-Japanese																				1	1	5%	13%
(% to total)																				100%	100%		
Second hand		**6**	**1**							**1**								**2**	**2**		**12**	**60%**	**100%**
(% to total)		50%	8%							8%								17%	17%		100%		
Japanese brand		1	1															1	2		5	25%	42%
(% to total)		20%	20%															20%	40%		100%		
Non-Japanese		5								1								1			7	35%	58%
(% to total)		71%								14%								14%			100%		
Combine harvester																**1**	**1**	**7**	**5**	**4**	**18**	**100%**	
(% to total)																6%	6%	39%	28%	22%	100%		
New purchase																**1**	**1**	**7**	**5**	**4**	**18**	**100%**	**100%**
(% to total)																6%	6%	39%	28%	22%	100%		
Japanese brand																1	1	7	5	4	18	100%	100%
(% to total)																6%	6%	39%	28%	22%	100%		
Non-Japanese																							
(% to total)																							

Source: Survey Team

Table 35: History of 4WD tractor and combine harvester purchases in Iloilo Province

Machinery	Year	Before 2000	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total	% to total	% to sub total
4WD tractor			**2**							**1**			**1**		**1**	**1**	**1**	**2**	**8**	**7**	**24**	**100%**	
(% to total)			8%							4%			4%		4%	4%	4%	8%	33%	29%	100%		
New purchase			**1**										**1**		**1**	**1**	**1**	**2**	**8**	**7**	**22**	**92%**	**100%**
(% to total)			5%										5%		5%	5%	5%	9%	36%	32%	100%		
Japanese brand															1	1		1	6	7	16	67%	73%
(% to total)															6%	6%		6%	38%	44%	100%		
Non-Japanese			1										1				1	1	2		6	25%	27%
(% to total)			17%										17%				17%	17%	33%		100%		
Second hand			**1**							**1**											**2**	**8%**	**100%**
(% to total)			50%							50%											100%		
Japanese brand																							
(% to total)																							
Non-Japanese			1							1											2	8%	100%
(% to total)			50%							50%											100%		
Combine harvester																**1**		**5**	**6**	**12**	**24**	**100%**	
(% to total)																4%		21%	25%	50%	100%		
New purchase																**1**		**5**	**6**	**12**	**24**	**100%**	**100%**
(% to total)																4%		21%	25%	50%	100%		
Japanese brand																1		5	6	12	24	100%	100%
(% to total)																4%		21%	25%	50%	100%		
Non-Japanese																							
(% to total)																							

Source: Survey Team

Regarding the interpretation of the 4WD tractor purchase history, Nueva Ecija has a long history of secondhand 4WD tractor purchase, which should not be excessively influenced by the market shares of Brand A and B Japanese machinery. Observations of historical records of 4WD purchases also indicate a recent rapid increase in the intensity of labor scarcity in rural areas. The increase in new 4WD tractor purchases in Iloilo Province overtaking that in Nueva Ecija Province is likely attributable to the existence of large tracts of sugar cane fields in Iloilo Province requiring large tractors for land preparation.

(2) Labor-saving effect

The labor-saving effect of 4WD tractor and combine harvester operations is considerable. For example, a single combine harvester requires an average of 8.1 operators and buggers in Nueva Ecija Province (Table 36) In the same region, a combine harvester provides 415 ha (Table 37) of rice harvesting services annually. Assuming that the manual rice harvest operation requires 20 MD per ha and a permanent employee works 250 days annually, the total annual labor-saving effect of a combine harvester is calculated at 4,939 MD (i.e. (20 MD-8.1 MD)*415 ha) which is equivalent to the permanent employment of 20 persons in Nueva Ecija. It is likely that the actual efficiency of combine harvester use is far less than reported; at least ten permanent employment equivalents must be saved or removed from rural areas by introducing a combine harvester in Nueva Ecija.

By employing the figures indicated in Table 36 and Table 37, the labor-saving effect in Iloilo is calculated at 6,112 MD (i.e. (20 MD - 3.3 MD)*366 ha), which is equivalent to the permanent employment of 24 persons. Assuming combine harvester use of 50%, the equivalent of 12 persons in permanent employment would be saved or removed from rural areas following the introduction of a combine harvester in Iloilo Province.

Table 36: Number of employees necessary to operate a combine harvester

Province	Average no. of combine harvesters per an enterprise	Average no. of employees par an enterprise	Average employees per a combine harvester
Nueva Ecija Province	1.8	12.8	8.1
Iloilo Province	2.4	7.5	3.3

Note: Most employees are hired on a temporary or seasonal bases.
Source: Survey Team

Table 37: Harvesting operation days and harvesting areas per one combine harvester

Province No. of observations	No. of crop seasons (times) a	Average harvesting operation days/season (days) b	Average harvesting operation days/year (days) c=a*b	Average harvesting operation ha./day (days) d	Average harvesting operation ha./season (ha.) e=b*d	Average harvesting operation ha./year (ha.) f=c*d	Average radius of harvesting operation areas (km) g
Nueva Ecija Province							
18	2	47	93	4.5	208	415	27
Iloilo Province							
17	2	52	113	3.0	171	366	19

Note: Differences in efficiency over dry and wet season are averaged.
Source: Survey Team

4.5.4 Perception of land preparation and harvesting service providers

(1) Physical, social and technical barriers

All the interviewees responded that the road condition of barangay roads and roads with higher grades sufficient to transport and operate 4WD tractors and combine harvesters. As shown in Table 27, the average radiuses for harvesting operation service areas are 27 and 19 km in Nueva Ecija and Iloilo provinces, respectively, indicating free access to their numerous clients in, for example, Iloilo Province shown in Table 38. Based on this observation the assumption of a physical constraint of "500 m distance from paved roads" when estimating combine harvester and loan demand to be met by the proposed project was removed for "less conservative demand estimates."

Table 38: Numbers of service clients per one 4WD tractor and combine harvester

Province	Average no. of service clients per one 4WD tractor			Average no. of service clients per one combine harvester		
	Minimum	Maximum	Average	Minimum	Maximum	Average
Nueva Ecija Province	No data	No data	No data	No data	No data	No data
Iloilo Province	40.4	75.0	53.0	47.5	125.0	49.8

Source: Survey Team

Since combine harvesters can be operated within in small tracts of rice fields covering an area of, for example 1,000 m^2, the effects of previous land reform results outside of the scope of interviewees' concern at the time of their harvester introduction. There is no difference between the interviewees' perception in Nueva Ecija Province, where land reform in most of the surveyed areas was completed during the 70s and the perception of interviewees in Iloilo Province, where land reform operation in the interviewees' areas remained incomplete or they were not subject to a land reform program.

Regarding social barriers to the mechanization of rice transplanting, that of rice transplanting in Iloilo Province should be considered lower than the barrier in Nueva Ecija Province. Per ha, the average cost of rice transplanting in Nueva Ecija and Iloilo provinces as shown in Table 39 was PHP 5,100 and 7,056, respectively. According to the social cost analysis presented in section 4.3.3 farmers in Iloilo Province should be ready for mechanized rice transplanting. This also tallies with the interviewees' perception of transplanting as presented in Table 40 where more respondents in Iloilo Province perceive mechanized transplanting to be favorable. However, several interviewees in Iloilo Province claimed that the technical barriers associated with seedling preparation for mechanized rice transplanting would have to be resolved to start marketing of transplanting services. This rice transplanting market failure seems to be resolved or compromised by the widespread application of the broadcast seeding method, which generally results in a lower rice production yield than production by the transplanting method.

Table 39: Average rice transplanting cost per ha

Province	Average transplanting cost (PHP/ha.)	Average labor needs (MD/ha.)
Nueva Ecija Province	5,100	15
Iloilo Province	7,056	23

Source: Survey Team

A significant technical barrier, particularly reported by interviewees in Iloilo Province, is the efficiency of after-sales services of agriculture machinery distributors. Delayed spare parts supplies significantly affect the profitability of, for example, combine harvester service business. According to the distributer supporting the survey implementation, the technical constraints perceived by interviewees would be addressed soon due to the competitive combine harvester market in Iloilo Province.

(2) Business prospect of 4WD tractors and combine harvester owners

Table 40 shows the future business perspective as expressed by interviewees in Nueva Ecija and Iloilo provinces. In general, the aggressive and service provider-oriented market situation in Iloilo can be interpreted from the results, which is one of the characteristics of the early stages of an agricultural service market dominated by market pioneers with a large capital base and faced with a lower level of competition. The interviewees in Iloilo Province felt favorable social conditions for mechanical transplanting and harvesting, strongly considered the declining labor availability, expressed a strong interest in obtaining concessionary loan packages and expected high market growth, client base and business expansion and their business diversification. Since the pioneers in Iloilo Province were well equipped with startup capital and creditworthiness, half reported that they would not need government support with exception of concessionary loans.

Conversely, the responses from interviewees in Nueva Ecija Province were moderate compared to those in Iloilo Province. In particular, differences in the areas of market competition, business diversification and government support between the two regions were relatively large, indicating the more matured agricultural service market in Nueva Ecija Province. Interviewees in the province faced higher competition among service providers, while fewer intended to diversify their business and request more government support in providing concessionary loans and subsidies.

Table 40: Future business perspective of interviewees

Questions	Nueva Ecija		Iloilo Province		Total	%
Answeres	(count)	(%)	(count)	(%)	(count)	(%)
Transplanting						
Favorable	7	70%	9	90%	16	80%
No answer	3	30%	1	10%	4	20%
Total	10	100%	10	100%	20	100%
Harvesting						
Favorable	Not asked		9	90%	9	90%
Not known	Not asked		1	10%	1	10%
Total			10	100%	10	100%
Avairable labour						
Increaseing	2	20%	1	10%	3	15%
Not change	1	10%			1	5%
Decreasing	5	50%	8	80%	13	65%
No answer	2	20%	1	10%	3	15%
Total	10	100%	10	100%	20	100%
6%-10% interest rate loan demand						
Interested to use	8	80%	9	90%	17	85%
Not interested	1	10%			1	5%
No answer	1	10%	1	10%	2	10%
Total	10	100%	10	100%	20	100%
Service market expectation						
Growth expected	7	70%	8	80%	15	75%
No growth expected	1	10%			1	5%
No answer	2	20%	2	20%	4	20%
Total	10	100%	10	100%	20	100%
Sufficent client						
Suffcieint clients	Not asked		8	80%	8	80%
Not sufficient clients	Not asked		1	10%	1	10%
No answer	Not asked		1	10%	1	10%
Total			10	100%	10	100%
Expected competition						
Not competitive	2	20%	5	50%	7	35%
Competitive	7	70%	4	40%	11	55%
No answer	1	10%	1	10%	2	10%
Total	10	100%	10	100%	20	100%
Business expantion						
Expansion	8	80%	9	90%	17	85%
Stable	1	10%			1	5%
Shrink						
Quit						
No answer	1	10%	1	10%	2	10%
Total	10	100%	10	100%	20	100%
Business diversification						
Intended	5	50%	8	80%	13	65%
Not intended	3	30%	1	10%	4	20%
No answer	2	20%	1	10%	3	15%
Total	10	100%	10	100%	20	100%
Government support						
Ag. machinery						
Knowhow						
Subsidies	3	30%	2	20%	5	25%
Concessionary loans	6	60%	2	20%	8	40%
Not needed	1	10%	5	50%	6	30%
No answer			1	10%	1	5%
Total	10	100%	10	100%	20	100%

Source: Survey Team

4.5.5 Financing and profitability of 4WD tractor and combine harvester operations

(1) Financing of 4WD tractor and combine harvester procurement

Table 41 and Table 42 present financing methods used to procure 4WD tractors and combine harvesters in Nueva Ecija and Iloilo provinces, respectively. In Nueva Ecija Province, bank loans were mainly used to procure new 4WD tractors (75% of purchases) and new combine harvesters (89% of purchases), while cash payment was common to procure secondhand 4WD tractors (92% of purchases). Only one secondhand 4WD tractor purchase was paid for by installments.

Table 41: Financing methods of 4WD tractor and combine harvester procurement in Nueva Ecija Province

Machinery	Year	Before	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total	% to total	Average interest rate
4WD tractor		**6**	**1**							**1**							**1**	**3**	**2**	**6**	**20**	**100%**	
Bank loan (units)																	**1**			**5**	**6**	**30%**	**12%**
Installment (units)		**1**																			**1**	**5%**	
Cash (units)		**5**	**1**							**1**								**3**	**2**	**1**	**13**	**65%**	
New purchase																	**1**	**1**		**6**	**8**	**100%**	
Bank loan (units)																	**1**			**5**	**6**	**75%**	
Installment (units)																							
Cash (units)																		**1**		**1**	**2**	**25%**	
Japanese brand																	1	1		5	7	100%	
Bank loan (units)																	1			4	5	71%	
Installment (units)																							
Cash (units)																		1		1	2	29%	
Non-Japanese																				1	1	100%	
Bank loan (units)																				1	1	100%	
Installment (units)																							
Cash (units)																							
Second hand		**6**	**1**							**1**								**2**	**2**		**12**	**100%**	
Bank loan (units)																							
Installment (units)		**1**																			**1**	**8%**	
Cash (units)		**5**	**1**							**1**								**2**	**2**		11	92%	
Japanese brand		1	1															1	2		5	100%	
Bank loan (units)																							
Installment (units)																							
Cash (units)		1	1															1	2		5	100%	
Non-Japanese		5								1								1			7	100%	
Bank loan (units)																							
Installment (units)		1																			1	14%	
Cash (units)		4								1								1			6	86%	
Combine harvester																**1**	**1**	**7**	**5**	**4**	**18**	**100%**	
Bank loan (units)																**1**	**1**	**7**	**5**	**2**	**16**	**89%**	**12%**
Installment (units)																							
Cash (units)																				**2**	2	**11%**	
New purchase																**1**	**1**	**7**	**5**	**4**	**18**	**100%**	
Bank loan (units)																**1**	**1**	**7**	**5**	**2**	**16**	**89%**	
Installment (units)																							
Cash (units)																				**2**	2	11%	
Japanese brand																1	1	7	5	4	18	100%	
Bank loan (units)																1	1	7	5	2	16	89%	
Installment (units)																							
Cash (units)																				2	2	11%	
Non-Japanese																							
Bank loan (units)																							
Installment (units)																							
Cash (units)																							

Source: Survey Team

Table 42: Financing methods of 4WD tractor and combine harvester procurement Iloilo Province

Machinery	Year Before	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total	% to total	Average interest rate
4WD tractor		**2**							**1**			**1**		**1**	**1**	**1**	**2**	**8**	**7**	**24**	**100%**	
Bank loan (units)																	**1**	**4**	**3**	**8**	**33%**	**12%**
Installment (units)		**1**												**1**	**1**	**1**	**1**	**4**	**4**	**13**	**54%**	
Cash (units)		**1**							**1**			**1**								**3**	**13%**	
New purchase		**1**										**1**		**1**	**1**	**1**	**2**	**8**	**7**	**22**	**100%**	
Bank loan (units)																	**1**	**4**	**3**	**8**	**36%**	
Installment (units)		**1**												**1**	**1**	**1**	**1**	**4**	**4**	**13**	**59%**	
Cash (units)												**1**								**1**	**5%**	
Japanese brand														1	1		1	6	7	16	100%	
Bank loan (units)																	1	3	3	7	44%	
Installment (units)														1	1			3	4	9	56%	
Cash (units)																						
Non-Japanese		1										1				1	1	2		6	100%	
Bank loan (units)																		1		1	17%	
Installment (units)		1														1	1	1		4	67%	
Cash (units)												1								1	17%	
Second hand		**1**							**1**											**2**	**100%**	
Bank loan (units)																						
Installment (units)																						
Cash (units)		**1**							**1**											2	100%	
Japanese brand																						
Bank loan (units)																						
Installment (units)																						
Cash (units)																						
Non-Japanese		1							1											2	100%	
Bank loan (units)																						
Installment (units)																						
Cash (units)		1							1											2	100%	
Combine harvester															**1**		**5**	**6**	**12**	**24**	**100%**	
Bank loan (units)																	**2**	**5**	**7**	**14**	**58%**	**14%**
Installment (units)															**1**		**2**	**1**	**5**	**9**	**38%**	
Cash (units)																	**1**			1	**4%**	
New purchase															**1**		**5**	**6**	**12**	**24**	**100%**	
Bank loan (units)																	**2**	**5**	**7**	**14**	**58%**	
Installment (units)															**1**		**2**	**1**	**5**	**9**	**38%**	
Cash (units)																	**1**			1	4%	
Japanese brand															1		5	6	12	24	100%	
Bank loan (units)																	2	5	7	14	58%	
Installment (units)															1		2	1	5	9	38%	
Cash (units)																	1			1	4%	
Non-Japanese																						
Bank loan (units)																						
Installment (units)																						
Cash (units)																						

Source: Survey Team

The cases of Nueva Ecija and Iloilo provinces differ in terms of how installment financing is applied. Since the distributor bears the default risk of buyers, this arrangement indicates the buyer has a stronger position within the machinery market in the province. The common reason expressed by the interviewees in the region was no interest payment to their machinery suppliers, which also suggests the strength of the buyers' strong position in the market. To procure new 4WD tractors 59% of purchases were made via installment arrangements and 36% by bank loans. All payments made to purchase two secondhand 4WD tractors were in cash. Regarding the procurement of new combine harvesters, 58% of purchases financed by bank loans and 38% by installment arrangements.

As shown in Table 43 and Table 44 the interest rates of the bank loans applied to purchase new 4WD tractors and combine harvesters in Nueva Ecija and Iloilo provinces differed. The average interest rate on loans for new 4WD tractor and combine harvester purchases in Nueva Ecija Province was 12% whereas the rate in Iloilo

Province is 14%, indicating a relatively insufficient supply of loan products for agricultural mechanization in the province. This also justifies the implementation of the project in the province to meet the high demand for agricultural mechanization loans. Although not explicitly stated by the interviewees, the higher interest rate could explain the higher incidences of installment arrangements in Iloilo Province. In general the interviewees paid a third of the machinery price by their own funds and the rest by loan financing.

Table 43: Financing arrangement of 4WD tractor procurement

Province / Financing modality	No of 4WD tractors		Average prices of 4WD tractors	Average payment by own funds	Average loan/installment financing		
	No.	% to total			Amount	Interest rate in %	Year
Nueva Ecija Province							
New 4WD tractor							
All procurement	8	100%	950,000	512,500			
Bank loan	4	50%	1,125,000	250,000	875,000	12%	1.8
(% of loan financing)			(100%)	(22%)	(78%)		
Installment	0	0%					
Cash	4	50%	775,000	775,000			
Secondhand 4WD tractor							
All procurement	12	100%	298,333	298,333			
Bank loan	0	0%					
(% of loan financing)							
Installment	1	8%	595,000	595,000			
Cash	11	92%	271,364	271,364			
Iloilo Province							
New 4WD tractor							
All procurement	22	100%	1,168,182	382,353			
Bank loan	8	36%	1,000,000	312,500	687,500	14%	1.5
(% of loan financing)			(100%)	(31%)	(69%)		
Installment	13	59%	1,253,846	325,000	1,000,000		
Cash	1	5%	1,400,000	1,400,000			
Secondhand 4WD tractor							
All procurement	2	100%	240,000	240,000			
Bank loan	0	0%					
(% of loan financing)							
Installment	0	0%					
Cash	2	100%	240,000	240,000			

Source: Survey Team

Table 44: Financing arrangement of new combine harvester procurement

Province / Financing modality	No of new combine harvesters		Average prices of combine harvester	Average payment by own funds	Average loan/installment financing		
	No.	% to total			Amount	Interest rate in %	Year
Nueva Ecija Province							
All procurement	18	100%	1,668,333	820,556			
Bank loan	15	83%	1,672,000	654,667	1,017,333	12%	2.0
(% of loan financing)			(100%)	(39%)	(61%)		
Installment	0	0%					
Cash	3	17%	1,650,000	1,650,000			
Iloilo Province							
All procurement	24	100%	1,799,583	581,250			
Bank loan	14	58%	1,806,429	642,857	1,163,571	14%	1.9
(% of loan financing)			(100%)	(36%)	(64%)		
Installment	9	38%	1,805,556	366,667	1,438,889		1.1
Cash	1	4%	1,650,000	1,650,000			

Source: Survey Team

(2) Profitability of 4WD tractor and combine harvester operations

Fee arrangements and the per-unit estimated annual profit of 4WD tractors are presented in Table 45. The per-ha service fee schedules for both single-pass and double-pass land preparation in Iloilo Province exceed the schedules in Nueva Ecija Province, which is consistent with the observation that the agricultural service market in Iloilo Province is less competitive. The estimated annual net profits per tractor presented in the table suffice to pay off the cost of a tractor purchase within one or two years. Although the reported efficiency of tractor operation should be overestimated and interviewees' calculations generally exclude costs of depreciation and maintenance, the profit should still suffice to pay off the cost of purchase in two to three years as they reported.

Table 45: 4WD tractors fee schedules and estimated annual net profit

Province	Single pass land preparation by a tractor			Double pass land preparation by a tractor			Single pass work %	Double pass work %	Estimated annual profit/ tractor
No. of observations	Fee /ha (PHP) a	Cost /ha. (PHP) b	Profit /ha. (PHP) c	Fee /ha (PHP) e	Cost /ha. (PHP) f	Profit /ha. (PHP) g	(%) i	(%) j	(PHP) k
Nueva Ecija Province									
New 4WD tractor									
8	2,663	1,175	1,488	5,600	2,300	3,300	50%	50%	561,643
Secondhand 4WD tractor									
12	3,513	1,133	1,550	5,600	2,300	3,300	50%	50%	876,600
Iloilo Province									
New 4WD tractor									
22	3,969	1,444	2,525	6,375	2,325	4,050	55%	45%	1,336,219
Secondhand 4WD tractor									
2	4,000	1,000	3,000	6,000	2,000	4,000	50%	50%	630,000

Source: Survey Team

Table 46: Rice yields, fee schedules, and estimated annual net profit of combine harvester service

Province	Average reported yield of unhulled rice					Average reported harvesting fee in sharecropping arrangement (% to total bags)			Average reported harvesting fee in fixed fee arrangement (PHP/ha.)			Estimated profit (PHP/ harvester/ year)
No. of observations	No. of bags/ha. in dry season (bags) a	No. of bags/ha. in wet season (bags) b	Weight /bag (kg) c	Yield/ha. (kg) d=(a+b)*c/2	ton /year/ harvester (ton) e	Fee /ha (%) f	Cost /ha. (%) g	Profit /ha. (%) h	Fee /ha (PHP) j	Cost /ha. (PHP) k	Profit /ha. (PHP) l	(PHP) i
Nueva Ecija Province												
18	174	110	60	9,058	3,707	10%	5%	5%	11,675	5,546	6,129	2,434,000
Iloilo Province												
21	80	109	44	4,097	2,056	15%	5%	10%	7,521	2,342	5,180	2,058,932

Note: In Nueva Ecija share cropping fee arrangement dominates, as opposed to a fixed fee arrangement in Iloilo Province. Shaded figures are estimated by assuming the price of unhulled rice at 13PHP/kg.
Source: Survey Team

Table 46 shows rice yields, fee schedules and estimated annual profit of the combine harvester services provided by interviewees in both provinces. The combine harvester rice harvesting operation in Nueva Ecija Province is characterized by the high per-ha yield of rice production and the application of share cropping arrangement. Conversely, the operation in Iloilo Province is characterized by the low per-ha yield and

application of a fixed cash payment arrangement. Although the share cropping equivalent rate of the cash payment schedule used in Iloilo Province is assumed to be 15%, which exceeds the rate of 10% in Nueva Ecija Province, the overall average profit in Iloilo Province is lower than that in Nueva Ecija Province due to the low per-ha yield of rice production in the former. This is attributable to the proliferation of rain-fed paddies in the province.

The strong market position of the harvester service provider in Iloilo Province is indicated by the cash payment arrangement, whereby production risks are borne by producers. In any case, according to the information provided by interviewees and presented in Table 46 the harvesting service provision should be considered lucrative since the cost of a combine harvester can be recovered within a year. Despite the reported efficiency of combine harvester operations being halved, the harvester purchase cost can be covered by harvester operations within two years.

4.6. Machinery-dealer-sales activities as a factor determining agricultural mechanization

It was observed that machinery-dealer-sales constitute a significant determinant factor of agricultural mechanization. Observation also suggest that agriculture machinery staff possess social, economic and financial information of their clients and potential clients obtained through daily sales activities to assess and determine their business risks and the probability of success. Accordingly, appropriate collaboration modalities with dealer companies to nature transparent and competitive environment will be key to underpin the success of the project.

4.7. Identification of actors of agricultural mechanization as project target groups

In this section, the results of an asset-based cooperative classification and anecdotal financial examination of cooperatives and a case study on selected farming households having purchased Japanese agricultural machinery are presented to identify the project target groups. The identified project target groups are then summarized as answers to the question of *Who will be the main actors of agricultural modernization in rural capital markets?* set under the observation points of Hypothesis 3 in the analytical framework.

Who will be the main actors of agricultural modernization in rural capital markets?

The following are five main contributors in the capital markets to the generation of the economic impacts from, for example, combine harvester mechanization. Since the project is a public intervention to 1) accelerate agricultural mechanization and 2) secure the equitable distribution of added value generated through mechanization with less-capitalized agriculture sector players, the project's priority target groups are actors B, C and F as shown in Table 47.

Table 47: Target group categories and actors

	Target group categories and actors	Asset level	Target group?
Category of actors belonging to rural cooperatives and equivalents (i.e. corporations and associations)			
Actor A:	Large and medium cooperatives or equivalents should play active roles in market-based mechanization, but their low turnover to total capital should be improved.	PHP >15 million	No
Actor B:	Relatively capital-poor upper-small cooperatives or equivalents are the main actors of mechanization with concessionary loans provided by the projects.	PHP 15 million.≥ and >5 mill	Yes
Actor C:	Capital-poor lower-small and micro cooperatives or equivalents are subjects of grant-based mechanization. However, since their graduation from grant support is expected, once willing cooperatives and equivalents are identified, they should be in the category of the target group.	PHP 5 million ≥	Yes
Category of actors belonging to farming households (or enterprises)			
Actor D:	Farming households possessing more than 3 ha of farmland.	> 3 ha.	No
Actor E:	Farming households possessing farmland less than or equal to 3 ha with other significant business	3 ha.≥ with other business	No
Actor F:	Farming households possessing farmland less than or equal to 3 ha with no other significant business.	3 ha. .≥ with no other business	Yes

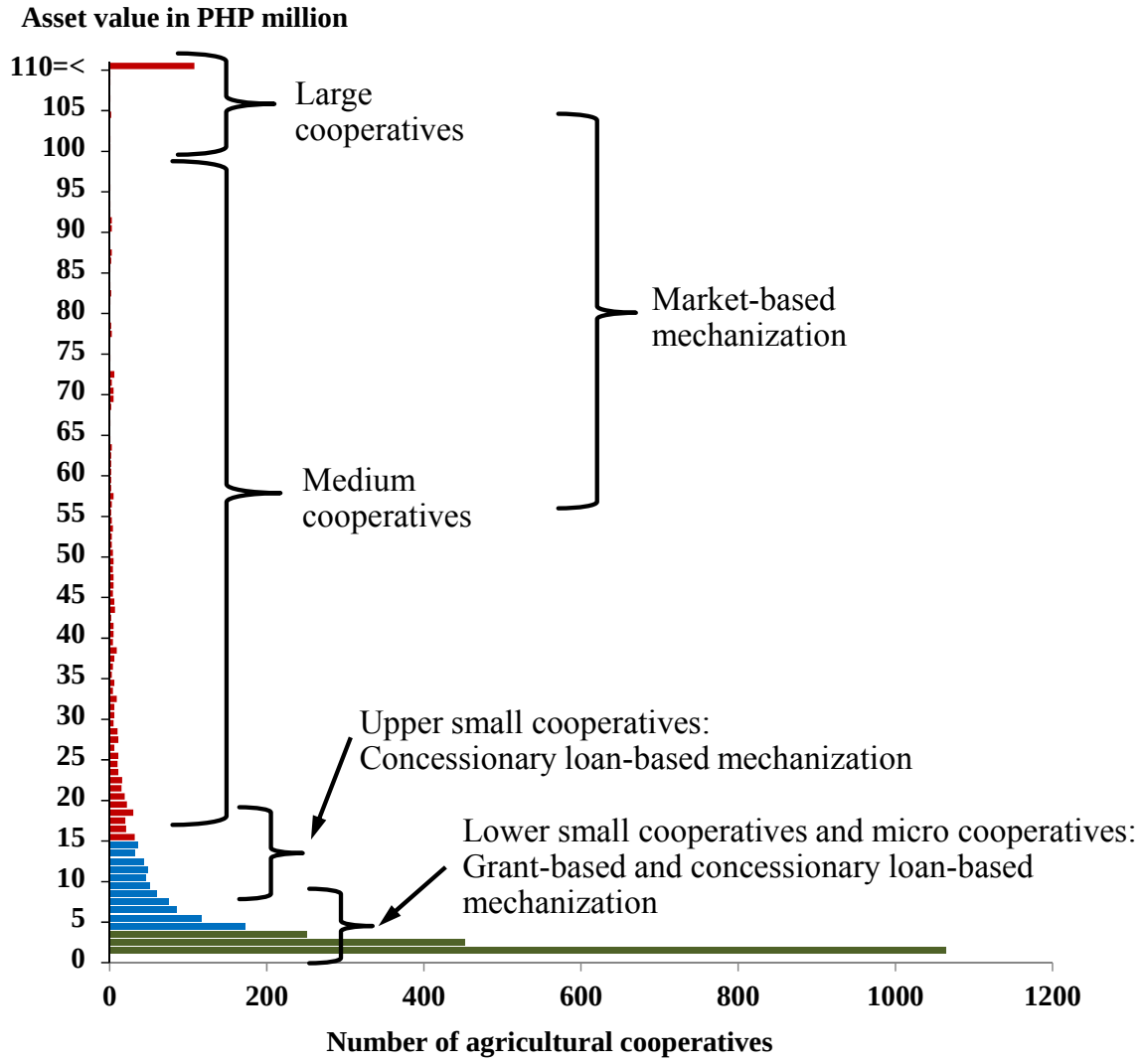
Source: Survey Team

4.7.1 Identification of organizational actors of agricultural mechanization

Since the project is a public intervention to 1) accelerate agricultural mechanization and 2) secure the equitable distribution of added value generated through mechanization with less-capitalized agriculture sector players, cooperative actors B and C below are the project's priority organization targets. As shown in Figure 10, there should be three main organizational contributors in the rural capital markets to generate the economic impact of agricultural mechanization and excess labor employment.

The large and medium cooperatives or their equivalents (Actor A) with total asset values exceeding PHP 15 million are driving market-based mechanization, but will not be the main target clients for the proposed project, although their low turnover to total capital should be subject to project intervention.

Relatively capital-poor upper-small cooperatives or their equivalents (Actor B), with total asset values exceeding PHP 15 million, are the main target cooperative actors to promote mechanization with concessionary loans provided under the project. Since they are less capitalized and have less capacity to drive market-based mechanization, public support for their mechanization businesses should spawn active machinery and capital markets in which wide-ranging cooperative actors participate. Significant amounts of subsidized business development services will be provided to the cooperative actors to improve their business management skills.



Source: Cooperative Development Authority and Survey Team

Figure 10: Distribution of agricultural cooperatives by asset size and project target group

Capital-poor lower-small and micro cooperatives or their equivalents (Actor C) with total asset value of less

than PHP 5 million are selected as subjects of grant-based mechanization in the expectation that government grant contributions to their production asset establishment will eventually enable them to accumulate asset bases to further develop agriculture machinery markets. Because their graduation from grant support is expected, once willing cooperatives and equivalents are identified, they should be in the category of the target group. Evidence also suggests that a significant amount of business development services will be provided at subsidized prices to actors to improve their business management skills. As such, close collaboration and coordination between current grant programs and loan-providing projects should be established and maintained.

An example of a cooperative belonging to Actor B is cooperative E in Table 31 with total assets of PHP 6.45 million; possessing property, plant and equipment valued at PHP 4.13 million and generating annual gross revenue from service operations of PHP 0.3 million. This cooperative E requires a significant improvement in turnover to the total capital rate, since a single combine harvester with asset value of around 1.7 million (Table 44) would, on average, generate annual net profit exceeding PHP 2 million (Table 45). An example Actor C is cooperative F in in Table 31 with total assets of PHP 1.25 million, possessing property, plant and equipment valued at PHP 1.22 million and generating annual gross revenue from service operations of PHP 0.02 million.

4.7.2 Identification of farming household actors of agricultural mechanization

(1) Asset accumulation and criteria for target group selection

To determine the selection criteria for target group selection, information inferring the level of farmers' asset accumulation was collected and summarized in Table 32. Assuming that the target group of the project is a set of farming households or enterprises, the selection criteria attributable to the group must be easily understood by third parties to ensure transparent project operation and equal opportunities for project participants to access concessionary loans for mechanization.

Based on the interpretation of information summarized in Table 32 two selection criteria, 1) three (3) ha. cut-off size of agricultural landholdings and 2) the non-existence of an additional business to agricultural production of farming households are selected. Applying these criteria yields the following categories of farming households (or enterprises):

Category of actors belonging to farming household (or enterprises)

- D: Farming households possessing more than 3 ha of farmland
- E: Farming households possessing farmland less than or equal to 3 ha with other significant business
- F: Farming households possessing farmland less than or equal to 3 ha with no other significant business

If a farming household possesses 3 ha or less of farmland with no other significant business operation (Actor F), the household should belong to the target group of Actor F and is eligible for a concessionary loan provided by the project for purchase of a 4WD tractor(s) and/or combine harvester(s). Actor F should include landless farers and farmworkers to encourage willing and capable persons in the category to participate the agriculture service markets. The two farming households (10% of interviewed) with enterprise no. 1 and 2 in Table 32 are examples of Actor F which are eligible project participants. Based on this observation, 10% of combine harvester owners in the advanced agricultural machinery markets are eligible for concessionary loans provided by the project.

Examples of the additional business identified through field observation are, agricultural service business, commodity and/or merchandise trading, agricultural processing business and professional occupations such as medical doctor, marine engineer, officer and elected civil servant. These additional business operations are likely indicators of established creditworthiness and capital base and possession of superior business skills necessary to succeed in the agricultural service business. The results presented in Table 32 indicate that relatively large capital investment (i.e. about PHP 2 million), e.g. to operate a combine harvester, is a way to enter the agricultural service sector with much higher economic returns. Therefore, the determination of the project target group must expand this opportunity to less capitalized farmers who would otherwise miss the opportunity to enter the agricultural service sector amid an environment of market-based agricultural mechanization without public sector interventions.

4.7.3 Competitive agriculture service market development by with participation of identified actors

The results of the field survey on the organizational and farming household actors suggest that there is policy rationale for the active public intervention to the inter-sectoral labor shifts and to emergence of the new class of agriculture service providers. It is observed that the rural sector in the Philippines is in the process of rapid structural change induced by out-migration through dynamic labor markets. The inter-sectorial labor shift is an engine of economic growth and driver of labor productivity improvement, which also associated with agricultural mechanization and agriculture service market development. In this sense the agriculture modernization and mechanization policies should not be confined in their own sector, but rather established to address inter-sectoral issues and national development agendas.

The survey results indicate that the current market-oriented agriculture mechanization and agriculture service market development may fall into the station of market failure in the future due to the current skewed agricultural land holdings and capital accumulation hindering fair and competitive market development. Although the emerging agriculture service business does not require landholding, the large landholders have an advantage to demonstrate creditworthiness and management capability to establish and manage the business. Therefore, distribution of opportunity to enter the business should be skewed, and this should result in less fair and competitive market. There is an incidence that local elites pioneering combine harvester service business in Iloilo Province attempted to form a cartel to prevent establishment of competitive market.

The emerging agriculture service businesses must be major players of agriculture industrialization and operation consolidation if the environment of fair and competitive markets participated by wide-ranging participants is secured. In this context the public intervention through implementation of the Yen Loan supported project should provide public services to less capitalized but qualified cooperatives, associations, and farming households to enhance fair and competitive market environment. The project also provide services to secure fair and competitive agriculture machinery and service market to establish and implement various administrative and regulatory functions.

5. Proposed agriculture mechanization promotion project to be supported by the Yen Loan scheme

This section establishes and identifies the target groups and areas. Table 50 summarizes the project objectives and component structure and Table 51 provides detailed descriptions of the components and subcomponents of the proposed project. Regarding Yen loan arrangements, Table 52, Table 54, and Table 55, respectively summarize the cost structure and borrower interest rates under Yen loan provision, the funding sources of the Agriculture Mechanization Promotion Policy Fund (AMPPF) by fund application types, and the funding sources and selected end user loan conditions of the Agriculture Mechanization Promotion Loan Fund (AMPLF). For explanation of the target organizations and groups in relation to agriculture potential areas, Table 57 and Table 58 describe three types of areas with different levels of agricultural mechanization potential, public sector target organizations, and private sector target groups in the areas with agricultural mechanization potential.

5.1 Project rationale and identification of target groups and priority areas

5.1.1 Overall project rationale and actions to be taken by the government

Based on the analytical framework and results of the survey the proposed public intervention rationales are framed with attention to rural labor and capital markets. Functions of public service delivery corresponding to the set rationale are also indicated.

For the rural labor market:

In order to achieve higher value addition and labor productivity of alternative employment and livelihood identification by excess/displaced/labor suppliers, the project will prepare financial resources for providing services to facilitate labor market adjustments and prevent social conflicts.

For the rural capital market:

In order to stimulate capital markets by supplying concessional loans to relatively under-capitalized cooperatives, corporations, associations, and individuals, the project will prepare financial resources to provide concessional loans. Given the relatively low business management capacity of these entities, the project will provide low-cost BDSs. An exit strategy should be well established to achieve the optimal financial market stimulation.

In order to coordinate and collaborate with mechanization capital support projects currently underway, the project will be conducted through close coordination and collaboration with existing machinery provision programs.

5.1.2 Target groups

As identified in section 4.7 and shown in Table 48 there are two target group categories and three main actors.

Table 48: Project target groups and actors

Target group categories	Actors
Rural cooperatives and equivalent target group	Actor B: Relatively capital-poor upper-small cooperatives or their equivalents with total asset value of less than or equal to PHP 15 million.
	Actor C: Capital-poor lower-small and micro cooperatives or equivalents with the total asset value of less than PHP 5 million.
Farming household (or farming enterprise) target group category	Actor F: Farming households possessing farmland less than or equal to 3 ha with no other significant business.

Source: Survey Team

5.1.3 Priority areas

As shown in Table 49, three types of agricultural mechanization performance area are established based on the observed and reported characteristics of rural agriculture labor and capital markets. The medium-performing agricultural mechanization areas receive high project implementation priority, the low-performing agricultural mechanization areas receive medium project implementation priority, and the high-performing agricultural mechanization areas receive low project implementation priority.

Table 49: Areas with agricultural mechanization potential

Characteristics of areas with agriculture mechanization potential	High-performing agricultural mechanization areas	Medium-performing agricultural mechanization areas	Low-performing agricultural mechanization areas
Rural labor market characteristics	High labor market mobility and decreasing labor availability	High labor market mobility and decreasing labor availability	High labor market mobility and decreasing labor availability
Demographic characteristics	Aging of the farmer population	Aging of the of the population	Aging of the population
Capital accumulation and capital market characteristics	High-level accumulation	Medium-level accumulation	Low-level accumulation
Policy priority	Low	Medium	High
Economic priority	Medium	High	Low
Overall project priority areas	**Medium**	**High**	**Medium**
Example areas (known and recognized areas)	Regions I (Ilocos), II (Cagayan Valley), III (Central Luzon), and IV-B (Mimaropa)	Region V (Bicol), Iloilo Province in Region VI (Western Visayas), Negros Occidental and Negros Oriental Provinces in Region VII (Central Visayas), and Leyte Province in Region VIII (Eastern Visayas)	Bohol Province in Region VII (Central Visayas)

Source: Survey Team

5.2 Project goal, objectives and component structure

As shown in Table 50, the overall project goal is to achieve rural development, poverty reduction, and food security in the Philippines through four project objectives: (1) increase agriculture and labor productivity, (2) reduce production costs and postharvest losses, (3) enhance the cost effectiveness of production and labor productivity through the promotion of mechanized custom services, and (4) strengthen the regulatory capacity of the DA. The core concept of the project is to apply agricultural mechanization as a means to achieve the broader objectives of sector modernization and growth. Therefore, the project will primarily focus on improving the business management and technical skills of the private sector target groups through the establishment of a conducive regulatory environment and active machinery and capital markets.

