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Rice estate areas: a sociocultural and institutional model for lowland rice farming

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Abstract. The rice cultivation business is dominated by small farmers with average land ownership of less than one hectare. Consequently, all efforts that have been made were unable to improve the farmer's welfare. The small land ownership is a problem in applying mechanization, technology adoption, and management efficiency. The consolidation of the agricultural system in the form of an agricultural, institutional model is essential to be developed to achieve farming efficiency, profit, and, in turn, and farmer's welfare. An agro-socio-cultural and institutional model was designed to overcome problems faced by farmers. The study was conducted in Banjarnegara and Purbalingga Regencies, Central Java. The study applied FGD and survey methods. The results showed that most farmers' age was 60 years, and their educational attainment was a primary school, owned less than 0.7 hectares of land size, low technology adoption rates, and yield of fewer than four tons/ha. The condition causes the farmers to get low income, with an amount of fewer than three million rupiahs/month. Sociocultural conditions, land potentials, institutions, access to capital, and product marketing were the basis for developing an institutional model of rice farming. An institutional model concept was offered in the form of management consolidation. Several farmers gathered in a joint venture called the Rice Estate Community (REC), with approximately 300 hectares. Management consolidation supported mechanization application, science and technology transfer, easier access for market access and capital for rice farming. The REC was a model delivering farming efficiency and prosperity to farmers.

1. Introduction

Rice is a staple food in Indonesia and consumed by almost 90% population. Efforts to increase rice productivity has been made viz. seeds and fertilizer subsidies, distribution of agricultural equipment and machine, and cultivation technology. The efforts made were only technical assistance. A socio-institutional model and management approach still rarely to be applied. Irrigated low land rice farming is dominated by small-scale farmers with land ownership of fewer than 0.3 hectares. The small land



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ownership leads to less optimal efforts to increase the farmer's prosperity. High productivity (10 ton hectare⁻¹) will not give a high margin for small size land (about 0.3 hectares), and on the contrary, a lot higher-margin will be gained by farmers with larger land size. Small size land had been reported by Mardikanto [1] will lead to gain lower income.

Small size land will complicate the implementation of mechanization, low farmer motivation for using high-quality seeds, and inefficiency rice farming management. Fragmentation of small size land causes planting time difference. As a result, pest and disease attacks will increase. Government instruction to the farmers for planting rice throughout the year to fulfil national rice demand also aggravates the pest and disease risk. Consequently, it is very essential to apply management consolidation in the agricultural system. The coalition is required to gain more efficiency and profit, and also to support the farmer prosperity in rice farming. A larger land size scale of rice farming will allow applying agricultural mechanization. The harvest can be processed to be the final product, rice. Waste products such as bran, broken rice, husk, and others can be processed and sold in more good manners. Motivation to technology adoption will increase, including the use of good quality seeds for superior varieties, which currently the application is still low, namely less than 50%.

The consolidation can also be in the form of land consolidation. The small-scale farmer with land ownership of fewer than 0.3 hectares does not need to work on their Land. However, their land is rented to other farmers. The farmer will get payment or profit-sharing. The farmers can use in different sectors so the farmer's sectors to get better income because of earning double income from land rent payment and other jobs. Another model for agricultural consolidation is management consolidation. The farmer joints to do the collective business in the same management. The business covers from upstream to downstream of the rice industry. In this management consolidation model, a new company will be established, and the farmers will be organized to do the role and task in each business line. The business line such as seeds production, rice yield, and harvesting process, rice processing, machinery workshop, etc. The other new jobs will give higher value-added and profit to the farmers.

Management consolidation is a, the model which most likely to be done for the current conditions. Land consolidation will encounter difficulties because off-farm employment will not be easily obtained. Also generally, most farmers have inadequate skills in educational attainment to work off-the farm.