Table 50: Summary of the project objectives, component structure, and component characteristics

Overall project goal
Rural development, poverty reduction, and food security through agriculture sector modernization
Project objectives
(1) Increase agricultural productivity through the promotion of agricultural mechanization (2) Reduce production costs and postharvest losses through the promotion of agricultural mechanization (3) Enhance the cost effectiveness of production and labor productivity through the promotion of mechanized custom services

(4) Strengthen the regulatory capacity of the DA, including the testing and evaluation capability of AMTEC

Component structure		Component characteristics
Component 1: Regulatory, extension, and business development services and establishment of financial facilities		Public service delivery and establishment of policy implementation financial facilities
Subcomponent 1-1:	Enhancement of regulatory, extension, and business development service delivery by the DA and related organizations	Provision of public services to enhance business environment and lower the management risks of borrowers
Subcomponent 1-2:	Establishment of an Agriculture Mechanization Promotion Policy Fund in the DA	Establishment and management of a policy implementation grant fund
Subcomponent 1-3:	Establishment of an Agriculture Mechanization Promotion Loan Fund in the DA	Establishment and management of a policy implementation loan fund
Component 2: Enhancement of mechanized agriculture production and processing services		Provision of concessionary loans for the promotion of agricultural mechanization
Subcomponent 2-1:	Application of ACPC medium-size loan schemes to promote agricultural mechanization	Provision of medium-size loans for the promotion of production mechanization
Subcomponent 2-2:	Application of ACPC large-size loan schemes for rice drying and milling businesses	Provision of large-size loans for the promotion of processing mechanization
Component 3: Social and agriculture labor market adjustment support		Public sector intervention for labor market adjustment
Subcomponent 3-1:	Employment facilitation and microfinancing support to saved labor suppliers	Provision of facilitation and financing services to vulnerable agriculture workers

Source: Survey Team

Component 1 focuses on the provision of regulatory, business development, and financial support public services. Component 2 provides opportunities to willing parties to obtain concessionary loans for the establishment and management of mechanized custom service businesses. Component 3 secures facilitative and financial support for labor market adjustment to lower the potential risk of conflicts between the saved labor suppliers and beneficiaries of agricultural mechanization.

5.2.1 Description of components and subcomponents

Table 51 summarizes the component and subcomponent structure, rationale, subcomponent objectives, and target groups, introduces the machinery considered, briefly describes the activities and functions of the DA, ACPC, LBP, and other collaborating financial institutions (CFIs)[17], and summarizes the pros and cons.

Table 51: Detailed component and subcomponent structure

Component Subcomponent Subcomponent description	
Component 1: Regulatory, extension, and business development service, and establishment of financial facilities	
<u>Subcomponent 1-1: Enhancement of regulatory, extension, and business development service delivery by the DA and related organizations</u>	
Rationale: (1)	***Economic inefficiency of the free provision of agriculture machinery***: The government should revisit and reconsider the policy of freely providing agriculture machinery to reconsider its efficiency and effectiveness. The DA's policy of freely providing agricultural machinery does not seem to trigger any advancement of the mechanization or expansion of machinery and financial markets as a general rule. In many cases, the production assets freely provided by the DA have been found to be grossly

[17] Land Bank of the Philippines (LBP) is one the collaborating financial institutions)

underutilized. Their total asset turnover ratios (sales to total assets ratios), meanwhile, are extremely low, at less than 0.1. Hence, no component of free distribution of machinery will be included in this project. It is strongly recommended, however, that the DA coordinate this project in close collaboration with the current machinery distribution programs and this loan project in order to achieve synergies and complementarities.

(2) ***Requirements for the working of the regulatory framework***: The regulatory framework for agricultural and fisheries machinery was established by the Agricultural and Fisheries Mechanization Law of 2013 (p. 6). The law allows for three years of preparation for the full application of various standards and machinery registration procedures which are to commence in 2017. The procedures and responsible bureau are still being prepared, however, and their operationalization will require significant efforts and resources.

(3) ***Public sector BDSs***: Subsidized public sector BDSs can be provided by DA-HQs, AFMEC, PhilRice, PhilMech, RFOs, provincial and municipal governments, and existing special projects targeting beneficiaries identified in conformity with the policies of the DA. These entities have only limited capacity, however, to provide high-quality BDSs to loan borrowers such as farmers, associations, cooperatives, and corporations in order to improve their business operations for growth. Such BDSs include support for the development of business plans for loan application, and technical and business management advice. BDSs should also seek to facilitate rural consultation processes necessary to support rural labor market transformation and mitigate social and market conflicts.

(4) ***Machinery testing facilities***: The machinery testing and evaluation capacity of AMTEC is limited, and testing and evaluation also consume time. No alternative testing centers for outsourcing have yet been identified or have had their capacities strengthened.

(5) ***Exit strategy for public interventions***: Public sector BDSs should be replaced by private sector BDSs once the agricultural mechanization trend is triggered by the public intervention. The provision of private sector BDSs such as marketing, machinery delivery, technical guidance, and maintenance and after-sale services should be provided at market prices. The exit strategies for the public sector interventions should include withdrawal of concessionary loan provision, facilitative services to promote fair and transparent user-vendor relationships, the organization of matching meetings, and technical seminars and business forums for users, service providers, suppliers, dealers, and manufacturers.

(6) ***Equity financing by banks***: Steps to involve banks more closely in the business management of borrowers' equity financing can also be considered.

(7) ***Project management***: The implementation of the project will require close collaboration with a number of organizations across the government. The project steering committee responsible for overall project implementation will therefore include representatives from the DA-HQs, DA-RFOs, PhilRice, PhiMech, AMTEC, LGUs, ACPC, Land Bank, and DoF.

Objectives:	This subcomponent is established to increase the efficiency and effectiveness of agricultural mechanization policy implementation through a strengthening of the regulatory functions and BDS delivery of the relevant national and local governments. The regulatory functions and BDSs should be provided to trigger the expansion of machinery and associated financial markets and the acceleration of labor market transformation. The BDSs will also include exit strategies for the public interventions to minimize market distortions.
Target groups:	DA-HQs, DA RFOs, PhilRice, PhilMech, AMTEC, LGUs, and other relevant public sector organizations (see Table 57 for details).
Machinery:	Experimental agricultural machinery for non-commercial production, demonstration agricultural machinery, and pilot agricultural machinery, including a large-scale rice mill facility for pilot processing (see Subcomponent 2-2).
Activities:	(1) Strengthening of the DA's business development service (BDS), standard-setting and testing service, research and development service, and market promotion and facilitation

service.

(2) Strengthening of the BDSs of provincial and county governments (i.e., agriculture extension officers). BDSs include, for example, support to borrowers' loan application development, procurement of production and processing machinery, and business management.

(3) Strengthening of the testing functions of AMTEC and other testing organizations.

(4) Identification of Farm Service Centers (FSCs) among well-performing borrowers and facilitation of management and technical skill development extension in collaboration with FSCs.

(5) Design and implementation of a large-scale, high-value, high-risk rice mill pilot project in collaboration with private sector participants (see Subcomponent 2-3). A risk-sharing arrangement between the DA, LBP, and participants will be determined.

(6) Implementation of existing strategies.

Yen loan schemes and functions of the DA, ACPC, LBP, and other collaborating financial institutions (CFIs)

(1) Project Yen Loan (Project financing)
DA: Policy supervising/implementing agency
ACPC: (no function)
LBP: (no function)
CFIs: (no function)

(2) Development Yen-loan (Two-Step Loan)
DA: Policy supervising/implementing agency
ACPC: (no function)
LBP: (no function)
CFIs: (no function)

Pros: ***For all areas with agricultural mechanization potential***

(1) The BDSs provided by the DA to potential borrowers for identifying capable rural entrepreneurs, developing loan application and business plans, and meeting loan eligibility criteria will lower the risk and costs borne by the CFIs in selecting incapable applicants.

(2) The BDSs provided by the DA to borrowers for improving their business management skills will decrease their default risks and increase their chances of business success.

(3) If the BDSs provided by the DA work poorly, the DA has the option of procuring private sector professional BDSs for BDS provision to borrowers and potential borrowers.

(4) Strengthening of the testing and evaluation capacity of AMTEC and other public and/or private testing institutions will promote the sale of loan products with the conditionality of standard and certified machinery purchase.

(5) Though effective in addressing monopolistic or oligopolistic paddy market operations, high-quality paddy and rice production targeting high-value-rice-market segments with large capital investment for rice drying and milling plants is perceived to have high business risk by willing-private-sector investors/participants, including medium to large cooperatives. Government support to high-value-added business and market development through the establishment of a public-private collaborative pilot project will reduce the risks private sector entities bear in establishing such markets and businesses.

Cons: ***For all areas with agricultural mechanization potential***

(1) There is a risk that the provisions of public sector BDSs will incur high costs and risks because public sector organizations are generally not-for-profit organizations.

(2) The testing and evaluation capacity of AMTEC may be too small to meet the testing and evaluation demands. It may therefore take time to identify and develop additional testing and evaluation capacity both in public and private sector organizations.

(3) It may be difficult to identify willing private-sector investors/participants for implementation of the pilot project due to the perceived high risk and costs of the

project.

(4) There is a risk that poor management of the pilot project will result in unsatisfactory results because of poor and opaque public/private relationships and a lack of efficient management due to redundant, ambiguous lines of business management.

Subcomponent 1-2: Establishment of an Agriculture Mechanization Promotion Policy Fund in the DA

Rationale: (1) There is no cost and impact management center for implementing the policy to promote agricultural mechanization. The costs and impacts of the mechanization policy implementation are poorly captured as a result, which makes it difficult to review and evaluate the implementation results. An example of this is the impact monitoring of the agriculture machinery distribution programs, where an absence of functions to centrally analyze and capture the costs and generated impacts prevents effective program reviews, improvements, and adjustments.

(2) The DA's policy control over various agriculture loan schemes is not comprehensive, and their interest rates as policy implementation control parameters are not determined in an integrated manner. Control over the parameter is important to manage market-oriented public interventions and their exist strategies.

(3) The costs of the DA's public service and BDS provisions for agricultural machinery promotion are not captured centrally, and the cost effectiveness of the public intervention to the mechanization promotion is difficult to measure and monitor.

Objectives: The Agriculture Mechanization Promotion Policy Fund (AMPPF) will be established within the framework of the government's Agro-Industry Modernization Credit and Financing Program (AMCFP) as an instrument for implementing the agricultural mechanization policy. The fund will support and control the costs of implementing the mechanization policy through the provision of administrative costs for loan management to the Land Bank of the Philippines (LBP) and other collaborating banks such as rural banks, cooperative banks, and NGO banks. The fund will also be applied for the provision of business development services (BDSs) by the government to the borrowers of loans in order to lower the risk of default and improve the management skills of the borrowers. Support from the fund will help to lower the risk of market failure and manage exit strategies for the public interventions as the agricultural loan and machinery markets mature.

Target groups: LBP and other loan service providers (see Table 57 for details)

Machinery: (not applicable)

Activities: (1) To enhance the agriculture loan market: The fund will provide loan administrative support to LBP and collaborating banks and provide BDSs to potential borrowers in support of loan application and business plan development, as well as production and processing business management if loans are provided. As the agricultural loan market matures, the intensity of the support will be lowered to prevent market distortion.

(2) To enhance the agriculture machinery market: The fund will provide BDSs maintenance services to the borrowers in areas with medium- to low-mechanization potential where the distribution and service networks of suppliers are less established. The BDS will be managed in such a way that the provision of BDSs stimulates the demand for agriculture machinery and the development of private sector distribution and maintenance networks. As the agricultural machinery market mature, the intensity of the BDSs will be lowered to prevent market distortion.

Funding sources: The initial financing arrangement of AMPPS is shown in Table 54. AMPPS will initially be funded with proceeds from the government's general appropriations and Yen Loan resources. Funds to replenish the AMPLF will be sourced from the general appropriations, Yen Loan resources, and interest earnings of the AMPLF.

Yen loan schemes and functions of the DA, ACPC, LBP, and other collaborating financial institutions (CFIs)

(1) Project Yen Loan (Project financing)
DA: Policy supervising agency

ACPC: Fund management agency
LBP: Administrative support recipient / ACPC loan provision agency
CFIs: Administrative support recipient / ACPC loan provision agencies

(2) Development Yen-loan (Two-Step Loan)
DA: Policy supervising agency
ACPC: (no function)
LBP: (no function)
CFIs: (no function)

Pros: ***For all areas with agricultural mechanization potential***

(1) The AMPPF as a center for controlling the cost of implementing the agriculture mechanization policy and loan scheme for easy policy-cost monitoring, impact assessment, and restructuring of policy instruments and procedures.

(2) The DA is able to control loan schemes implemented by ACPC, LBP, and other collaboration FIs by meeting their administrative costs and other necessary costs for loan administration financed from the AMPPF.

(3) If the AMPPF functions well in accelerating agriculture mechanization, activating machinery and capital markets, and generating impact and growth, the DA may opt to shift more general appropriation budget to finance the AMPPF in the future. In this sense, the project can be considered a pilot to test the effectiveness and efficiency of the policy implementation instrument with the AMPPF and AMPLF (see Subcomponent 1-3).

(4) For ACPC and the CFIs, including LBP, the AMPPF funds to cover administrative costs will enable them to design concessionary loan products flexibly for the promotion of agricultural mechanization. A wider range of financial institutions can become CFIs under this arrangement, and their capital market competitiveness will improve.

(5) BDSs provided to borrowers for loan application and business plan development, business management, and technical improvement will lower the risks of poor management and default, which in turn will increase the business confidence of the borrowers and lower the financing costs of the CFIs. Another result will be better access to the loan products by low-capitalized farmers and farm workers, associations, cooperatives, and corporations.

Cons: ***For all areas with agricultural mechanization potential***

(1) Setting concessionary interest rates by covering the administrative cost of the CFIs distorts the rural capital market and may cause inefficiency of the market as a result. If the aggregated size of the rural capital market is significantly larger than the loans to be provided under this project, the negative impact of the project can be considered small. Negative impacts of project implementation should be monitored carefully, and countermeasures to effectively address the impacts should be in place.

(2) As a grant fund established within the DA, the AMPPF is subject to a risk of politicized management. Therefore, transparent and accountable governance arrangements will be designed and implemented to prevent any mismanagement or misappropriation of funds.

(3) A skilled and experienced management team needs to be deployed for efficient, transparent, and accountable management of the AMPPF. Though costly, such a team is necessary to maintain high management standards.

(4) the AMPPF is not a revolving fund, and thus will be depleted and require replenishment. The fund will be replenished with government's general appropriations, Yen Loan resources, and interest earnings of the AMPLF with clear justifications. The justifications need to be identified carefully in order to outline the overall contribution of the project to value addition and economic growth.

Subcomponent 1-3: Establishment of an Agriculture Mechanization Promotion Loan Fund in the DA

Rationale: (1) The Agriculture and Fisheries Modernization Act of 1997 establishes Agro-Industry Modernization Credit and Financing Program (AMCFP). Under the overall framework of AMCFP, the DA and ACPC recently established the Program for Unified Lending to Agriculture (PUNLA), a program within which various loan products can be placed to

fulfil specific policy objectives. In this context, the project will gain benefits by setting a special loan instrument in the program framework. Figure 9 shows a schematic representation of the framework.

Objectives: ACPC will provide CFIs entrusted funds from AMPLF for an 0% entrustment fee, together with administrative cost support from the AMPPF to achieve integrated control over the provision of ACPC-designed loan products.

Target groups: LBP and the collaborating banks (rural banks, cooperative banks, and NGO banks) (see Table 57 for details)

Machinery: (not applicable)

Activities:

(1) An Agriculture Mechanization Promotion Loan Fund (AMPLF) will be established as a PUNLA loan product within the overall framework of the Agro-Industry Modernization Credit and Financing Program (AMCFP).

(2) The loan products will be designed by ACPC in consultation with the CFIs, including LBP.

(3) Financial resources from the AMPLF will be entrusted to the CFIs at an 0% entrustment fee, to be used for the management of the ACPC loan schemes. Administrative support from the AMPPF will also be provided based on the design of the ACPC loan products.

(4) The CFIs will deliver loan application assessment, loan disbursement, interest and principle collection, and BDSs to borrowers based on the loan products specifications set by ACPC.

(5) The loan fund is managed transparently, efficiently, and effectively.

Funding sources: The initial financing arrangement of the AMPLF is shown in Table 55. AMPLF will initially be funded with proceeds from Yen Loan resources. Funds to replenish the AMPLF will be financed by the government's general appropriations, Yen Loan resources, and interest earnings of the AMPLF. Interests set to Yen Loan resources by JICA and DoF when the resources are allocated to the AMPLF will be financed by funds provided by the AMPPF. ACPC will thus be able to entrust the AMPLF funds with the CFIs at an 0% entrustment fee.

Yen loan schemes and functions of the DA, ACPC, LBP, and other collaborating financial institutions (CFIs)

(1) Project Yen Loan (Project financing)
DA: Policy supervising agency
ACPC: Fund management agency
LBP: Fund entrusted / ACPC loan provision agency
CFIs: Fund entrusted / ACPC loan provision agencies

(2) Development Yen-loan (Two-Step Loan)
DA: Policy supervising agency
ACPC: (no function)
LBP: (no function)
CFIs: (no function)

Pros: ***For all areas with agricultural mechanization potential***

(1) ACPC supports the establishment of the AMPLF and AMPPF with low interest Yen Loan resources. The AMPLF enables ACPC to design concessionary loan schemes for the promotion of agriculture mechanization.

(2) ACPC is willing to develop a new loan product with a higher upper limit. The loan amount is expected to be determined based on assessments of the business and procurement plans. A loan amount larger than the upper limit can be approved when ACPC deems it appropriate.

(3) LBP supports the establishment of the AMPLF and AMPPF, as the end-borrower interest rates will be competitive and LBP will be able to receive administrative cost support from the AMPPF. If 4.5% of LBP's administrative cost can be covered, LBP is willing to act as an entrusted FI for implementation of ACPC loan products with stipulated terms and conditions.

(4) The AMPLF will be used to finance ACPC loan schemes managed by the CFIs. Their good performance will ensure repayment of principal and interests for the growth of the fund and should also stimulate the growth of the agriculture machinery and rural capital markets. In addition, the DA's awareness of the good performance is likely to result in the allocation of more general appropriations as seed funds to the AMPLF.

Cons: ***For all areas with agricultural mechanization potential***

(1) A skilled and experienced management team needs to be deployed for efficient, transparent, and accountable management of the AMPPF. Though costly, such a team is necessary to maintain high management standards.

(2) It seems to be difficult for ACPC and LBP to accept a strict Japanese brand selection condition stipulated for loan products. It will be possible, however, to accept an alternative approach indicated in Table 55. There will be the two types of fund: one for financing applications with Japanese brand machinery and the other for applications with non-Japanese brand machinery. As shown in Table 55, these two funds will be established with different incentive measures for the promotion of Japanese brand choice by potential borrowers.

Component 2: Enhancement of mechanized agriculture production and processing services

Subcomponent 2-1: Application of ACPC medium-size loan schemes to promote agricultural mechanization

Rationale: (1) In areas with high and low agriculture potential, capitalized farmers, cooperatives, and associations obtain combine harvesters, tractors, and transplanters to the market and provide production services at market prices. The agriculture machines have large optimal economic operation areas (more than 50 ha), and the owners of the equipment become production service providers. The need for loan services for their purchase and operation is increasing rapidly, particularly in areas with high agricultural mechanization potential.

(2) It was reported that the average radius of a service provider's coverage is within his/her municipality (or province). Economic and social reasons for such limited coverage areas have been identified. Economically, it is inefficient to move large machines over long distances. Socially, the agriculture service market is segmented to secure service provision by locals, not by service providers from other municipalities. While inter-regional services were common in the past, the recent trend is to prohibit such services in order to protect local interests. Concessional loans need to be provided based on careful examination of socioeconomic conditions through, for example, mandatory rural consultations.

(3) The management capacities and skill sets of low-capitalized farmers, associations, and cooperatives are low, whereas their demand for loan products for the purchase and operation of agricultural machinery was observed to be relatively high. It will thus be necessary to provide BDSs to improve the management and technical skills of the borrowers both before loan provision and during their business operations, in order to reduce risk of default and poor business management.

(4) The distributers' networks of machinery manufacturers and suppliers were found to be insufficiently established in middle- and low-capitalized areas, and their repair and maintenance services are costly. The provision of public sector BDSs to facilitate the matching of demand and supply of machinery maintenance and repair services should thus be considered to reduce the high transactions costs of the services, until such time that the network is developed and operational.

(5) Given the medium-size capital requirement for the preparation of agriculture production service businesses (PHP 2 to 10 million) and large capital requirement for establishing a drying and milling plant (more than PHP 200 million), two types of agricultural mechanization promotion funds should be established to meet medium and large capital needs.

(6) Observations indicate that the first priority in providing public BDSs and concessional

loan support should be given to associations, cooperatives, and corporations organized by low-capitalized farm workers and labor surplus landed or tenant farmers (off-farm employment dominated farmers). The agriculture workers and labor surplus farmers are likely to be displaced workers due to the labor-saving nature of agricultural mechanization. This negative impact should be minimized by giving them first priority as farm service providers, notwithstanding the inevitably high costs of providing public services to build their capacities. Associations, cooperatives, and corporations organized by low- and medium-capitalized farmers should be given the second priority.

(7) Another reason to focus support to cooperatives is their tax-exempt status. This provides them significant incentive to form cooperatives for mechanized service provision to increase the profit and welfare of their members.

(8) To reduce the risk of default and improve the management and technical capacities of the applicants, the submission and successful appraisal of business plans must be mandatory. A business plan should include financial, management, procurement, technical and operational plans to demonstrate applicant's competence and ability to maintain a sustainable business. The procurement plan within the business plan should include details of the selected brands and specifications, to enable CFIs to select appropriate types of funds from which the loan resources can be sourced. The eligible types of fund are indicated in Table 55.

Objectives: To provide medium-size concessionary loans for the purchase of tractors, combine harvesters, rice transplanters, and dryers to the selected target groups in order to trigger and promote the development of agricultural machinery markets and associated capital markets.

Target groups: Table 58 explains the details of the target groups with their priority settings.

Machinery: (1) As shown in Table 55, two types of sub-funds, Type A1 and Type A2, will be established. If an applicant prefers to procure Japanese brand machinery, then the Type A1 fund is selected as the loan source. If, on the other hand, an applicant prefers to procure non-Japanese brand machinery, the Type A2 fund is selected. More favorable loan schedules are set for the Type A1 fund in order to promote the purchase of Japanese brand machinery. For the Type A1 fund, for example, the maximum loan amount is PHP 5 million, the loanable % of the machinery value is 90%, and the interest rate is 4.5%. For the Type A2 fund, the maximum loan amount is PHP 1 million, the loanable % of the machinery value is 80%, and the annual interest rate is 5.5%. The ratios of Yen loan contribution to the Type A1 fund and Type A2 fund are 80% and 20%, respectively.

(2) The project supports the procurement of tractors, combine harvesters, rice transplanters, and dryers. The agriculture operation unit should be set to around 50 to 100 ha based on the physical and socioeconomic environments of the proposed businesses. One loan condition is the procurement of officially tested and certified machinery. Other conditions consistent with the Agricultural Mechanization Act will be established.

(3) The development of sound business plans for a 7- to 10-year planning period is mandated to loan applications for the selection of capable borrowers. The BDSs of the DA can be provided to loan applicants and borrowers. The idea of applying for high-quality machinery for high profitability in the 7- to 10-year planning period will be promoted.

Ownership: The machinery is purchased and owned by borrowers. The machinery is also an asset treated as collaterals for the CFIs to help them manage the borrowers' default risk.

Upper limit: The upper limit of a loan is either PHP 5 million or an amount based on assessments of business plans.

Interest rate: In the range of 4.4~5.5%/year fixed rate

Activities: By applying the ACPC lending schemes and mobilizing the established information networks, the following organizations are targeted for lending:

(1) Associations, cooperatives, and enterprises organized by agriculture workers and low-capitalized farmers

(2) Medium- or high-capitalized farmers, and associations, cooperatives, and enterprises

organized by medium- and/or high-capitalized farmers

(3) Small-, medium-, and large-scale cooperatives and enterprises financed by cooperatives

(4) Small- and medium-scale enterprises intending to commence agriculture service businesses

Yen loan schemes and functions of the DA, ACPC, LBP, and other collaborating financial institutions (CFIs) (Note: LBP is one of the collaborating financial institutions)

(1) Project Yen Loan (Project financing)
DA: Policy supervising agency
ACPC: Fund management agency
LBP: Fund entrusted / ACPC loan provision agency
CFIs: Fund entrusted / ACPC loan provision agencies

(2) Development Yen-loan (Two-Step Loan)
DA: Policy supervising agency
ACPC: (no function)
LBP: Two-Step Loan recipient / LBP loan provision agency
CFIs: (no function)

Pros: ***For all areas with agricultural mechanization potential***

(1) In the areas with high mechanization potential (i.e., Region II of Cagayan Valley and Region III of Central Luzon), Japanese brand tractors, combine harvesters, and rice transplanters are gaining high regard for their high quality, low maintenance cost, high durability, and low harvest loss. This should be consistent with an estimation that from the medium-term (7 to 10 year) business management perspective with set assumptions, the utilization of Japanese brand machinery yields higher returns than the utilization of other brand machinery.

(2) Because the loan is provided for procurement of assets (agricultural machinery), the assets can be treated as collaterals for the CFIs to help them manage the borrowers' default risk.

(3) LBP is interested in becoming an entrusted CBI in order to obtain loan resources at an 0% entrustment fee and provide ACPC loan products. In this arrangement, LBP is able to cover the 4.5% administrative cost.

(4) By mobilizing LBP's nationwide banking and business networks, the project will be able to identify well-capacitated large-, medium-, and small-potential borrowers.

For areas with high agricultural mechanization potential

(5) There are large areas of flat, highly productive agricultural lands. The land conditions contribute to high rates of profit from agricultural mechanization if the machinery is used in optimal operation units for the agricultural land.

(6) Because of the large size of the agriculture machinery market and well-established distribution networks, the users of agricultural machinery are able to obtain high-quality and low-cost maintenance services.

(7) LBP, which is one of the CFIs, deploys a large number of lending managers in the areas due to the high agricultural loan demand.

For areas with medium agricultural mechanization potential

(8) Conditions and circumstances in the markets for agriculture products, labor, and machinery indicate a readiness for the rapid expansion of agricultural mechanization. The provision of financial products by private sector banks for mechanization entails relatively high risk due to the early stage of mechanization in the area. Notwithstanding a persistently high risk of default, public intervention to provide concessionary loans in the area to stimulate commercial adoption of mechanized production services should help to improve machinery and capital market conditions. By further stimulating the markets, this can be expected to enable private sector participants to meet the financial needs of the service providers. This public intervention should yield a larger impact in these areas than in the areas with high and low mechanization potential.

(9) From the point of view suppliers, their prior investments to develop distribution

networks enables them to take advantages of the market stimulation effects achieved through the public intervention and to mobilize their invested capacity for the further expansion of the machinery markets. The same applies to the private sector banking institutions.

For areas with low agricultural mechanization potential

(10) Given the major players in the areas, namely, low-capitalized farm workers, farmers, and associations and cooperatives, the identification of capable borrowers will be costly and time-consuming, particularly for private banks. The project, on the other hand, will be able to bear the cost of capacity building through subsidized provision of BDS. Although this will be costly, it will enable improvements to the business management capacity of the low-capitalized clients and ultimately help to increase their income.

(11) Given the limited capacity of the labor market in these areas to absorb excess labor resulting from agriculture mechanization, the outmigration of labor and/or increase in social tension will become problematic without the implementation of countermeasures through public interventions. If countermeasures such as activities to facilitate the identification of alternative employment and promote microfinancing arrangements work well, the public intervention will also help increase labor productivity in the areas.

Cons: ***For all areas with agricultural mechanization potential***

(1) High initial cost of introducing Japanese brand machinery

(2) LBP is unable to restrict the brand choice of borrowers in the design of its own lending products.

(3) There is no estimated market size for agricultural machinery (tractors, rice transplanters, combine harvesters, and dryers) loans. (This issue is addressed in Section 6 of this report.)

For areas with high agricultural mechanization potential

(4) Agriculture machinery and related capital markets will continue working without intervention through this project. As such, the responses of these markets to the public intervention will necessarily be smaller than the responses of these of markets in areas with medium agricultural mechanization potential.

(5) Because the capital markets in the areas are already led by private sector banks, the project intervention to the markets should be carefully handled to avoid market conflict with the private sector banks. The project should provide BDS and loan products to low-capitalized and high-risk clients for the formation and operation of associations, cooperatives, and corporations. This choice will require costly and time-consuming project operations in these areas.

For areas with medium agricultural mechanization potential

(6) The initial impact of the project intervention should be high. However, as machinery and related capital markets are stimulated and gain momentum for further growth, the function of capital and BDS supply to agriculture service enterprises should be handed over gradually to the private sector players. The timing of this handover process should be carefully decided in order to minimize market distortion by the project.

(7) There is a chance that the public intervention by the project will spur a rapid expansion of agriculture mechanization with large numbers of saver labor suppliers. In this case the project will pay the high expenditure required to help low-capitalized target clients form service associations, cooperatives, and corporations to secure employment, and provide other support activities for job creation and the identification of alternative forms of employment.

For areas with low agricultural mechanization potential

(9) The project will provide fixed interest rate loans across all of the areas with agricultural mechanization potential. This can be expected push up the demand for loans in areas with low agricultural mechanization potential, where default risk and market interest rates are high. Therefore, costs of identifying capacitated borrowers, providing BDS services, and managing risk will be higher than in areas with medium and high

mechanization potential.

(10) Finding capacitated borrowers among low-capitalized clients is time-consuming and costly.

(11) The growth rate of excess labor suppliers is slower than that in areas with medium mechanization potential; hence, it will be more difficult and costly to support the identification of alternative forms of employment and livelihood.

(12) High cost of maintenance service due to underdeveloped dealer networks. The cost of the BDSs provided by the DA will also be high.

(13) Small-size and sloping agriculture production lands drive up the cost of agriculture mechanization.

(14) LBP has a low presence in the areas in terms of the numbers of deployed staff, and has an insufficient capacity to identify capable borrowers.

Subcomponent 2-2: Application of ACPC large-size loan schemes for rice drying and milling businesses

Rationale: (1) Pilot intervention to be designed to verify new, costly, comprehensive mechanization solutions to promote rice market diversification and value addition. The observations indicate a need for consistent specifications from production to processing to establish and promote high value brand rice products in the market. The diversification will introduce competitive markets for high-quality rice paddies and milled rice, which in turn will help mitigate monopolistic or oligopolistic practices in the rice paddy market that prevent small farmers from gaining larger market shares.

(2) A pilot intervention should be implemented with willing, risk-taking private sector counterparts such as medium- to large-scale cooperatives and medium- to large-scale enterprises.

(3) Equity financing together with subsidized loans can be considered to mobilize the management experience of large business operations by LBP in order to increase the probability of successful management and address issues of operational capital shortages.

Objectives: To provide large-size concessionary loans for the establishment of pilot rice milling businesses with a milling plant equipped with drying, storing, and milling facilities. The pilot will include plans to experiment with a mechanization solution to promote rice market diversification and high value rice production with willing, risk-taking private sector participants.

Target groups: See Table 58 for details.

Machinery: (1) Two types of sub-funds, Type B1 and Type B2, will be established, as shown in Table 55. As Subcomponent 2-2 will be managed to finance the implementation of the pilot for the time being, only the Type B1 fund will be financed by proceeds from Yen Loan resources. If the participants of the pilot prefer to procure Japanese brand machinery, then the Type B1 fund is selected as the loan source. Favorable loan conditions will be set in order to support high-risk investment by private sector participants: maximum loan amount of PHP 200 million, loans of up to 95% of the machinery value, and an interest rate of 3.5%.

(2) Rice drying and milling machinery and facilities. Set 1,000~2,000 ha of production land as the production unit for a rice milling business. It is assumed that the Satake brand is to be introduced on a pilot basis for the production of high-value-added brand rice products based on a supply of high-quality rice paddies from identified rice producers.

Ownership: Plants and machinery are purchased and owned by the borrowers.

Upper limit: The upper limit of a loan will be either PHP 200 million or an amount based on business plan assessments.

Interest rate: Special yearly fixed rate of 3.5% (Given the large size of the loan for pilot project implementation, the rate should be low enough to attract risk-taking private enterprises.)

Activities: (1) This subcomponent will be used to finance the pilot project in collaboration with the DA, LBP, and private sector participants during the project period. At the completion of the five-year project, the pilot should be attractive enough to draw private sector

attention for investment. At the beginning of the pilot, the DA and LBP will collaborate to identify and select interested private sector participants for the pilot. The pilot project proposal will be furnished by the private sector participants themselves. Satake's products will be selected in the proposal to meet the output specifications set by the project. Risk-sharing arrangements among the DA, LBP, and private sector participants will be determined.

Yen loan schemes and functions of the DA, ACPC, LBP, and other collaborating financial institutions (CFIs)

(1) Project Yen Loan (Project financing)
DA: Policy supervising agency
ACPC: Fund management agency
LBP: Fund entrusted / ACPC loan provision agency
CFIs: Fund entrusted / ACPC loan provision agencies

(2) Development Yen-loan (Two-Step Loan)
DA: Policy supervising agency
ACPC: (no function)
LBP: Two-Step Loan recipient / LBP loan provision agency
CFIs: (no function)

Pros: ***For all areas with agricultural mechanization potential***

(1) If the pilot succeeds, there will be an opportunity to increase the diversification, competitiveness, and value addition of the rice markets in the Philippines.

(2) The success of the project will stimulate investment in the production of diversified and high-value rice, which in turn should incentivize the farmers' to produce high-quality, high-value rice varieties and attract private sector investment for the production of high-quality rice. Overall rice production and the processing markets are expected to become more competitive, which will equitably benefit both the rice producers and consumers.

Cons: ***For all areas with agricultural mechanization potential***

(1) The rate of rice milling mechanization is almost 100%, and further mechanization would provide a means for tapping into new market opportunities for diversification and high-value-added products. . The risk and costs of the pilot project are assumed to be high, as the required shifts in the rice varieties preferred by farmers and the rice products preferred by consumers can only be brought about through costly and time-consuming market interventions.

(2) Additional information collection and consultation, particularly with potential private sector participants, will be necessary for making a final decision on the inclusion of this component to the project

(3) It is still necessary to clarify the detailed design of the pilot, as well as the financing and risk-sharing arrangements among the DA, CFIs, and private sector participants. This includes technical assessments regarding the introduction of the Satake brand for achieving the objectives of the pilot in comparisons with the specifications and reputations of other brands of rice milling plants.

(4) The pilot will be implemented to explore business opportunities for high-value rice production and market diversification. However, success in finding opportunities depends not on the general trends in the labor and capital markets, but rather on specific circumstances and conditions. Examples of such circumstances would include the existence of similar and previously existing businesses, specific natural conditions for the production of particular varieties, the existence of entrepreneurs, and booming markets. Generally speaking, these circumstances are likely to be found in the areas with high mechanization potential. Further information in this regard will be needed for the identification of the business opportunities.

(5) It will not be possible to estimate the loan demand prior to the project operation.

Component 3: Social and agriculture labor market adjustment support

Subcomponent 3-1: Employment facilitation and microfinancing support to saved labor suppliers

Rationale: (1) It has been argued that agriculture sector modernization requires increased labor productivity, a condition also linked to the productivity of excess labor providers. It thus becomes necessary to monitor, manage, and facilitate the process of finding alternative uses of the excess labor generated in the process of agriculture mechanization. The labor productivity of the alternative utilization should be equal to or higher than the labor productivity of the agriculture work before the mechanization.

Objectives: To promote and facilitate the alternative utilization of the excess labor resulting from agriculture mechanization.

Target groups: See Table 58 for details. Target groups are low-capitalized farmers and labors of excess labor suppliers, and associations, cooperatives, and formal enterprises formed by the farmers and/or labors. The target groups will be identified before loan approval through rural consultations and observations of the dynamics of the agricultural labor and mechanized service markets.

Means of support: Agriculture mechanization loans under Subcomponents 2-1 and 2-2 and existing microfinance schemes

Machinery: Necessary agricultural machinery to be used by associations, cooperatives, and enterprises organized by the low-capitalized agricultural farmers and/or labors of excess labor suppliers.

Ownership: Borrowers

Upper limit: Based on the upper limit set by Subcomponent 2-1 and/or Subcomponent 2-2.

Interest rate: Based on the interest rates set by Subcomponent 2-1 and/or Subcomponent 2-2.

Activities:
(1) Establishment of association, cooperative, and formal enterprises as mechanized agriculture service providers by low-capitalized farmers and/or labors of excess labor suppliers.
(2) Provision of facilitation services to low-capitalized farmers and labors for identification of alternative employment, livelihood improvement measures, and vocational training opportunities in collaboration with other departments.
(3) Facilitate and support the process for identifying and accessing the agriculture mechanization loans provided under Subcomponents 2-1 and 2-1, and existing microfinance schemes for the implementation of activity (2).

Yen loan schemes and functions of the DA, ACPC, LBP, and other collaborating financial institutions (CFIs)

(1) Project Yen Loan (Project financing)
DA: Policy supervising/implementing agency
ACPC: Fund management agency
LBP: Fund entrusted / ACPC loan provision agency
CFIs: Fund entrusted / ACPC loan provision agencies

(2) Development Yen-loan (Two-Step Loan)
DA: Policy supervising agency / implementing agency
ACPC: (no function)
LBP: Two-Step Loan recipient / LBP loan provision agency
CFIs: (no function)

Pros:

For all areas with agricultural mechanization potential

(1) Implementation of local consultations facilitated by the DA before the approval of mechanization loans enables the DA to control and mitigate any potential or confirmed socioeconomic conflicts before borrowers begin implementing mechanization activities.
(2) The opportunities for alternative employment by excess labor suppliers will increase.
(3) Acceleration of association, cooperatives, and corporation formation through the organization of low-capitalized agriculture labor and farmers. This should increase both their labor productivity and income.

For areas with high agricultural mechanization potential

(4) Excess labor can be absorbed relatively easily by alternative employment within and outside the province through active labor markets. The need for intervention by the

	project is low in these areas, and the cost of intervention should also be low.
	For areas with low agricultural mechanization potential
	(5) The absorption of excess labor within the province by alternative employment is not easy in these areas, as outmigration to other provinces is commonly observed. Although the cost of interventions will be high, the projects services to facilitate the identification of alternative employment within the concerned province will have long-term impacts of agriculture sector transformation and labor shift.
Cons:	For all areas with agricultural mechanization potential
	(1) The costs of local consultations and consequent implementation of mitigation measures will be risky and costly to the project. In some cases the cost may be higher than the social cost saved by the public interventions.
	(2) The task of identifying alternative employment for excess labor suppliers is usually difficult and costly for the government since employment creation requires market-wise involvement of economic players. Given the limited resources of the project, collaborations with other government bodies and projects, cooperatives, corporation, NGOs, and CBOs should be considered in addressing the issue of employment efficiently.

Source: Survey Team

5.2.2 Financial arrangements and end-user interest rates

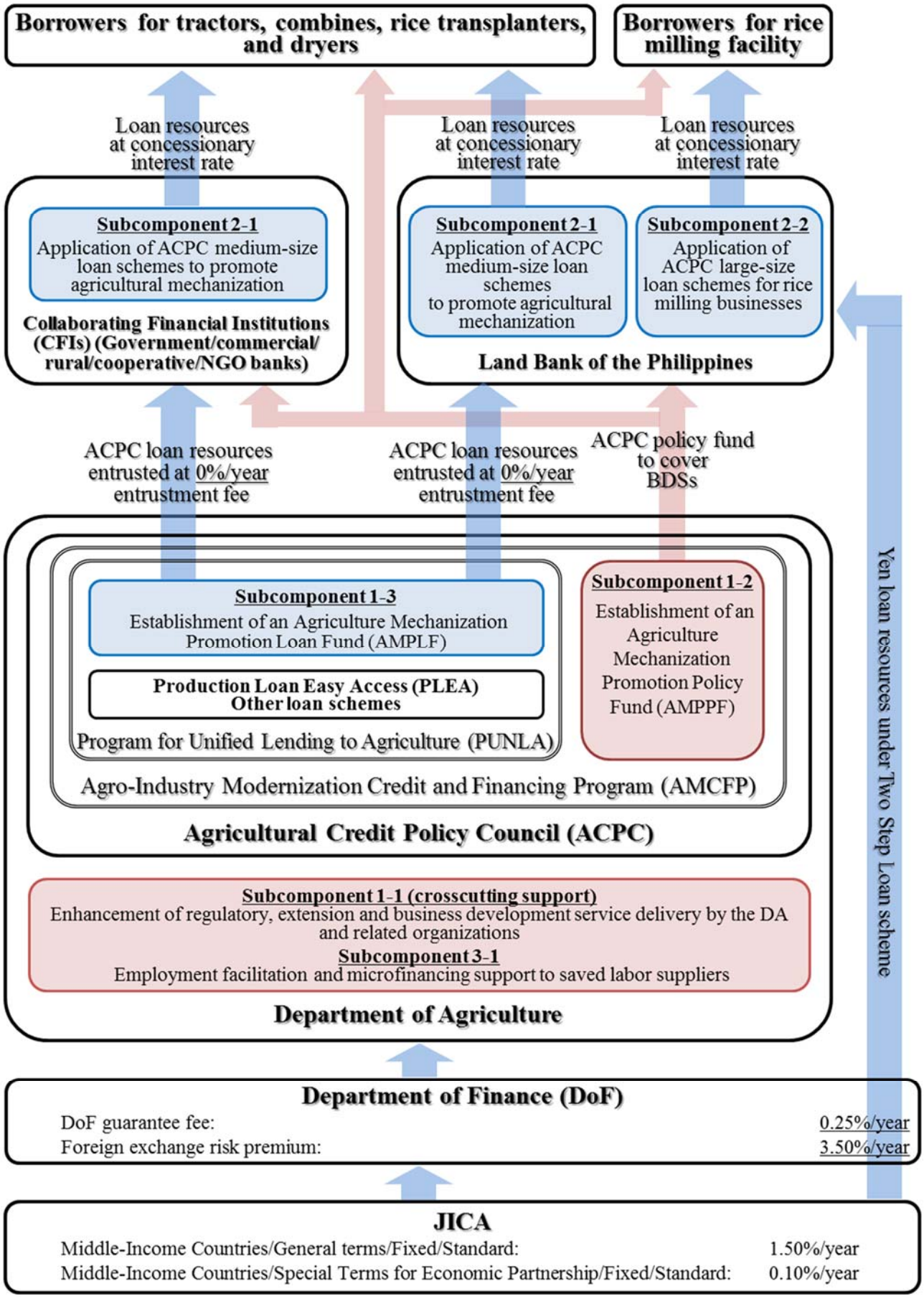
JICA's Yen Loan Project Financing scheme is selected to finance the proposed project to provide agricultural mechanization loan products at annual concessionary interest rates of less than 6.00%. Based on an examination of related regulations and consultations with the DA, DoF, NEDA, ACPC, LBP, and other relevant organizations, the Agricultural Credit Policy Council under the Department of Agriculture is selected as the custodian of a loan fund and grant fund responsible for providing the loans and business development services to borrowers.

A schematic representation of the project components and subcomponents with respect to institutional and financial arrangements is shown in Figure 11. Detailed descriptions of the subcomponents in the figure are presented in Table 51. The figure indicates the financial flows of JICA's Project Financing scheme and Financial Intermediately Loan (Two-Step Loan) scheme, and the former scheme will be explained further in this section. Table 52 describes the possible financial cost/interest structure and borrower interest rates under the Project Financing Yen Loan and Two-Step Loan arrangements.

In Case 1 in the table, the Project Loan scheme is selected with the following terms: "Middle-Income Countries/General Terms/Fixed interest rate/Standard." In this case JICA Yen Loan interest rate of 1.50% is absorbed by DoF. Guarantee fee and foreign exchange risk premium do not apply to ACPC, and therefore, they are set at 0.00%. It was confirmed with DoF that JICA Yean Loan funds will be provided to ACPC through DoF without any risk premium or interests as ACPC being a part of the government. ACPC provides loan funds to financial intermediaries (FIs) at 0.00% cost.

In Case 1, LBP adds a minimum administration fee of 5.50% (i.e. low risk premium) yielding a minimum end-user interest rate of 5.50%, and it adds high administration fee of 6.50% (i.e. high risk premium), the end-user interest rate becomes 6.50%. In Case 2, Bank A adds minimum and maximum administration fees of 5.50% and 6.50%, respectively, yielding minimum and maximum user interest rates of 5.50% and 6.50%, respectively.

In Case 3, Two-Step Loan scheme is administered with LBP where DoF charges gurantee fee of 0.25% and foreign exchange risk premium of 3.5% to LBP. LBP adds a minimum interest of 5.50%, so the lowest end-user interest rate becomes 10.75% (i.e. 1.5%+0.25%+3.5%+5.5%). If LBP applies a higher interest rate of 6.50% to riskier borrowers, the end-user interest rate becomes 11.75% (i.e. 1.5%+0.25%+3.5%+6.5%).



Source: Survey Team

Figure 11: Schematic representation of the project with respect to financial arrangements

Table 52: Financial cost/interest structure and borrower interest rates under Yen Loan arrangement

Type of Yen Loan/Market interest rates	Middle-Income Countries/ General Terms/ Fixed/Standard			Realized market interest rates of agricultural machinery	
Terms of conditions of Yen Loan	Project Yen Loan through ACPC		Two-step loan		
Case name	Case 1	Case 2	Case 3	***Bank A***	***LBP***
End user lending currency	PHP	PHP	PHP	Combine harvester and tractor loans for 3,000 cases since around 2010 (average estimated loan principal of PHP 1.5 million for 2 years repayment period with high rate of repayment)	Combine harvester, tractor, and milling plant loan for 34 cases since 2015 (average loan principal of 2.29 million)
Financial cost of DoF to obtain Yen Loan					
a) JICA Yen Loan interest rate (in Yen term)	1.50%	1.50%	1.50%		
b) DoF guarantee fee (not for GoP)	0.00%	0.00%	0.25%		
c) Foreign exchange risk premium (not for GoP)	0.00%	0.00%	3.50%		
d) Subtotal (a+b+c)	**1.50%**	**1.50%**	**5.25%**		
Financial cost of DA/ACPC to obtain Fund resources from DoF					
e) DA/ACPC's financial cost	0.00%	0.00%	N.A.		
Financial cost of financial intermediaries (FI)	***LBP***	***Bank A***	***LBP***		
f) FI's financial cost to obtain loan fund from ACPC or DoF	0.00%	0.00%	5.25%		
g) FI's maximum high risk spread	6.50%	6.50%	6.50%		
h) FI's minimum low risk spread	5.50%	5.50%	5.50%		
Borrower interest rate				(market rate)	(market rate)
i) Maximum and high risk interest rate (f+g)	**6.50%**	**6.50%**	**11.75%**	**15.00%**	**9.00%**
% to high risk market rate of Bank A	43.33%	43.33%	78.33%	100.00%	60.00%
j) Minimum and low risk interest rate (f+h)	**5.50%**	**5.50%**	**10.75%**	**12.00%**	**6.00%**
% to low risk market in rate of Bank A	45.83%	45.83%	89.58%	100.00%	50.00%

Note: 1) Bank A's market interest rates for agricultural mechanization are selected as the rates for comparison with borrower interest rates of Case 1, Case 2, and Case 3.
Source: Land Bank of the Philippines, ACPC, and Survey Team

Leveraging private sector funds through loan product management

Case 2 is also an example of leveraging private sector funds through loan products management by Bank A, which obtains low-cost loan resources from ACPC at 0.00%. As shown in Table 53, Bank A provides a borrower a loan out of which 60% comes from ACPC and 40% comes from Bank A's own resources. In this way Bank A differentiates the financial sources without reducing the interest rate of its own loan sources. Since the market interest rates of low- and high-risk agricultural machinery loans are 12% and 15%, respectively, the range of end-user interest rates with 60% of ACPC loan funds becomes 5.50% - 6.50%. These interest rates can be adjusted differently by changing the portfolio ratios of the ACPC and Bank A contributions.

Design of agricultural mechanization promotion lending products

In light of the DA's policy of keeping an end-user rate of around 6%, or less than 6% if possible, Cases 1 and 2 meet this policy condition. As explained, Bank A above has the options of either lowering or controlling its additional interest rate with the mobilization of private sector financial resources according to agreed terms and conditions between ACPC and the bank. By incorporating the factors of the policy, private sector resource mobilization, and other terms and conditions, the agricultural mechanization promotion lending products of ACPC will be designed before the project begins.

5.2.3 Agriculture Mechanization Promotion Policy Fund

The proposed initial funding arrangement for the Agriculture Mechanization Promotion Policy Fund (AMPPF) is presented in Table 54. It is assumed that no administrative support to collaborating financial institutions will be provided. Since ACPC is a part of the government, the DA requires no DoF guarantee fee or foreign exchange risk premium from ACPC. The proceeds of the Yen Loan finance the costs of the BDS provided to the borrowers. The interest earnings of the Agriculture Mechanization Loan Fund (AMPLF) can become a funding source for the AMPPF in the future.

Table 53: Leveraging private sector funds through loan products management by Bank A

		Low risk case (12%)		High risk case (15%)	
		Financial cost (%)	Financial cost (PHP)	Financial cost (%)	Financial cost (PHP)
Price of a combine harvester (an example)	1,100,000				
Owner's equity	100,000				
Bank A's total loan amount	1,000,000	5.50%	54,960	6.50%	65,040
Entrusted funds from ACPC (60% of total)	600,000	0.00%	0	0.00%	0
Bank A's administration cost for ACPC funds		1.16%	6,960	0.84%	5,040
Total of financial cost of funds from ACPC		1.16%	6,960	0.84%	5,040
Bank A's own funds (40% of total)	400,000	12.00%	48,000	15.00%	60,000

Source: Survey Team

Table 54: Initial funding arrangement of Agriculture Mechanization Promotion Policy Fund

Financial structure of the Agriculture Mechanization Promotion Policy Fund	Initial funding sources			
	DA general appropriation	Yen Loan	Other sources	Total
Financial support to collaborating financial institutions (CFIs)				
Administrative support grant	0%	0%	0%	0%
Financial support to DA and other collaborating government agencies				
Yen Loan interest (1.40% or 0.10%)	0%	0%	0%	0%
DoF guarantee fee (0.25%) (not for GoP)	0%	0%	0%	0%
Foreign exchange risk premium (3.5%) (not for GoP)	0%	0%	0%	0%
Business development service provision	0%	100%	0%	100%

Source: Survey Team

5.2.4 Agriculture Mechanization Promotion Loan Fund

Table 55 shows the proposed initial funding sources and end-borrower loan conditions of the Agriculture Mechanization Promotion Loan Fund (AMPLF). For “Subcomponent 2-1: Application of ACPC medium-size loan schemes to promote agricultural mechanization,” a Type A1 fund will be established for Japanese brand machinery purchases and a Type A2 fund will be established for non-Japanese brand machinery purchases. The Type A1 fund will be financed by Yen Loan resources making up 80% of the total allocation to Subcomponent 2-1. Twenty percent (20%) of the total allocation to Subcomponent 2-1 will be drawn from the Type A2 fund, which will be financed by other loan schemes. As shown in the table, the end user loan conditions are set equally to conform to the government's procurement regulations prohibiting single source/brand procurement of agricultural machinery. ACPC's new loan products to promote agricultural mechanization will determine detailed end-user conditions.

Table 55: Initial funding sources and loan conditions of the Agriculture Mechanization Promotion Loan Fund

Agriculture Mechanization Promotion Loan Fund (AMPLF) financial structure	Initial funding sources					End user loan conditions[*1]		
	DA general appro-priation	Yen Loan	Other schemes	Other sources	Total	Upper limit[*2] (PHP)	Loanable % to value of machinery	Recommended ranges of interest rate
Subcomponent 2-1: Application of ACPC medium-size loan schemes to promote agricultural mechanization								
Type A1 fund for Japanese brand machinery purchase	0%	80%	0%	0%	80%	5 mill.	90%	5.5%~6.5%
Type A2 fund for non-Japanese brand machinery purchase	0%	0%	20%	0%	20%	5 mill.	90%	5.5%~6.5%
Total	0%	80%	20%	0%	100%			
Subcomponent 2-2: Application of ACPC large-size loan schemes for rice drying and milling businesses								
Type B1 fund for Japanese brand machinery purchase	0%	100%	0%	0%	100%	200 mill.	95%	3.5%
Type B2 fund for non-Japanese brand machinery purchase	0%	0%	0%	0%	0%	N.A.	N.A.	N.A.
Total	0%	100%	0%	0%	100%			

Note: 1) The collaterals of the borrowers are machinery and plants purchased by the loans provided. 2) Loan amounts will be determined based on assessments of the applicants' business plans and will not be strictly constrained by the upper limits cited in this table.
Source: Survey Team

In a similar fashion, a Type B1 fund and Type B2 fund will be established for the implementation of "Subcomponent 2-2: Application of ACPC large-size loan schemes for rice drying and milling businesses." However, due to the pilot nature of the rice mill projects, only the Type B1 fund will be financed by Yen Loan resources.

5.2.5 Design of the agricultural mechanization loan products of ACPC

ACPC currently has two loan products under the Program for Unified Lending to Agriculture (PUNLA). One or more new loan products for the promotion of agricultural mechanization based on Production Loan Easy Access (PLEA) should be designed, tested, and carried out for implementation of the project. Table 56 outlines an example of a new loan product of this type.

Table 56: An example of a new lending product for the promotion of agricultural mechanization

Main features of the loan product	
Seed fund:	JICA Yen Loan and government's contributions
Program partners:	Cooperative banks, cooperatives, rural banks, and NGOs as lending conduits
Geographic coverage:	Nationwide
Eligible borrowers:	Actor B: Relatively capital-poor upper small cooperatives or their equivalents with the total asset value of less than or equal to PHP 15 million. Actor C: Capital-poor lower-small and micro cooperatives or equivalents with the total asset value of less than PHP 5 million. Actor F: Farming households with possession of farmland less than or equal to 3 ha without other significant business.
Loan purpose:	Agricultural mechanization promotion
Start of project:	(TBD)
Documentation	Business plan encompassing a financial plan, procurement plan, and technical management

	plan. Other necessary documents.
Loan amount:	Non-collateralized (purchased machinery as collateral) loans of up to PHP 5 million per borrower over terms ranging from 2 years to 10 years to maturity.
Annual interest:	Around 6% or less
Additional assistance:	60% subsidy for PCIC Crop Insurance coverage Subsidized business development services and capacity-building for borrowers

Source: Survey Team

Table 57: Implementing and collaborating organizations in the public sector

Target implementing/capacity building/collaborating institutions	Subcomponent 1-1	Subcomponent 1-2	Subcomponent 1-3
National government			
Department of Agriculture			
Headquarters			
Central Agriculture and Fisheries Engineering Division	xxx	xxx	xxx
Field Offices			
Regional Field Offices (RFOs)	xxx	xxx	xxx
Bureaus			
Bureau of Agricultural and Fisheries Engineering	xxx		
Agricultural Training Institute	xxx		
Attached agencies			
Agricultural Credit Policy Council		xxx	xxx
Phil. Center for Postharvest Dev. and Mech. (PhilMech)	xxx		
Attached corporations			
Quedan and Rural Credit Guarantee Corporation		xxx	xxx
Philippine Rice Research Institute (PhilRice)	xxx		
Philippine Crop Insurance Corporation		xxx	xxx
Other organizations			
Agri. Machinery Testing and Eval. Center (AMTEC)	xxx		
Local government			
Provincial governments			
Agricultural departments	xxx	xxx	xxx
Municipality/city governments			
Agricultural divisions	xxx	xxx	xxx
Collaborating banking institutions			
Government financial institutions			
Land Bank of the Philippines (LBP)		xxx	xxx
Private sector financial institutions			
Commercial banks		xxx	xxx
Rural banks	xxx	xxx	
Cooperative banks	xxx	xxx	
NGO/microfinancing institutions	xxx	xxx	

Source: Survey Team

5.2.6 Implementing and collaborating organizations in the public sector

A list of implementing and collaborating organizations from the public sector for the implementation of Subcomponents 1-1, 1-2, and 1-3 is presented in Table 57 Detailed descriptions of collaborative arrangements are presented in Table 51. The Central Agriculture and Fisheries Engineering Division and Agricultural Credit Policy Council will bear major responsibilities for the project formulation, implementation, coordination, and monitoring and evaluation at the central level. The Regional Field Offices of the DA, extension arms of Local Government Units, and collaborating banking institutions will deliver loan services and business development services at the field level. Particular attention will be paid to the enhancement of the testing capacity of AMTEC.

5.2.7 Project support intensity by target groups and areas of mechanization potential

Table 58 explains the recommended project support intensity by target groups and areas of mechanization potential. For Subcomponent 2-1, medium-performing agricultural mechanization areas, including Iloilo Province, will receive the highest intervention priority since they are considered to be in the early stages of

rapid agricultural mechanization. In other areas, high-intensity support will be provided to all categories of target groups. For high-performing agricultural mechanization areas, the highest support intensity will be given to Actor F with the lowest accumulation of capital to accelerate bottom-up mechanization following the observed trend of agricultural service market development. In the low-performing agricultural mechanization areas, Actors with larger capital accumulation (i.e. Actor B) should be supported intensively; also following the market trend observed.

For Subcomponent 2-2, only Actors B with the largest capital accumulation among all actors will be supported, because significant investment (exceeding USD 5 million) is expected in Subcomponent 2-2.

For Subcomponent 3-1 only Actor F, including agricultural labor without land holdings, will be the subject of high-intensity project support. This is because most of the displaced labor will likely be released from this category of Actor and managing the displaced/excess/saved labor properly and productively will underpin the success of this project.

Table 58: Project support intensity by target groups and areas of mechanization potential

A: Subcomponent	Subcomponent 2-1			Sub-component 2-2	Sub-component 3-1
B: Machinery	Tractors, trans-planters, combine harvesters, and dryers			Drying and milling plants	Tractors, trans-planters, combine harvesters, and dryers
C: Area classification by mechanization potential	High performing agricultural mechani-zation areas	Medium performing agricultural mechani-zation areas	Low performing agricultural mechani-zation areas	All performing agricultural mechani-zation areas	All performing agricultural mechani-zation areas
D: Target groups					
Rural cooperatives and equivalent (i.e. corporations and associations) target group					
Actor B: Relatively capital-poor upper small cooperatives or their equivalents with the total asset value of less than or equal to PHP 15 million.	X	XXX	XXX	XXX	
Actor C: Capital-poor lower-small and micro cooperatives or equivalents with the total asset value of less than PHP 5 million.	XX	XXX	XX		
Farming household (or farming enterprise) target group category					
Actor F: Farming households (including landless agriculture workers) with possession of farmland less than or equal to 3 ha without other significant business.	XXX	XXX	X		XXX

Note: "XXX", "XX" and "X" indicate high, medium and low intensity support from the project, respectively.
Source: Survey Team

5.3 ACPC's capacity and procedures to establish the project with loan and grant facilities

5.3.1 Current organizational capacity of ACPC

In terms of the current organizational capacity of ACPC its organizational structure and deployment of staff members by permanent and contract employment types are shown in Table 59. Table 60 indicates the field deployment of PLEA Program Focal Persons and geographical distribution of Type 1 and 2 Lending Conduits

under the Production Loan Easy Access (PLEA) Program. No staff members of ACPC other than the Program Focal Persons are deployed in the field. PLEA Lending Conduits are the identified collaborating rural banks, cooperative banks and NGO microfinancing listed by province in Annex 4.

(1) ACPC organizational structure and capacity

ACPC employs a total of 115 staff members, including 36 permanent staff and 79 contract service staff. All staff members, except twenty-one (21) PLEA Program Focal Persons (94 members) are deployed to ACPC Headquarters in Metro Manila.

Table 59: ACPC's Organizational structure and deployment of staff members

Executive Director / Staff / Division / Section	Permanent Staff													Contract Service Staff												
	Exec. Director	Deputy Exec. Director	Director II	CAO/OIC	Officer V	Officer VI	Officer III	Officer II	Officer I	Adm. Assistant V	Adm. Assistant I	Adm. Aide VI	**Sub-total**	Officer VI	Officer III	Officer II	Officer I	Adm. Assistant V	Adm. Assistant VI	Adm. Assistant II	Adm. Assistant I	Adm. Aide V	Adm. Aide VI	**Sub-total**	**Total**
Office of the Executive Director	1	1											**2**		1				2					**3**	**5**
Public Affairs and Communication														1	2	3								**6**	**6**
Policy, Planning, Program Development and Advocacy Staff			1										**1**												**1**
Policy and Planning Division					2	1	2						**5**			1			1					**2**	**7**
Accreditation and Certification Division					1		1	1					**3**												**3**
Policy Research Division																									
Program Development Division				1				1					**2**	3	2	10	2							**17**	**19**
PLEA Program Focal Person (see next table for details)															*1*				*8*			*12*		***21***	***21***
Institutional Capacity Building Division																									
Advocacy Division					1								**1**	3										**3**	**4**
Administrative and Financial Management Staff			1										**1**												**1**
Financial Management Division					2		1			1			**4**					1	2					**3**	**7**
Cash Section																									
Budget Section																									
Accounting Section																									
Information Systems Management Division							1		1				**2**			2	1							**3**	**5**
Administrative Division				1				1			1		**3**	1				1	1	1	1	5	2	**12**	**15**
Human Resource Management Section																									
Property and Supply Section																									
Motor Pool Section																									
Messengerial Section																									
Program Monitoring and Information System Management Staff			1										**1**												**1**
Monitoring Division					1		1						**2**		2	1								**3**	**5**
Fund Management Staff			1										**1**												**1**
Fund recovery Division					1	1							**2**				2		1					**3**	**5**
Collection Section																									
Remedial Accounts Management Section																									
Agri-Industry Modernization Credit and Financing Program																									
Assets Disposition Division					1								**1**	1	1									**2**	**3**
Assigned Properties Section																									
Assigned Receivables Section																									
Coterminous with the Incumbent			2									3	**5**												**5**
Commission on Audit																					1			**1**	**1**
Total	**1**	**1**	**6**	**2**	**9**	**2**	**6**	**3**	**1**	**1**	**1**	**3**	**36**	**9**	**9**	**17**	**5**	**2**	**15**	**1**	**2**	**17**	**2**	**79**	**115**

Note: 1) Totals for staff members are indicated at division level or higher. 2) CAO: Chief Administrative Officer. OIC: Officer in Charge.
Source: ACPC and Survey Team

Table 60: Sikat Saka Program performance, PLEA Program Focal Person and Lending Conduits

Regions and provinces (Underlined provinces are Sikat Saka loan product target provinces. There are 45 target provinces.)	Sikat Saka Program performance (as of 8/2017)		PLEA Program Focal Person				PLEA Lending Counduits		
	Existence of Land Bank of the Philippines Lending Center	No. of borrowers	Officer III	Project Assistant IV	Admin. Aide V	Total	Type 1	Type 2	Total
Philippines total		**12,086**	**1**	**8**	**12**	**21**	**76**	**35**	**111**
Region I (Ilocos Region)		**423**					**3**		**3**
Ilocos Norte	Yes	225					2		2
Ilocos Sur	Yes	13							
La Union	Yes	35					1		1
Pangasinan	Yes	150							
Region II (Cagayan Valley)		**2,852**			**1**	**1**	**4**		**4**
Batanes									
Cagayan	Yes	164							
Isabela	Yes	2,422			1	1	4		4
Nueva Vizcaya	Yes	266							
Quirino									
Region III (Central Luzon)		**2,845**					**11**	**1**	**12**
Bataan	Yes	15					7		7
Bulacan	Yes	64							
Nueva Ecija	Yes	1,903					4	1	5
Pampanga	Yes	540							
Tarlac	Yes	311							
Zambales	Yes	12							
Aurora									
Region IV-A (Calabarzon)		**28**					**4**	**1**	**5**
Batangas								1	1
Cavite									
Laguna	Yes	14					1		1
Quezon	Yes	14					3		3
Rizal									
Region IV-B (Mimaropa Re		**1,641**			**2**	**2**	**2**		**2**
Marinduque									
Occidental Mindoro	Yes	1,146			1	1	1		1
Oriental Mindoro	Yes	278					1		1
Palawan	Yes	217			1	1			
Romblon									
Region V (Bicol Region)		**81**							
Albay	Yes	1							
Camarines Norte	Yes	65							
Camarines Sur									
Catanduanes									
Masbate	Yes								
Sorsogon	Yes	15							
Region VI (Western Visayas		**860**			**3**	**3**	**6**		**6**
Aklan	Yes	61							
Antique	Yes	20			1	1	3		3
Capiz	Yes	137							
Iloilo	Yes	489			1	1	2		2
Negros Occidental	Yes	153			1	1	1		1
Guimaras									
Region VII (Central Visayas		**567**		**1**		**1**	**5**		**5**
Bohol	Yes	567					1		1
Cebu									
Negros Oriental				1		1	2		2
Siquijor							2		2

Regions and provinces (Underlined provinces are Sikat Saka loan product target provinces. There are 45 target provinces.)	Sikat Saka Program performance (as of 8/2017)		PLEA Program Focal Person				PLEA Lending Counduits		
	Existence of Land Bank of the Philippines Lending Center	No. of borrowers	Officer III	Project Assistant IV	Admin. Aide V	Total	Type 1	Type 2	Total
Region VIII (Eastern Visayas)		**341**		**2**		**2**	**3**	**11**	**14**
Eastern Samar								1	1
Leyte	Yes	322							
Northern Samar	Yes	19		1		1	3	9	12
Western Samar	Yes			1		1		1	1
Southern Leyte									
Biliran									
Region IX (Zamboanga Peninsula)		**68**			**1**	**1**	**3**		**3**
Zamboanga del Norte	Yes	28			1	1	3		3
Zamboanga del Sur	Yes	26							
Zamboanga Sibugay	Yes	14							
Region X (Northern Mindanao)		**361**			**1**	**1**	**4**		**4**
Bukidnon	Yes	361			1	1	4		4
Camiguin									
Lanao del Norte	Yes								
Misamis Occidental									
Misamis Oriental									
Region XI (Davao Region)		**65**							
Davao del Norte	Yes	65							
Davao del Sur	Yes								
Davao Oriental									
Compostela Valley									
Davao Occidental									
Region XII (Soccsksargen)		**1,630**		**2**		**2**	**19**	**9**	**28**
North Cotabato	Yes	1,420		1		1	6	8	14
South Cotabato	Yes	57					1		1
Sultan Kudarat	Yes	153							
Sarangani				1		1	12	1	13
Region XIII (Caraga)		**34**			**1**	**1**	**6**		**6**
Agusan del Norte	Yes	34							
Agusan del Sur							5		5
Surigao del Norte					1	1	1		1
Surigao del Sur									
Dinagat Islands									
Cordillera Administrative Region		**178**	**1**	**1**	**1**	**3**	**6**	**13**	**19**
Abra									
Benguet			1			1	3	11	14
Ifugao									
Kalinga	Yes	178		1		1			
Mountain Province									
Apayao					1	1	3	2	5
ARMM		**112**		**2**	**1**	**3**			
Basilan					1	1			
Lanao del Sur	Yes			1		1			
Maguindanao	Yes	112		1		1			
Sulu									
Tawi-Tawi									
Un-identified (WAO)					1	1			

Source: ACPC and Survey Team

A comparison between the Sikat Saka Program performance and the geographical extent of the deployment of PLEA Program Focal Persons shown in Table 60 infers that ACPC places less attention to provide PLEA loans in Regions I, II and III where agricultural mechanization is at an advanced stage. It also indicates that ACPC is able to deploy these field staff members based on program specific priority areas. The expected functions of the Program Focal Person in the project are to monitor and support activities of the Lending Conduits, coordinate among the Lending Conduits, DA-Regional Offices and ACPC Headquarters and help the Lending Conduits in identifying potential borrowers of agricultural machinery loans in coordination with machinery dealers. Recently ACPC is increasing the number of the Program Focal Persons rapidly and capacity improvement of the Focal Persons should be a key to success of the project.

(2) Lending Conduits for Production Loan Easy Access (PLEA)

Since all the lending activities, including assessment of loan applicants, fund disbursement to borrowers and collection of principal and interest from the borrowers are carried out by Lending Conduits, their distribution, size and performance are also important determinants of ACPC project implementation capacity. In this regard, the conduits should be carefully selected and support for their capacity development should be appropriate to boost project efficiency. The PLEA Lending Conduits listed in Annex 4 seem small. Because the expected size of a loan for combine harvester purchase is relatively large at around PHP 1 million (see Table 44) the Lending Conduits must have the capacity to deal with the risks associated with such loans.

The eligibility criteria of Type 1 and 2 Lending Conduits are specified in the Special Lending Facility for Marginal Farmers and Fisherfolk Implementing Guidelines approved by the Department of Agriculture Secretary on August 24, 2016 under the framework of PLEA. The guidelines specify Type 1 and 2 Lending Conduits as follows:

Type 1 Lending Conduits

Type 1 conduits are cooperatives, cooperative banks and NGOs that are currently accredited by or have been/are qualified under any existing partnership under the ACPC lending programs and/or with any of the following institutions/programs: Land Bank of the Philippines, People's Credit and Finance Corporation, Agricultural Guarantee Fund Pool, Development Bank of the Philippines, Small Business Guarantee and Finance Corporation.

Type 2 Lending Conduits

Type 2 conduits are cooperatives/farmers organizations and NGOs that are not qualified as Type 1 conduits, but comply with the eligibility criteria shown in Table 61. Type 2 conduits that have developed a satisfactory track record in the program after at least a year may graduate to become Type 1 conduits. They must show (a) good repayment performance (past due ratio not exceeding 5%) and (b) an established financial recording and control system.

Table 61: Eligibility criteria of Type 1 conduits

Criteria item	Minimum Criteria
a) Legal Entity	Duly registered with the Securities and Exchange Commission, Cooperative Development Authority, Department of Labor and Employment or other government agencies.
b) Governance	The organization must be endorsed by a government agency/instrumentality and with an existing set of elected officers with good character references.
c) Core Management Team	Presence of a manager, treasurer and bookkeeper who can be part- or full-time
d) Financial Transaction	Must have an existing bank account in the name of the organization. If none, pre-release should be contingent on compliance therewith.
e) Paid-up capital/Savings	Must have contributions (in cash or in kind) and/or savings from members.

Source: ACPC

(3) Type 1 Lending Conduits to be selected for the project conduit

Examinations of the Lending Conduit selection criteria and a sample Memorandum of Agreement for Type 1 and 2 Lending Conduits under the PLEA Program conclude that Type 1 PLEA Lending Conduits or equivalent

should be selected as conduits for the proposed project. Expected capacity of Type 2 PLEA Lending Conduits seems too small to handle the risks associated with less-capitalized Actor B, C and F discussed in the previous sections.

5.3.2 Procedures to establish the yen loan project under ACPC

(1) Establishment of ACPC's funding sources

ACPC was established by an Executive Order No. 113 "Establishing the Comprehensive Agricultural Loan Funds (CALF), Creating the Agricultural Credit Policy Council (ACPC) and for other purposes" in 1986. Section 2 of the Executive Order specifies the financial sources of CALF, which ACPC is designated to manage, as:

> All existing and future loan funds that are agricultural and agriculture-related in nature shall be consolidated under a single fund to be called the "Comprehensive Agricultural Loan Fund" (CALF) which shall comprise 1) government-owned funds now administered by the Central Bank; 2) loanable funds for agricultural commodities and activities administered by government agencies, corporations and banks sourced from the National Treasury; and 3) funding of foreign-assisted projects, which shall be subject to negotiation with the respective foreign institution, in consultation with the Central Bank and the National Economic and Development Authority: Provided, that funds emanating from foreign sources, where the Central Bank of the Philippines is the original or ultimate borrower, shall not, together with the counterpart funds thereof, be covered by this Executive Order.
>
> The Comprehensive Agricultural Loan Fund (CALF) may be augmented through other sources such as general appropriations, loans, donations and grants nationally and overseas.

The closures in Section 2 allows CALF to be financed by funding of foreign-assisted projects, except the case in which the Central Bank of the Philippines is the original or ultimate borrower. In the case of the Yen loan project, since the Central Bank is not the original or ultimate borrower of the loan, the above closure should provide a legal basis for the proposed establishment of the loan and grant funds in ACPC within the framework of the Yen loan project. The closure also secures that funding sources of these funds can be general appropriations and other allowable sources.

(2) Creation of the Agricultural Credit Policy Council (ACPC) and its power

The Section 5 of Executive Order establishes ACPC and defines its composition and power as:

> The Agricultural Credit Policy Council (ACPC), hereinafter referred to as the "Council", is hereby established to replace the Presidential Committee on Agricultural Credit (PCAC) and the Technical Board for Agricultural Credit (TBAC).
>
> The Council shall be composed of: The Minster, Ministry of Agriculture and Food (former DA), as Chairman; the Governor, Central Bank of the Philippines, as Vice-Chairman; the Director-General, National Economic and Development Authority; the Minister, Ministry of Budget and Management; and the Minister, Ministry of Finance, as members.
>
> The Council may call on any instrumentalities of the Government for assistance and support in the form of human, technical and financial resources toward the attainment of the Policy of the State.
>
> The Council shall assist the Ministry of Agriculture and Food (MAF) in synchronizing all credit policies and programs in support of the Ministry of Agriculture and Food (MAF) priority programs covering such activities as:
>
> a) land development/improvement and farm production
> b) farm mechanization
> c) production and supply of agricultural inputs
> d) transportation and storage
> e) processing
> f) marketing and other related activities
> g) small farm financing
> h) resource mobilization

> The Council shall review and evaluate the economic soundness of all on-going and proposed agricultural credit programs. All proposed agricultural credit programs shall have the prior approval of the Council before submission to the approving or funding agency, whether domestic or foreign.
>
> The Council shall receive all reports and documents of all programs with agricultural credit and financing components.
>
> The Council shall undertake measures to increase its fund base and adopt other liquidity, interest stabilization and risk cover mechanisms for its various financing programs in consultation with the Monetary Board.

According to the closures, the Council is chaired by the Secretary of DA and represented by all the key institutions of the Central Bank, NEDA, Department of Budget and Management and DoF. The Council is given authority to approve proposals, for example, the farm mechanization agricultural credit program before submission to the approving or funding agency, whether domestic or foreign, which means that proposals for the yen loan mechanization project need to be approved by the Council before submission to DA, NEDA, DoF and the government of Japan and JICA.

(3) Procedures to establish the project under ACPC

The procedures to establish the project under ACPC are summarized as follows:

- Preparation of a project proposal and F/S by DA.
- Submission of the project proposal and F/S to NEDA from DA.
- Submission of the project proposal and F/S to DoF from NEDA.
- Submission of the project proposal and F/S to JICA from the DoF (Department of Foreign Affairs).
- Establishment of a Loan Agreement between the Government of the Philippines and the government of Japan (JICA).
- ACPC council resolution to approve the establishment of the project, establishment of loan and grant funds, lending guidelines, multi-year work plan and budget, and human resource allocations.
- Issuance of an Administrative Order by DA Secretary Order to formally establish the project.
- Preparation of an annual work plan and budget reflected in the general appropriation act.
- Establishment of project implementation unit in ACPC.
- Fund transfer from the Department of Budget and Management through DA to ACPC. In this case the custodian of funds is the Treasury.
- To manage of the loan fund, JICA disburses in tranches based on borrowers lists prepared by Loan Conduits and verified by ACPC.
- To manage the grant fund, JICA disburses loan proceeds to reimburse expenditures claimed by ACPC with supporting documents.
- Implementation of the project, including establishment of a project implementation unit in ACPC, staff recruitment, development of detailed project implementation procedures, selection of Loan Conduits, provision of business development support in collaboration with DA and fund management.
- Repayment of the Yen loan by the DoF once the grace period has elapsed.
- Closure of the project by issuance of administrative orders.

Council resolutions of the ACPC, an Administrative Order issued by Secretary of DA and other formal documents regarding the management of the Upland Development Programme supported by the European Commission were reviewed to understand the power given to the Council of ACPC and DA to manage the loan fund to be established under the proposed project.

It can be assumed that that repayment of Yen loans in Yen currency by the Government of the Philippines (i.e. DoF) after the grace period of ten years is not linked to the handling of project loan seed funds provided to the project in PHP currency by the DoF during the period of project implementation. Based on the interpretation of the Executive Order No. 113, the Council of ACPC has the power to decide how to handle the seed funds provided by the DoF and operated by ACPC and Loan Conduits, with interest possibly added to the original funds on closure of the loan project. Continuous operation of the loan fund or termination of the fund by transferring its remaining money to the government treasury are further options.

5.3.3 Collaborating arrangements among stakeholders to promote fair and competitive machinery markets

To implement the project effectively, potential buyer's information should be collected and distributed strategically, ethically and fairly to promote fair competition in the machinery market. Preparing and implementing the proposed project will involve a number of stakeholders, including relevant sections of DA, ACPC, Financial Conduits, competing machinery dealers, as well as competing banking businesses and farming households as beneficiaries, users of combine harvesters and competing agricultural production service providers. One of the key principles that needs to be maintained to promote fair competition among machinery dealers, Loan Conduits and production services of mechanized farmers is fair access to information on identified potential machinery buyers (i.e. farming households meeting the project selection criteria discussed in section 4) by all parties involved. If ACPC and its Loan Conduits systematically identify potential buyers, their information should be assembled promptly and shared with participating machinery dealers, banks and other stakeholders fairly and promptly. At the same time the project, ACPC and Loan Conduits should also explain to potential buyers that their information will be shared with, for example, participating distributors and that distributors would approach following disclosure of said information.

6. Preliminary financial and economic analysis of the proposed project

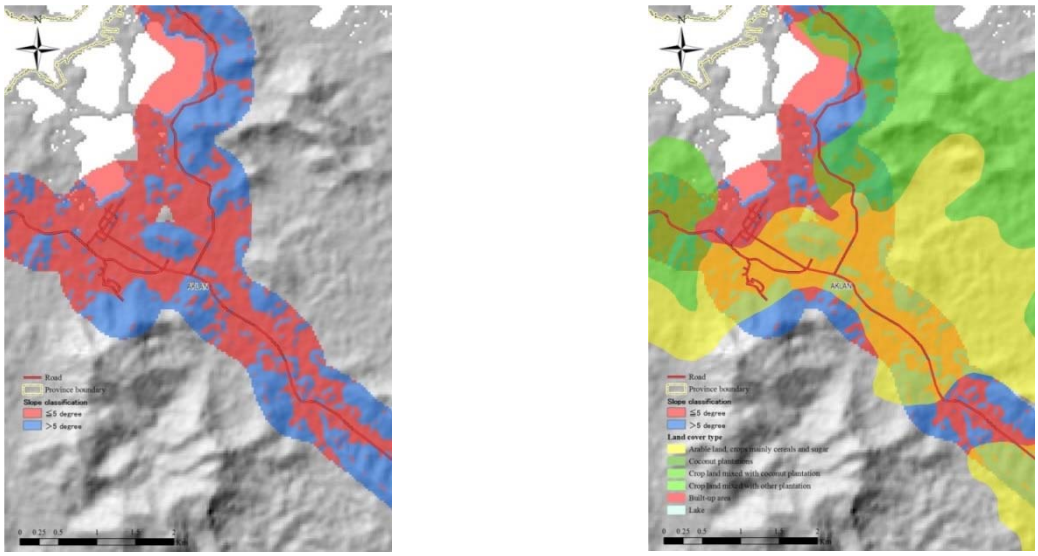
The preliminary financial and economic analysis of the project was conducted by the following steps: 1) determining the magnitude of project intervention by estimating the loan demand from the target groups determined in section 4.7; 2) economic analysis of the expected economic impact (i.e. generation of value addition and net contribution to the economic growth) of the project by setting the assumed project costs and other parameters and 3) for the financial analysis, implementing an agricultural service business with a combine harvester to demonstrate that returns on equity financing/investment suffice to attract entities to participate in the project.

6.1 Determination of the magnitude of the project intervention by estimating loan demand

To determine the magnitude of the project intervention, the demand for concessional loans from the target groups determined in section 4.7 was estimated based on the reference mechanization potential of combine harvesters estimated in section 4. Two estimate methods were applied to determine conservative and less conservative estimates. As shown in Figure 13 and Figure 14 crop production areas meeting the following conditions were selected nationwide for ***conservative estimate***: land used as "arable land, crops mainly cereals and sugar," within a 500 m buffer zones of paved roads and slopes equal to or less than 5 degrees. For ***less conservative estimate***, the condition of "within a 500 m buffer zones of paved roads" is omitted from the area selection conditions. The latter estimate method is included in the estimate methods due to the fact that interviewees do not consider road networks up to barangay roads (an example is shown in Figure 12) to hinder their service operations covering widespread clients. The selected areas are divided by 50 ha and multiplied by 50% to calculate the demand for the number of combine harvesters making the demand estimate conservative (market saturation number) for the selected crop (mainly rice and corn) lands.