2. Materials and methods

The research was carried out from April to November 2018 in Purbalingga and Banjarnegara Regencies. A qualitative survey was applied to obtain institutional data by focus group discussion and purposive sampling. Focus group discussion was attended by farmer group (Poktan), farmer group association (Gapoktan), agricultural equipment and machinery rental services (UPJA), village-owned business entity (BUMDes), Superior Farmers and Fishermen Group (KTNA), Indonesian farmer association (Hkti), Indonesian Logistics Bureau (BULOG), and seeds producer. A quantitative survey by a questionnaire instrument was done to 60 farmers for mapping the socio-cultural condition of a rice farmer.

The research was conducted in six steps, namely: (1) focus group discussion for activity plan; (2) identification of potency; (3) data analysis; (4) modelling; (5) Focus group discussion for modelling; and (6) model approval. A model was arranged base on the data of socio-cultural and institutional mapping.

3. Results and discussions

3.1. Socio-cultural and institutional condition as a background the rec attending

3.1.1. Socio-cultural mapping. The young generation will soon leave the agriculture sector as a source of living because one of the reasons is its small return. As a result, agriculture faces ageing farmers as occurred in the research sites. The majority of sample farmers had been more than 50 years old. In both regencies, Purbalingga and Banjarnegara, the average age of farmers, which was more than 50

years old were 31.7% in Purbalingga and 40% in Banjarnegara. The farmers in both regencies had low educational attainment, over 60% in elementary school (Figure 1).

All farmers were classified into unproductive labour age group as indicated the farmer did not have any personal life insurance, mainly as they getting old. The farmers still had to work in the old age, as stated by Andini et al. (2013) [2] because they did not have any insurance. The characteristics of the farmer's educational attainment, according to Manyamsari and Mujiburrahmad (2014) [3], will influence the farmer's competence to do the agricultural practices. The low farmer's educational attainment will cause poor planning and coordination, as mentioned by Suyanto and Khususiyah (2006) [4].

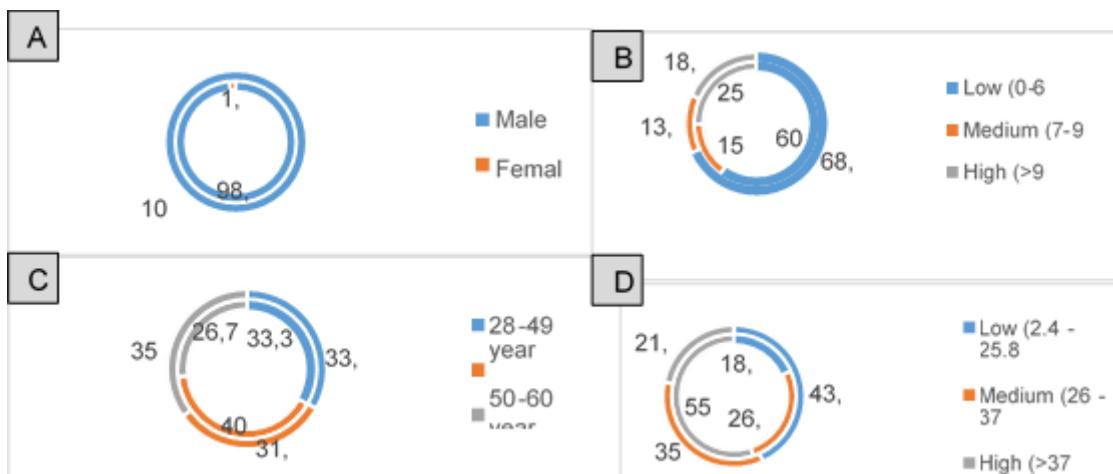


Figure 1. Sex (A), age (B), education (C), and income (D) of a rice farmer in Purbalingga and Banjarnegara regencies, central java

Generally, old and low educated farmers will lead to low participation in technology adoption and innovation. Both aspects will end in lowly farmer's income coming from agriculture practices. The small size of land ownership also gives a contribution to low yield. More than 70% of rice farmers in both regencies managed land less than 0.7 hectares, with an average result of fewer than 4.3 tons/season (Figure 2).