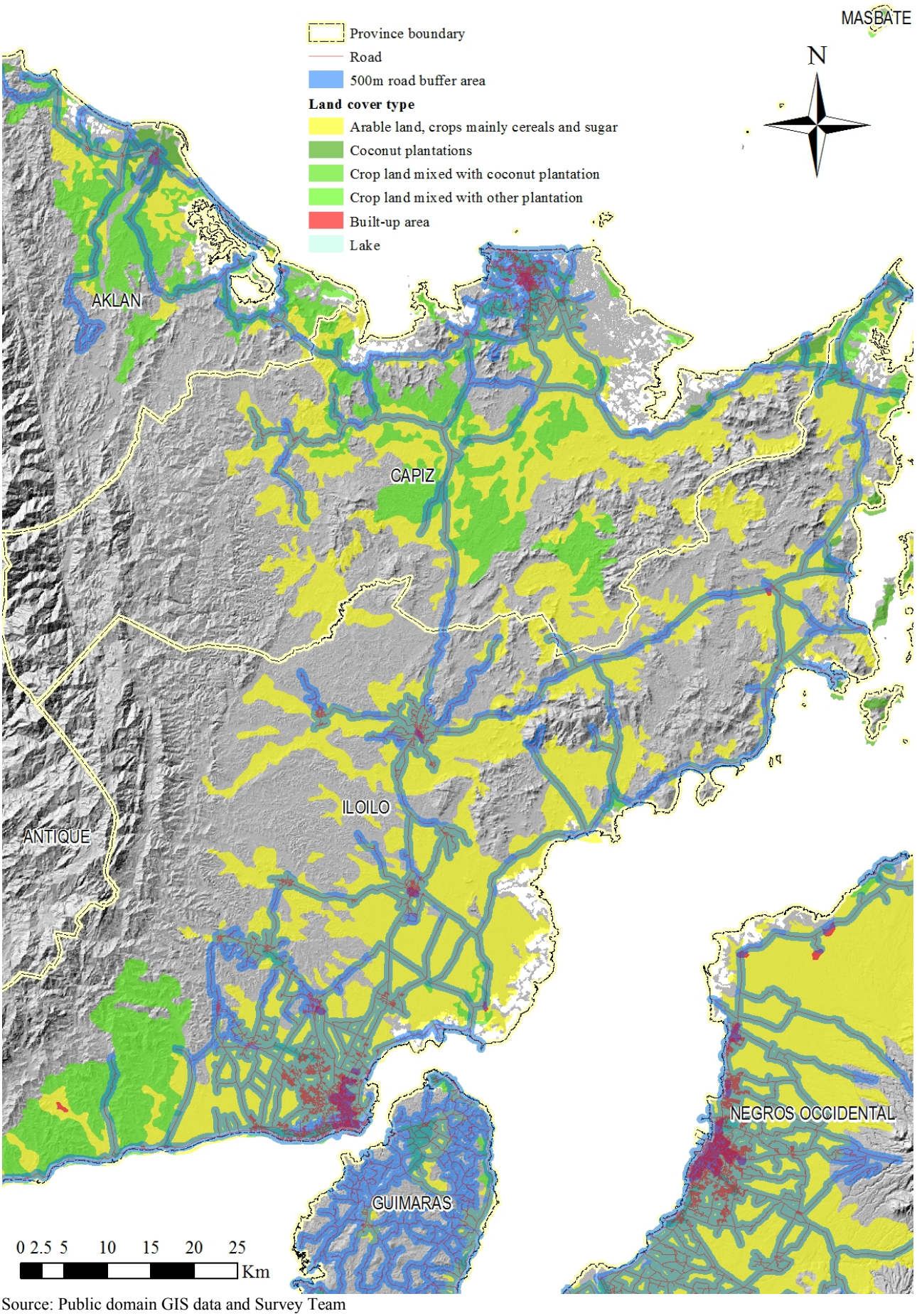
Source: Survey Team

Figure 12: Condition of barangay road where a combine harvester can be transported by a trailer



Source: Public domain GIS data and Survey Team

Figure 13: Example of crop lands meeting road distance and slope conditions in Aklan Province



Source: Public domain GIS data and Survey Team

Figure 14: Crop production land use and 500 m road buffer zones in Iloilo Province

6.1.1 Estimate of expected demand of combine harvesters by Actors B and C

(1) Conservative estimate under the condition of "within a 500 m buffer zones of paved roads"

The results of conservative estimate of expected demand of combine harvesters from rural cooperatives and equivalent target group category (Actors B and C) are shown in Table 62 (detailed province-wise results are shown in Annex 6). The estimated total number of combine harvesters in the areas meeting the three conditions is 15,333. To make the estimate as conservative as possible only Actor B with asset holding in the rage of less than PHP 15 million and more than or equal to PHP 3 million is considered for estimate. In addition considering the fact that the Land Bank of the Philippines usually grants credit lines to cooperatives (although credit lines are given to cooperatives larger than Actor B) at about 40% of their asset values, Actor B cooperatives should be able to finance one combine harvester within their range of assumed credit lines since 40% of PHP 15 million and 3 million are PHP 6 million and 1.2 million, respectively.

Sixty-one percent (61%) of the total number of cooperatives are in the Actor B category and to maintain a conservative estimate, it is further assumed that 1/5 (20%) of Actor B, or 13% of the total number of Actors A and B, will have loan demand at an annual interest rate of 6%. By excluding Regions I, II and III, the total expected demand for combine harvesters by Actor B is estimated at 1,006.

Table 62: Conservative estimation of expected demand of combine harvesters from Actor B

Region	Target areas (500m from paved roads, equal to or less than 5 degree slope in cereals and sugar areas)		No. of cooperatives by size class (only large + medium and small cooperatives)			% of cooperatives by size class			Expected % of large and medium cooperatives, and small cooperatives and equivalents procured combine harvesters			Expected demand of combine harvesters by small cooperatives and equivalent		
	Target area	No of combine harvesters	Actor A	**Actor B**	Total	Actor A	**Actor B**	Total	Actor A	**Actor B**	Total	Actor A	**Actor B**	Total
	(ha) a	(no.) b=a/50ha*50%	(no.) c	(no.) d	(no.) e=c+d	(%) f	(%) g	(%) h=f+g	(%) i=k-j	(%) j=g/5	(%) k=i+j	(no.) l=b*i	(no.) m=b*j	(no.) n=l+m
Total/Average	**1,533,330**	**15,333**	**506**	**795**	**1,301**	**39%**	**61%**	**100%**	**87%**	**13%**	**100%**	**13,085**	**1,963**	**15,047**
Total (Excluding Regions I, II, and III)												**6,668**	**1,006**	**7,674**
Region I	209,314	2,093	34	68	102	33%	67%	100%	86%	14%	100%	1,808	285	2,093
Region II	111,266	1,113	48	41	89	54%	46%	100%	91%	9%	100%	1,008	104	1,113
Region III	435,167	4,352	69	143	212	33%	67%	100%	87%	13%	100%	3,600	568	4,168
Region IV-A	140,872	1,409	44	67	111	40%	60%	100%	88%	12%	100%	1,207	202	1,409
Region IV-B	45,059	451	40	60	100	40%	60%	100%	88%	12%	100%	397	54	451
Region IX	19,081	191	10	16	26	38%	62%	100%	88%	12%	100%	166	25	191
Region V	80,600	806	14	29	43	33%	67%	100%	87%	13%	100%	684	122	806
Region VI	177,739	1,777	46	84	130	35%	65%	100%	87%	13%	100%	1,561	216	1,777
Region VII	44,179	442	7	10	17	41%	59%	100%	88%	12%	100%	317	29	345
Region VIII	38,578	386	10	14	24	42%	58%	100%	88%	12%	100%	307	73	380
Region X	72,815	728	31	69	100	31%	69%	100%	86%	14%	100%	621	107	728
Region XI	26,603	266	42	49	91	46%	54%	100%	89%	11%	100%	237	29	266
Region XII	101,587	1,016	43	55	98	44%	56%	100%	89%	11%	100%	900	116	1,016
Region XIII	23,586	236	21	37	58	36%	64%	100%	87%	13%	100%	208	27	236
CAR	6,885	69	47	53	100	47%	53%	100%	89%	11%	100%	61	7	69

Source: Survey Team

(2) Less conservative estimate without the condition of "within a 500 m buffer zones of paved roads"

The results for the conservative estimate of expected demand of combine harvesters from rural cooperatives and equivalent target group categories (Actors B and C) are shown in Table 63 (detailed province-wise results in Annex 7). The estimated total number of combine harvesters in areas meeting the three conditions is 33,249.

To make the estimate conservative only numbers of Actor B, which should be able to purchase at least a combine harvester by via bank loans, are used for the calculation. The logic of this assumption is explained in the previous section. To maintain the estimate conservative, it is further assumed that 1/5 (20%) of Actor B will have loan demand at an annual interest rate of 6%. By excluding Regions I, II and III, the total expected demand for combine harvesters by Actor B is estimated at 2,220.

Table 63: Less conservative estimation of expected demand of combine harvesters form Actor B

Region	Target areas (Equal to or less than 5 degree slope in cereals and sugar areas)		No. of cooperatives by size class (only large + medium and small cooperatives)			% of cooperatives by size class			Expected % of large and medium cooperatives, and small cooperatives and equivalents procured combine harvesters			Expected demand of combine harvesters by small cooperatives and equivalent		
	Target area	No of combine harvesters	Actor A	**Actor B**	Total	Actor A	**Actor B**	Total	Actor A	**Actor B**	Total	Actor A	**Actor B**	Total
	(ha)	(no.)	(no.)	(no.)	(no.)	(%)	(%)	(%)	(%)	(%)	(%)	(no.)	(no.)	(no.)
	a	b=a/50ha*50%	c	d	e=c+d	f	g	h=f+g	i=k-j	j=g/5	k=i+j	l=b*i	m=b*j	n=l+m
Total/Average	**3,324,864**	**33,249**	**506**	**795**	**1,301**	**39%**	**61%**	**100%**	**88%**	**12%**	**100%**	**28,499**	**4,067**	**32,566**
Total (Excluding Regions I, II, and III)												**14,989**	**2,220**	**17,210**
Region I	359,642	3,596	34	68	102	33%	67%	100%	87%	13%	100%	3,114	483	3,596
Region II	502,003	5,020	48	41	89	54%	46%	100%	91%	9%	100%	4,555	465	5,020
Region III	703,888	7,039	69	143	212	33%	67%	100%	87%	13%	100%	5,841	899	6,740
Region IV-A	200,506	2,005	44	67	111	40%	60%	100%	88%	12%	100%	1,737	268	2,005
Region IV-B	132,842	1,328	40	60	100	40%	60%	100%	88%	12%	100%	1,175	154	1,328
Region V	210,551	2,106	14	29	43	33%	67%	100%	87%	13%	100%	1,794	312	2,106
Region VI	445,767	4,458	46	84	130	35%	65%	100%	87%	13%	100%	3,889	569	4,458
Region VII	87,545	875	7	10	17	41%	59%	100%	88%	12%	100%	491	53	544
Region VIII	92,883	929	10	14	24	42%	58%	100%	88%	12%	100%	761	118	879
Region IX	62,938	629	10	16	26	38%	62%	100%	88%	12%	100%	550	79	629
Region X	157,152	1,572	31	69	100	31%	69%	100%	86%	14%	100%	1,336	236	1,572
Region XI	54,770	548	42	49	91	46%	54%	100%	89%	11%	100%	486	60	545
Region XII	190,268	1,903	43	55	98	44%	56%	100%	89%	11%	100%	1,677	226	1,903
Region XIII	76,157	762	21	37	58	36%	64%	100%	87%	13%	100%	666	95	762
CAR	47,952	480	47	53	100	47%	53%	100%	89%	11%	100%	429	51	480

Source: Survey Team

6.1.2 Estimate of expected demand of combine harvesters from Actor F

The results of conservative and less conservative estimates for expected demand of combine harvesters from Actor F are shown in Table 64 (detailed province-wise results are shown in Annex 8). The estimated total numbers of combine harvesters in the areas meeting the three and two conditions are 15,333 and 33,249 units of combine harvesters, respectively.

In section 4.7.2 it was defined that 10% of combine harvester owners in the advanced agricultural machinery markets are considered to be Actor F, who are eligible for concessionary loans provided by the project. By extending this factor of 10% to this estimate exercise and excluding Regions I, II and III, the total expected demand for combine harvesters by Actor F for conservative and less conservative estimates becomes 778 and 1,759 units of combine harvesters, respectively. The defined approximate factor of 10% is inferred from market-based mechanization in Nueva Ecija Province without significant public intervention. Considering the considerable observed demand for a 6 to 10% concessionary loan (see Table 40) more than 10% of Actor F should likely be identified if concessionary loans were provided by the project as a means of accelerating agricultural mechanization. Therefore, the factor of 10% can be considered a conservative estimate factor.

Table 64: Estimations of expected demand of combine harvesters from Actor F

Region	Conservative estiation method					Less conservative estimation method				
	Target areas (500m from paved roads, equal to or less than 5 degree slope in serial crop areas)		Expected demand of combine harvesters by small cooperatives and equivalent			Target areas (Equal to or less than 5 degree slope in cereals and sugar areas)		Expected demand of combine harvesters by small cooperatives and equivalent		
	Target area (ha) a	No of combine harvesters (no.) b=a/100ha	Actors D and E (90%) (no.) c=b* 90%	**Actor F** (10%) (no.) d=b* 10%	Total (no.) e=c+d	Target area (ha) f	No of combine harvesters (no.) g=f/100ha	Actors D and E (90%) (no.) h=g* 90%	**Actor F** (10%) (no.) i=g* 10%	Total (no.) j=g+h
Total/Average	**1,533,330**	**15,333**	**13,800**	**1,533**	**15,333**	**3,324,864**	**33,249**	**29,924**	**3,325**	**33,249**
Total (Excluding Regions I, II, and III)			**6,998**	**778**	**7,776**			**15,834**	**1,759**	**17,593**
Region I	209,314	2,093	1,884	209	2,093	359,642	3,596	3,237	360	3,596
Region II	111,266	1,113	1,001	111	1,113	502,003	5,020	4,518	502	5,020
Region III	435,167	4,352	3,917	435	4,352	703,888	7,039	6,335	704	7,039
Region IV-A	140,872	1,409	1,268	141	1,409	200,506	2,005	1,805	201	2,005
Region IV-B	45,059	451	406	45	451	132,842	1,328	1,196	133	1,328
Region IX	19,081	191	172	19	191	210,551	2,106	1,895	211	2,106
Region V	80,600	806	725	81	806	445,767	4,458	4,012	446	4,458
Region VI	177,739	1,777	1,600	178	1,777	87,545	875	788	88	875
Region VII	44,179	442	398	44	442	92,883	929	836	93	929
Region VIII	38,578	386	347	39	386	62,938	629	566	63	629
Region X	72,815	728	655	73	728	157,152	1,572	1,414	157	1,572
Region XI	26,603	266	239	27	266	54,770	548	493	55	548
Region XII	101,587	1,016	914	102	1,016	190,268	1,903	1,712	190	1,903
Region XIII	23,586	236	212	24	236	76,157	762	685	76	762
CAR	6,885	69	62	7	69	47,952	480	432	48	480

Source: Survey Team

6.1.3 Determination of loan supply from the project to meet estimated demand

The total estimated demand from Actors B, C and F is summarized in Table 65. The total demand in the case of conservative estimate is 1,783 units which is 2.5% of the national reference mechanization potential in terms of total combine harvesters. For the less conservative estimate, the total demand reaches 3,979 units, constituting 5.6% of the reference mechanization potential. Taking the estimates into consideration and making the supply of concessionary loans committed to the project as conservative as possible, the project' supply of the loans is determined as 1,000 units of combine harvester equivalent. The 1,000 units constitutes 1.4% of the national reference mechanization potential.

Table 65: Estimation methods, target groups, loan demand estimates, and loan supply determined

Estimated demand of combine harvesters	Conservative estimation method		Less-conservative estimation method	
	Number of combine harvesters	% to the national demand	Number of combine harvesters	% to the national demand
National reference mechanization potential	**71,257**	**100.0%**	**71,257**	**100.0%**
Region I, II, and III excluded				
National reference mechanization potential	**44,610**	**62.6%**	**44,610**	**62.6%**
Total combine harvester expected demand estimated	**7,674**	**10.8%**	**14,989**	**21.0%**
Total demand from all the target group category	**1,783**	**2.5%**	**3,979**	**5.6%**
Target group category of rural cooperatives and equivalent (Actors B and C)	1,006	1.4%	2,220	3.1%
Target group category of farming household (or farming enterprise) (Actors F)	778	1.1%	1,759	2.5%
Demands to be met by the project	**1,000**	**1.4%**	**1,000**	**1.4%**

Source: Survey Team

6.2 Project cost estimation and calculation of economic internal rate of return

The economic internal rate of return (EIRR) of the project is calculated at 31%, a level sufficient to conclude that the project is feasible for implementation.

6.2.1 Project cost estimation

An approximate estimation of project costs is presented in Table 66. In Section A of the table, the progress of the project is indicated by the percentage progress and the numbers of loans provided for machinery purchases. The total project costs are estimated to be PHP 3,654 million (Yen 8,103 million), of which 83% is allocated as loan sources and 27% is allocated to the government's BDSs and other activities as grant provision to the target groups. The unit numbers of tractors, rice transplanters, and dryers to be demanded by targets and procured by loans to be provided by the project are estimated as follows based on the deterred number of 1,000 combine harvesters to be purchased by the concessionary loan borrowers:

Tractors:	The estimated unit demand (no. of units) is the same as that for combine harvesters
Rice transplanters:	The estimated unit demand (no. of units) is 1/3 of that for combined harvesters (proportional to the area of irrigated rice)
Dryers:	The estimated unit demand (no. of units) is the same as that for combine harvesters

Under Subcomponent 1-1, PHP 50,000 worth of BDS is allocated for each loan, and budgets are allocated for the testing and research capacity of AMTEC and other collaborating institutions. For Subcomponents 1-2 and 1-3, the project will cover the annual administration costs of the Agriculture Mechanization Promotion Policy Fund (AMPPF) and Agriculture Mechanization Promotion Loan Fund (AMPLF).

For Components 2-1 and 2-2, loans to cover 80% of the purchase costs for tractors, rice transplanters, combine harvesters, and dryers are assumed. The cost of establishing a pilot rice mill is estimated under Component 2-2. The interest incomes associated with both components are also estimated. For the time being, it is assumed that these interest revenues will be applied to finance the grant part of the project.

For Component 3-1, a cost of PHP 50,000 per machine purchased is allocated for rural consultation and facilitation services to support excess labor supplies for the creation and/or finding of alternative employment. Services include facilitation of microfinancing services from collaborating microfinancing institutions.

6.2.2 Estimation of value added and calculation of economic internal rate of return

The economic internal rate of return (EIRR) is an economy-wide impact indicator of a project. According to the standard of Asian Development Bank, a project is bankable when the EIRR exceeds 12%. EIRR measures the value added or economic growth contribution of a project, hence the net contribution of the project to the economy must be measured by subtracting the opportunity costs of productivity increase and other seeming improvements in profit and benefits. The mechanization of agriculture mainly shifts the flows of values created by agriculture production from saved labor to mechanized farmers and operators without contributing significantly to the fresh generation of new market values. The largest value addition by agriculture mechanization will come from new job creation by saved labor suppliers without harming other job opportunities. This understanding is applied for the calculation of benefits. The project cost and added value or benefits need to be determined for the calculation of the EIRR.

The estimated value added/benefit is shown in the final section of Table 67, assuming that the one-year acceleration effects with all saved labor providers have alternatively created employment at a wage of PHP 370/day, the wage rate for average daily rice production in the country in 2016. Although the alternative, nonagricultural employment, can be assumed to have higher daily wage rate, the average rice production rate is applied for the analysis to prevent overestimation.

Table 66: Project cost estimation based on assumed progress of loan provisions

Section A: Progress of loan provisions to target borrowers (measured as numbers of machinery units)							
Items	5-year project period					**Total**	Note
	2018	2019	2020	2021	2022		
Under Subcomponent 2-1							
% progress of loan provision	**10%**	**20%**	**20%**	**30%**	**20%**	**100%**	
Tractor (unit no. is the same as c. harvesters)	100	200	200	300	200	**1,000**	45 HP
Combine harvester (unit no. is estimated)	100	200	200	300	200	**1,000**	60 HP
Rice transplanter (unit no. is 1/3 of c. harvester)	33	67	67	100	67	**333**	6 lines
Dryer (unit no. is the same as c. harvester)	100	200	200	300	200	**1,000**	
Under Subcomponent 2-2							
% progress of loan provision			**100%**			**100%**	
Rice mill plant			1			**1**	One pilot plant

Section B: Project cost estimation based on assumed progress of loan provisions to target borrowers									
								All monetary values are at 2017 constant values; Yen/PHP as of 2017/11/04: 2.2245	
Component structure	Unit cost	5-year project period					**Total**	**Total**	% to
		2018	2019	2020	2021	2022			the total
	('000PHP)	('000PHP)	('000PHP)	('000PHP)	('000PHP)	('000PHP)	('000PHP)	('000Yen)	(%)
Component 1: Regulatory, extension, and business development services and establishment of financial facilities									
Subcomponent 1-1: Enhancement of regulatory, extension and business development service delivery by the DA and related organizations									
Provision of BDS for machinery procured by borrowers (PHP 50 thousand per one machinery)									
Tractor (45HP)	50/purchase	5,000	10,000	10,000	15,000	10,000	**50,000**	**111,225**	1.3%
Combine harvester (60HP)	50/purchase	5,000	10,000	10,000	15,000	10,000	**50,000**	**111,225**	1.3%
Rice transplanter (6 lines)	50/purchase	1,667	3,333	3,333	5,000	3,333	**16,667**	**37,075**	0.4%
Dryer	50/purchase	5,000	10,000	10,000	15,000	10,000	**50,000**	**111,225**	1.3%
AMTEC improvement		150,000	120,000				**270,000**	**600,616**	7.1%
Subcomponent 1-1 subtotal		166,667	153,333	33,333	50,000	33,333	**436,667**	**971,367**	11.5%
Subcomponent 1-2: Establishment of Agriculture Mechanization Promotion Policy Fund (AMPPF) in the DA									
AMPPF administration	1,000/year	1,000	1,000	1,000	1,000	1,000	**5,000**	**11,123**	0.1%
Subcomponent 1-3: Establishment of Agriculture Mechanization Promotion Loan Fund (AMPLF) in the DA									
AMPLF administration	1,000/year	1,000	1,000	1,000	1,000	1,000	**5,000**	**11,123**	0.1%
Component 2: Enhancement of mechanized agriculture production and processing services									
Subcomponent 2-1: Application of ACPC medium-size loan schemes for agricultural mechanization promotion									
ACPC loan disbursed									
Tractor (45HP)	80% of 1,100	88,000	176,000	176,000	264,000	176,000	**880,000**	**1,957,563**	23.2%
Combine harvester (60HP)	80% of 1,700	136,000	272,000	272,000	408,000	272,000	**1,360,000**	**3,025,325**	35.8%
Rice transplanter (6 lines)	80% of 1,100	29,333	58,667	58,667	88,000	58,667	**293,333**	**652,521**	7.7%
Dryer	80% of 500	40,000	80,000	80,000	120,000	80,000	**400,000**	**889,802**	10.5%
Subtotal		293,333	586,667	586,667	880,000	586,667	**2,933,333**	**6,525,211**	77.3%
Interest charged to borrowers									
Total interest charged	6.00%	17,600	35,200	35,200	52,800	35,200	**176,000**	**391,513**	4.6%
Subcomponent 2-2: Application of ACPC large-size loan scheme for rice drying and milling business									
ACPC loan disbursed									
Rice mill plant	100% of 250,000			250,000			**250,000**	**556,126**	6.6%
Interest charged to borrowers									
Total interest charged	Assumed 6%			15,000			**15,000**	**33,368**	0.4%
Component 3: Social and agriculture labor market adjustment support									
Subcomponent 3-1: Employment facilitation and microfinancing support to saved labor suppliers									
Tractor (45HP)	50/purchase	5,000	10,000	10,000	15,000	10,000	**50,000**	**111,225**	1.3%
Combine harvester (60HP)	50/purchase	5,000	10,000	10,000	15,000	10,000	**50,000**	**111,225**	1.3%
Rice transplanter (6 lines)	50/purchase	1,667	3,333	3,333	5,000	3,333	**16,667**	**37,075**	0.4%
Dryer	50/purchase	5,000	10,000	10,000	15,000	10,000	**50,000**	**111,225**	1.3%
Subcomponent 3-1 subtotal		16,667	33,333	33,333	50,000	33,333	**166,667**	**370,751**	4.4%
Total ACPC loan disbursement		**293,333**	**586,667**	**836,667**	**880,000**	**586,667**	**3,183,333**	**7,081,337**	83.8%
Total operating cost		**185,333**	**188,667**	**68,667**	**102,000**	**68,667**	**613,333**	**1,364,362**	16.2%
Project total cost		**478,667**	**775,333**	**905,333**	**982,000**	**655,333**	**3,796,667**	**8,445,699**	100.0%
Interest income at 6% for 3 year loan		17,600	35,200	50,200	52,800	35,200	191,000	424,880	5.0%

Note: 1) Interest includes interest to be collected after completion of the 5-year project period. 2) Project total cost without interest income is the initial cost to be financed by the government of the Philippines and Yen Loan financing of JICA.
Source: Survey Team

The assumptions for tractor use are 1,000 man days of labor-saving per 100 ha of operation, per year, per tractor. This means that one day of tractor use on one hectare saves 10 man days of labor use. In the same way, the assumptions for rice transporters are 1,500 man days of labor-saving per 100 ha operation, per year, per rice transplanter. This translates to 15 man days of labor-saving per hectare per day. The assumptions for combine harvesters are 1,400 man days of labor-saving per 100 ha operation, per year, per unit. The

assumptions for dryers are 100 man days per 100 ha of operation, per year, per unit. The reduction in rice yield is reflected in this calculation for dryers. Based on these assumptions, the one-year production of value addition is calculated to be PHP 1,135 million. The resulting EIRR is calculated at 72%. As this EIRR is considerably higher than the 12% set by the ADB, the project should be considered feasible for implementation.

Table 67: Calculation of the economic internal rate of return based on the project cost estimation

Year No.	Year		Progress of loan provision							Operating cost							
			No. of Subcomponent 2-1 machinery					No. of Subcomponent 2-2 machinery		Subcomponent 1-1 (BDS for machinery procured by borrowers)						Sub-component 1-2	Sub-component 1-3
		Project period	% progress of loan provision	Tractor	Rice transplanter	Combine harvester	Dryer	% progress of loan provision	Rice mill plant	Tractor (PHP 50,000/unit)	Rice transplanter (PHP 50,000/unit)	Combine harvester (PHP 50,000/unit)	Dryer (PHP 50,000/unit)	Improvement of AMTEC and other testing facilities	Total	Annual administration cost of 1,000,000	Annual administration cost of 1,000,000
			(%)	(unit)	(unit)	(unit)	(unit)	(%)	(unit)	('000 PHP)	('000 PHP)	('000 PHP)	('000 PHP)	('000 PHP)	('000 PHP)	('000 PHP)	('000 PHP)
a	b	c	d	e=d*1,000	f=d*1,000	g=d*333	h=d*1,000	i	j=i*1	k=e*50	l=f*50	m=g*50	n=h*50	o	p=k+l+m+n+o	r	s
	2017																
1	2018	1	10%	100	100	33	100			5,000	5,000	1,667	5,000	150,000	166,667	1,000	1,000
2	2019	2	20%	200	200	67	200			10,000	10,000	3,333	10,000	120,000	153,333	1,000	1,000
3	2020	3	20%	200	200	67	200	100%	1	10,000	10,000	3,333	10,000		33,333	1,000	1,000
4	2021	4	30%	300	300	100	300			15,000	15,000	5,000	15,000		50,000	1,000	1,000
5	2022	5	20%	200	200	67	200			10,000	10,000	3,333	10,000		33,333	1,000	1,000
6	2023																
7	2024																
8	2025																
Total			100%	1,000	1,000	333	1,000	100%	1	50,000	50,000	16,667	50,000	270,000	436,667	5,000	5,000
Total (Yen value)										111,225	111,225	37,075	111,225	600,616	971,367	11,123	11,123

Table 67: Calculation of the economic internal rate of return based on the project cost estimation (cont.)

Year No.	Year		Operating cost											
			Subcomponent 2-1 (Interest cost of total loans provided for 80% of machinery purchase costs)						Subcomponent 2-2 (Interest cost of a loan provided)		Subcomponent 3-1 (BDS for rural consultations and employment facilitation)				
		Project period	Loan amount for 80% of tractor purchase price 1,100,000	Loan amount for 80% of rice transplanter purchase price of 1,700,000	Loan amount for 80% of combine harvester purchase price of 1,100,000	Loan amount for 80% dryer purchase price of 500,000	Total ACPC loan amount	Total interest rate for 3 year by principal and interest equ repayment method (6%)	Loan amount for 100% of rice mill plant procurement cost of 250,000,000	Approximate interest for 5 year loan (6%)	Tractor (PHP 50,000/unit)	Rice transplanter (PHP 50,000/unit)	Combine harvester (PHP 50,000/unit)	Dryer (PHP 50,000/unit)	Total
			('000 PHP)	('000 PHP)	('000 PHP)	('000 PHP)	('000 PHP)	('000 PHP)	('000 PHP)	('000 PHP)	('000 PHP)	('000 PHP)	('000 PHP)	('000 PHP)	('000 PHP)
a	b	c	t=e*1,100*80%	u=f*1,700*80%	v=g*1,100*80%	w=h*500*80%	x=t+u+v+w	y=x*6%	z=j*250,000	aa=z*6%	ab=e*50	ac=f*50	ad=g*50	ae=h*50	af=ab+ac+ad+ae
	2017														
1	2018	1	88,000	136,000	29,333	40,000	293,333	17,600			5,000	5,000	1,667	5,000	16,667
2	2019	2	176,000	272,000	58,667	80,000	586,667	35,200			10,000	10,000	3,333	10,000	33,333
3	2020	3	176,000	272,000	58,667	80,000	586,667	35,200	250,000	15,000	10,000	10,000	3,333	10,000	33,333
4	2021	4	264,000	408,000	88,000	120,000	880,000	52,800			15,000	15,000	5,000	15,000	50,000
5	2022	5	176,000	272,000	58,667	80,000	586,667	35,200			10,000	10,000	3,333	10,000	33,333
6	2023														
7	2024														
8	2025														
Total			880,000	1,360,000	293,333	400,000	2,933,333	176,000	250,000	15,000	50,000	50,000	16,667	50,000	166,667
Total (Yen value)			1,957,563	3,025,325	652,521	889,802	6,525,211	391,513	556,126	33,368	111,225	111,225	37,075	111,225	370,751

Table 67: Calculation of the economic internal rate of return based on the project cost estimation (cont.)

Year No.	Year		Operating cost			Value added/benefit					Net benefit/ value added
			ACPC loan total	**Operating cost total**	**Project cost total**	Subcomponent 2-1 (Assuming 1 year acceleration effects with all saved labor providers have alternative created employment at 370PHP/day)					
		Project period	('000 PHP)	**('000 PHP)**	**('000 PHP)**	Tractor labor saving of 1,000MD/100ha/year/unit ('000 PHP)	Rice transplanter labor savin of 1,500MD/ 100ha/ year/un ('000 PHP)	Combine harvester labor saving of 1,400MD/100ha/year/unit ('000 PHP)	Dryer labor saving of 0MD/100ha/year/unit ('000 PHP)	**Total value added/benefit ('000 PHP)**	**('000 PHP)**
a	b	c	ag=x+z	**ah=p+r+s +y+aa+af**	**ai=ag+ah**	aj=e*1000 *370/1000	ak=f*1500 *370/1000	al=g*1400 *370/1000	am=h*100 *370/1000	**an=aj+ak +al+am**	**ao=an-ah**
	2017										
1	2018	1	293,333	**202,933**	**496,267**	37,000	55,500	17,267	3,700	**113,467**	**-89,467**
2	2019	2	586,667	**223,867**	**810,533**	74,000	111,000	34,533	7,400	**226,933**	**3,067**
3	2020	3	836,667	**118,867**	**955,533**	74,000	111,000	34,533	7,400	**226,933**	**108,067**
4	2021	4	880,000	**154,800**	**1,034,800**	111,000	166,500	51,800	11,100	**340,400**	**185,600**
5	2022	5	586,667	**103,867**	**690,533**	74,000	111,000	34,533	7,400	**226,933**	**123,067**
6	2023										
7	2024										
8	2025										
Total			3,183,333	**804,333**	**3,987,667**	370,000	555,000	172,667	37,000	**1,134,667**	**330,333**
Total (Yen value)			7,081,337	**1,789,243**	**8,870,579**	823,066	1,234,600	384,098	82,307	**2,524,070**	**734,828**
										EIRR:	**72%**
									Benefit/cost ratio:	1.41	

Source: Survey Team

6.3 Financial internal rate of return of a combine harvester service business

The financial internal rate of return (FIRR) of a combine harvester service business over a period of 16 years is calculated at 26%, indicating that the business is attractive for investment. The financial internal rate of return (FIRR) of a combine harvester service business over a period of 16 years is the return to the equity financing to the production capital (i.e., combine harvester) by the owner(s) of the business. If the FIRR is sufficiently larger than the prevailing interest rate of the capital market, the business is attractive to investors. As the market interest rate for loans for combine harvester procurement ranges from 12% to 15%, the business should be attractive for investment if the FIRR is larger than, say, 15%.

6.3.1 Debt and equity financing and three-year interest and repayment schedules

Table 68 shows a debt and equity financing schedule for a combine harvester service business over a period of 16 years. Table 69 shows a three-year interest and repayment schedule for debt financing at a 6% interest rate. It is assumed that a combine harvester service business borrows a concessionary loan at a 6% interest rate with a 3 year repayment period. The repayment method is assumed to be a principal and interest equal repayment method. The borrower uses the loan to finance 80% of the cost of combine harvester procurement and the remaining 20% of the cost is financed by the borrower's own equity financing, the returns to which are calculated as FIRR.

The management planning time is set at 16 years, a period twice as long as the depreciation period for the combine harvester. It is therefore further assumed that the combine harvester will be replaced twice over the 16 years. Given the durability and high quality of Japanese brand products, the combine harvester will last without major repairs or breakdowns. Repayment of the principal and interest are calculated separately because

they are handled differently for the FIRR calculation.

Table 68: Debt and equity financing schedule for a combine harvester service business over a 16-year period

Year No.	Year		Debt and equity financing schedules						Dep-reciation (8-year)	% of debt and equity financing					
			Debt financing		Equity financing		Total			Debt financing		Equity financing		Total	
		Project period	Annual	Cumulated	Annual	Cumulated	Annual	Cumulated	Anuual	Annual	Cumulated	Annual	Cumulated	Annual	Cumulated
			(PHP)	(PHP)	(PHP)	(PHP)	(PHP)	(PHP)	(PHP)	(%)	(%)	(%)	(%)	(%)	(%)
a	b	c	d	$e=e_{t-1}+d_t$	f	$g=g_{t-1}+f_t$	h	$i=i_{t-1}+h_t$	j	k=e/i	l=f/j	m=g/i	n=h/j	o=i/i	p=j/j
	2017														
1	2018	1	1,360,000	1,360,000	340,000	340,000	1,700,000	1,700,000	212,500	80%	80%	20%	20%	100%	100%
2	2019	2		1,360,000		340,000		1,700,000	212,500		80%		20%		100%
3	2020	3		1,360,000		340,000		1,700,000	212,500		80%		20%		100%
4	2021	4		1,360,000		340,000		1,700,000	212,500		80%		20%		100%
5	2022	5		1,360,000		340,000		1,700,000	212,500		80%		20%		100%
6	2023			1,360,000		340,000		1,700,000	212,500		80%		20%		100%
7	2024			1,360,000		340,000		1,700,000	212,500		80%		20%		100%
8	2025			1,360,000		340,000		1,700,000	212,500		80%		20%		100%
9	2026		1,360,000	2,720,000	340,000	680,000	1,700,000	3,400,000	212,500	80%	80%	20%	20%	100%	100%
10	2027			2,720,000		680,000		3,400,000	212,500		80%		20%		100%
11	2028			2,720,000		680,000		3,400,000	212,500		80%		20%		100%
12	2029			2,720,000		680,000		3,400,000	212,500		80%		20%		100%
13	2030			2,720,000		680,000		3,400,000	212,500		80%		20%		100%
14	2031			2,720,000		680,000		3,400,000	212,500		80%		20%		100%
15	2032			2,720,000		680,000		3,400,000	212,500		80%		20%		100%
16	2033			2,720,000		680,000		3,400,000	212,500		80%		20%		100%
Total			2,720,000	2,720,000	680,000	680,000	3,400,000	3,400,000		80%	80%	20%	20%	100%	100%

Source: Survey Team

Table 69: Three-year interest and repayment schedule for debt financing at a 6% interest rate

Year No.	Year		Opening balance	Debt financing and interests							
				Debt at the end of year before annual interests			Annual interest at 6% (INT) interest rate		Debt at the end of year with annual interests		
				Draw down for financing (principal)		Debt at the end of year			Draw down for financing and annual interest		Debt at the end of year
		Project period		Annual	Cumulated		Annual	Cumulated	Annual	Cumulated	Annual
			(PHP)	(PHP)	(PHP)	(PHP)	(PHP)	(PHP)	(PHP)	(PHP)	(PHP)
a	b	c	$d_t=s_{t-1}$	e	$f=f_{t-1}+e_t$	g=d+e	h=g*INT	$i=i_{t-1}+h_t$	j=e+h	$k=k_{t-1}+j_t$	l=g+h
	2017										
1	2018	1		1,360,000	1,360,000	1,360,000	81,600	81,600	1,441,600	1,441,600	1,441,600
2	2019	2	932,811		1,360,000	932,811	55,969	137,569	55,969	1,497,569	988,779
3	2020	3	479,990		1,360,000	479,990	28,799	166,368	28,799	1,526,368	508,789
4	2021	4	0		1,360,000	0	0	166,368	0	1,526,368	0
5	2022	5	0		1,360,000	0	0	166,368	0	1,526,368	0
6	2023		0		1,360,000	0	0	166,368	0	1,526,368	0
7	2024		0		1,360,000	0	0	166,368	0	1,526,368	0
8	2025		0		1,360,000	0	0	166,368	0	1,526,368	0
9	2026		0	1,360,000	2,720,000	1,360,000	81,600	247,968	1,441,600	2,967,968	1,441,600
10	2027		932,811		2,720,000	932,811	55,969	303,937	55,969	3,023,937	988,779
11	2028		479,990		2,720,000	479,990	28,799	332,736	28,799	3,052,736	508,789
12	2029		0		2,720,000	0	0	332,736	0	3,052,736	0
13	2030		0		2,720,000	0	0	332,736	0	3,052,736	0
14	2031		0		2,720,000	0	0	332,736	0	3,052,736	0
15	2032		0		2,720,000	0	0	332,736	0	3,052,736	0
16	2033		0		2,720,000	0	0	332,736	0	3,052,736	0
Total				2,720,000	2,720,000		332,736	332,736	3,052,736	3,052,736	

Table 69: Three-year interest and repayment schedule for debt financing at a 6% interest rate (cont.)

Year No.	Year	Project period	Repayment of principles and interests						Closing balance
			Principal repayment		Interest repayment		Total repayment by principal and interest equal repayment method		
			Annual (PHP)	Cumulated (PHP)	Annual (PHP)	Cumulated (PHP)	Annual (PHP)	Cumulated (PHP)	(PHP)
a	b	c	$m=g_t-g_{t+1}$	$n=n_{t-1}+m_t$	$o=q-m$	$p=p_{t-1}+o_t$	$q=(e*INT*(1+INT)^3)/((1+INT)^3-1)$	$r=r_{t-1}+q_t$	$s=l-q$
	2017								
1	2018	1	427,189	427,189	81,600	81,600	508,789	508,789	932,811
2	2019	2	452,821	880,010	55,969	137,569	508,789	1,017,579	479,990
3	2020	3	479,990	1,360,000	28,799	166,368	508,789	1,526,368	0
4	2021	4		1,360,000		166,368		1,526,368	0
5	2022	5		1,360,000		166,368		1,526,368	0
6	2023			1,360,000		166,368		1,526,368	0
7	2024			1,360,000		166,368		1,526,368	0
8	2025			1,360,000		166,368		1,526,368	0
9	2026		427,189	1,787,189	81,600	247,968	508,789	2,035,157	932,811
10	2027		452,821	2,240,010	55,969	303,937	508,789	2,543,947	479,990
11	2028		479,990	2,720,000	28,799	332,736	508,789	3,052,736	0
12	2029			2,720,000		332,736		3,052,736	0
13	2030			2,720,000		332,736		3,052,736	0
14	2031			2,720,000		332,736		3,052,736	0
15	2032			2,720,000		332,736		3,052,736	0
16	2033			2,720,000		332,736		3,052,736	0
Total			2,720,000	2,720,000	332,736	332,736	3,052,736	3,052,736	

Source: Survey Team

6.3.2 Calculation of the financial internal rate of return

Table 70 shows the calculation of a 26% financial internal rate of return (FIRR) for a combine harvester service business over a period of 16 years. With this FIRR, the business is attractive for investment.