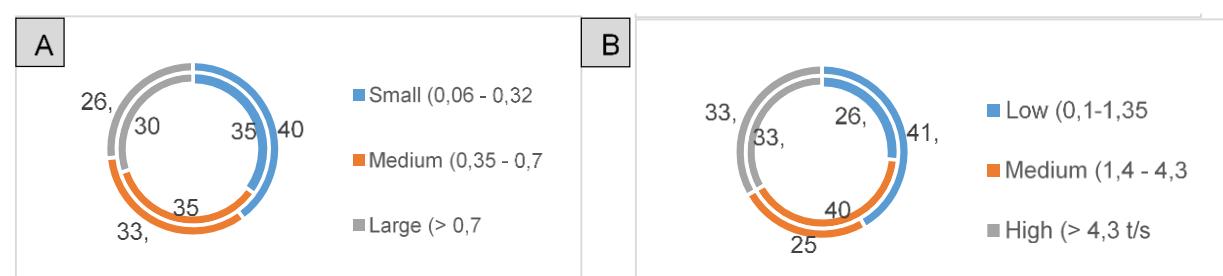


Figure 2. Land area (A) and yield (B) rice farming of farmer in Purbalingga and Banjarnegara regency, central java

The land size was one of the main capitals for determining rice yield. The land ownership of fewer than 0.7 hectares showed by almost all farmers in both the regencies were, and it was classified into small-scale farmers. The land ownership less than 0.5 ha, according to Suratiyah (2015) [5], could be classified into the small farmers. This kinds of landholding status could be private, rented, government (bengkok), and sharecropping. A similar phenomenon of land ownership was reported by Dewi et al. (2018) [6] in Kulon Progo.

3.1.2. A low institutional role for the farmers. Farming business is tightly related to the institutional role as an aspiration recipient and inspiration source. A vital institution will be a medium for the farmer to upgrade capacity, capability, and prosperity. All this time, the role was played by the farmer's group (Poktan) that was joined in the Farmers Group Association (Gapoktan). Both institutions attended to strengthen the bargaining position.

Table 1. An institutional role for rice farmer in Banjarnegeara and Purbalingga Regencies

Institutional role	Means of Score	
	Banjarnegeara	Purbalingga
Source and link of information	2.3	3.4
Source of production facilities	2.7	3.2
Support for the marketing process	2.4	2.5
Institutional role	2.5	3.1

2.3-2.6=low, 2.7-3.0=medium, 3.1-3.4=high

Farmer institutional could play the role of the source of information, production facilities, and support to the marketing process support. Generally, this role still lows in Banjarnegeara and Purbalingga, i.e. 2.5 and 3.1, respectively (Table 1). These indicated that was needed an institutional assistance as a medium to get access to the production facilities and marketing process. Farmer's perception of technology innovation was delivered to be the determinant of success in the adoption process of innovation. Rogers (2003) [7] reported that sooner or later, the adoption process of innovation was affected by the characteristic inherent in that innovation. Some characteristics in technology innovation for rice agriculture, according to Efendy and Hutapea (2010) [8] viz. complexity of technology innovation, triability for utilization, and selective exposure for the farmer's needs. The institutional of farmer group (Poktan) was expected to be the proper medium to increase innovation adoption.

Table 2. Group dynamics of rice farmers in Banjarnegeara and Purbalingga regencies

Group dynamics	Means of Score	
	Banjarnegeara	Purbalingga
Group goals	2.7	3.1
Group solidarity	2.8	3.3
Group task function	2.7	3.0
Group atmosphere	2.9	3.5
Pressure in the group	2.7	2.5
Group dynamics	2.8	3.1

2.7-2.9=low, 3.0-3.2=medium, 3.3-3.5=high

Table 3. The capability of a rice farmer in Banjarnegeara and Purbalingga Regencies

Capability aspect	Means of Score	
	Banjarnegeara	Purbalingga
Use of technology	3.2	3.6
Decision-making	2.8	3.0
Use of production facilities	2.6	3.0
Management of capital and advantage	2.4	3.1
Partnership for product marketing	2.1	2.9
Farmer's capability	2.6	3.1

2.1 – 2.6=low, 2.7-3.1=medium, 3.2-3.6=high

The existence of the institutional could be measured by institutional dynamics and the capacity to become the problem solver and source of information. Group dynamics could be measured by creating

the farmer group goals, solidarity, task function, atmosphere, and the pressure in the group. Group dynamics in Purbalingga Regency were better than that of Banjarnegara regencies (Table 2). The groups in both regencies were categorized in the medium category.

Table 4. Cultural values and access to information of rice farmer in Banjarnegara and Purbalingga regencies

Aspects	Means of Score	
	Banjarnegara	Purbalingga
The teamwork of a farmer	1.4	2.6
Obey the rules of farming	2.9	3.2
Access to farming information	2.3	2.6
Cultural values and information access	2.1	2.7

1.4-2.0=low, 2.1-2.6=medium, 2.7-3.2=High

The farmer capability still low category in Banjarnegara and medium category in Purbalingga, i.e., 2.6 and 3.1, respectively (Table 3). The institutional capacity could be measured by several aspects, viz. teamwork, obey the rules, and access to information. The ability to socio-cultural and access to information was categorized in the low category (Table 4). A conducive atmosphere in the farmer group, according to Wiyanti et al. (2014) [9], could increase the capacity of the member groups. The production capacity of seeds producer was upgraded by technology and information transfer, viz. management and marketing [10], and adoption of technology for seeds production [11].

3.2. How will the rice estate community be built?

3.2.1. Definition. The rice Estate Community (REC) was established by small farmers in the same area that commits to a principle for synergy, consolidation, cooperation, and sustainability. The REC consist of 300 hectares for rice production and three hectares for rice seeds production. The farmer worked in self land or a collective system. Land cultivated could private or rented land. Members of REC has commitments which called “Collective Agreement” (Pakta Bersama) to obey the principle and do the REC program, and established the collective company.