Table 70: Financial internal rate of return of a combine harvester service business over a 16-year period

Year No.	Year	Project period	Equity financing	Operating cost														Maintenance fee
				Operator fee (1 operator/machine)				Bagger fee (2~3 bagger/machine; total payment is divided by them)				Trans-portation cost	Operator fee (1 operator/machine)					
				Fee/bag	Bags/ha	Area harvested	Total	Fee/bag	Bags/ha	Area harvested	Total		Price/litter	Diesel consumption/h	Area harvested	Total		5% of machine cost
a	b	c	(PHP) d	(PHP) e	(bags) f	(ha) g	(PHP) $h=e*f*g$	(PHP) i	(bags) j	(ha) k	(PHP) $l=i*j*k$	(PHP) m	(PHP) n	(litter) o	(ha) p	(PHP) $q=n*o*p$		(PHP) r
	2017																	
1	2018	1	340,000	4	100	100	40,000	4	100	100	40,000	50,000	30	10	100	30,000		85,000
2	2019	2		4	100	100	40,000	4	100	100	40,000	50,000	30	10	100	30,000		85,000
3	2020	3		4	100	100	40,000	4	100	100	40,000	50,000	30	10	100	30,000		85,000
4	2021	4		4	100	100	40,000	4	100	100	40,000	50,000	30	10	100	30,000		85,000
5	2022	5		4	100	100	40,000	4	100	100	40,000	50,000	30	10	100	30,000		85,000
6	2023			4	100	100	40,000	4	100	100	40,000	50,000	30	10	100	30,000		85,000
7	2024			4	100	100	40,000	4	100	100	40,000	50,000	30	10	100	30,000		85,000
8	2025			4	100	100	40,000	4	100	100	40,000	50,000	30	10	100	30,000		85,000
9	2026		340,000	4	100	100	40,000	4	100	100	40,000	50,000	30	10	100	30,000		85,000
10	2027			4	100	100	40,000	4	100	100	40,000	50,000	30	10	100	30,000		85,000
11	2028			4	100	100	40,000	4	100	100	40,000	50,000	30	10	100	30,000		85,000
12	2029			4	100	100	40,000	4	100	100	40,000	50,000	30	10	100	30,000		85,000
13	2030			4	100	100	40,000	4	100	100	40,000	50,000	30	10	100	30,000		85,000
14	2031			4	100	100	40,000	4	100	100	40,000	50,000	30	10	100	30,000		85,000
15	2032			4	100	100	40,000	4	100	100	40,000	50,000	30	10	100	30,000		85,000
16	2033			4	100	100	40,000	4	100	100	40,000	50,000	30	10	100	30,000		85,000
Total			680,000				640,000				640,000	800,000				480,000		1,360,000

Table 70: Financial internal rate of return of a combine harvester service business over a 16-year period (cont.)

Year No.	Year		Operating cost		Revenue								Gross operating profit	Depre-ciation	Profit before interest and tax (PBIT)	Interest on debt	Profit before tax and bonus
			Other costs	Total	Harvest service fee												
		Project period	2% of machine cost		Yield/ha (50kg/ bag* 100bags/ha)	Rate	Paddy price per KG	Total/ha	Capacity ha/day	Working days/year	Area harvested/year	Total/year					
a	b	c	(PHP) s	(PHP) t=h+l+m+q+r+s	(kg) u	(%) v	(PHP) w	(PHP) x=u*v*w	(ha) y	(days) z	(ha) aa	(PHP) ab=x*aa	(PHP) ac=ab-t	(PHP) ad	(PHP) ae=ac-ad	(PHP) af	(PHP) ag=ae-af
	2017																
1	2018	1	34,000	279,000	5,000	10%	14	7,000	2	50	100	700,000	421,000	212,500	208,500	81,600	126,900
2	2019	2	34,000	279,000	5,000	10%	14	7,000	2	50	100	700,000	421,000	212,500	208,500	55,969	152,531
3	2020	3	34,000	279,000	5,000	10%	14	7,000	2	50	100	700,000	421,000	212,500	208,500	28,799	179,701
4	2021	4	34,000	279,000	5,000	10%	14	7,000	2	50	100	700,000	421,000	212,500	208,500		208,500
5	2022	5	34,000	279,000	5,000	10%	14	7,000	2	50	100	700,000	421,000	212,500	208,500		208,500
6	2023		34,000	279,000	5,000	10%	14	7,000	2	50	100	700,000	421,000	212,500	208,500		208,500
7	2024		34,000	279,000	5,000	10%	14	7,000	2	50	100	700,000	421,000	212,500	208,500		208,500
8	2025		34,000	279,000	5,000	10%	14	7,000	2	50	100	700,000	421,000	212,500	208,500		208,500
9	2026		34,000	279,000	5,000	10%	14	7,000	2	50	100	700,000	421,000	212,500	208,500	81,600	126,900
10	2027		34,000	279,000	5,000	10%	14	7,000	2	50	100	700,000	421,000	212,500	208,500	55,969	152,531
11	2028		34,000	279,000	5,000	10%	14	7,000	2	50	100	700,000	421,000	212,500	208,500	28,799	179,701
12	2029		34,000	279,000	5,000	10%	14	7,000	2	50	100	700,000	421,000	212,500	208,500		208,500
13	2030		34,000	279,000	5,000	10%	14	7,000	2	50	100	700,000	421,000	212,500	208,500		208,500
14	2031		34,000	279,000	5,000	10%	14	7,000	2	50	100	700,000	421,000	212,500	208,500		208,500
15	2032		34,000	279,000	5,000	10%	14	7,000	2	50	100	700,000	421,000	212,500	208,500		208,500
16	2033		34,000	279,000	5,000	10%	14	7,000	2	50	100	700,000	421,000	212,500	208,500		208,500
Total			544,000	4,464,000													

Table 70: Financial internal rate of return of a combine harvester service business over 16-year period (cont.)

Year No.	Year		Bonus and welfare fund	Profit before tax (PBT)	Corporate tax	Profit after tax	Tax on interest	Net profit	Loan repayment	Net cash flow	Interest and loan repayment total	All cost except depreciation	All revenue
		Project period											
a	b	c	(PHP) ah=ag*2%	(PHP) ai=ag-ah	(PHP) aj=ai*20%	(PHP) ak=ai-aj	(PHP) al	(PHP) am=ak-al	(PHP) an	(PHP) ao=am-an+ad-d	(PHP) ap=af+an	(PHP) aq=d+t+af+ah+aj+al+an	(PHP) ar=ab
	2017												
1	2018	1	2,538	124,362	24,872	99,490		99,490	427,189	-455,200	508,789	1,155,200	700,000
2	2019	2	3,051	149,481	29,896	119,585		119,585	452,821	-120,736	508,789	820,736	700,000
3	2020	3	3,594	176,107	35,221	140,885		140,885	479,990	-126,605	508,789	826,605	700,000
4	2021	4	4,170	204,330	40,866	163,464		163,464		375,964		324,036	700,000
5	2022	5	4,170	204,330	40,866	163,464		163,464		375,964		324,036	700,000
6	2023		4,170	204,330	40,866	163,464		163,464		375,964		324,036	700,000
7	2024		4,170	204,330	40,866	163,464		163,464		375,964		324,036	700,000
8	2025		4,170	204,330	40,866	163,464		163,464		375,964		324,036	700,000
9	2026		2,538	124,362	24,872	99,490		99,490	427,189	-455,200	508,789	1,155,200	700,000
10	2027		3,051	149,481	29,896	119,585		119,585	452,821	-120,736	508,789	820,736	700,000
11	2028		3,594	176,107	35,221	140,885		140,885	479,990	-126,605	508,789	826,605	700,000
12	2029		4,170	204,330	40,866	163,464		163,464		375,964		324,036	700,000
13	2030		4,170	204,330	40,866	163,464		163,464		375,964		324,036	700,000
14	2031		4,170	204,330	40,866	163,464		163,464		375,964		324,036	700,000
15	2032		4,170	204,330	40,866	163,464		163,464		375,964		324,036	700,000
16	2033		4,170	204,330	40,866	163,464		163,464		375,964		324,036	700,000
Total									2,720,000	2,354,559	3,052,736	8,845,441	11,200,000
								Financial Internal Rate of Return (FIRR)		26%		BC ratio	1.27

Source: Survey Team

7. Way forward

7.1 Emerging policy issues and contribution of the project for continuous policy dialog

It is recommended that one page of well-refined statements be added to summarize emerging policy issues and the relevance of project implementation to facilitate further policy dialog and address agricultural sector transformation and development. Please consider the following findings of CAFED, PDS, ACPC and consultant joint team recommendation presented at the feedback meeting held at DA on February 2, 2018.

7.2 Facilitation of agricultural mechanization policy dialog

Observations: Philippine Development Plan 2017-2022, Agriculture and Fisheries Modernization Act of 1997 and Agricultural and Fisheries Mechanization Law of 2013 state the importance of agricultural mechanization to promote labor productivity and economic development. Based on policies established in the documents, it is recommended further that policy rationale for active public intervention to inter-sectoral labor shifts and the emergence of the new class of agricultural service providers need to be explored. The largest economic impact of the agricultural mechanization is attributable to the labor shift and the resulting increase in labor productivity and the emerging class could be major factors behind the sectoral transformation and industrialization, or the future rural elite class which may replace the functions of the landlord class. Agricultural modernization policies are not necessarily confined to their own sector, but rather established to address inter-sectoral issues.

In this regard, ongoing policy dialog to increase project values should be considered. The added value created by the project goes beyond socioeconomic gains alone. Experimenting with timely and effective adjustment of agricultural policies in the context of a changing society should be project outcomes, which is why continuous policy dialog to boost the project value needs to be considered.

7.3 Procedures to establish implementation structure in DA Headquarters and regional offices

Procedures to establish an implementation structure, particularly for Components 1 and 3 in DA Headquarters and regional offices should be designed and approved promptly with necessary general appropriation budgets. If DA and ACPC decide that only the ACPC technical support division will conduct these components coordinated with DA offices, ACPC will draft this subsection.

7.4 Designing of collaboration procedures and conditionalities

It is necessary to refine collaboration procedures and conditionalities among ACPC, conduits, private sector participants and machinery buyers proposed by the consultant to enhance fair competition and market efficiency. Based on the information collected from ACPC, private sector distributors, users of and agricultural service providers with 4WD tractors and combine harvesters the consultant proposed options to 1) identify of potential users, 2) market agricultural machinery to potential users by conduits and private sector distributors, 3) provide BDS and 3) finance the purchase by potential users keeping fair and competitive market mechanisms. In the consultant report, several options will be proposed and the DA and ACPC will determine which are to be tested and implemented. The DA and ACPC will then review the proposals to finalize procedures to facilitate matching between demands of potential buyers and machinery suppliers in a transparent and competitive manner.

7.5 Farmers/SMEs and cooperatives expected loan demand analysis using sampled data

Verify and compare the results of the three methods and conclude the magnitudes of expected machinery and financial demands of the set target group (i.e. cooperatives with asset values less than or equal to PHP 15 million and farmers with 3 ha or less of agricultural land with no other businesses (Note: the cut-off value could be 5 ha. The DA and ACPC will determine the cut-off value based on their policy positions.) The following survey is to be planned, conducted and concluded by the DA in collaboration with the Philippine Statistical Authority.

(1) Survey subjects: 1) cooperatives with asset value of less than or equal to 15 million PHP and 2) farmers/SMEs with land holdings of 5 ha or less to relativize farmers with 3 ha or less and with no other businesses.

(2) Survey planning, implementation, data analysis and reporting period: March 2018

(3) Survey framework: Nation-wide and regional. Comparisons among the best-performing or highest potential province in each region.

(4) Survey procedure:

1) Select two officers to work 30 MD in each regional office of the DA. They will be training in Manila for two days.
2) Select one best-performed or highest potential state in terms of the adoption of 4WD tractors, combine harvesters and rice transplanters. The selection will be made based on the knowledge of the agriculture officers.
3) Select barangays under a land classification of cropland using publicly available GIS polygon coverage. A GIS specialist in Philippine Statistical Authority should be able to support this data extraction. Otherwise officers in the regional office will select barangays which come under the crop land use category to establish two-stage random sampling survey population. (The consultant will be able to provide the names of such barangays, except in the Mindanao area based on GIS analysis.)
4) From this barangay statistical population ten (10) barangays will be randomly selected.
5) Visit these ten randomly selected barangays and further randomly select ten (10) farmers with landholdings of 5 ha or less from lists of barangay households. If such lists are inaccessible, ask the barangay caption to select such farmers. In this case it is better to refrain from informing the captain of the accurate objective of the survey. Some survey objective statements which would result in less biased selection by the captains would be prepared in advance. However, all proper protocols should always be observed to handle collaborating persons and survey subjects.
6) A questionnaire will be developed with about ten questions which require interviews lasting 10 to 20 minutes except for the time of protocol and courtesy. As far as the occasions allow, ask the selected survey subjects to gather in a location where the surveys are to be conducted. Selected questions must be selective to solicit their opinions on mechanization business participation and a mark sheet method should be applied. When designing questionnaires, geo-cording and for simple data entry tools and procedures, request support from Philippine Statistical Authority.

    i) Agricultural land area in ha.
    ii) Existence of other businesses
    iii) Agricultural machinery possessed (type, number, year of purchase, (price), financing, interest rates)
    iv) Willingness to purchase Japanese/other 4WD tractor at a price of 1 million PHP.
    v) Willingness to purchase a Japanese/other combine harvester at a price of 2 million PHP.
    vi) Interest of securing 6% loan with a repayment period of two to three years
    vii) Possibility of securing at least 50 service clients
    viii) Family structure (design answers to this question as simple as possible)
    ix) Per-ha cost of manual transplanting and harvesting and mechanized rice transplanting (if applicable) and harvesting (cost calculation should be standardized due to the many regional variations to calculate the costs)

7) For cooperatives randomly select ten cooperatives in the selected region from a list of cooperatives. Only choose randomly selected cooperatives with asset values of 15 million PHP or less. Use subset of questions applied to farmer/SMEs by omitting questions 1) and 8). They could be replaced by two other questions applicable to cooperatives.
8) Total samples in each region are: for farmers/SMEs 100 subjects and for cooperatives 10 subjects. Including ARMM, there will be 1600 farmers/SMEs and 160 cooperatives. They must suffice to estimate the expected demand statistically. If the budget and human resources are not sufficient in DA, these samples could be halved, but not less than half. Otherwise the target regions should be selected by keeping 100 farmers and 10 cooperative samples in each region.
9) Data in the questionnaires will be entered in Excel format and sent to DA-HQs for consolidation.
10) The rate of willingness to purchase will be calculated and real action factors (influenced by sales efforts and government intervention level) will be determined based on the experiences of officers of DA, ACPC and private sector distributers. For the time being, 20% is assumed.

As observed in the above procedures, the estimated values are always expected demand, whatever methods are applied. This is the basic nature of projects dealing with the markets, since market behavior follows a non-linear process and is difficult to predict based on past information. This is the main difference between market handling projects and hardware development projects, which are usually explained by linear (blue-plan) models. By recognizing this difference, market handling projects can be applied to adaptive management models where constant monitoring and feedback are used to adjust the next action to be taken to achieve an optimal pass. Therefore, for this project, Components 1 and 3 were included to manage the project adaptively.

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Annexes

Annex 1: Average planted areas of irrigated and rain-fed rice, white and yellow corn and other crops

By Region

Geo Code	Name of locations	Land area (Ha)	Rice average area planted (Ha)									Corn average area planted (Ha)									Sugar cane and cassava average area planted (Ha)						Total average area planted		
			Irrigated rice			Rain-fed rice			Rice total			White corn			Yellow corn			Corn total			Sugar cane			Cassava					
			1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1990-1996	1997-2006	2007-2016	1990-1996	1997-2006	2007-2016	1987/1996-1996	1997-2006	2007-2016
00	Philippines total	34,226,276	2,116,842	2,679,211	3,113,439	1,383,290	1,297,017	1,437,051	3,500,041	3,976,077	4,550,994	2,348,636	1,569,159	1,309,512	1,060,363	962,653	1,265,295	3,394,416	2,528,242	2,574,693	324,091	376,249	411,424	227,197	212,050	217,812	7,445,744	7,092,618	7,754,923
01	Region I (Ilocos Region)	1,301,260	171,908	228,722	267,538	138,475	120,630	131,458	310,383	349,353	398,996	22,449	16,943	15,986	46,972	42,530	64,444	69,389	59,473	80,429	484	370	445	1,991	1,993	2,111	382,248	411,189	481,982
02	Region II (Cagayan Valley)	2,822,883	297,992	402,590	477,658	54,461	61,271	76,557	352,453	463,861	554,216	91,805	29,710	23,275	206,355	257,805	385,890	298,160	287,515	409,165	1,284	5,521	9,928	604	2,411	6,802	652,500	759,307	980,111
03	Region III (Central Luzon)	2,201,463	398,690	463,070	599,208	124,357	89,504	78,567	523,032	552,575	677,775	6,722	7,591	10,560	7,311	25,655	33,712	13,510	33,065	44,272	27,401	23,959	17,760	1,145	1,175	1,496	565,088	610,773	741,303
04	Region IV-A (Calabarzon)	1,687,331	97,612	85,372	81,142	61,691	38,666	30,570	159,303	124,038	111,711	83,553	8,413	18,795	57,957	27,600	14,164	141,460	36,008	32,959	31,142	30,247	30,633	8,224	8,915	7,877	340,129	199,208	183,180
05	Region V (Bicol Region)	1,815,582	171,707	175,008	213,434	121,840	109,268	109,496	293,547	284,277	322,930	62,903	47,634	53,566	102,171	42,073	51,761	164,631	89,016	105,327	3,067	6,687	5,845	30,283	28,912	22,683	491,529	408,891	456,785
06	Region VI (Western Visayas)	2,079,418	196,269	284,975	303,741	274,807	273,670	317,272	471,076	558,645	621,404	35,065	40,886	48,132	49,365	45,433	74,532	84,382	86,319	122,664	189,890	192,284	204,261	8,877	6,512	6,624	754,225	843,760	954,953
07	Region VII (Central Visayas)	1,588,597	46,402	44,010	56,793	64,938	46,259	44,589	111,299	90,268	101,520	383,740	226,934	209,379	28,680	11,142	2,321	412,315	238,067	211,696	31,010	40,557	44,627	20,619	13,640	11,787	575,243	382,531	369,630
08	Region VIII (Eastern Visayas)	2,325,110	90,435	99,705	129,295	126,228	122,051	146,424	216,663	221,756	275,719	161,406	55,619	55,718	1,469	3,219	6,893	162,209	57,801	62,566	10,912	9,875	7,973	24,909	22,878	20,412	414,694	312,310	366,669
09	Region IX (Zamboanga Peninsula)	1,682,291	60,528	94,885	91,883	59,305	68,788	63,363	119,832	163,673	155,246	230,467	196,666	124,881	4,186	3,912	11,336	234,438	200,578	136,217		153	89	4,642	5,982	6,714	358,912	370,385	298,266
10	Region X (Northern Mindanao)	2,049,602	100,149	119,938	132,845	22,602	14,453	17,951	122,751	134,389	150,796	265,899	243,529	195,429	101,386	143,812	178,249	366,876	387,338	373,678	21,638	42,505	65,846	13,740	10,179	22,708	525,005	574,411	613,027
11	Region XI (Davao Region)	2,035,742	81,048	96,545	84,369	20,421	12,182	10,544	101,469	108,578	94,913	234,799	181,701	133,869	5,167	17,457	19,361	239,031	197,745	153,230	4,942	10,846	9,536	2,585	2,137	1,994	348,026	319,306	259,673
12	Region XII (Soccsksargen)	2,233,730	147,854	247,769	262,760	66,592	62,116	76,912	214,446	309,884	339,671	480,115	218,379	138,574	297,373	224,562	281,350	777,488	442,941	419,924	2,322	12,367	12,717	1,612	1,132	2,781	995,868	766,324	775,093
14	Cordillera AR	1,942,203	64,154	78,545	91,765	11,500	11,474	25,612	75,620	90,019	117,377	11,684	12,806	8,674	12,540	19,369	48,552	23,802	32,169	57,226		149	498	297	288	485	99,718	122,625	175,586
15	ARMM	3,351,142	29,979	49,367	54,668	79,044	116,902	151,954	109,023	166,269	206,598	206,179	231,537	234,600	102,389	65,442	58,642	300,372	296,980	293,243		726	1,263	96,750	95,856	95,665	506,145	559,831	596,768
16	Region XIII (Caraga)	2,147,835	53,212	77,424	91,479	42,008	37,577	58,314	95,220	115,001	149,793	67,858	46,342	30,881	2,350	4,396	11,096	68,857	50,517	41,967		3	3	8,725	7,858	5,193	172,801	173,379	196,955
17	Mimaropa Region	2,962,087	108,904	131,286	174,861	115,021	112,206	97,468	223,925	243,492	272,329	3,992	4,469	7,193	34,693	28,247	22,992	37,495	32,712	30,131				2,194	2,184	2,481	263,614	278,387	304,942

By Province

Geo Code	Name of locations	Land area (Ha)	Rice average area planted (Ha)									Corn average area planted (Ha)									Sugar cane and cassava average area planted (Ha)						Total average area planted		
			Irrigated rice			Rain-fed rice			Rice total			White corn			Yellow corn			Corn total			Sugar cane			Cassava					
			1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1990-1996	1997-2006	2007-2016	1990-1996	1997-2006	2007-2016	1987/1996-1996	1997-2006	2007-2016
00	Philippines total	34,226,276	2,116,842	2,679,211	3,113,439	1,383,290	1,297,017	1,437,051	3,500,041	3,976,077	4,550,994	2,348,636	1,569,159	1,309,512	1,060,363	962,653	1,265,295	3,394,416	2,528,242	2,574,693	324,091	376,249	411,424	227,197	212,050	217,812	7,445,744	7,092,618	7,754,923
01	Region I (Ilocos Region)	1,301,260	171,908	228,722	267,538	138,475	120,630	131,458	310,383	349,353	398,996	22,449	16,943	15,986	46,972	42,530	64,444	69,389	59,473	80,429	484	370	445	1,991	1,993	2,111	382,248	411,189	481,982
0128	Ilocos Norte	346,789	33,399	50,093	54,370	10,921	9,168	11,842	44,320	59,261	66,212	2,706	4,530	4,706	9,173	6,948	7,947	11,879	11,478	12,653		109	188	410	490	436	56,610	71,338	79,490
0129	Ilocos Sur	259,600	14,885	20,304	26,318	21,076	23,151	21,323	35,961	43,455	47,641	1,852	1,199	2,684	3,780	6,255	10,996	5,632	7,454	13,680		16	53	19	37	117	41,612	50,961	61,490
0133	La Union	149,770	18,133	19,028	22,119	13,360	12,978	14,265	31,494	32,006	36,384	1,801	3,114	2,577	165	1,260	3,086	1,933	4,374	5,663		13	28	182	193	219	33,608	36,586	42,293
0155	Pangasinan	545,101	105,491	139,297	164,731	93,118	75,333	84,029	198,609	214,630	248,760	16,091	8,101	6,019	33,855	28,067	42,415	49,946	36,168	48,434	484	233	176	1,380	1,274	1,339	250,418	252,304	298,709
02	Region II (Cagayan Valley)	2,822,883	297,992	402,590	477,658	54,461	61,271	76,557	352,453	463,861	554,216	91,805	29,710	23,275	206,355	257,805	385,890	298,160	287,515	409,165	1,284	5,521	9,928	604	2,411	6,802	652,500	759,307	980,111
0209	Batanes	21,901			2			60			62			41			76			117			2			4			184
0215	Cagayan	929,575	73,270	115,343	156,426	31,474	42,187	48,418	104,744	157,530	204,844	15,806	13,238	12,021	31,057	45,441	86,576	46,863	58,678	98,597	1,284	5,111	5,310	186	1,160	1,095	153,076	222,479	309,846
0231	Isabela	1,241,493	178,831	223,981	249,036	16,990	14,982	22,259	195,821	238,964	271,294	72,058	13,367	9,579	158,286	177,374	252,492	230,345	190,740	262,071		396	4,600	186	1,023	4,879	426,352	431,122	542,844
0250	Nueva Vizcaya	397,567	33,988	49,705	53,819	2,204	1,896	3,749	36,192	51,601	57,568	1,224	2,091	1,371	8,246	12,278	13,755	9,471	14,369	15,126		7	2	193	184	140	45,855	66,160	72,835
0257	Quirino	232,347	11,903	13,561	18,376	3,793	2,206	2,071	15,696	15,767	20,447	2,717	1,015	263	8,765	22,713	32,992	11,482	23,727	33,255		7	14	39	44	685	27,217	39,546	54,401
03	Region III (Central Luzon)	2,201,463	398,690	463,070	599,208	124,357	89,504	78,567	523,032	552,575	677,775	6,722	7,591	10,560	7,311	25,655	33,712	13,510	33,065	44,272	27,401	23,959	17,760	1,145	1,175	1,496	565,088	610,773	741,303
0308	Bataan	137,298	19,215	26,938	30,537	139	168	632	19,340	27,106	31,170	143	290	481	198	246	1,152	251	507	1,632		128	82	81	59	122	19,673	27,800	33,006
0314	Bulacan	279,610	55,633	49,912	61,204	25,527	20,561	16,584	81,160	70,472	77,788	90	576	955	873	509	31	918	932	986		11	2	136	82	76	82,214	71,497	78,852
0349	Nueva Ecija	575,133	181,779	201,888	262,350	51,877	39,201	37,951	233,656	241,089	300,300	3,688	2,746	4,752	477	864	1,977	4,164	3,610	6,729		16	64	51	35	84	237,872	244,749	307,176
0354	Pampanga	206,247	47,749	58,843	81,675	4,542	3,349	3,111	52,291	62,192	84,785	2,059	3,215	3,006	1,638	6,898	8,241	3,369	10,113	11,248	10,251	8,867	6,050	662	707	744	66,572	81,879	102,827
0369	Tarlac	305,360	66,235	90,169	119,748	31,151	15,250	10,035	97,387	105,419	129,783	570	285	591	4,025	16,501	18,575	4,595	16,786	19,165	17,150	14,922	11,542	29	20	30	119,161	137,147	160,519
0371	Zambales	383,083	13,176	16,621	22,428	8,954	8,262	8,671	22,130	24,884	31,098	54	58	125	82	61	170	92	119	294		15	21	105	142	236	22,326	25,160	31,650
0377	Aurora	314,732	14,902	18,700	21,268	2,167	2,713	1,584	17,069	21,413	22,851	119	421	651	20	578	3,567	121	998	4,218				80	129	205	17,270	22,540	27,274
04	Region IV-A (Calabarzon)	1,687,331	97,612	85,372	81,142	61,691	38,666	30,570	159,303	124,038	111,711	83,553	8,413	18,795	57,957	27,600	14,164	141,460	36,008	32,959	31,142	30,247	30,633	8,224	8,915	7,877	340,129	199,208	183,180
0410	Batangas	311,975	15,226	12,356	9,398	18,238	9,376	4,740	33,464	21,733	14,138	69,611	4,553	7,155	33,655	3,726	1,387	103,266	8,279	8,543	23,460	29,049	29,605	1,071	1,199	929	161,260	60,259	53,214
0421	Cavite	157,417	13,468	11,670	10,154	3,580	3,052	1,405	17,048	14,722	11,559	5,565	1,020	794	4,121	1,059	456	9,687	2,079	1,249		392	806	243	305	311	26,977	17,497	13,926
0434	Laguna	191,785	29,644	27,655	29,076	2,566	659	440	32,210	28,314	29,516	5,463	346	981	1,450	375	343	6,913	721	1,324	7,682	807	137	220	189	144	47,025	30,031	31,120
0456	Quezon	906,960	32,424	25,815	26,043	36,133	24,533	22,925	68,557	50,348	48,968	1,335	2,326	9,632	18,661	22,418	11,832	19,996	24,743	21,464			85	6,565	7,096	6,387	95,118	82,187	76,904
0458	Rizal	119,194	6,850	7,876	6,471	1,174	1,046	1,059	8,024	8,921	7,530	1,578	169	233	70	22	147	1,599	187	380				125	126	106	9,748	9,234	8,016
05	Region V (Bicol Region)	1,815,582	171,707	175,008	213,434	121,840	109,268	109,496	293,547	284,277	322,930	62,903	47,634	53,566	102,171	42,073	51,761	164,631	89,016	105,327	3,067	6,687	5,845	30,283	28,912	22,683	491,529	408,891	456,785
0505	Albay	257,577	48,691	37,975	40,057	8,094	10,698	11,129	56,785	48,673	51,186	1,830	1,236	2,656	53,509	17,489	17,950	55,339	18,725	20,605		1,053	1,042	4,465	2,426	1,807	116,589	70,877	74,640
0516	Camarines Norte	232,007	13,289	12,011	14,194	4,694	5,800	8,270	17,983	17,810	22,464	3,946	458	859	222	42	166	4,146	500	1,025				808	529	704	22,937	18,839	24,193
0517	Camarines Sur	549,703	74,931	94,192	118,556	43,253	37,480	38,659	118,184	131,672	157,214	1,056	1,379	4,557	44,099	23,037	32,793	45,155	24,416	37,349	3,067	5,633	4,803	20,963	22,303	16,706	187,369	184,024	216,072
0520	Catanduanes	149,216	4,335	4,022	5,509	7,836	6,353	6,401	12,171	10,375	11,911	941	122	243	730	121	106	1,671	243	349		1	0	129	101	103	13,971	10,720	12,362
0541	Masbate	415,178	3,338	3,464	10,642	42,550	38,472	36,075	45,888	41,936	46,717	54,613	44,309	45,079	703	1,152	627	54,894	44,770	45,707				972	835	966	101,754	87,541	93,390
0562	Sorsogon	211,901	27,123	23,344	24,477	15,413	10,466	8,962	42,536	33,810	33,438	517	130	173	2,909	231	119	3,426	362	292		0	0	2,947	2,718	2,397	48,909	36,889	36,127
06	Region VI (Western Visayas)	2,079,418	196,269	284,975	303,741	274,807	273,670	317,272	471,076	558,645	621,404	35,065	40,886	48,132	49,365	45,433	74,532	84,382	86,319	122,664	189,890	192,284	204,261	8,877	6,512	6,624	754,225	843,760	954,953
0604	Aklan	182,142	21,067	20,900	18,167	15,304	21,271	19,823	36,371	42,171	37,989	96	54	267	1,296	385	728	1,344	439	995				450	807	730	38,165	43,417	39,715
0606	Antique	272,917	28,774	44,195	45,150	16,216	24,507	32,945	44,990	68,702	78,095	557	309	453	2,943	1,497	1,596	3,500	1,806	2,048		566	923	322	349	406	48,812	71,422	81,472
0619	Capiz	259,464	15,931	24,121	29,966	69,961	82,610	75,158	85,892	106,731	105,124	493	275	442	9,391	10,835	18,242	9,884	11,110	18,684	8,399	9,905	8,936	752	717	673	104,927	128,463	133,417
0630	Iloilo	507,917	75,576	118,070	124,036	125,780	104,820	136,399	201,356	222,890	260,434	4,613	8,503	11,079	21,332	18,405	29,718	25,944	26,908	40,796	15,121	18,192	17,841	1,517	1,314	1,669	243,939	269,303	320,741
1845	Negros Occidental	796,521	52,124	74,242	82,774	34,867	25,483	37,653	86,991	99,725	120,818	28,557	31,149	35,431	13,764	14,076	23,985	42,321	45,224	59,416	166,370	163,621	176,560	5,771	3,267	3,075	301,453	311,838	359,868
0679	Guimaras	60,457	2,797	3,448	3,649	12,678	14,978	15,296	15,475	18,426	18,944	750	596	461	640	236	264	1,390	832	725				64	59	70	16,929	19,316	19,740
07	Region VII (Central Visayas)	1,588,597	46,402	44,010	56,793	64,938	46,259	44,589	111,299	90,268	101,520	383,740	226,934	209,379	28,680	11,142	2,321	412,315	238,067	211,696	31,010	40,557	44,627	20,619	13,640	11,787	575,243	382,531	369,630
0712	Bohol	482,095	14,892	22,922	34,456	59,047	41,354	39,224	73,939	64,276	73,680	34,124	18,594	13,702	1,072	813	211	35,196	19,406	13,913				12,237	6,161	5,510	121,371	89,843	93,104
0722	Cebu	534,200	3,860	4,422	4,536	2,899	563	456	6,759	4,985	4,992	228,042	115,661	113,238	23,112	7,012	1,030	251,154	122,673	114,268	10,318	8,009	7,120	3,740	3,371	2,484	271,970	139,038	128,864
1846	Negros Oriental	538,553	26,790	15,902	17,137	2,855	4,205	4,823	29,645	20,107	22,105	110,653	84,886	75,192	4,347	3,222	1,029	115,000	88,109	76,220	20,692	32,548	37,507	3,210	2,842	3,036	168,546	143,606	138,869
0761	Siquijor	33,749	860	764	665	138	137	86	957	901	742	10,921	7,793	7,248	150	95	51	10,966	7,879	7,294				1,433	1,265	757	13,355	10,044	8,793

Annex 1: Average planted areas of irrigated and rain-fed rice, white and yellow corn and other crops (cont.)

Geo Code	Name of locations	Land area (Ha)	Rice average area planted (Ha)									Corn average area planted (Ha)									Sugar cane and cassava average area planted (Ha)						Total average area planted		
			Irrigated rice			Rain-fed rice			Rice total			White corn			Yellow corn			Corn total			Sugar cane			Cassava					
			1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1990-1996	1997-2006	2007-2016	1990-1996	1997-2006	2007-2016	1987/1996-1996	1997-2006	2007-2016
08	Region VIII (Eastern Visayas)	2,325,110	90,435	99,705	129,295	126,228	122,051	146,424	216,663	221,756	275,719	161,406	55,619	55,718	1,469	3,219	6,893	162,209	57,801	62,566	10,912	9,875	7,973	24,909	22,878	20,412	414,694	312,310	366,669
0826	Eastern Samar	466,047	736	1,503	4,142	13,169	12,320	15,869	13,904	13,824	20,010	112	67	128		39	105	112	102	233		1	0	2,437	2,140	2,138	16,453	16,066	22,381
0837	Leyte	651,505	61,914	63,230	83,051	31,143	35,627	45,757	93,057	98,857	128,808	114,502	37,406	38,126	1,084	1,667	4,202	115,044	39,073	42,328	10,912	9,870	7,968	7,443	7,119	6,638	226,456	154,919	185,742
0848	Northern Samar	369,293	2,194	3,431	4,252	37,899	34,738	35,319	40,093	38,169	39,571	13,606	6,298	6,789		1,017	1,674	13,606	6,502	8,463				2,449	2,436	2,413	56,147	47,107	50,447
0860	Samar (Western Samar)	604,803	8,801	13,333	18,359	3,224	3,172	3,079	12,025	16,505	21,438	13,049	5,639	4,638	130	252	299	13,075	5,689	4,937		4	4	6,012	4,962	4,471	31,112	27,160	30,850
0864	Southern Leyte	179,861	3,056	4,036	4,794	39,554	35,165	46,174	42,610	39,201	50,968	19,804	5,792	5,610	25	22	449	19,809	5,796	6,014		0	0	5,805	5,600	4,194	68,225	50,597	61,176
0878	Biliran	53,601	13,735	14,172	14,698	1,238	1,029	225	14,973	15,201	14,923	334	418	427	230	222	164	564	640	592				763	621	558	16,300	16,461	16,073
09	Region IX (Zamboanga Peninsula)	1,682,291	60,528	94,885	91,883	59,305	68,788	63,363	119,832	163,673	155,246	230,467	196,666	124,881	4,186	3,912	11,336	234,438	200,578	136,217		153	89	4,642	5,982	6,714	358,912	370,385	298,266
0972	Zamboanga Del Norte	730,100	9,563	13,513	14,187	19,084	18,385	18,457	28,648	31,899	32,644	80,113	61,378	35,325	357	417	1,133	80,256	61,796	36,458		70	70	1,006	1,267	1,465	109,909	95,031	70,636
0973	Zamboanga Del Sur	591,416	45,462	53,620	55,082	36,478	27,982	16,596	81,940	81,603	71,677	144,432	102,508	75,856	2,219	2,262	7,610	146,651	104,770	83,466		53	3	1,614	1,449	2,759	230,205	187,874	157,905
			5,503	4,505	4,787	3,742	1,960	2,206	9,245	6,465	6,994	5,922	2,499	2,748	1,610	820	1,834	7,531	3,319	4,582		16	10	2,022	2,851	2,073	18,798	12,651	13,658
0983	Zamboanga Sibugay	360,775		23,246	17,827		20,460	26,104		43,707	43,931		30,280	10,952		413	759		30,693	11,711		15	6		415	418		74,829	56,067
10	Region X (Northern Mindanao)	2,049,602	100,149	119,938	132,845	22,602	14,453	17,951	122,751	134,389	150,796	265,899	243,529	195,429	101,386	143,812	178,249	366,876	387,338	373,678	21,638	42,505	65,846	13,740	10,179	22,708	525,005	574,411	613,027
1013	Bukidnon	1,049,859	57,188	61,164	76,684	14,564	2,607	8,961	71,753	63,771	85,645	116,929	50,097	32,327	93,839	131,947	158,016	210,768	182,044	190,343	21,638	42,472	65,840	6,647	5,229	13,650	310,805	293,516	355,478
1018	Camiguin	23,795	723	584	611		7	7	723	589	617	642	490	398	30	21	43	645	509	441				1,025	457	257	2,393	1,555	1,315
1035	Lanao Del Norte	415,994	24,144	36,502	32,613	6,070	10,752	7,109	30,214	47,253	39,722	88,785	125,360	98,575	1,668	5,717	7,576	90,120	131,077	106,150				576	1,110	1,282	120,910	179,440	147,154
1042	Misamis Occidental	205,522	10,593	15,950	17,084	804	675	1,417	11,397	16,624	18,501	17,790	24,395	24,707	119	319	1,151	17,862	24,714	25,859				826	443	1,729	30,084	41,781	46,089
1043	Misamis Oriental	354,432	7,501	5,738	5,854	1,163	413	457	8,665	6,151	6,311	41,752	43,188	39,421	5,730	5,807	11,463	47,482	48,995	50,885		33	6	4,666	2,940	5,790	60,812	58,119	62,991
11	Region XI (Davao Region)	2,035,742	81,048	96,545	84,369	20,421	12,182	10,544	101,469	108,578	94,913	234,799	181,701	133,869	5,167	17,457	19,361	239,031	197,745	153,230	4,942	10,846	9,536	2,585	2,137	1,994	348,026	319,306	259,673
1123	Davao Del Norte	342,697	47,525	40,195	27,475	15,399	2,543	2,422	62,924	42,737	29,897	119,979	35,980	11,430	2,866	2,204	5,073	122,272	38,184	16,504		9	11	1,291	622	441	186,488	81,551	46,853
1124	Davao Del Sur	677,104	25,162	24,472	25,284	2,708	1,495	601	27,870	25,817	25,885	51,885	53,313	48,780	1,784	3,637	5,083	53,669	56,950	53,862	4,942	10,829	9,521	848	662	700	87,328	94,258	89,968
1125	Davao Oriental	567,964	8,361	10,001	10,969	2,314	4,931	3,606	10,675	14,933	14,575	62,935	60,454	45,660	517	4,712	2,638	63,090	63,752	48,297		0	0	445	379	392	74,210	79,063	63,264
1182	Compostela Valley	447,977		21,877	20,641		3,214	3,915		25,091	24,556		31,954	28,000		6,904	6,568		38,858	34,567		8	4		475	461		64,432	59,588
1186	Davao Occidental																												
12	Region XII (Soccsksargen)	2,233,730	147,854	247,769	262,760	66,592	62,116	76,912	214,446	309,884	339,671	480,115	218,379	138,574	297,373	224,562	281,350	777,488	442,941	419,924	2,322	12,367	12,717	1,612	1,132	2,781	995,868	766,324	775,093
1247	Cotabato (North Cotabato)	900,890	52,932	82,062	90,164	24,806	36,121	36,537	77,738	118,182	126,700	154,256	68,150	36,393	75,100	63,024	90,495	229,356	131,174	126,888	2,322	10,210	8,672	1,101	784	944	310,516	260,351	263,205
1263	South Cotabato	442,881	42,924	72,638	69,100	13,184	8,169	14,223	56,108	80,808	83,323	241,180	74,002	32,667	169,252	90,225	109,279	410,432	164,226	141,946		800	841	437	198	1,577	466,977	246,033	227,688
1265	Sultan Kudarat	529,834	47,008	85,083	93,751	23,277	11,765	21,610	70,285	96,848	115,361	23,665	26,984	25,186	28,631	52,343	55,490	52,296	79,327	80,676		210	1,525	44	85	160	122,625	176,469	197,722
1280	Sarangani	360,125	4,990	7,986	9,744	5,326	6,061	4,542	10,315	14,047	14,287	61,015	49,244	44,328	24,389	18,970	26,086	85,404	68,214	70,414		1,147	1,679	30	64	99	95,749	83,472	86,478
14	Cordillera AR	1,942,203	64,154	78,545	91,765	11,500	11,474	25,612	75,620	90,019	117,377	11,684	12,806	8,674	12,540	19,369	48,552	23,802	32,169	57,226		149	498	297	288	485	99,718	122,625	175,586
1401	Abra	416,525	9,085	12,264	14,645	6,728	4,168	9,118	15,813	16,432	23,763	7,805	6,794	6,237		29	193	7,805	6,818	6,431			18	9	14	16	23,627	23,263	30,228
1411	Benguet	282,659	3,637	4,760	5,222	352	744	1,058	3,954	5,504	6,279	571	61	35	168	8	4	739	69	39			5	229	170	133	4,923	5,742	6,457
1427	Ifugao	262,821	9,412	13,236	16,304	305	883	872	9,717	14,119	17,176	1,337	1,956	821	3,582	8,436	24,403	4,919	10,392	25,225			12	9	14	46	14,645	24,524	42,458
1432	Kalinga	323,125	23,524	26,485	33,228	1,601	805	1,977	25,125	27,290	35,204	688	484	808	4,722	4,459	12,544	5,410	4,943	13,352	130	441		20	21	28	30,555	32,383	49,025
1444	Mountain Province	215,738	6,930	7,356	5,559	1,744	1,228	895	8,674	8,584	6,454	1,069	2,866	311	1,405	2,517	5,855	2,052	5,384	6,165	19	22		29	27	17	10,755	14,014	12,659
1481	Apayao	441,335	11,567	14,444	16,808	770	3,647	11,693	12,337	18,091	28,501	213	646	462	2,663	3,920	5,553	2,876	4,566	6,015					43	246	15,213	22,699	34,761
15	ARMM	3,351,142	29,979	49,367	54,668	79,044	116,902	151,954	109,023	166,269	206,598	206,179	231,537	234,600	102,389	65,442	58,642	300,372	296,980	293,243	726	1,263		96,750	95,856	95,665	506,145	559,831	596,768
1507	Basilan	322,447	1,703	457	1,010	1,700	1,216	488	3,403	1,673	1,497	4,101	2,667	738				4,101	2,667	738	1	2		18,122	17,611	17,374	25,626	21,952	19,612
1536	Lanao Del Sur	1,349,437	4,884	15,641	16,275	22,453	34,553	43,068	27,337	50,194	59,343	108,734	125,713	94,558	22,176	29,670	18,308	130,910	155,383	112,866	719	1,116		33,415	32,257	30,858	191,662	238,553	204,183
1538	Maguindanao	972,904	23,393	33,269	37,303	44,807	75,692	106,181	68,199	108,961	143,484	76,984	100,271	136,815	69,973	35,773	40,334	146,957	136,044	177,150	5	143		898	940	923	216,055	245,949	321,700
1566	Sulu	343,699			81	7,882	3,898	1,801	7,882	3,898	1,857	15,584	1,529	1,324	10,200			17,624	1,529	1,324				28,130	26,564	27,560	53,636	31,991	30,742
1570	Tawi-Tawi	362,655				2,203	1,543	417	2,203	1,543	417	776	1,357	1,165	40			780	1,357	1,165	1	2		16,184	18,485	18,949	19,166	21,386	20,532
16	Region XIII (Caraga)	2,147,835	53,212	77,424	91,479	42,008	37,577	58,314	95,220	115,001	149,793	67,858	46,342	30,881	2,350	4,396	11,096	68,857	50,517	41,967	3	3		8,725	7,858	5,193	172,801	173,379	196,955
1602	Agusan Del Norte	354,686	10,990	15,077	18,215	10,028	6,832	6,524	21,018	21,909	24,738	24,320	9,646	5,412	260	465	1,256	24,372	10,018	6,668	1	1		941	848	773	46,331	32,777	32,180
1603	Agusan Del Sur	998,952	11,158	26,925	34,829	13,004	16,197	34,897	24,162	43,122	69,726	29,470	30,533	20,173	1,530	3,343	8,927	30,235	33,876	29,100				430	455	491	54,827	77,454	99,317
1667	Surigao Del Norte	197,293	17,473	18,529	16,129	3,165	7,603	7,018	20,637	26,133	23,148	601	436	455	143	405	300	658	841	756				4,283	3,317	1,551	25,578	30,291	25,454
1668	Surigao Del Sur	493,270	13,591	16,893	20,382	15,812	6,944	9,122	29,403	23,837	29,503	13,467	5,727	4,792	417	183	597	13,592	5,782	5,389	2	2		3,071	3,237	2,234	46,065	32,858	37,128
1685	Dinagat Islands	103,634			1,924			753			2,677			49			17			55						144			2,877
17	Mimaropa Region	2,962,087	108,904	131,286	174,861	115,021	112,206	97,468	223,925	243,492	272,329	3,992	4,469	7,193	34,693	28,247	22,992	37,495	32,712	30,131				2,194	2,184	2,481	263,614	278,387	304,942
1740	Marinduque	95,258	1,738	3,401	2,769	10,748	11,028	4,764	12,486	14,429	7,533	455	706	259	754	772	102	1,209	1,478	320				61	79	80	13,756	15,986	7,933
1751	Occidental Mindoro	586,571	40,770	38,139	53,279	29,254	23,760	28,644	70,025	61,899	81,923	546	1,782	3,187	5,080	10,313	14,442	5,408	12,095	17,628				568	482	581	76,000	74,476	100,132
1752	Oriental Mindoro	423,838	46,502	53,849	75,104	29,912	25,226	20,885	76,414	79,074	95,989	175	42	200	5,509	3,215	836	5,579	3,253	1,035				417	412	515	82,410	82,739	97,540
1753	Palawan	1,703,075	15,850	29,940	38,476	33,507	43,632	38,249	49,357	73,572	76,725	1,446	1,302	2,824	20,418	13,218	7,549	20,996	14,520	10,373				648	689	927	71,000	88,780	88,026
1759	Romblon	153,345	4,043	5,958	5,233	11,600	8,560	4,926	15,643	14,518	10,159	1,371	636	723	2,933	731	64	4,304	1,367	774				501	522	378	20,448	16,407	11,312

Source: Philippine Statistics Authority and Survey Team.

Annex 2: Percentages of average planted areas of irrigated and rain-fed rice, white and yellow corn and other crops as proportions of land areas

By Region

Geo Code	Name of locations	Land area (Ha)	Rice average area planted (Ha)									Corn average area planted (Ha)									Sugar cane and cassava average area planted (Ha)						Total average area planted		
			Irrigated rice			Rain-fed rice			Rice total			White corn			Yellow corn			Corn total			Sugar cane			Cassava					
			1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1990-1996	1997-2006	2007-2016	1990-1996	1997-2006	2007-2016	1987/1996-1996	1997-2006	2007-2016
00	Philippines total	100.0%	6.2%	7.8%	9.1%	4.0%	3.8%	4.2%	10.2%	11.6%	13.3%	6.9%	4.6%	3.8%	3.1%	2.8%	3.7%	9.9%	7.4%	7.5%	0.9%	1.1%	1.2%	0.7%	0.6%	0.6%	21.8%	20.7%	22.7%
01	Region I (Ilocos Region)	100.0%	13.2%	17.6%	20.6%	10.6%	9.3%	10.1%	23.9%	26.8%	30.7%	1.7%	1.3%	1.2%	3.6%	3.3%	5.0%	5.3%	4.6%	6.2%	0.0%	0.0%	0.0%	0.2%	0.2%	0.2%	29.4%	31.6%	37.0%
02	Region II (Cagayan Valley)	100.0%	10.6%	14.3%	16.9%	1.9%	2.2%	2.7%	12.5%	16.4%	19.6%	3.3%	1.1%	0.8%	7.3%	9.1%	13.7%	10.6%	10.2%	14.5%	0.0%	0.2%	0.4%	0.0%	0.1%	0.2%	23.1%	26.9%	34.7%
03	Region III (Central Luzon)	100.0%	18.1%	21.0%	27.2%	5.6%	4.1%	3.6%	23.8%	25.1%	30.8%	0.3%	0.3%	0.5%	0.3%	1.2%	1.5%	0.6%	1.5%	2.0%	1.2%	1.1%	0.8%	0.1%	0.1%	0.1%	25.7%	27.7%	33.7%
04	Region IV-A (Calabarzon)	100.0%	5.8%	5.1%	4.8%	3.7%	2.3%	1.8%	9.4%	7.4%	6.6%	5.0%	0.5%	1.1%	3.4%	1.6%	0.8%	8.4%	2.1%	2.0%	1.8%	1.8%	1.8%	0.5%	0.5%	0.5%	20.2%	11.8%	10.9%
05	Region V (Bicol Region)	100.0%	9.5%	9.6%	11.8%	6.7%	6.0%	6.0%	16.2%	15.7%	17.8%	3.5%	2.6%	3.0%	5.6%	2.3%	2.9%	9.1%	4.9%	5.8%	0.2%	0.4%	0.3%	1.7%	1.6%	1.2%	27.1%	22.5%	25.2%
06	Region VI (Western Visayas)	100.0%	9.4%	13.7%	14.6%	13.2%	13.2%	15.3%	22.7%	26.9%	29.9%	1.7%	2.0%	2.3%	2.4%	2.2%	3.6%	4.1%	4.2%	5.9%	9.1%	9.2%	9.8%	0.4%	0.3%	0.3%	36.3%	40.6%	45.9%
07	Region VII (Central Visayas)	100.0%	2.9%	2.8%	3.6%	4.1%	2.9%	2.8%	7.0%	5.7%	6.4%	24.2%	14.3%	13.2%	1.8%	0.7%	0.1%	26.0%	15.0%	13.3%	2.0%	2.6%	2.8%	1.3%	0.9%	0.7%	36.2%	24.1%	23.3%
08	Region VIII (Eastern Visayas)	100.0%	3.9%	4.3%	5.6%	5.4%	5.2%	6.3%	9.3%	9.5%	11.9%	6.9%	2.4%	2.4%	0.1%	0.1%	0.3%	7.0%	2.5%	2.7%	0.5%	0.4%	0.3%	1.1%	1.0%	0.9%	17.8%	13.4%	15.8%
09	Region IX (Zamboanga Peninsula)	100.0%	3.6%	5.6%	5.5%	3.5%	4.1%	3.8%	7.1%	9.7%	9.2%	13.7%	11.7%	7.4%	0.2%	0.2%	0.7%	13.9%	11.9%	8.1%		0.0%	0.0%	0.3%	0.4%	0.4%	21.3%	22.0%	17.7%
10	Region X (Northern Mindanao)	100.0%	4.9%	5.9%	6.5%	1.1%	0.7%	0.9%	6.0%	6.6%	7.4%	13.0%	11.9%	9.5%	4.9%	7.0%	8.7%	17.9%	18.9%	18.2%	1.1%	2.1%	3.2%	0.7%	0.5%	1.1%	25.6%	28.0%	29.9%
11	Region XI (Davao Region)	100.0%	4.0%	4.7%	4.1%	1.0%	0.6%	0.5%	5.0%	5.3%	4.7%	11.5%	8.9%	6.6%	0.3%	0.9%	1.0%	11.7%	9.7%	7.5%	0.2%	0.5%	0.5%	0.1%	0.1%	0.1%	17.1%	15.7%	12.8%
12	Region XII (Soccsksargen)	100.0%	6.6%	11.1%	11.8%	3.0%	2.8%	3.4%	9.6%	13.9%	15.2%	21.5%	9.8%	6.2%	13.3%	10.1%	12.6%	34.8%	19.8%	18.8%	0.1%	0.6%	0.6%	0.1%	0.1%	0.1%	44.6%	34.3%	34.7%
14	Cordillera AR	100.0%	3.3%	4.0%	4.7%	0.6%	0.6%	1.3%	3.9%	4.6%	6.0%	0.6%	0.7%	0.4%	0.6%	1.0%	2.5%	1.2%	1.7%	2.9%		0.0%	0.0%	0.0%	0.0%	0.0%	5.1%	6.3%	9.0%
15	ARMM	100.0%	0.9%	1.5%	1.6%	2.4%	3.5%	4.5%	3.3%	5.0%	6.2%	6.2%	6.9%	7.0%	3.1%	2.0%	1.7%	9.0%	8.9%	8.8%		0.0%	0.0%	2.9%	2.9%	2.9%	15.1%	16.7%	17.8%
16	Region XIII (Caraga)	100.0%	2.5%	3.6%	4.3%	2.0%	1.7%	2.7%	4.4%	5.4%	7.0%	3.2%	2.2%	1.4%	0.1%	0.2%	0.5%	3.2%	2.4%	2.0%		0.0%	0.0%	0.4%	0.4%	0.2%	8.0%	8.1%	9.2%
17	Mimaropa Region	100.0%	3.7%	4.4%	5.9%	3.9%	3.8%	3.3%	7.6%	8.2%	9.2%	0.1%	0.2%	0.2%	1.2%	1.0%	0.8%	1.3%	1.1%	1.0%				0.1%	0.1%	0.1%	8.9%	9.4%	10.3%

By Province

Geo Code	Name of locations	Land area (Ha)	Rice average area planted (Ha)									Corn average area planted (Ha)									Sugar cane and cassava average area planted (Ha)						Total average area planted		
			Irrigated rice			Rain-fed rice			Rice total			White corn			Yellow corn			Corn total			Sugar cane			Cassava					
			1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1990-1996	1997-2006	2007-2016	1990-1996	1997-2006	2007-2016	1987/1996-1996	1997-2006	2007-2016
00	Philippines total	100.0%	6.2%	7.8%	9.1%	4.0%	3.8%	4.2%	10.2%	11.6%	13.3%	6.9%	4.6%	3.8%	3.1%	2.8%	3.7%	9.9%	7.4%	7.5%	0.9%	1.1%	1.2%	0.7%	0.6%	0.6%	21.8%	20.7%	22.7%
01	Region I (Ilocos Region)	100.0%	13.2%	17.6%	20.6%	10.6%	9.3%	10.1%	23.9%	26.8%	30.7%	1.7%	1.3%	1.2%	3.6%	3.3%	5.0%	5.3%	4.6%	6.2%	0.0%	0.0%	0.0%	0.2%	0.2%	0.2%	29.4%	31.6%	37.0%
0128	Ilocos Norte	100.0%	9.6%	14.4%	15.7%	3.1%	2.6%	3.4%	12.8%	17.1%	19.1%	0.8%	1.3%	1.4%	2.6%	2.0%	2.3%	3.4%	3.3%	3.6%		0.0%	0.1%	0.1%	0.1%	0.1%	16.3%	20.6%	22.9%
0129	Ilocos Sur	100.0%	5.7%	7.8%	10.1%	8.1%	8.9%	8.2%	13.9%	16.7%	18.4%	0.7%	0.5%	1.0%	1.5%	2.4%	4.2%	2.2%	2.9%	5.3%		0.0%	0.0%	0.0%	0.0%	0.0%	16.0%	19.6%	23.7%
0133	La Union	100.0%	12.1%	12.7%	14.8%	8.9%	8.7%	9.5%	21.0%	21.4%	24.3%	1.2%	2.1%	1.7%	0.1%	0.8%	2.1%	1.3%	2.9%	3.8%		0.0%	0.0%	0.1%	0.1%	0.1%	22.4%	24.4%	28.2%
0155	Pangasinan	100.0%	19.4%	25.6%	30.2%	17.1%	13.8%	15.4%	36.4%	39.4%	45.6%	3.0%	1.5%	1.1%	6.2%	5.1%	7.8%	9.2%	6.6%	8.9%	0.1%	0.0%	0.0%	0.3%	0.2%	0.2%	45.9%	46.3%	54.8%
02	Region II (Cagayan Valley)	100.0%	10.6%	14.3%	16.9%	1.9%	2.2%	2.7%	12.5%	16.4%	19.6%	3.3%	1.1%	0.8%	7.3%	9.1%	13.7%	10.6%	10.2%	14.5%	0.0%	0.2%	0.4%	0.0%	0.1%	0.2%	23.1%	26.9%	34.7%
0209	Batanes	100.0%			0.0%			0.3%			0.3%			0.2%			0.3%			0.5%		0.0%			0.0%			0.8%
0215	Cagayan	100.0%	7.9%	12.4%	16.8%	3.4%	4.5%	5.2%	11.3%	16.9%	22.0%	1.7%	1.4%	1.3%	3.3%	4.9%	9.3%	5.0%	6.3%	10.6%	0.1%	0.5%	0.6%	0.0%	0.1%	0.1%	16.5%	23.9%	33.3%
0231	Isabela	100.0%	14.4%	18.0%	20.1%	1.4%	1.2%	1.8%	15.8%	19.2%	21.9%	5.8%	1.1%	0.8%	12.7%	14.3%	20.3%	18.6%	15.4%	21.1%		0.0%	0.4%	0.0%	0.1%	0.4%	34.3%	34.7%	43.7%
0250	Nueva Vizcaya	100.0%	8.5%	12.5%	13.5%	0.6%	0.5%	0.9%	9.1%	13.0%	14.5%	0.3%	0.5%	0.3%	2.1%	3.1%	3.5%	2.4%	3.6%	3.8%		0.0%	0.0%	0.0%	0.0%	0.0%	11.5%	16.6%	18.3%
0257	Quirino	100.0%	5.1%	5.8%	7.9%	1.6%	0.9%	0.9%	6.8%	6.8%	8.8%	1.2%	0.4%	0.1%	3.8%	9.8%	14.2%	4.9%	10.2%	14.3%		0.0%	0.0%	0.0%	0.0%	0.3%	11.7%	17.0%	23.4%
03	Region III (Central Luzon)	100.0%	18.1%	21.0%	27.2%	5.6%	4.1%	3.6%	23.8%	25.1%	30.8%	0.3%	0.3%	0.5%	0.3%	1.2%	1.5%	0.6%	1.5%	2.0%	1.2%	1.1%	0.8%	0.1%	0.1%	0.1%	25.7%	27.7%	33.7%
0308	Bataan	100.0%	14.0%	19.6%	22.2%	0.1%	0.1%	0.5%	14.1%	19.7%	22.7%	0.1%	0.2%	0.4%	0.1%	0.2%	0.8%	0.2%	0.4%	1.2%		0.1%	0.1%	0.1%	0.0%	0.1%	14.3%	20.2%	24.0%
0314	Bulacan	100.0%	19.9%	17.9%	21.9%	9.1%	7.4%	5.9%	29.0%	25.2%	27.8%	0.0%	0.2%	0.3%	0.3%	0.2%	0.0%	0.3%	0.3%	0.4%		0.0%	0.0%	0.0%	0.0%	0.0%	29.4%	25.6%	28.2%
0349	Nueva Ecija	100.0%	31.6%	35.1%	45.6%	9.0%	6.8%	6.6%	40.6%	41.9%	52.2%	0.6%	0.5%	0.8%	0.1%	0.2%	0.3%	0.7%	0.6%	1.2%		0.0%	0.0%	0.0%	0.0%	0.0%	41.4%	42.6%	53.4%
0354	Pampanga	100.0%	23.2%	28.5%	39.6%	2.2%	1.6%	1.5%	25.4%	30.2%	41.1%	1.0%	1.6%	1.5%	0.8%	3.3%	4.0%	1.6%	4.9%	5.5%	5.0%	4.3%	2.9%	0.3%	0.3%	0.4%	32.3%	39.7%	49.9%
0369	Tarlac	100.0%	21.7%	29.5%	39.2%	10.2%	5.0%	3.3%	31.9%	34.5%	42.5%	0.2%	0.1%	0.2%	1.3%	5.4%	6.1%	1.5%	5.5%	6.3%	5.6%	4.9%	3.8%	0.0%	0.0%	0.0%	39.0%	44.9%	52.6%
0371	Zambales	100.0%	3.4%	4.3%	5.9%	2.3%	2.2%	2.3%	5.8%	6.5%	8.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%		0.0%	0.0%	0.0%	0.0%	0.1%	5.8%	6.6%	8.3%
0377	Aurora	100.0%	4.7%	5.9%	6.8%	0.7%	0.9%	0.5%	5.4%	6.8%	7.3%	0.0%	0.1%	0.2%	0.0%	0.2%	1.1%	0.0%	0.3%	1.3%				0.0%	0.0%	0.1%	5.5%	7.2%	8.7%
04	Region IV-A (Calabarzon)	100.0%	5.8%	5.1%	4.8%	3.7%	2.3%	1.8%	9.4%	7.4%	6.6%	5.0%	0.5%	1.1%	3.4%	1.6%	0.8%	8.4%	2.1%	2.0%	1.8%	1.8%	1.8%	0.5%	0.5%	0.5%	20.2%	11.8%	10.9%
0410	Batangas	100.0%	4.9%	4.0%	3.0%	5.8%	3.0%	1.5%	10.7%	7.0%	4.5%	22.3%	1.5%	2.3%	10.8%	1.2%	0.4%	33.1%	2.7%	2.7%	7.5%	9.3%	9.5%	0.3%	0.4%	0.3%	51.7%	19.3%	17.1%
0421	Cavite	100.0%	8.6%	7.4%	6.5%	2.3%	1.9%	0.9%	10.8%	9.4%	7.3%	3.5%	0.6%	0.5%	2.6%	0.7%	0.3%	6.2%	1.3%	0.8%		0.2%	0.5%	0.2%	0.2%	0.2%	17.1%	11.1%	8.8%
0434	Laguna	100.0%	15.5%	14.4%	15.2%	1.3%	0.3%	0.2%	16.8%	14.8%	15.4%	2.8%	0.2%	0.5%	0.8%	0.2%	0.2%	3.6%	0.4%	0.7%	4.0%	0.4%	0.1%	0.1%	0.1%	0.1%	24.5%	15.7%	16.2%
0456	Quezon	100.0%	3.6%	2.8%	2.9%	4.0%	2.7%	2.5%	7.6%	5.6%	5.4%	0.1%	0.3%	1.1%	2.1%	2.5%	1.3%	2.2%	2.7%	2.4%			0.0%	0.7%	0.8%	0.7%	10.5%	9.1%	8.5%
0458	Rizal	100.0%	5.7%	6.6%	5.4%	1.0%	0.9%	0.9%	6.7%	7.5%	6.3%	1.3%	0.1%	0.2%	0.1%	0.0%	0.1%	1.3%	0.2%	0.3%				0.1%	0.1%	0.1%	8.2%	7.7%	6.7%
05	Region V (Bicol Region)	100.0%	9.5%	9.6%	11.8%	6.7%	6.0%	6.0%	16.2%	15.7%	17.8%	3.5%	2.6%	3.0%	5.6%	2.3%	2.9%	9.1%	4.9%	5.8%	0.2%	0.4%	0.3%	1.7%	1.6%	1.2%	27.1%	22.5%	25.2%
0505	Albay	100.0%	18.9%	14.7%	15.6%	3.1%	4.2%	4.3%	22.0%	18.9%	19.9%	0.7%	0.5%	1.0%	20.8%	6.8%	7.0%	21.5%	7.3%	8.0%		0.4%	0.4%	1.7%	0.9%	0.7%	45.3%	27.5%	29.0%
0516	Camarines Norte	100.0%	5.7%	5.2%	6.1%	2.0%	2.5%	3.6%	7.8%	7.7%	9.7%	1.7%	0.2%	0.4%	0.1%	0.0%	0.1%	1.8%	0.2%	0.4%				0.3%	0.2%	0.3%	9.9%	8.1%	10.4%
0517	Camarines Sur	100.0%	13.6%	17.1%	21.6%	7.9%	6.8%	7.0%	21.5%	24.0%	28.6%	0.2%	0.3%	0.8%	8.0%	4.2%	6.0%	8.2%	4.4%	6.8%	0.6%	1.0%	0.9%	3.8%	4.1%	3.0%	34.1%	33.5%	39.3%
0520	Catanduanes	100.0%	2.9%	2.7%	3.7%	5.3%	4.3%	4.3%	8.2%	7.0%	8.0%	0.6%	0.1%	0.2%	0.5%	0.1%	0.1%	1.1%	0.2%	0.2%		0.0%	0.0%	0.1%	0.1%	0.1%	9.4%	7.2%	8.3%
0541	Masbate	100.0%	0.8%	0.8%	2.6%	10.2%	9.3%	8.7%	11.1%	10.1%	11.3%	13.2%	10.7%	10.9%	0.2%	0.3%	0.2%	13.2%	10.8%	11.0%				0.2%	0.2%	0.2%	24.5%	21.1%	22.5%
0562	Sorsogon	100.0%	12.8%	11.0%	11.6%	7.3%	4.9%	4.2%	20.1%	16.0%	15.8%	0.2%	0.1%	0.1%	1.4%	0.1%	0.1%	1.6%	0.2%	0.1%		0.0%	0.0%	1.4%	1.3%	1.1%	23.1%	17.4%	17.0%
06	Region VI (Western Visayas)	100.0%	9.4%	13.7%	14.6%	13.2%	13.2%	15.3%	22.7%	26.9%	29.9%	1.7%	2.0%	2.3%	2.4%	2.2%	3.6%	4.1%	4.2%	5.9%	9.1%	9.2%	9.8%	0.4%	0.3%	0.3%	36.3%	40.6%	45.9%
0604	Aklan	100.0%	11.6%	11.5%	10.0%	8.4%	11.7%	10.9%	20.0%	23.2%	20.9%	0.1%	0.0%	0.1%	0.7%	0.2%	0.4%	0.7%	0.2%	0.5%				0.2%	0.4%	0.4%	21.0%	23.8%	21.8%
0606	Antique	100.0%	10.5%	16.2%	16.5%	5.9%	9.0%	12.1%	16.5%	25.2%	28.6%	0.2%	0.1%	0.2%	1.1%	0.5%	0.6%	1.3%	0.7%	0.8%		0.2%	0.3%	0.1%	0.1%	0.1%	17.9%	26.2%	29.9%
0619	Capiz	100.0%	6.1%	9.3%	11.5%	27.0%	31.8%	29.0%	33.1%	41.1%	40.5%	0.2%	0.1%	0.2%	3.6%	4.2%	7.0%	3.8%	4.3%	7.2%	3.2%	3.8%	3.4%	0.3%	0.3%	0.3%	40.4%	49.5%	51.4%
0630	Iloilo	100.0%	14.9%	23.2%	24.4%	24.8%	20.6%	26.9%	39.6%	43.9%	51.3%	0.9%	1.7%	2.2%	4.2%	3.6%	5.9%	5.1%	5.3%	8.0%	3.0%	3.6%	3.5%	0.3%	0.3%	0.3%	48.0%	53.0%	63.1%
1845	Negros Occidental	100.0%	6.5%	9.3%	10.4%	4.4%	3.2%	4.7%	10.9%	12.5%	15.2%	3.6%	3.9%	4.4%	1.7%	1.8%	3.0%	5.3%	5.7%	7.5%	20.9%	20.5%	22.2%	0.7%	0.4%	0.4%	37.8%	39.2%	45.2%
0679	Guimaras	100.0%	4.6%	5.7%	6.0%	21.0%	24.8%	25.3%	25.6%	30.5%	31.3%	1.2%	1.0%	0.8%	1.1%	0.4%	0.4%	2.3%	1.4%	1.2%				0.1%	0.1%	0.1%	28.0%	32.0%	32.7%
07	Region VII (Central Visayas)	100.0%	2.9%	2.8%	3.6%	4.1%	2.9%	2.8%	7.0%	5.7%	6.4%	24.2%	14.3%	13.2%	1.8%	0.7%	0.1%	26.0%	15.0%	13.3%	2.0%	2.6%	2.8%	1.3%	0.9%	0.7%	36.2%	24.1%	23.3%
0712	Bohol	100.0%	3.1%	4.8%	7.1%	12.2%	8.6%	8.1%	15.3%	13.3%	15.3%	7.1%	3.9%	2.8%	0.2%	0.2%	0.0%	7.3%	4.0%	2.9%				2.5%	1.3%	1.1%	25.2%	18.6%	19.3%
0722	Cebu	100.0%	0.7%	0.8%	0.8%	0.5%	0.1%	0.1%	1.3%	0.9%	0.9%	42.7%	21.7%	21.2%	4.3%	1.3%	0.2%	47.0%	23.0%	21.4%	1.9%	1.5%	1.3%	0.7%	0.6%	0.5%	50.9%	26.0%	24.1%
1846	Negros Oriental	100.0%	5.0%	3.0%	3.2%	0.5%	0.8%	0.9%	5.5%	3.7%	4.1%	20.5%	15.8%	14.0%	0.8%	0.6%	0.2%	21.4%	16.4%	14.2%	3.8%	6.0%	7.0%	0.6%	0.5%	0.6%	31.3%	26.7%	25.8%
0761	Siquijor	100.0%	2.5%	2.3%	2.0%	0.4%	0.4%	0.3%	2.8%	2.7%	2.2%	32.4%	23.1%	21.5%	0.4%	0.3%	0.2%	32.5%	23.3%	21.6%				4.2%	3.7%	2.2%	39.6%	29.8%	26.1%

Annex 2: Percentages of average planted areas of irrigated and rain-fed rice, white and yellow corn, sugar cane and cassava to the total land areas (cont.)

Geo Code	Name of locations	Land area (Ha)	Rice average area planted (Ha)									Corn average area planted (Ha)									Sugar cane and cassava average area planted (Ha)						Total average area planted		
			Irrigated rice			Rain-fed rice			Rice total			White corn			Yellow corn			Corn total			Sugar cane			Cassava					
			1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1987-1996	1997-2006	2007-2016	1990-1996	1997-2006	2007-2016	1990-1996	1997-2006	2007-2016	1987/1996-1996	1997-2006	2007-2016
08	Region VIII (Eastern Visayas)	100.0%	3.9%	4.3%	5.6%	5.4%	5.2%	6.3%	9.3%	9.5%	11.9%	6.9%	2.4%	2.4%	0.1%	0.1%	0.3%	7.0%	2.5%	2.7%	0.5%	0.4%	0.3%	1.1%	1.0%	0.9%	17.8%	13.4%	15.8%
0826	Eastern Samar	100.0%	0.2%	0.3%	0.9%	2.8%	2.6%	3.4%	3.0%	3.0%	4.3%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0.5%	0.5%	0.5%	3.5%	3.4%	4.8%
0837	Leyte	100.0%	9.5%	9.7%	12.7%	4.8%	5.5%	7.0%	14.3%	15.2%	19.8%	17.6%	5.7%	5.9%	0.2%	0.3%	0.6%	17.7%	6.0%	6.5%	1.7%	1.5%	1.2%	1.1%	1.1%	1.0%	34.8%	23.8%	28.5%
0848	Northern Samar	100.0%	0.6%	0.9%	1.2%	10.3%	9.4%	9.6%	10.9%	10.3%	10.7%	3.7%	1.7%	1.8%		0.3%	0.5%	3.7%	1.8%	2.3%				0.7%	0.7%	0.7%	15.2%	12.8%	13.7%
0860	Samar (Western Samar)	100.0%	1.5%	2.2%	3.0%	0.5%	0.5%	0.5%	2.0%	2.7%	3.5%	2.2%	0.9%	0.8%	0.0%	0.0%	0.0%	2.2%	0.9%	0.8%		0.0%	0.0%	1.0%	0.8%	0.7%	5.1%	4.5%	5.1%
0864	Southern Leyte	100.0%	1.7%	2.2%	2.7%	22.0%	19.6%	25.7%	23.7%	21.8%	28.3%	11.0%	3.2%	3.1%	0.0%	0.0%	0.2%	11.0%	3.2%	3.3%		0.0%	0.0%	3.2%	3.1%	2.3%	37.9%	28.1%	34.0%
0878	Biliran	100.0%	25.6%	26.4%	27.4%	2.3%	1.9%	0.4%	27.9%	28.4%	27.8%	0.6%	0.8%	0.8%	0.4%	0.4%	0.3%	1.1%	1.2%	1.1%				1.4%	1.2%	1.0%	30.4%	30.7%	30.0%
09	Region IX (Zamboanga Peninsula)	100.0%	3.6%	5.6%	5.5%	3.5%	4.1%	3.8%	7.1%	9.7%	9.2%	13.7%	11.7%	7.4%	0.2%	0.2%	0.7%	13.9%	11.9%	8.1%		0.0%	0.0%	0.3%	0.4%	0.4%	21.3%	22.0%	17.7%
0972	Zamboanga Del Norte	100.0%	1.3%	1.9%	1.9%	2.6%	2.5%	2.5%	3.9%	4.4%	4.5%	11.0%	8.4%	4.8%	0.0%	0.1%	0.2%	11.0%	8.5%	5.0%		0.0%	0.0%	0.1%	0.2%	0.2%	15.1%	13.0%	9.7%
0973	Zamboanga Del Sur	100.0%	7.7%	9.1%	9.3%	6.2%	4.7%	2.8%	13.9%	13.8%	12.1%	24.4%	17.3%	12.8%	0.4%	0.4%	1.3%	24.8%	17.7%	14.1%		0.0%	0.0%	0.3%	0.2%	0.5%	38.9%	31.8%	26.7%
0983	Zamboanga Sibugay	100.0%		6.4%	4.9%		5.7%	7.2%		12.1%	12.2%		8.4%	3.0%		0.1%	0.2%		8.5%	3.2%		0.0%	0.0%		0.1%	0.1%		20.7%	15.5%
10	Region X (Northern Mindanao)	100.0%	4.9%	5.9%	6.5%	1.1%	0.7%	0.9%	6.0%	6.6%	7.4%	13.0%	11.9%	9.5%	4.9%	7.0%	8.7%	17.9%	18.9%	18.2%	1.1%	2.1%	3.2%	0.7%	0.5%	1.1%	25.6%	28.0%	29.9%
1013	Bukidnon	100.0%	5.4%	5.8%	7.3%	1.4%	0.2%	0.9%	6.8%	6.1%	8.2%	11.1%	4.8%	3.1%	8.9%	12.6%	15.1%	20.1%	17.3%	18.1%	2.1%	4.0%	6.3%	0.6%	0.5%	1.3%	29.6%	28.0%	33.9%
1018	Camiguin	100.0%	3.0%	2.5%	2.6%		0.0%	0.0%	3.0%	2.5%	2.6%	2.7%	2.1%	1.7%	0.1%	0.1%	0.2%	2.7%	2.1%	1.9%				4.3%	1.9%	1.1%	10.1%	6.5%	5.5%
1035	Lanao Del Norte	100.0%	5.8%	8.8%	7.8%	1.5%	2.6%	1.7%	7.3%	11.4%	9.5%	21.3%	30.1%	23.7%	0.4%	1.4%	1.8%	21.7%	31.5%	25.5%				0.1%	0.3%	0.3%	29.1%	43.1%	35.4%
1042	Misamis Occidental	100.0%	5.2%	7.8%	8.3%	0.4%	0.3%	0.7%	5.5%	8.1%	9.0%	8.7%	11.9%	12.0%	0.1%	0.2%	0.6%	8.7%	12.0%	12.6%				0.4%	0.2%	0.8%	14.6%	20.3%	22.4%
1043	Misamis Oriental	100.0%	2.1%	1.6%	1.7%	0.3%	0.1%	0.1%	2.4%	1.7%	1.8%	11.8%	12.2%	11.1%	1.6%	1.6%	3.2%	13.4%	13.8%	14.4%		0.0%	0.0%	1.3%	0.8%	1.6%	17.2%	16.4%	17.8%
11	Region XI (Davao Region)	100.0%	4.0%	4.7%	4.1%	1.0%	0.6%	0.5%	5.0%	5.3%	4.7%	11.5%	8.9%	6.6%	0.3%	0.9%	1.0%	11.7%	9.7%	7.5%	0.2%	0.5%	0.5%	0.1%	0.1%	0.1%	17.1%	15.7%	12.8%
1123	Davao Del Norte	100.0%	13.9%	11.7%	8.0%	4.5%	0.7%	0.7%	18.4%	12.5%	8.7%	35.0%	10.5%	3.3%	0.8%	0.6%	1.5%	35.7%	11.1%	4.8%		0.0%	0.0%	0.4%	0.2%	0.1%	54.4%	23.8%	13.7%
1124	Davao Del Sur	100.0%	3.7%	3.6%	3.7%	0.4%	0.2%	0.1%	4.1%	3.8%	3.8%	7.7%	7.9%	7.2%	0.3%	0.5%	0.8%	7.9%	8.4%	8.0%	0.7%	1.6%	1.4%	0.1%	0.1%	0.1%	12.9%	13.9%	13.3%
1125	Davao Oriental	100.0%	1.5%	1.8%	1.9%	0.4%	0.9%	0.6%	1.9%	2.6%	2.6%	11.1%	10.6%	8.0%	0.1%	0.8%	0.5%	11.1%	11.2%	8.5%		0.0%	0.0%	0.1%	0.1%	0.1%	13.1%	13.9%	11.1%
1182	Compostela Valley	100.0%		4.9%	4.6%		0.7%	0.9%		5.6%	5.5%		7.1%	6.3%		1.5%	1.5%		8.7%	7.7%		0.0%	0.0%		0.1%	0.1%		14.4%	13.3%
1186	Davao Occidental																												
12	Region XII (Soccsksargen)	100.0%	6.6%	11.1%	11.8%	3.0%	2.8%	3.4%	9.6%	13.9%	15.2%	21.5%	9.8%	6.2%	13.3%	10.1%	12.6%	34.8%	19.8%	18.8%	0.1%	0.6%	0.6%	0.1%	0.1%	0.1%	44.6%	34.3%	34.7%
1247	Cotabato (North Cotabato)	100.0%	5.9%	9.1%	10.0%	2.8%	4.0%	4.1%	8.6%	13.1%	14.1%	17.1%	7.6%	4.0%	8.3%	7.0%	10.0%	25.5%	14.6%	14.1%	0.3%	1.1%	1.0%	0.1%	0.1%	0.1%	34.5%	28.9%	29.2%
1263	South Cotabato	100.0%	9.7%	16.4%	15.6%	3.0%	1.8%	3.2%	12.7%	18.2%	18.8%	54.5%	16.7%	7.4%	38.2%	20.4%	24.7%	92.7%	37.1%	32.1%		0.2%	0.2%	0.1%	0.0%	0.4%	105.4%	55.6%	51.4%
1265	Sultan Kudarat	100.0%	8.9%	16.1%	17.7%	4.4%	2.2%	4.1%	13.3%	18.3%	21.8%	4.5%	5.1%	4.8%	5.4%	9.9%	10.5%	9.9%	15.0%	15.2%		0.0%	0.3%	0.0%	0.0%	0.0%	23.1%	33.3%	37.3%
1280	Sarangani	100.0%	1.4%	2.2%	2.7%	1.5%	1.7%	1.3%	2.9%	3.9%	4.0%	16.9%	13.7%	12.3%	6.8%	5.3%	7.2%	23.7%	18.9%	19.6%		0.3%	0.5%	0.0%	0.0%	0.0%	26.6%	23.2%	24.0%
14	Cordillera AR	100.0%	3.3%	4.0%	4.7%	0.6%	0.6%	1.3%	3.9%	4.6%	6.0%	0.6%	0.7%	0.4%	0.6%	1.0%	2.5%	1.2%	1.7%	2.9%		0.0%	0.0%	0.0%	0.0%	0.0%	5.1%	6.3%	9.0%
1401	Abra	100.0%	2.2%	2.9%	3.5%	1.6%	1.0%	2.2%	3.8%	3.9%	5.7%	1.9%	1.6%	1.5%		0.0%	0.0%	1.9%	1.6%	1.5%			0.0%	0.0%	0.0%	0.0%	5.7%	5.6%	7.3%
1411	Benguet	100.0%	1.3%	1.7%	1.8%	0.1%	0.3%	0.4%	1.4%	1.9%	2.2%	0.2%	0.0%	0.0%	0.1%	0.0%	0.0%	0.3%	0.0%	0.0%			0.0%	0.1%	0.1%	0.0%	1.7%	2.0%	2.3%
1427	Ifugao	100.0%	3.6%	5.0%	6.2%	0.1%	0.3%	0.3%	3.7%	5.4%	6.5%	0.5%	0.7%	0.3%	1.4%	3.2%	9.3%	1.9%	4.0%	9.6%			0.0%	0.0%	0.0%	0.0%	5.6%	9.3%	16.2%
1432	Kalinga	100.0%	7.3%	8.2%	10.3%	0.5%	0.2%	0.6%	7.8%	8.4%	10.9%	0.2%	0.1%	0.3%	1.5%	1.4%	3.9%	1.7%	1.5%	4.1%		0.1%	0.0%	0.0%	0.0%	0.0%	9.5%	10.0%	15.2%
1444	Mountain Province	100.0%	3.2%	3.4%	2.6%	0.8%	0.6%	0.4%	4.0%	4.0%	3.0%	0.5%	1.3%	0.1%	0.7%	1.2%	2.7%	1.0%	2.5%	2.9%		0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	6.5%	5.9%
1481	Apayao	100.0%	2.6%	3.3%	3.8%	0.2%	0.8%	2.6%	2.8%	4.1%	6.5%	0.0%	0.1%	0.1%	0.6%	0.9%	1.3%	0.7%	1.0%	1.4%					0.0%	0.1%	3.4%	5.1%	7.9%
15	ARMM	100.0%	0.9%	1.5%	1.6%	2.4%	3.5%	4.5%	3.3%	5.0%	6.2%	6.2%	6.9%	7.0%	3.1%	2.0%	1.7%	9.0%	8.9%	8.8%		0.0%	0.0%	2.9%	2.9%	2.9%	15.1%	16.7%	17.8%
1507	Basilan	100.0%	0.5%	0.1%	0.3%	0.5%	0.4%	0.2%	1.1%	0.5%	0.5%	1.3%	0.8%	0.2%				1.3%	0.8%	0.2%		0.0%	0.0%	5.6%	5.5%	5.4%	7.9%	6.8%	6.1%
1536	Lanao Del Sur	100.0%	0.4%	1.2%	1.2%	1.7%	2.6%	3.2%	2.0%	3.7%	4.4%	8.1%	9.3%	7.0%	1.6%	2.2%	1.4%	9.7%	11.5%	8.4%		0.1%	0.1%	2.5%	2.4%	2.3%	14.2%	17.7%	15.1%
1538	Maguindanao	100.0%	2.4%	3.4%	3.8%	4.6%	7.8%	10.9%	7.0%	11.2%	14.7%	7.9%	10.3%	14.1%	7.2%	3.7%	4.1%	15.1%	14.0%	18.2%		0.0%	0.0%	0.1%	0.1%	0.1%	22.2%	25.3%	33.1%
1566	Sulu	100.0%			0.0%	2.3%	1.1%	0.5%	2.3%	1.1%	0.5%	4.5%	0.4%	0.4%	3.0%			5.1%	0.4%	0.4%				8.2%	7.7%	8.0%	15.6%	9.3%	8.9%
1570	Tawi-Tawi	100.0%				0.6%	0.4%	0.1%	0.6%	0.4%	0.1%	0.2%	0.4%	0.3%	0.0%			0.2%	0.4%	0.3%		0.0%	0.0%	4.5%	5.1%	5.2%	5.3%	5.9%	5.7%
16	Region XIII (Caraga)	100.0%	2.5%	3.6%	4.3%	2.0%	1.7%	2.7%	4.4%	5.4%	7.0%	3.2%	2.2%	1.4%	0.1%	0.2%	0.5%	3.2%	2.4%	2.0%		0.0%	0.0%	0.4%	0.4%	0.2%	8.0%	8.1%	9.2%
1602	Agusan Del Norte	100.0%	3.1%	4.3%	5.1%	2.8%	1.9%	1.8%	5.9%	6.2%	7.0%	6.9%	2.7%	1.5%	0.1%	0.1%	0.4%	6.9%	2.8%	1.9%		0.0%	0.0%	0.3%	0.2%	0.2%	13.1%	9.2%	9.1%
1603	Agusan Del Sur	100.0%	1.1%	2.7%	3.5%	1.3%	1.6%	3.5%	2.4%	4.3%	7.0%	3.0%	3.1%	2.0%	0.2%	0.3%	0.9%	3.0%	3.4%	2.9%				0.0%	0.0%	0.0%	5.5%	7.8%	9.9%
1667	Surigao Del Norte	100.0%	8.9%	9.4%	8.2%	1.6%	3.9%	3.6%	10.5%	13.2%	11.7%	0.3%	0.2%	0.2%	0.1%	0.2%	0.2%	0.3%	0.4%	0.4%				2.2%	1.7%	0.8%	13.0%	15.4%	12.9%
1668	Surigao Del Sur	100.0%	2.8%	3.4%	4.1%	3.2%	1.4%	1.8%	6.0%	4.8%	6.0%	2.7%	1.2%	1.0%	0.1%	0.0%	0.1%	2.8%	1.2%	1.1%		0.0%	0.0%	0.6%	0.7%	0.5%	9.3%	6.7%	7.5%
1685	Dinagat Islands	100.0%			1.9%			0.7%			2.6%			0.0%			0.0%			0.1%						0.1%			2.8%
17	Mimaropa Region	100.0%	3.7%	4.4%	5.9%	3.9%	3.8%	3.3%	7.6%	8.2%	9.2%	0.1%	0.2%	0.2%	1.2%	1.0%	0.8%	1.3%	1.1%	1.0%				0.1%	0.1%	0.1%	8.9%	9.4%	10.3%
1740	Marinduque	100.0%	1.8%	3.6%	2.9%	11.3%	11.6%	5.0%	13.1%	15.1%	7.9%	0.5%	0.7%	0.3%	0.8%	0.8%	0.1%	1.3%	1.6%	0.3%				0.1%	0.1%	0.1%	14.4%	16.8%	8.3%
1751	Occidental Mindoro	100.0%	7.0%	6.5%	9.1%	5.0%	4.1%	4.9%	11.9%	10.6%	14.0%	0.1%	0.3%	0.5%	0.9%	1.8%	2.5%	0.9%	2.1%	3.0%				0.1%	0.1%	0.1%	13.0%	12.7%	17.1%
1752	Oriental Mindoro	100.0%	11.0%	12.7%	17.7%	7.1%	6.0%	4.9%	18.0%	18.7%	22.6%	0.0%	0.0%	0.0%	1.3%	0.8%	0.2%	1.3%	0.8%	0.2%				0.1%	0.1%	0.1%	19.4%	19.5%	23.0%
1753	Palawan	100.0%	0.9%	1.8%	2.3%	2.0%	2.6%	2.2%	2.9%	4.3%	4.5%	0.1%	0.1%	0.2%	1.2%	0.8%	0.4%	1.2%	0.9%	0.6%				0.0%	0.0%	0.1%	4.2%	5.2%	5.2%
1759	Romblon	100.0%	2.6%	3.9%	3.4%	7.6%	5.6%	3.2%	10.2%	9.5%	6.6%	0.9%	0.4%	0.5%	1.9%	0.5%	0.0%	2.8%	0.9%	0.5%				0.3%	0.3%	0.2%	13.3%	10.7%	7.4%

Source: Philippine Statistics Authority and Survey Team.

Annex 3: State-wise reference mechanization potential and estimated purchase market size

Geo Code	Regions	Current known mechani-zation status	Average area harvested in 2007-2016 (ha)			Reference mechanization potential			Estimated new purchase market size	
			Rice	Corn	Total	Rice	Corn	Total	Units to be sold	USD'000 value
			a	b	c=a+b	d=a/50ha	e=b/50ha	f=c/50ha	g=f*50%	h=g*price
00	**Philippines total**		**4,550,994**	**2,574,693**	**7,125,687**	**91,020**	**51,494**	**142,514**	**71,257**	**1,425,137**
01	**Region I (Ilocos Region)**		**398,996**	**80,429**	**479,425**	**7,980**	**1,609**	**9,589**	**4,794**	**95,885**
0128	Ilocos Norte		66,212	12,653	78,865	1,324	253	1,577	789	15,773
0129	Ilocos Sur		47,641	13,680	61,321	953	274	1,226	613	12,264
0133	La Union		36,384	5,663	42,047	728	113	841	420	8,409
0155	Pangasinan		248,760	48,434	297,193	4,975	969	5,944	2,972	59,439
02	**Region II (Cagayan Valley)**	**High**	**554,216**	**409,165**	**963,381**	**11,084**	**8,183**	**19,268**	**9,634**	**192,676**
0209	Batanes		62	117	179	1	2	4	2	36
0215	Cagayan		204,844	98,597	303,441	4,097	1,972	6,069	3,034	60,688
0231	Isabela		271,294	262,071	533,365	5,426	5,241	10,667	5,334	106,673
0250	Nueva Vizcaya		57,568	15,126	72,694	1,151	303	1,454	727	14,539
0257	Quirino		20,447	33,255	53,702	409	665	1,074	537	10,740
03	**Region III (Central Luzon)**	**High**	**677,775**	**44,272**	**722,047**	**13,556**	**885**	**14,441**	**7,220**	**144,409**
0308	Bataan		31,170	1,632	32,802	623	33	656	328	6,560
0314	Bulacan		77,788	986	78,774	1,556	20	1,575	788	15,755
0349	Nueva Ecija		300,300	6,729	307,029	6,006	135	6,141	3,070	61,406
0354	Pampanga		84,785	11,248	96,033	1,696	225	1,921	960	19,207
0369	Tarlac		129,783	19,165	148,948	2,596	383	2,979	1,489	29,790
0371	Zambales		31,098	294	31,392	622	6	628	314	6,278
0377	Aurora		22,851	4,218	27,069	457	84	541	271	5,414
04	**Region IV-A (Calabarzon)**		**111,711**	**32,959**	**144,670**	**2,234**	**659**	**2,893**	**1,447**	**28,934**
0410	Batangas		14,138	8,543	22,680	283	171	454	227	4,536
0421	Cavite		11,559	1,249	12,809	231	25	256	128	2,562
0434	Laguna		29,516	1,324	30,840	590	26	617	308	6,168
0456	Quezon		48,968	21,464	70,432	979	429	1,409	704	14,086
0458	Rizal		7,530	380	7,910	151	8	158	79	1,582
05	**Region V (Bicol Region)**		**322,930**	**105,327**	**428,257**	**6,459**	**2,107**	**8,565**	**4,283**	**85,651**
0505	Albay		51,186	20,605	71,791	1,024	412	1,436	718	14,358
0516	Camarines Norte		22,464	1,025	23,488	449	20	470	235	4,698
0517	Camarines Sur		157,214	37,349	194,564	3,144	747	3,891	1,946	38,913
0520	Catanduanes		11,911	349	12,259	238	7	245	123	2,452
0541	Masbate		46,717	45,707	92,424	934	914	1,848	924	18,485
0562	Sorsogon		33,438	292	33,731	669	6	675	337	6,746
06	**Region VI (Western Visayas)**		**621,404**	**122,664**	**744,068**	**12,428**	**2,453**	**14,881**	**7,441**	**148,814**
0604	Aklan		37,989	995	38,985	760	20	780	390	7,797
0606	Antique		78,095	2,048	80,143	1,562	41	1,603	801	16,029
0619	Capiz		105,124	18,684	123,808	2,102	374	2,476	1,238	24,762
0630	Iloilo	Medium	260,434	40,796	301,230	5,209	816	6,025	3,012	60,246
1845	Negros Occidental		120,818	59,416	180,233	2,416	1,188	3,605	1,802	36,047
0679	Guimaras		18,944	725	19,669	379	14	393	197	3,934
07	**Region VII (Central Visayas)**		**101,520**	**211,696**	**313,216**	**2,030**	**4,234**	**6,264**	**3,132**	**62,643**
0712	Bohol	Low	73,680	13,913	87,593	1,474	278	1,752	876	17,519
0722	Cebu		4,992	114,268	119,260	100	2,285	2,385	1,193	23,852
1846	Negros Oriental		22,105	76,220	98,326	442	1,524	1,967	983	19,665
0761	Siquijor		742	7,294	8,037	15	146	161	80	1,607
08	**Region VIII (Eastern Visayas)**		**275,719**	**62,566**	**338,284**	**5,514**	**1,251**	**6,766**	**3,383**	**67,657**
0826	Eastern Samar		20,010	233	20,243	400	5	405	202	4,049
0837	Leyte		128,808	42,328	171,136	2,576	847	3,423	1,711	34,227
0848	Northern Samar		39,571	8,463	48,034	791	169	961	480	9,607
0860	Samar (Western Samar)		21,438	4,937	26,375	429	99	527	264	5,275
0864	Southern Leyte		50,968	6,014	56,982	1,019	120	1,140	570	11,396
0878	Biliran		14,923	592	15,515	298	12	310	155	3,103
09	**Region IX (Zamboanga Peninsula)**		**155,246**	**136,217**	**291,463**	**3,105**	**2,724**	**5,829**	**2,915**	**58,293**
0972	Zamboanga Del Norte		32,644	36,458	69,102	653	729	1,382	691	13,820
0973	Zamboanga Del Sur		71,677	83,466	155,143	1,434	1,669	3,103	1,551	31,029
0983	Zamboanga Sibugay		43,931	11,711	55,642	879	234	1,113	556	11,128

Annex 3: State-wise reference mechanization potential and estimated purchase market size (cont.)

Geo Code	Regions	Current known mechani-zation status	Average area harvested in 2007-2016 (ha)			Reference mechanization potential			Estimated new purchase market size	
			Rice	Corn	Total	Rice	Corn	Total	Units to be sold	USD'000 value
			a	b	c=a+b	d=a/50ha	e=b/50ha	f=c/50ha	g=f*50%	h=g*price
10	**Region X (Northern Mindanao)**		**150,796**	**373,678**	**524,474**	**3,016**	**7,474**	**10,489**	**5,245**	**104,895**
1013	Bukidnon		85,645	190,343	275,988	1,713	3,807	5,520	2,760	55,198
1018	Camiguin		617	441	1,058	12	9	21	11	212
1035	Lanao Del Norte		39,722	106,150	145,872	794	2,123	2,917	1,459	29,174
1042	Misamis Occidental		18,501	25,859	44,360	370	517	887	444	8,872
1043	Misamis Oriental		6,311	50,885	57,195	126	1,018	1,144	572	11,439
11	**Region XI (Davao Region)**		**94,913**	**153,230**	**248,143**	**1,898**	**3,065**	**4,963**	**2,481**	**49,629**
1123	Davao Del Norte		29,897	16,504	46,401	598	330	928	464	9,280
1124	Davao Del Sur		25,885	53,862	79,747	518	1,077	1,595	797	15,949
1125	Davao Oriental		14,575	48,297	62,873	292	966	1,257	629	12,575
1182	Compostela Valley		24,556	34,567	59,123	491	691	1,182	591	11,825
1186	Davao Occidental									
12	**Region XII (Soccsksargen)**		**339,671**	**419,924**	**759,595**	**6,793**	**8,398**	**15,192**	**7,596**	**151,919**
1247	Cotabato (North Cotabato)		126,700	126,888	253,588	2,534	2,538	5,072	2,536	50,718
1263	South Cotabato		83,323	141,946	225,270	1,666	2,839	4,505	2,253	45,054
1265	Sultan Kudarat		115,361	80,676	196,037	2,307	1,614	3,921	1,960	39,207
1280	Sarangani		14,287	70,414	84,701	286	1,408	1,694	847	16,940
14	**Cordillera AR**		**117,377**	**57,226**	**174,603**	**2,348**	**1,145**	**3,492**	**1,746**	**34,921**
1401	Abra		23,763	6,431	30,194	475	129	604	302	6,039
1411	Benguet		6,279	39	6,319	126	1	126	63	1,264
1427	Ifugao		17,176	25,225	42,400	344	504	848	424	8,480
1432	Kalinga		35,204	13,352	48,556	704	267	971	486	9,711
1444	Mountain Province		6,454	6,165	12,619	129	123	252	126	2,524
1481	Apayao		28,501	6,015	34,516	570	120	690	345	6,903
15	**ARMM**		**206,598**	**293,243**	**499,840**	**4,132**	**5,865**	**9,997**	**4,998**	**99,968**
1507	Basilan		1,497	738	2,236	30	15	45	22	447
1536	Lanao Del Sur		59,343	112,866	172,209	1,187	2,257	3,444	1,722	34,442
1538	Maguindanao		143,484	177,150	320,633	2,870	3,543	6,413	3,206	64,127
1566	Sulu		1,857	1,324	3,182	37	26	64	32	636
1570	Tawi-Tawi		417	1,165	1,581	8	23	32	16	316
16	**Region XIII (Caraga)**		**149,793**	**41,967**	**191,760**	**2,996**	**839**	**3,835**	**1,918**	**38,352**
1602	Agusan Del Norte		24,738	6,668	31,406	495	133	628	314	6,281
1603	Agusan Del Sur		69,726	29,100	98,826	1,395	582	1,977	988	19,765
1667	Surigao Del Norte		23,148	756	23,903	463	15	478	239	4,781
1668	Surigao Del Sur		29,503	5,389	34,892	590	108	698	349	6,978
1685	Dinagat Islands		2,677	55	2,732	54	1	55	27	546
17	**Mimaropa Region**		**272,329**	**30,131**	**302,461**	**5,447**	**603**	**6,049**	**3,025**	**60,492**
1740	Marinduque		7,533	320	7,853	151	6	157	79	1,571
1751	Occidental Mindoro		81,923	17,628	99,551	1,638	353	1,991	996	19,910
1752	Oriental Mindoro		95,989	1,035	97,025	1,920	21	1,940	970	19,405
1753	Palawan		76,725	10,373	87,099	1,535	207	1,742	871	17,420
1759	Romblon		10,159	774	10,934	203	15	219	109	2,187

Note:
1) The optimal working area of a combine harvester is assumed to be 50 ha per unit combine harvester.
2) The same combine harvester is used to harvest rice and corn.
3) The new purchase market estimation parameter is established at 50% based on the sale performance of a private company in the Philippines.
4) The price of a combine harvester is set at USD20,000/unit.
Source: Philippine Statistics Authority and Survey Team.

Annex 4: Production Loan Easy Access (PLEA) Lending Conduits per Province and Type

Region and Province	Type 1 or 2[*1]	Name of Lending Conduits
Region I (Ilocos Region)		
Ilocos Norte & Ilocos Sur		
	1	Nueva Segovia Consortium of Cooperative
	1	Ilocos Consolidated Cooperative Bank
La Union		
	1	Cooperative Bank of La Union
Region II (Cagayan Valley)		
Isabela, Nueva Vizcaya & Quirino		
	1	Cordon Multi-Purpose Cooperative
	1	Mallig FST Multi-Purpose Cooperative
	1	San Manuel Multi-Purpose Cooperative
	1	Cooperative Bank of Nueva Vizcaya
Region III (Central Luzon)		
Bataan		
	1	Dinalupihan Multi-Purpose Cooperative
	1	Watchlife Workers Multi-Purpose Cooperative
	1	Capitol Employees of Bataan Multi-Purpose Cooperative
	1	Abucay Multi-Purpose Cooperative
	1	Iwahori Multi-Purpose Cooperative
	1	Lingap Kapwa Multi-Purpose Cooperative
	1	Kaizen Multi-Purpose Cooperative
Nueva Ecija		
	1	Bongabon Municipal Employees Multi- Purpose Cooperative
	1	Eastern Primary Multi-Purpose Cooperative
	1	Simula ng Panibagong Bukas Multi- Purpose Cooperative
	1	New Rural Bank of San Leonardo
	2	Parcutela Multi-Purpose Cooperative
Region IV-A (Calabarzon)		
Batangas		
	2	Sorosoro Multi-Purpose and Allied Services Cooperative
Laguna		
	1	Sentrong Ugnayan ng Mamamayang Pilipino
Quezon		
	1	Cooperative Bank of Quezon Province
	1	RHUDARDA Multi-Purpose Cooperative
	1	Dolores Development Cooperative
Region IV-B (Mimaropa Region)		
Occidental Mindoro		
	1	Cooperative Bank of Occidental Mindoro
Oriental Mindoro		
	1	Saklaw Foundation, Inc.
Region V (Bicol Region)		
Region VI (Western Visayas)		
Antique		
	1	Pandan Multi-Purpose Cooperative
	1	Antique Provincial Government Employees' Multi-Purpose Cooperative
	1	Egaña Parish Credit Cooperative
Iloilo		
	1	Kooperatiba Naton Multi-Purpose Cooperative
	1	Rural Bank of Miagao, Inc.
Negros Occidental		
	1	Negros Cooperative Bank
Region VII (Central Visayas)		
Bohol		
	1	Metro Ormoc Community Multi-Purpose Cooperative (OCCCI)
Negros Oriental		

Annex 4: Production Loan Easy Access (PLEA) Lending Conduits per Province and Type (cont.)

Region and Province	Type 1 or 2[*1]	Name of Lending Conduits
	1	Negros Oriental Sugar Planters Multi-Purpose Agricultural Cooperative
	1	Cooperative Bank of Negros Oriental
Siquijor		
	1	Paglaum Multi-Purpose Cooperative
	1	Catulayan Community Multi-Purpose Cooperative
Region VIII (Eastern Visayas)		
Eastern Samar		
	2	Farmers Entrepreneurs Association
Northern Samar		
	1	Agricultural Development Workers and Employees Multi-Purpose Cooperative
	1	Samar Multi-purpose Cooperative
	1	Hibubullao Multi-Purpose Cooperative
	2	Coops for Christ Northern Samar Multi-Purpose Cooperative
	2	Nortehanon Access Center Inc.
	2	Samahan ng Mga Kababaihan Sa Barangay
	2	Allen Organic Vegetable Raisers
	2	Ginulgan Farmers Entrepreneur Association
	2	St. John the Baptist Multi-Purpose Cooperative
	2	Victoria Multi-Purpose Cooperative
	2	San Isidro 1st Movement for Peace and Progress Association
	2	Mainland Farmers Producers Cooperative
Western Samar		
	2	Basey Farmers Rain-fed Producers Association
Region IX (Zamboanga Peninsula)		
Zamboanga del Norte		
	1	Piñan Multi-Purpose Cooperative
	1	Bayside Multi-Purpose Cooperative
	1	Tampilisan United Farmers' Multi-Purpose Cooperative
Region X (Northern Mindanao)		
Bukidnon		
	1	Mindanao Consolidated Cooperative Bank
	1	Sta. Monica of Pangantucan Multi-Purpose Cooperative
	1	Lumintao Farmers Multi-Purpose Cooperative
	1	Philippine International Travel Assistance Center Multi-Purpose Cooperative
Region XI (Davao Region)		
Region XII (Soccsksargen)		
North Cotabato		
	1	Taculen Farmers Multi-Purpose Cooperative
	1	Don Bosco Multi-Purpose Cooperative
	1	Alamada Multi-Purpose Cooperative
	1	Cooperative Bank of Cotabato
	1	Rural Bank of Midsayap
	1	Mua-an Farmers Producers Cooperative
	2	Tulunan Fresh Fruits Producers Processor Cooperative
	2	TM OFW Multi-Purpose Cooperative
	2	Carmen Agriculture Resources and Development Multi-Purpose Cooperative
	2	Matalam Rubber Planters Integrated Cooperative
	2	Sumbac Multi-Purpose Cooperative
	2	Muslim Lumad Christian Marketing Cooperative
	2	Midpapan2 Water Service Cooperative
	2	Nicaan Barangay Water Service Association-1
South Cotabato		
	1	San Jose Multi-Purpose Cooperative

Annex 4: Production Loan Easy Access (PLEA) Lending Conduits per Province and Type (cont.)

Region and Province	Type 1 or 2*[1]	Name of Lending Conduits
Sarangani		
	1	Kiamba Micro Entrepreneurs Multi-Purpose Cooperative
	1	United Maligang Farmers Multi-Purpose Cooperative
	1	Communal Tree Planters Multi-Purpose Cooperative
	1	Malapatan Multi-Purpose Cooperative
	1	Sarangani Vegetable Seed Growers Multi-Purpose Cooperative
	1	Pangi Multi-Purpose Cooperative
	1	Muslim Christian Fisherfolk Multi-Purpose Cooperative
	1	Glan Multi-Purpose Cooperative
	1	Sapu Masla Taliawid Producers Multi-Purpose Cooperative
	1	Sta Cruz Multi-Purpose Cooperative
	1	Alabel Government Employees and Peoples Multi-Purpose Cooperative
	1	Upper Lumabat Small Farmers Producers Cooperative
	2	Glan Sarangani Credit Cooperative
Region XIII (Caraga)		
Agusan del Sur		
	1	Dacutan Farmers' Multi-Purpose Cooperative
	1	Farmers Alternative for Self-Reliance Multi-Purpose Cooperative
	1	Mindanao Consolidated Cooperative Bank
	1	Boan Barangay Irrigation Development Association, Inc.
	1	Southern Agusan Seed Producers Cooperative
Surigao del Norte		
	1	Malimono Multi-Purpose Cooperative
Cordillera Administrative Region (CAR)		
Benguet		
	1	Cattubo Multi-Purpose Cooperative
	1	Bad-ayan Buguias Development Multi-Purpose Cooperative
	1	Mountain Blooms Multi-Purpose Cooperative
	2	Lengaoan Indigenous Farmers Multi- Purpose Cooperative
	2	PAKIYA Multi-Purpose Cooperative
	2	Benguet Traders Multi-Purpose Cooperative
	2	Bashoy Farmers Multi-Purpose Cooperative
	2	Tabano Obang Livelihood Project Association
	2	Self-Reliant Team Cooperative of La Trinidad
	2	La Trinidad Organic Farmers Practitioners Multi-Purpose Cooperative
	2	Sheckdan Strawberry Growers and Processors Association
	2	Baculongan Norte Farmers Association Inc.
	2	Oclupan Clan Farmers Association Inc.
	2	Apanberang Farmers Association
Apayao		
	1	Apayao Vegetable Seed Growers Multi-Purpose Cooperative
	1	Calaoan Agrarian Reform Beneficiaries Multi-Purpose Cooperative
	1	Conner Multi-Purpose Cooperative
	2	Flora Multi-Purpose Cooperative
	2	New Cabatacan Multi-Purpose Cooperative
ARMM		

Note: 1) Eligibility for Type 1 or Type 1 Lending Conduits of Production Loan Easy Access (PLEA) are: Based on an excerpt of the Program for Unified Lending to Agriculture (PUNLA) Track 1: Special Lending Facility for Marginal Farmers and Fisherfolk Implementing Guidelines approved by the Department of Agriculture Secretary dated 24 August 2016. Eligible Lending Conduits are non-government organizations (NGOs), cooperatives and cooperative banks, categorized as follows:

1. Type 1 Lending Conduits

Type 1 conduits are cooperatives, cooperative banks and NGOs that are currently accredited by or have been/are qualified under any existing partnership under the ACPC lending programs and/or with any of the following institutions/programs: Land Bank of the Philippines, People's Credit and Finance Corporation, Agricultural Guarantee Fund Pool, Development

Bank of the Philippines, Small Business Guarantee and Finance Corporation.

2. Type 2 Lending Conduits

Type 2 conduits are cooperatives/farmers organizations and NGOs that are not qualified as Type 1 conduits, but comply with the following basic eligibility criteria:

Criteria item	Minimum Criteria
a) Juridical Personality	Duly registered with the Securities and Exchange Commission, Cooperative Development Authority, Department of Labor and Employment or other government agencies.
b) Governance	The organization must be endorsed by a government agency/instrumentality and with an existing set of elected officers with good character reference.
c) Core Management Team	Presence of a manager, treasurer and bookkeeper who can be part-time or full-time
d) Financial Transaction	Must have an existing bank account in the name of the organization. If none, pre-release should be contingent on compliance therewith.
e) Paid-up capital/Savings	Must have contributions (cash or kind) and/or savings from members.

Type 2 conduits that have developed a satisfactory track record in the program after at least a year may graduate into Type 1 conduits. They must have (a) good repayment performance (due past ration not exceeding 5%) and (b) an established financial recording and control system.

Source: 2018. ACPC

Annex 5: Sample Memorandum of Agreement for Type 1 and 2 Lending Conduits

Sample Memorandum of Agreement for Type 1 Lending Conduit

MEMORANDUM OF AGREEMENT

KNOW ALL MEN BY THESE PRESENTS:

This Agreement is hereby made and entered to into this _ day of 2017 in Pasig City, Philippines, by and between:

The AGRICULTURAL CREDIT POLICY COUNCIL, an agency attached to the Department of Agriculture created pursuant to Executive Order No. 113 with office address at the 28thFloor, One San Miguel Avenue Building, San Miguel Avenue, Ortigas Center, Pasig City Philippines, represented herein by its Executive Director, JOCELYN ALMA R. BADIOLA, herein referred to as the "ACPC";

and,

The COOPERATIVE BANK OF XXXXX (CBX), a cooperative banking institution organized and existing under and by virtue of the Laws of the Republic of the Philippines with business office and postal address located at Executive Office, XXXX, XXXXX City represented herein by its President, XXXXX XXXXX, for Finance, XXXXX XXXXX, and Head Office Cashier, XXXXX XXXXX, and hereinafter referred to as the "Lending Conduit"

WITNESSETH:

WHEREAS, ACPC is mandated under EO 113 to assist the Department of Agriculture (DA) in synchronizing all agriculture and fisheries credit policies and programs and to review and evaluate the economic soundness of all agriculture and fisheries credit programs;

WHEREAS, by virtue of R.A. 7607 (Magna Carta for Small Farmers), the role of ACPC has been expanded to include the conduct of: (i) special projects to promote innovative financing schemes for small farmers and fisherfolk; (ii) institutional capacity building programs that will support the establishment of strong and viable farmers and fisherfolk organizations; and (iii) an intensive information drive that will improve credit awareness;

WHEREAS, in support of the DA's major thrusts and programs in alleviating poverty among small farmers and fisherfolk particularly in critical areas identified by the DA and requiring development intervention, the DA Secretary has identified pilot areas for the implementation of the Production Loan Easy Access (PLEA) adopting the basic features of the Program for Unified Lending in Agriculture (PUNLA) which is a special credit facility for marginal farmers and fisherfolk in the poorest provinces of the country;

WHEREAS, eligible organizations such as Cooperatives/Farmers Organizations, Cooperative Banks, Rural Banks, and Non-Governmental Organizations (NGOs) will be tapped to act as lending conduits to extend loans in a manner that is fast and convenient for intended borrowers of the program accordance with approved guidelines, policies, and procedures;

WHEREAS, the Lending Conduit, through its Board Resolution No. 262, Series of 2017 dated 13 September 2017, signified its intention to act as a lending conduit of PLEA under PUNLA, and has been evaluated by the ACPC as an eligible Lending Conduit in accordance with the implementing guidelines of the program;

NOW, THEREFORE, for and in consideration of the foregoing premises and of the mutual covenants hereinafter set forth, the ACPC and the Lending Conduit hereby agree on the following

ARTICLE I

The Production Loan Easy Access (PLEA)

The Production Loan Easy Access (PLEA), a special credit facility under the Program for Unified Lending to Agriculture (PUNLA), hereinafter referred to as PLEA, which is designed to address the financial needs of farmers and fisherfolk-borrowers that are classified as poor in a manner that is fast and convenient and at a cost that is affordable to intended borrowers.

Non-collateralized loans for agri-fishery production and agri-microfinance will be made available to poor farmers and fishers in the program pilot areas. The Lending Conduit shall act as the administrator of credit to intended beneficiaries of the program.

ARTICLE II Program Coverage Area

The program shall be implemented by the Lending Conduit for the benefit of its marginal/small farmer-members residing in the province of XXXXX. Other areas may be included in the coverage areas upon mutual agreement by the parties.

ARTICLE III

Fund Management Arrangement

1) Fund Allocation

The initial amount of FORTY MILLION PESOS (PHP40, 000,000.00), hereinafter referred to as the "Fund" is hereby established in favor of the Lending Conduit. The Fund may be increased subject to the approval by the ACPC which shall be relayed to the Lending Conduit thru a letter of Fund approval and which shall be subject to the terms and conditions stipulated in this Agreement.

2) Fund Releases

The Fund to be released by ACPC shall be deposited to the Lending Conduit's bank account for the PLEA fund and shall be based on the list of borrowers with the corresponding approved loan amount approved by the Lending Conduit and submitted to ACPC.

3) Purpose of the Fund

The Lending Conduit shall utilize the Fund for lending to finance the agri-fishery projects and other income generating activities of marginal farmers and fisherfolk and their households in accordance with the lending guidelines provided in Article IV hereof and other policies, guidelines, and procedures to be adopted by the Lending Conduit for PLEA subject to the approval by the ACPC.

4) Loan Disbursement

The Lending Conduit shall identify, screen, evaluate and process loan applications and submit to ACPC the list of borrowers with approved loans with corresponding loan amount. Upon authorization by the ACPC of the approved loan amount indicated in the submitted list, the Lending Conduit shall effect the release of the loans to corresponding borrowers in the list not later than 30 days which may be extended subject for approval by the ACPC.

5) Loan Collection

The Lending Conduit shall collect all principal and interest from borrowers under the credit program and remit all principal collections to the account of the Agricultural Credit Policy Council. Immediately upon remittance of the principal collection, the Lending Conduit shall notify the ACPC in writing specifying therein the amount and date of remittance and location of the receiving bank branch.

6) Liability of the Lending Conduit

6.1 The Lending Conduit, acting as Attorney-In-Fact of ACPC, shall not bear credit risk from loan losses arising from extending loans to poor farmers and fisherfolk-borrowers under the program;

6.2 In the event, however, that the Lending Conduit was found by ACPC to have utilized the program fund, or portion thereof, not in accordance with the implementing guidelines in Article V hereof and such other policies, guidelines and procedures duly approved by the ACPC, the latter shall demand the immediate return of such Fund or portion thereof not utilized in accordance with the approved guidelines;

6.3 For failure to return the funds that are subject of demand by the ACPC, a penalty equivalent to 12% per annum may be imposed against the Lending Conduit effective from the date of notice from ACPC demanding the return of such funds until the same is fully returned by the Lending Conduit to ACPC. Moreover, it is understood that the ACPC reserves the right to file the necessary legal actions and/or impose the appropriate sanctions as a consequence of the violation committed by the Lending Conduit.

ARTICLE IV Lending Guidelines

The Lending Conduit shall open a special credit facility for PLEA wherein it shall lend to eligible farmers and fisherfolk and their households in accordance with the lending guidelines hereto attached as Annex A which shall form part of this agreement and conform to the following:

1. Eligible borrowers are marginal and small farmers, small fisherfolk and farmworkers defined as follows:

1.1 Small Farmer: Refers to “natural person dependent on small-scale subsistence farming or fishing activity as primary source of income” (Section 4, RA 8435/AFMA), i.e., those who (a) own or are still amortizing lands that are not more than three (3) hectares, tenants, leaseholders, and stewards (Presidential AO No. 21 of 2011, Revised IRR of RA 8425/Social Reform Act); or (b) engaged in backyard livestock and poultry raising defined by Philippine Statistics Authority(PSA) as engaged in: (a) livestock raising not exceeding any of the following: (i) 20 head of adults and zero young, (ii) 40 head of young animals, (iii) 10 head of adults and 22 head of young animals; and (b) poultry raising not exceeding: (i) 500 layers or 1,000 broilers, (ii) 100 layers and 100 broilers if raised in combination, (iii) 100 head of duck;

1.2 Small Fishefolk: Refers to those directly or indirectly engaged in taking, culturing, or processing fishery or aquatic resources, to include, (a) those engaged in fishing using gears that do not require boats or boats less than three (3) tons, in municipal waters coastal and marine areas; (b) workers in commercial fishing and aquaculture; (c) vendors and processors of fish and coastal products; (d) subsistence producers such as shell- gatherers, managers, and producers of mangrove resources, and other related producers (Presidential AO No. 21 of 2011, Revised IRR of RA 8425/Social Reform Act);

1.3 Farmworker: Refers to natural person who renders service for value as employee or laborer in an agricultural enterprise or farm regardless of whether his compensation is paid on a daily, weekly, monthly or "pakyaw" basis and includes “regular or seasonal farm workers”.(Section3, RA 6657, Comprehensive Agrarian Law of 1998);

1.4 Marginal Farmers: Refers to small farmers and fisherfolk whose incomes are within the poverty threshold as defined by the National Economic Development Authority (NEDA).

2. Loan Purpose

Loans availed under PLEA shall be used to finance the production of crops, livestock and poultry. Loan amount shall be based on the production requirements.

3. Loan Limit to Borrowers

The amount shall be based on the production requirement of the project but shall not exceed P50,000.00 per borrower except for high value crops such as garlic, onion, mango and such other crops that will be identified for the priority development by the DA of which loan limit shall not exceed P150,000.00.

4. Loan Maturity and Mode of Payment

The loan maturity shall be determined by the Lending Conduit based on the production cycle/ gestation period of the project of the SFF borrowers which may be from 2 years term but not to exceed ten (10) years;

5. Finance Charge

Loans extended to borrowers shall bear interest of 6% per annum payable on due date. The interest shall not be deducted in advance from the loan. Such income from the lending operation shall accrue to the Lending Conduit which may be used by the latter to cover its operating expenses incurred in administering the program.

ARTICLE V Duties and Responsibilities of the Parties

1. The ACPC shall:

1.1 Effect the release of funds directly to the Lending Conduit's bank deposit account for PLEA;

1.2 Monitor and evaluate the Lending Conduit's performance in the implementation of the PLEA credit project;

1.3 Train the Lending Conduit on how to access and use the ACPC Program Management Information System (ACPC MIS) -- a computerized system of data collection, management, and report generation for the Program;

1.4 Coordinate with the DA-Regional Field Office (RFO) and other agencies for the provision of technical, marketing, and such other support for PLEA;

2. The Lending Conduit shall:

2.1 Identify eligible borrowers and process loan applications in accordance with the approved PLEA lending guidelines;

2.2 Disburse the proceeds of the PLEA Fund directly to borrowers with approved loans in accordance with the list submitted by the Lending Conduit to ACPC;

2.3 Utilize the Fund with diligence in implementing the PLEA as if the Lending Conduit is the owner of the Fund;

2.4 Maintain a separate financial recording system for PLEA and ensure that all fund transactions pertaining to fund disbursements and collection are accurately recorded in a manner consistent with acceptable accounting principles;

2.5 Open a separate bank account where PLEA Funds and loan collections shall be deposited and maintained. The Lending Conduit shall execute a deed of assignment with undertaking in favor of ACPC assigning all rights over said separate bank account.

2.6 Designate the authorized signatory/ies for all fund transactions pertaining to program fund disbursements;

2.7 Collect from end-borrowers with diligence as an owner of the fund would and deposit such loan collections to the bank deposit account designated for PLEA;

2.8 Use the ACPC Program Management Information System (ACPC MIS) in recording all information required by DA/ACPC on borrowers and loans under the Program and abides by the terms and conditions set by ACPC on the use and access of the system.

2.9 Submit to ACPC monthly reports on fund disbursements and loan collection.

ARTICLE VI Miscellaneous Provisions

1. This Agreement shall be binding upon and to the benefit of ACPC and the Lending Conduit and their respective successors and assignees.

2. This Agreement constitutes the entire agreement of the parties with respect to the subject matter hereof and shall supersede any prior expressions of intent or understanding with respect to the transaction.

3. In the event that any provision of this Agreement or any portion thereof is declared invalid or ineffective by a court of competent authority, the rest of the provisions thereof not affected shall remain in full force and in effect.

ARTICLE VII Effectivity and Termination

This Agreement shall take effect immediately upon signing hereof by both parties and shall remain in force and effect over a period of two (2) years unless extended or terminated by either of the parties hereto or their successors through a formal written notice at least ninety (90) days prior to termination thereof.

ARTICLE VIII Amendments

The amendments, modifications or alterations to this Agreement shall be valid or binding for either party unless otherwise expressed in writing and executed with the same formality as this Agreement.

IN WITNESS WHEREOF, the parties, through their duly authorized representatives, have hereunto affixed their signatures on this day of 2017, Pasig City.

AGRICULTURAL CREDIT POLICY COUNCIL (ACPC)	COOPERATIVE BANK OF XXXXXX (Lending Conduit)
JOCELYN ALMA R. BADIOLA Executive Director	XXXXX XXXXX President XXXXX XXXXX VP for Finance XXXXX XXXXX Head Office Cashier

SIGNED IN THE PRESENCE OF:

ACKNOWLEDGMENT

REPUBLIC OF THE PHILIPPINES
) S.S.

BEFORE ME, this day of 2017 at:

Name Gov't-issued ID
Expiry

JOCELYN ALMA R. BADIOLA TIN - 102985564
XXXXX XXXXX
XXXXX XXXXX
XXXXX XXXXX

known to me to be the same persons who executed the foregoing instrument and who acknowledged to me that the same is their free and voluntary act and deed, and the free and voluntary act and deed of the entity they represent. This instrument refers to a Memorandum of Agreement consisting of six (6) pages, including this page wherein the acknowledgment is written, signed by the parties and their witnesses on each and every page thereof.

IN WITNESS WHEREOF, I have hereunto set my hand and seal on this day of 2017.

NOTARY PUBLIC

Doc. No.
Page No.
Book No.
Series of 2017

Source: ACPC

Sample Memorandum of Agreement for Type 2 Lending Conduit

MEMORANDUM OF AGREEMENT KNOW ALL MEN BY THESE PRESENTS:

This Agreement made and entered to into this day of 2017 in Pasig City, Philippines, by and between:

The AGRICULTURAL CREDIT POLICY COUNCIL, an agency attached to the Department of Agriculture created pursuant to Executive Order No. 113 with office address at the 28th Floor, One San Miguel Avenue Building, San Miguel Avenue, Ortigas Center, Pasig City Philippines, represented herein by its Executive Director, JOCELYN ALMA R. BADIOLA, herein referred to as the "ACPC";

And,

The XXXX RUBBER PLANTERS INTEGRATED COOPERATIVE, a cooperative institution organized and existing under and by virtue of the Laws of the Republic of the Philippines with business office and postal address located at XXX, XXXX, Cotabato represented herein by its Chairperson, XXXXX XXXX and its Manager, XXXX XXXX hereinafter referred to as the "Lending Conduit".

WITNESSETH:

WHEREAS, ACPC is mandated under EO 113 to assist the Department of Agriculture (DA) in synchronizing all agriculture and fisheries credit policies and programs and to review and evaluate the economic soundness of all agriculture and fisheries credit programs;

WHEREAS, by virtue of R.A. 7607 (Magna Carta for Small Farmers), the role of ACPC has been expanded to include the conduct of: (i) special projects to promote innovative financing schemes for small farmers and fisherfolk; (ii) institutional capacity building programs that will support the establishment of strong and viable farmers and fisherfolk organizations; and (iii) an intensive information drive that will improve credit awareness;

WHEREAS, in support of the DA's major thrusts and programs in alleviating poverty among small farmers and fisherfolk particularly in critical areas identified by the DA that need development intervention, the ACPC has developed a Program for Unified Lending for Agriculture (PUNLA) which is a special credit facility for marginal farmers and fisherfolk;

WHEREAS, the PUNLA taps eligible organizations such as cooperatives, Peoples Organizations (POs) and Non-Governmental Organizations (NGOs) to act as lending conduits to extend loans in a manner that is fast and convenient to intended borrowers of the program in accordance with approved guidelines, policies and procedures;

WHEREAS, the Lending Conduit, through its Board Resolution No. 27, Series of 2017, signified its intention to act as a lending conduit of PUNLA, and has been evaluated by the ACPC as an eligible Type 2 Lending Conduit in accordance with the implementing guidelines of the program;

NOW, THEREFORE, for and in consideration of the foregoing premises and of the mutual covenants hereinafter set forth, the ACPC and the Lending Conduit hereby agree on the following:

ARTICLE I The Program

The Program for Unified Lending to Agriculture Track 1, hereinafter referred to as PUNLA, is a special lending facility designed to address the financial needs of farmers and fisherfolk-borrowers that are classified as poor. The facility seeks to extend credit that is fast, convenient and at a cost affordable to intended borrowers.

Non-collateralized loans for agri-fishery production and agri-microfinance will be made available to poor farmers and fishers and/or their households in the program coverage areas. The Lending Conduit shall act as administrator of credit to intended beneficiaries of the program in accordance with the duly approved PUNLA Credit Project Operations Guidelines.

ARTICLE II Program Coverage Areas

The program shall be implemented by the Lending Conduit in the province of XXXX covering the municipality of XXXXX. Other cities/municipalities may be included in the coverage areas upon mutual agreement by the parties.

ARTICLE III

Duties and Responsibilities of the Parties

1. The ACPC shall:

1.1 Make funds available to finance the credit requirements of eligible borrowers identified and endorsed by the Lending Conduit (LC) for financing under PUNLA;

1.2 Tap a Cashiering Institution to provide cashiering (fund disbursement) and deposit taking services (receiving of loan collections) for the LC's lending activity under PUNLA;

1.3 Effect the release of loan funds to the Cashiering Institution based on the total loans approved by the Lending Conduit and submitted to ACPC;

1.4 Monitor and evaluate the Lending Conduit's performance in the implementation of the PUNLA credit project;

1.5 Coordinate with the DA-Regional Field Office (RFO) and other agencies for the provision of technical, marketing and such other support for PUNLA;

2. The Lending Conduit shall have the following responsibilities:

2.1 Orient its members about the PUNLA and its implementing guidelines, procedures and requirements;

2.2 Identify eligible borrowers and process loan applications in accordance with the approved PUNLA lending guidelines and PUNLA credit operations guidelines to be developed by the Lending Conduit and approved by the ACPC;

2.3 Assist its individual member-borrowers in opening their savings account with the designated Cashiering Institution for its PUNLA credit project;

2.4 Submit to ACPC the list of member-borrowers with corresponding individual amount of approved loans;

2.5 Ensure that each member-borrower with approved loan has executed a promissory note (PN) corresponding to the loan amount received. The original copies of the duly signed PNs shall be submitted to ACPC through its designated official representative;

2.6 Maintain individual loan ledgers of member-borrowers under PUNLA and ensure that fund disbursements by the Cashiering Institution to individual borrowers as well as loan collections from the borrowers are accurately recorded in a manner consistent with acceptable accounting principles;

2.7 Collect, with diligence, from individual member-borrowers the principal and interest payments and remit all principal collections to ACPC's deposit account with the Cashiering Institution;

2.8 May charge an appropriate fee to cover its administrative expenses for loan processing and collecting loan repayments but such fee shall not to exceed 6% per annum;

2.9 Submit to ACPC a monthly report on the actual amount of loans received by the member- borrowers and amount of loans collected/deposited in the ACPC deposit account; and,

2.10 Cooperate and participate in the PUNLA management structure created by the DA and/or ACPC.

ARTICLE IV LENDING GUIDELINES

The Lending Conduit shall implement its lending activities for PUNLA in accordance with the Credit Project Operational Guidelines to be drawn and agreed upon by the ACPC and the Lending Conduit during the a credit project planning workshop to be conducted by ACPC and which shall form part of this Agreement.

ARTICLE V Miscellaneous Provisions

1. This Agreement shall be binding upon and to the benefit of ACPC and the Lending Conduit and their respective successors and assignees.

2. This Agreement constitutes the entire agreement of the parties with respect to the subject matter hereof and shall supersede any prior expressions of intent or understanding with respect to the transaction.

3. In the event that any provision of this Agreement or any portion thereof is declared invalid or ineffective by a court of competent authority, the rest of the provisions thereof not affected shall remain in full force and in effect.

ARTICLE VI Effectivity and Termination

This Agreement shall take effect upon signing hereof and shall continue to be in full force and effect for a period of one year, subject to renewal, unless revoked or terminated by either party through a formal written notice to the other party. The termination shall be effective upon the 30th calendar day following the notice, unless a later date is set forth. It is understood that upon termination of the Program, the Lending Conduit shall make proper turn-over of all residual assets of the Fund, if any, to include cash balances and loan receivables which solely belongs to the ACPC.

ARTICLE VII Amendments

The amendments, modifications, or alterations to this Agreement shall be valid or binding for either party unless otherwise expressed in writing and executed with the same formality as this Agreement.

IN WITNESS WHEREOF, the parties, through their duly authorized representatives, have hereunto affixed their signatures on this day of 2017, Pasig City.

AGRICULTURAL CREDIT POLICY COUNCIL (ACPC)	XXXXX RUBBER PLANTERS INTEGRATED COOPERATIVE (Lending Conduit)
JOCELYN ALMA R. BADIOLA Executive Director	XXXXX XXXXX Chairperson XXXXX XXXXX Manager

SIGNED IN THE PRESENCE OF:

ACKNOWLEDGMENT

REPUBLIC OF THE PHILIPPINES
) S.S.

BEFORE ME, this day of 2017 at :

Name	Gov' t-issued ID	Expiry
JOCELYN ALMA R.	TIN: 102-985-564	
XXXXX XXXXX		
XXXXX XXXXX		

known to me to be the same persons who executed the foregoing instrument and who acknowledged to me that the same is their free and voluntary act and deed, and the free and voluntary act and deed of the entities they represent. This instrument refers to a Memorandum of Agreement consisting of four (4) pages, including this page wherein the acknowledgment is written, signed by the parties and their witnesses on each and every page thereof.

IN WITNESS WHEREOF, I have hereunto set my hand and seal on this day of 2017.

NOTARY PUBLIC

Doc. No.
Page No.
Book No.
Series of 2017

Source: ACPC

Annex 6: Conservative estimation of expected demand of combine harvesters by rural cooperatives and equivalent target group category

Region / Province	Target areas (500m from paved roads, equal to or less than 5 degree slope in cereals and sugar areas)		No. of cooperatives by size class (only large + medium and small cooperatives)			% of cooperatives by size class			Expected % of large and medium cooperatives, and small cooperatives and equivalents procured combine harvesters			Expected demand of combine harvesters by small cooperatives and equivalent		
	Target area	No of combine harvesters	Actor A PHP mill. >15	**Actor B** PHP mill. 15> >3	Total	Actor A PHP mill. >15	**Actor B** PHP mill. 15> >3	Total	Actor A PHP mill. >15	**Actor B** PHP mill. 15> >3	Total	Actor A PHP mill. >15	**Actor B** PHP mill. 15> >3	Total
	(ha)	(no.)	(no.)	(no.)	(no.)	(%)	(%)	(%)	(%)	(%)	(%)	(no.)	(no.)	(no.)
	a	b=a/50ha*50%	c	d	e=c+d	f	g	h=f+g	i=k-j	j=g/5	k=i+j	l=b*i	m=b*j	n=l+m
Total/Average	**1,533,330**	**15,333**	**506**	**795**	**1,301**	**39%**	**61%**	**100%**	**87%**	**13%**	**100%**	**13,085**	**1,963**	**15,047**
Total (Excluding Regions I, II, and III)												**6,668**	**1,006**	**7,674**
Region I	**209,314**	**2,093**	**34**	**68**	**102**	**33%**	**67%**	**100%**	**86%**	**14%**	**100%**	**1,808**	**285**	**2,093**
Ilocos Norte	26,867	269	6	8	14	43%	57%	100%	89%	11%	100%	238	31	269
Ilocos Sur	20,706	207	9	13	22	41%	59%	100%	88%	12%	100%	183	24	207
La Union	15,650	157	3	8	11	27%	73%	100%	85%	15%	100%	134	23	157
Pangasinan	146,091	1,461	16	39	55	29%	71%	100%	86%	14%	100%	1,254	207	1,461
Region II	**111,266**	**1,113**	**48**	**41**	**89**	**54%**	**46%**	**100%**	**91%**	**9%**	**100%**	**1,008**	**104**	**1,113**
Cagayan	40,224	402	12	15	27	44%	56%	100%	89%	11%	100%	358	45	402
Isabela	54,723	547	24	17	41	59%	41%	100%	92%	8%	100%	502	45	547
Nueva Vizcaya	10,799	108	9	6	15	60%	40%	100%	92%	8%	100%	99	9	108
Quirino	5,520	55	3	3	6	50%	50%	100%	90%	10%	100%	50	6	55
Region III	**435,167**	**4,352**	**69**	**143**	**212**	**33%**	**67%**	**100%**	**87%**	**13%**	**100%**	**3,600**	**568**	**4,168**
Aurora	5,498	55	3	1	4	75%	25%	100%	95%	5%	100%	52	3	55
Bataan	15,195	152	7	10	17	41%	59%	100%	88%	12%	100%	134	18	152
Bulacan	82,287	823	15	48	63	24%	76%	100%	85%	15%	100%	697	125	823
Nueva Ecija	119,113	1,191	31	54	85	36%	64%	100%	87%	13%	100%	1,040	151	1,191
Pampanga	95,759	958	6	17	23	26%	74%	100%	85%	15%	100%	816	142	958
Tarlac	98,916	989	7	13	20	35%	65%	100%	87%	13%	100%	861	129	989
Zambales	18,399	184												
Region IV-A	**140,872**	**1,409**	**44**	**67**	**111**	**40%**	**60%**	**100%**	**88%**	**12%**	**100%**	**1,207**	**202**	**1,409**
Batangas	43,160	432	21	25	46	46%	54%	100%	89%	11%	100%	385	47	432
Cavite	45,393	454	2	13	15	13%	87%	100%	83%	17%	100%	375	79	454
Laguna	34,486	345	3	13	16	19%	81%	100%	84%	16%	100%	289	56	345
Quezon	7,811	78	16	12	28	57%	43%	100%	91%	9%	100%	71	7	78
Rizal	10,021	100	2	4	6	33%	67%	100%	87%	13%	100%	87	13	100
Region IV-B	**45,059**	**451**	**40**	**60**	**100**	**40%**	**60%**	**100%**	**88%**	**12%**	**100%**	**397**	**54**	**451**
Marinduque	96	1		3	3		100%	100%	80%	20%	100%	1	0	1
Occidental Mindoro	22,835	228	18	27	45	40%	60%	100%	88%	12%	100%	201	27	228
Oriental Mindoro	11,760	118	6	10	16	38%	63%	100%	88%	13%	100%	103	15	118
Palawan	9,205	92	16	15	31	52%	48%	100%	90%	10%	100%	83	9	92
Romblon	1,163	12		5	5		100%	100%	80%	20%	100%	9	2	12
Region V	**80,600**	**806**	**14**	**29**	**43**	**33%**	**67%**	**100%**	**87%**	**13%**	**100%**	**684**	**122**	**806**
Albay	14,447	144		2	2		100%	100%	80%	20%	100%	116	29	144
Camarines Norte	1,071	11	3	4	7	43%	57%	100%	89%	11%	100%	9	1	11
Camarines Sur	37,554	376	7	15	22	32%	68%	100%	86%	14%	100%	324	51	376
Catanduanes	803	8		2	2		100%	100%	80%	20%	100%	6	2	8
Masbate	23,726	237	1	3	4	25%	75%	100%	85%	15%	100%	202	36	237
Sorsogon	2,999	30	3	3	6	50%	50%	100%	90%	10%	100%	27	3	30
Region VI	**177,739**	**1,777**	**46**	**84**	**130**	**35%**	**65%**	**100%**	**87%**	**13%**	**100%**	**1,561**	**216**	**1,777**
Aklan	2,677	27	4	5	9	44%	56%	100%	89%	11%	100%	24	3	27
Antique	14,178	142	5	2	7	71%	29%	100%	94%	6%	100%	134	8	142
Capiz	11,693	117	3	19	22	14%	86%	100%	83%	17%	100%	97	20	117
Guimaras	3,948	39	3		3	100%		100%	100%		100%	39		39
Iloilo	50,095	501	13	12	25	52%	48%	100%	90%	10%	100%	453	48	501
Negros Occidental	95,147	951	18	46	64	28%	72%	100%	86%	14%	100%	815	137	951
Region VII	**44,179**	**442**	**7**	**10**	**17**	**41%**	**59%**	**100%**	**88%**	**12%**	**100%**	**317**	**29**	**345**
Bohol	12,708	127	4	9	13	31%	69%	100%	86%	14%	100%	109	18	127
Cebu	21,817	218	3	1	4	75%	25%	100%	95%	5%	100%	207	11	218
Negros Oriental	6,430	64												
Siquijor	3,224	32												
Region VIII	**38,578**	**386**	**10**	**14**	**24**	**42%**	**58%**	**100%**	**88%**	**12%**	**100%**	**307**	**73**	**380**
Biliran	1,485	15	1	2	3	33%	67%	100%	87%	13%	100%	13	2	15
Eastern Samar														
Leyte	510	5	6	10	16	38%	63%	100%	88%	13%	100%	4	1	5
Northern Samar	34,949	349		1	1		100%	100%	80%	20%	100%	280	70	349
Samar	530	5												
Southern Leyte	1,104	11	3	1	4	75%	25%	100%	95%	5%	100%	10	1	11
Region IX	**19,081**	**191**	**10**	**16**	**26**	**38%**	**62%**	**100%**	**88%**	**12%**	**100%**	**166**	**25**	**191**
Zamboanga Del Norte	3,179	32	2	5	7	29%	71%	100%	86%	14%	100%	27	5	32
Zamboanga Del Sur	10,217	102	6	7	13	46%	54%	100%	89%	11%	100%	91	11	102
Zamboanga Sibugay	5,686	57	1	4	5	20%	80%	100%	84%	16%	100%	48	9	57
Region X	**72,815**	**728**	**31**	**69**	**100**	**31%**	**69%**	**100%**	**86%**	**14%**	**100%**	**621**	**107**	**728**
Bukidnon	58,769	588	14	40	54	26%	74%	100%	85%	15%	100%	501	87	588
Camiguin														
Lanao del Norte	6,449	64	1	13	14	7%	93%	100%	81%	19%	100%	53	12	64
Misamis Occidental	2,876	29	8	5	13	62%	38%	100%	92%	8%	100%	27	2	29
Misamis Oriental	4,721	47	8	11	19	42%	58%	100%	88%	12%	100%	42	5	47
Region XI	**26,603**	**266**	**42**	**49**	**91**	**46%**	**54%**	**100%**	**89%**	**11%**	**100%**	**237**	**29**	**266**
Compostela Valley	7,323	73	10	12	22	45%	55%	100%	89%	11%	100%	65	8	73
Davao Del Norte	1,986	20	17	16	33	52%	48%	100%	90%	10%	100%	18	2	20
Davao Del Sur	14,859	149	3	4	7	43%	57%	100%	89%	11%	100%	132	17	149
Davao Occidental				1	1		100%	100%	80%	20%	100%			
Davao Oriental	2,435	24	5	4	9	56%	44%	100%	91%	9%	100%	22	2	24
Region XII	**101,587**	**1,016**	**43**	**55**	**98**	**44%**	**56%**	**100%**	**89%**	**11%**	**100%**	**900**	**116**	**1,016**
North Cotabato	32,791	328	10	20	30	33%	67%	100%	87%	13%	100%	284	44	328
Sarangani	6,849	68	3	4	7	43%	57%	100%	89%	11%	100%	61	8	68
South Cotabato	32,532	325	21	19	40	53%	48%	100%	91%	10%	100%	294	31	325
Sultan Kudarat	29,415	294	9	12	21	43%	57%	100%	89%	11%	100%	261	34	294
Region XIII	**23,586**	**236**	**21**	**37**	**58**	**36%**	**64%**	**100%**	**87%**	**13%**	**100%**	**208**	**27**	**236**
Agusan Del Norte	2,919	29	5	9	14	36%	64%	100%	87%	13%	100%	25	4	29
Agusan Del Sur	4,729	47	8	18	26	31%	69%	100%	86%	14%	100%	41	7	47
Dinagat Islands	124	1		1	1		100%	100%	80%	20%	100%	1	0	1
Surigao Del Norte	4,592	46	3	3	6	50%	50%	100%	90%	10%	100%	41	5	46
Surigao Del Sur	11,221	112	5	6	11	45%	55%	100%	89%	11%	100%	100	12	112
CAR	**6,885**	**69**	**47**	**53**	**100**	**47%**	**53%**	**100%**	**89%**	**11%**	**100%**	**61**	**7**	**69**
Abra	2,465	25	4	3	7	57%	43%	100%	91%	9%	100%	23	2	25
Apayao	2,442	24	2	7	9	22%	78%	100%	84%	16%	100%	21	4	24
Benguet	177	2	14	30	44	32%	68%	100%	86%	14%	100%	2	0	2
Ifugao	213	2	10	3	13	77%	23%	100%	95%	5%	100%	2	0	2
Kalinga	1,355	14	8	5	13	62%	38%	100%	92%	8%	100%	13	1	14
Mountain Province	234	2	6	4	10	60%	40%	100%	92%	8%	100%	2	0	2

Source: Survey Team

Annex 7: Less conservative estimation of expected demand of combine harvesters by rural cooperatives and equivalent target group category

Region / Province	Target areas (Equal to or less than 5 degree slope in cereals and sugar areas)		No. of cooperatives by size class (only large + medium and small cooperatives)			% of cooperatives by size class			Expected % of large and medium cooperatives, and small cooperatives and equivalents procured combine harvesters			Expected demand of combine harvesters by small cooperatives and equivalent		
	Target area	No of combine harvesters	Actor A PHP mill. >15	**Actor B** PHP mill. 15> >3	Total	Actor A PHP mill. >15	**Actor B** PHP mill. 15> >3	Total	Actor A PHP mill. >15	**Actor B** PHP mill. 15> >3	Total	Actor A PHP mill. >15	**Actor B** PHP mill. 15> >3	Total
	(ha)	(no.)	(no.)	(no.)	(no.)	(%)	(%)	(%)	(%)	(%)	(%)	(no.)	(no.)	(no.)
	a	b=a/50ha*50%	c	d	e=c+d	f	g	h=f+g	i=k-j	j=g/5	k=i+j	l=b*i	m=b*j	n=l+m
Total/Average	**3,324,864**	**33,249**	**506**	**795**	**1,301**	**39%**	**61%**	**100%**	**88%**	**12%**	**100%**	**28,499**	**4,067**	**32,566**
Total (Excluding Regions I, II, and III)												**14,989**	**2,220**	**17,210**
Region I	**359,642**	**3,596**	**34**	**68**	**102**	**33%**	**67%**	**100%**	**87%**	**13%**	**100%**	**3,114**	**483**	**3,596**
Ilocos Norte	60,944	609	6	8	14	43%	57%	100%	89%	11%	100%	540	70	609
Ilocos Sur	49,599	496	9	13	22	41%	59%	100%	88%	12%	100%	437	59	496
La Union	27,660	277	3	8	11	27%	73%	100%	85%	15%	100%	236	40	277
Pangasinan	221,439	2,214	16	39	55	29%	71%	100%	86%	14%	100%	1,900	314	2,214
Region II	**502,003**	**5,020**	**48**	**41**	**89**	**54%**	**46%**	**100%**	**91%**	**9%**	**100%**	**4,555**	**465**	**5,020**
Cagayan	162,914	1,629	12	15	27	44%	56%	100%	89%	11%	100%	1,448	181	1,629
Isabela	289,310	2,893	24	17	41	59%	41%	100%	92%	8%	100%	2,653	240	2,893
Nueva Vizcaya	27,489	275	9	6	15	60%	40%	100%	92%	8%	100%	253	22	275
Quirino	22,290	223	3	3	6	50%	50%	100%	90%	10%	100%	201	22	223
Region III	**703,888**	**7,039**	**69**	**143**	**212**	**33%**	**67%**	**100%**	**87%**	**13%**	**100%**	**5,841**	**899**	**6,740**
Aurora	13,780	138	3	1	4	75%	25%	100%	95%	5%	100%	131	7	138
Bataan	18,605	186	7	10	17	41%	59%	100%	88%	12%	100%	164	22	186
Bulacan	94,028	940	15	48	63	24%	76%	100%	85%	15%	100%	797	143	940
Nueva Ecija	269,713	2,697	31	54	85	36%	64%	100%	87%	13%	100%	2,354	343	2,697
Pampanga	131,191	1,312	6	17	23	26%	74%	100%	85%	15%	100%	1,118	194	1,312
Tarlac	146,696	1,467	7	13	20	35%	65%	100%	87%	13%	100%	1,276	191	1,467
Zambales	29,875	299												
Region IV-A	**200,506**	**2,005**	**44**	**67**	**111**	**40%**	**60%**	**100%**	**88%**	**12%**	**100%**	**1,737**	**268**	**2,005**
Batangas	82,535	825	21	25	46	46%	54%	100%	89%	11%	100%	736	90	825
Cavite	49,285	493	2	13	15	13%	87%	100%	83%	17%	100%	407	85	493
Laguna	37,842	378	3	13	16	19%	81%	100%	84%	16%	100%	317	61	378
Quezon	20,251	203	16	12	28	57%	43%	100%	91%	9%	100%	185	17	203
Rizal	10,593	106	2	4	6	33%	67%	100%	87%	13%	100%	92	14	106
Region IV-B	**132,842**	**1,328**	**40**	**60**	**100**	**40%**	**60%**	**100%**	**88%**	**12%**	**100%**	**1,175**	**154**	**1,328**
Marinduque	211	2		3	3		100%	100%	80%	20%	100%	2	0	2
Occidental Mindoro	48,184	482	18	27	45	40%	60%	100%	88%	12%	100%	424	58	482
Oriental Mindoro	40,518	405	6	10	16	38%	63%	100%	88%	13%	100%	355	51	405
Palawan	41,861	419	16	15	31	52%	48%	100%	90%	10%	100%	378	41	419
Romblon	2,068	21		5	5		100%	100%	80%	20%	100%	17	4	21
Region V	**210,551**	**2,106**	**14**	**29**	**43**	**33%**	**67%**	**100%**	**87%**	**13%**	**100%**	**1,794**	**312**	**2,106**
Albay	27,230	272		2	2		100%	100%	80%	20%	100%	218	54	272
Camarines Norte	2,691	27	3	4	7	43%	57%	100%	89%	11%	100%	24	3	27
Camarines Sur	92,754	928	7	15	22	32%	68%	100%	86%	14%	100%	801	126	928
Catanduanes	1,703	17		2	2		100%	100%	80%	20%	100%	14	3	17
Masbate	76,161	762	1	3	4	25%	75%	100%	85%	15%	100%	647	114	762
Sorsogon	10,012	100	3	3	6	50%	50%	100%	90%	10%	100%	90	10	100
Region VI	**445,767**	**4,458**	**46**	**84**	**130**	**35%**	**65%**	**100%**	**87%**	**13%**	**100%**	**3,889**	**569**	**4,458**
Aklan	8,285	83	4	5	9	44%	56%	100%	89%	11%	100%	74	9	83
Antique	19,863	199	5	2	7	71%	29%	100%	94%	6%	100%	187	11	199
Capiz	47,431	474	3	19	22	14%	86%	100%	83%	17%	100%	392	82	474
Guimaras	4,706	47	3		3	100%		100%	100%		100%	47		47
Iloilo	123,042	1,230	13	12	25	52%	48%	100%	90%	10%	100%	1,112	118	1,230
Negros Occidental	242,440	2,424	18	46	64	28%	72%	100%	86%	14%	100%	2,076	349	2,424
Region VII	**87,545**	**875**	**7**	**10**	**17**	**41%**	**59%**	**100%**	**88%**	**12%**	**100%**	**491**	**53**	**544**
Bohol	29,182	292	4	9	13	31%	69%	100%	86%	14%	100%	251	40	292
Cebu	25,231	252	3	1	4	75%	25%	100%	95%	5%	100%	240	13	252
Negros Oriental	28,153	282												
Siquijor	4,979	50												
Region VIII	**92,883**	**929**	**10**	**14**	**24**	**42%**	**58%**	**100%**	**88%**	**12%**	**100%**	**761**	**118**	**879**
Biliran	1,718	17	1	2	3	33%	67%	100%	87%	13%	100%	15	2	17
Eastern Samar	1,339	13												
Leyte	68,168	682	6	10	16	38%	63%	100%	88%	13%	100%	596	85	682
Northern Samar	14,442	144		1	1		100%	100%	80%	20%	100%	116	29	144
Samar	3,645	36												
Southern Leyte	3,571	36	3	1	4	75%	25%	100%	95%	5%	100%	34	2	36
Region IX	**62,938**	**629**	**10**	**16**	**26**	**38%**	**62%**	**100%**	**88%**	**12%**	**100%**	**550**	**79**	**629**
Zamboanga Del Norte	8,620	86	2	5	7	29%	71%	100%	86%	14%	100%	74	12	86
Zamboanga Del Sur	38,642	386	6	7	13	46%	54%	100%	89%	11%	100%	345	42	386
Zamboanga Sibugay	15,676	157	1	4	5	20%	80%	100%	84%	16%	100%	132	25	157
Region X	**157,152**	**1,572**	**31**	**69**	**100**	**31%**	**69%**	**100%**	**86%**	**14%**	**100%**	**1,336**	**236**	**1,572**
Bukidnon	119,111	1,191	14	40	54	26%	74%	100%	85%	15%	100%	1,015	176	1,191
Camiguin														
Lanao del Norte	24,641	246	1	13	14	7%	93%	100%	81%	19%	100%	201	46	246
Misamis Occidental	4,702	47	8	5	13	62%	38%	100%	92%	8%	100%	43	4	47
Misamis Oriental	8,698	87	8	11	19	42%	58%	100%	88%	12%	100%	77	10	87
Region XI	**54,770**	**548**	**42**	**49**	**91**	**46%**	**54%**	**100%**	**89%**	**11%**	**100%**	**486**	**60**	**545**
Compostela Valley	20,646	206	10	12	22	45%	55%	100%	89%	11%	100%	184	23	206
Davao Del Norte	2,755	28	17	16	33	52%	48%	100%	90%	10%	100%	25	3	28
Davao Del Sur	26,371	264	3	4	7	43%	57%	100%	89%	11%	100%	234	30	264
Davao Occidental	255	3		1	1		100%	100%	80%	20%	100%			
Davao Oriental	4,743	47	5	4	9	56%	44%	100%	91%	9%	100%	43	4	47
Region XII	**190,268**	**1,903**	**43**	**55**	**98**	**44%**	**56%**	**100%**	**89%**	**11%**	**100%**	**1,677**	**226**	**1,903**
North Cotabato	88,303	883	10	20	30	33%	67%	100%	87%	13%	100%	765	118	883
Sarangani	9,183	92	3	4	7	43%	57%	100%	89%	11%	100%	81	10	92
South Cotabato	43,145	431	21	19	40	53%	48%	100%	91%	10%	100%	390	41	431
Sultan Kudarat	49,637	496	9	12	21	43%	57%	100%	89%	11%	100%	440	57	496
Region XIII	**76,157**	**762**	**21**	**37**	**58**	**36%**	**64%**	**100%**	**87%**	**13%**	**100%**	**666**	**95**	**762**
Agusan Del Norte	6,197	62	5	9	14	36%	64%	100%	87%	13%	100%	54	8	62
Agusan Del Sur	36,853	369	8	18	26	31%	69%	100%	86%	14%	100%	318	51	369
Dinagat Islands	941	9		1	1		100%	100%	80%	20%	100%	8	2	9
Surigao Del Norte	5,439	54	3	3	6	50%	50%	100%	90%	10%	100%	49	5	54
Surigao Del Sur	26,727	267	5	6	11	45%	55%	100%	89%	11%	100%	238	29	267
CAR	**47,952**	**480**	**47**	**53**	**100**	**47%**	**53%**	**100%**	**89%**	**11%**	**100%**	**429**	**51**	**480**
Abra	15,484	155	4	3	7	57%	43%	100%	91%	9%	100%	142	13	155
Apayao	16,330	163	2	7	9	22%	78%	100%	84%	16%	100%	138	25	163
Benguet	606	6	14	30	44	32%	68%	100%	86%	14%	100%	5	1	6
Ifugao	2,804	28	10	3	13	77%	23%	100%	95%	5%	100%	27	1	28
Kalinga	11,017	110	8	5	13	62%	38%	100%	92%	8%	100%	102	8	110
Mountain Province	1,711	17	6	4	10	60%	40%	100%	92%	8%	100%	16	1	17

Source: Survey Team

Annex 8: Conservative and less conservative estimation of expected demand of combine harvesters by rural household category

Region / Province	Conservative estiation method					Less conservative estimation method				
	Target areas (500m from paved roads, equal to or less than 5 degree slope in cereals and sugar areas)		Expected demand of combine harvesters by small cooperatives and equivalent			Target areas (Equal to or less than 5 degree slope in cereals and sugar areas)		Expected demand of combine harvesters by small cooperatives and equivalent		
	Target area	No of combine harvesters	Actors D and E (90%)	**Actor F** (10%)	Total	Target area	No of combine harvesters	Actors D and E (90%)	**Actor F** (10%)	Total
	(ha)	(no.)	(no.)	(no.)	(no.)	(ha)	(no.)	(no.)	(no.)	(no.)
	a	b=a/100ha	c=b* 90%	d=b* 10%	e=c+d	f	g=f/100ha	h=g* 90%	i=g* 10%	j=g+h
Total/Average	**1,533,330**	**15,333**	**13,800**	**1,533**	**15,333**	**3,324,864**	**33,249**	**29,924**	**3,325**	**33,249**
Total (Excluding Regions I, II, and III)			**6,998**	**778**	**7,776**			**15,834**	**1,759**	**17,593**
Region I	**209,314**	**2,093**	**1,884**	**209**	**2,093**	**359,642**	**3,596**	**3,237**	**360**	**3,596**
Ilocos Norte	26,867	269	242	27	269	60,944	609	548	61	609
Ilocos Sur	20,706	207	186	21	207	49,599	496	446	50	496
La Union	15,650	157	141	16	157	27,660	277	249	28	277
Pangasinan	146,091	1,461	1,315	146	1,461	221,439	2,214	1,993	221	2,214
Region II	**111,266**	**1,113**	**1,001**	**111**	**1,113**	**502,003**	**5,020**	**4,518**	**502**	**5,020**
Cagayan	40,224	402	362	40	402	162,914	1,629	1,466	163	1,629
Isabela	54,723	547	493	55	547	289,310	2,893	2,604	289	2,893
Nueva Vizcaya	10,799	108	97	11	108	27,489	275	247	27	275
Quirino	5,520	55	50	6	55	22,290	223	201	22	223
Region III	**435,167**	**4,352**	**3,917**	**435**	**4,352**	**703,888**	**7,039**	**6,335**	**704**	**7,039**
Aurora	5,498	55	49	5	55	13,780	138	124	14	138
Bataan	15,195	152	137	15	152	18,605	186	167	19	186
Bulacan	82,287	823	741	82	823	94,028	940	846	94	940
Nueva Ecija	119,113	1,191	1,072	119	1,191	269,713	2,697	2,427	270	2,697
Pampanga	95,759	958	862	96	958	131,191	1,312	1,181	131	1,312
Tarlac	98,916	989	890	99	989	146,696	1,467	1,320	147	1,467
Zambales	18,399	184	166	18	184	29,875	299	269	30	299
Region IV-A	**140,872**	**1,409**	**1,268**	**141**	**1,409**	**200,506**	**2,005**	**1,805**	**201**	**2,005**
Batangas	43,160	432	388	43	432	82,535	825	743	83	825
Cavite	45,393	454	409	45	454	49,285	493	444	49	493
Laguna	34,486	345	310	34	345	37,842	378	341	38	378
Quezon	7,811	78	70	8	78	20,251	203	182	20	203
Rizal	10,021	100	90	10	100	10,593	106	95	11	106
Region IV-B	**45,059**	**451**	**406**	**45**	**451**	**132,842**	**1,328**	**1,196**	**133**	**1,328**
Marinduque	96	1	1	0	1	211	2	2	0	2
Occidental Mindoro	22,835	228	206	23	228	48,184	482	434	48	482
Oriental Mindoro	11,760	118	106	12	118	40,518	405	365	41	405
Palawan	9,205	92	83	9	92	41,861	419	377	42	419
Romblon	1,163	12	10	1	12	2,068	21	19	2	21
Region V	**80,600**	**806**	**725**	**81**	**806**	**210,551**	**2,106**	**1,895**	**211**	**2,106**
Albay	14,447	144	130	14	144	27,230	272	245	27	272
Camarines Norte	1,071	11	10	1	11	2,691	27	24	3	27
Camarines Sur	37,554	376	338	38	376	92,754	928	835	93	928
Catanduanes	803	8	7	1	8	1,703	17	15	2	17
Masbate	23,726	237	214	24	237	76,161	762	685	76	762
Sorsogon	2,999	30	27	3	30	10,012	100	90	10	100
Region VI	**177,739**	**1,777**	**1,600**	**178**	**1,777**	**445,767**	**4,458**	**4,012**	**446**	**4,458**
Aklan	2,677	27	24	3	27	8,285	83	75	8	83
Antique	14,178	142	128	14	142	19,863	199	179	20	199
Capiz	11,693	117	105	12	117	47,431	474	427	47	474
Guimaras	3,948	39	36	4	39	4,706	47	42	5	47
Iloilo	50,095	501	451	50	501	123,042	1,230	1,107	123	1,230
Negros Occidental	95,147	951	856	95	951	242,440	2,424	2,182	242	2,424
Region VII	**44,179**	**442**	**398**	**44**	**442**	**87,545**	**875**	**788**	**88**	**875**
Bohol	12,708	127	114	13	127	29,182	292	263	29	292
Cebu	21,817	218	196	22	218	25,231	252	227	25	252
Negros Oriental	6,430	64	58	6	64	28,153	282	253	28	282
Siquijor	3,224	32	29	3	32	4,979	50	45	5	50
Region VIII	**38,578**	**386**	**347**	**39**	**386**	**92,883**	**929**	**836**	**93**	**929**
Biliran	1,485	15	13	1	15	1,718	17	15	2	17
Eastern Samar						1,339	13	12	1	13
Leyte	510	5	5	1	5	68,168	682	614	68	682
Northern Samar	34,949	349	315	35	349	14,442	144	130	14	144
Samar	530	5	5	1	5	3,645	36	33	4	36
Southern Leyte	1,104	11	10	1	11	3,571	36	32	4	36
Region IX	**19,081**	**191**	**172**	**19**	**191**	**62,938**	**629**	**566**	**63**	**629**
Zamboanga Del Norte	3,179	32	29	3	32	8,620	86	78	9	86
Zamboanga Del Sur	10,217	102	92	10	102	38,642	386	348	39	386
Zamboanga Sibugay	5,686	57	51	6	57	15,676	157	141	16	157
Region X	**72,815**	**728**	**655**	**73**	**728**	**157,152**	**1,572**	**1,414**	**157**	**1,572**
Bukidnon	58,769	588	529	59	588	119,111	1,191	1,072	119	1,191
Camiguin										
Lanao del Norte	6,449	64	58	6	64	24,641	246	222	25	246
Misamis Occidental	2,876	29	26	3	29	4,702	47	42	5	47
Misamis Oriental	4,721	47	42	5	47	8,698	87	78	9	87
Region XI	**26,603**	**266**	**239**	**27**	**266**	**54,770**	**548**	**493**	**55**	**548**
Compostela Valley	7,323	73	66	7	73	20,646	206	186	21	206
Davao Del Norte	1,986	20	18	2	20	2,755	28	25	3	28
Davao Del Sur	14,859	149	134	15	149	26,371	264	237	26	264
Davao Occidental						255	3	2	0	3
Davao Oriental	2,435	24	22	2	24	4,743	47	43	5	47
Region XII	**101,587**	**1,016**	**914**	**102**	**1,016**	**190,268**	**1,903**	**1,712**	**190**	**1,903**
North Cotabato	32,791	328	295	33	328	88,303	883	795	88	883
Sarangani	6,849	68	62	7	68	9,183	92	83	9	92
South Cotabato	32,532	325	293	33	325	43,145	431	388	43	431
Sultan Kudarat	29,415	294	265	29	294	49,637	496	447	50	496
Region XIII	**23,586**	**236**	**212**	**24**	**236**	**76,157**	**762**	**685**	**76**	**762**
Agusan Del Norte	2,919	29	26	3	29	6,197	62	56	6	62
Agusan Del Sur	4,729	47	43	5	47	36,853	369	332	37	369
Dinagat Islands	124	1	1	0	1	941	9	8	1	9
Surigao Del Norte	4,592	46	41	5	46	5,439	54	49	5	54
Surigao Del Sur	11,221	112	101	11	112	26,727	267	241	27	267
CAR	**6,885**	**69**	**62**	**7**	**69**	**47,952**	**480**	**432**	**48**	**480**
Abra	2,465	25	22	2	25	15,484	155	139	15	155
Apayao	2,442	24	22	2	24	16,330	163	147	16	163
Benguet	177	2	2	0	2	606	6	5	1	6
Ifugao	213	2	2	0	2	2,804	28	25	3	28
Kalinga	1,355	14	12	1	14	11,017	110	99	11	110
Mountain Province	234	2	2	0	2	1,711	17	15	2	17

Source: Survey Team