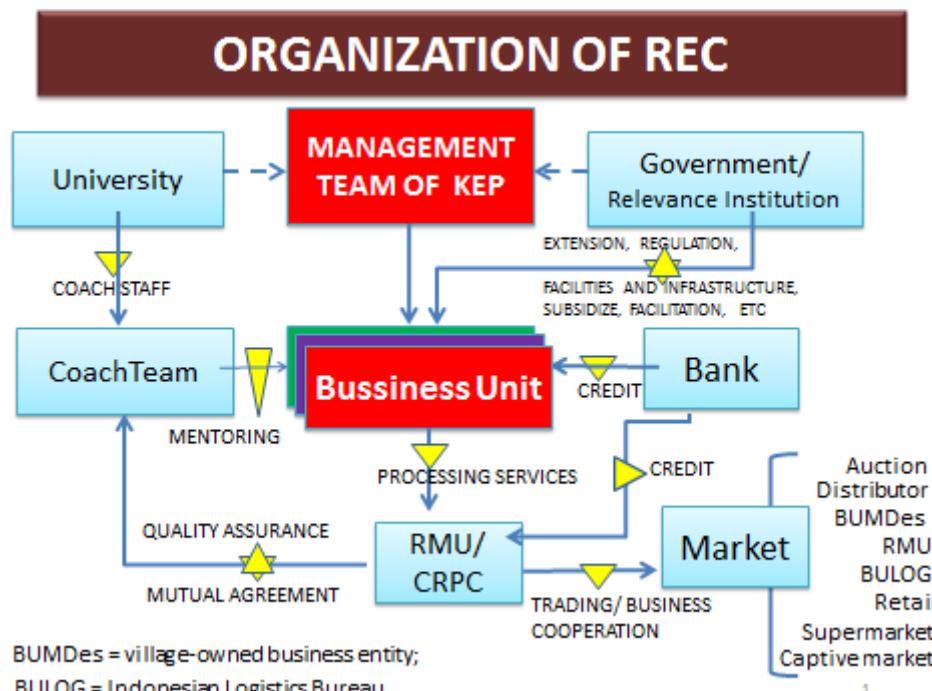


Figure 3. Organization concept of REC

3.2.2. Organization. The REC Organization was an interrelation relationship between REC and other institution. That relationship was needed to support the operation of management. The institutional that has a relation to REC, among others: (1) Government and research institution; (2) university; (3) Financial institution (Bank), Rice Milling Unit/Centralized Rice Process Complex (CRPC); and (5) modern and traditional market (Figure 3). Government plays a role as a decision-maker for agricultural institutions or public prosperity, while university and other research and development institutions provided innovations for farmers.

The relations also occurred in simple reference to the market, rice milling unit (RMU), and financial institution. The traditional market could be the buyer for REC products. Collaboration with the RMU in the REC's surrounding areas can be the solution for high investment in the first year for rice milling machines. Cooperation with a financial institution can be done to support the financing scheme of the farmers.

3.2.3. Management. The collective company was owned the small farmers. The structure of REC management must be designed in a straightforwardly. Government was formed to give the full power to the farmer, and represented by a forum for representatives of farmer-owners and land tenants (FP4L). The FP4L is a complete power institution and make the various strategic systems in REC. To implement all of the systems and manage the administration of the REC, a manager was appointed. The REC management consisted of: farmers, managers, and forums for FP4L (Figure 4).

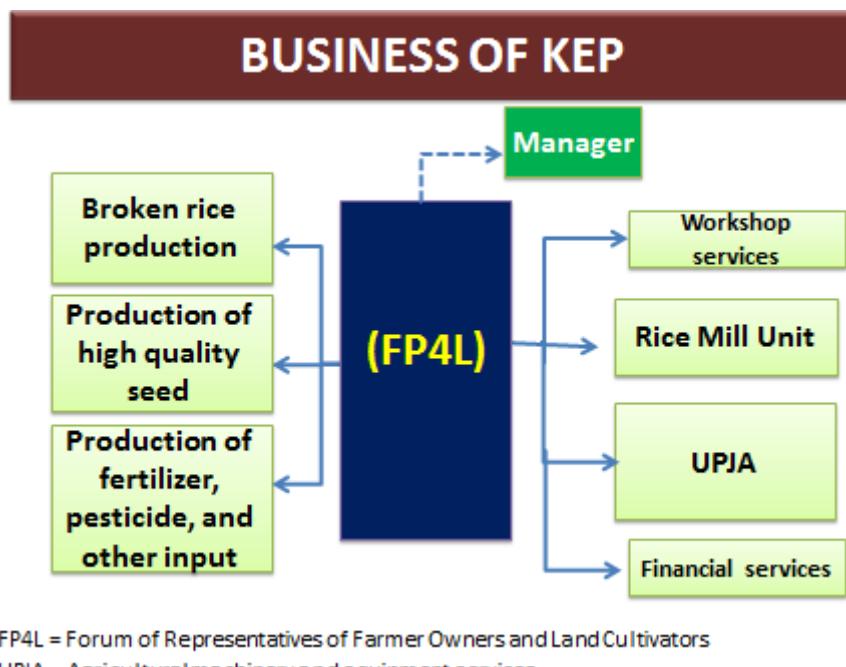


Figure 4. The Management concept of REC

Members of the forum for FP4L numbered nine persons, and chosen from the farmers, adhered to by the REC members. All of the policies decided by FP4L and would be implemented by a manager in the production, processing, and marketing process. Forum for FP4L has a function to: (1) arrange and supervise the implementation of the policies in collective business that was implemented by the farmer; (2) periodically set farmer potency and obstacles mapping; and (3) formulate and design all of the joint business activities.

Manager officiated to manage the administration of farmers' activities and be an entry point for stakeholders to get associated with REC members. The manager consolidated the farmers to implement the policy. The manager arranged administration and database, controlled farmer's development, and recorded and documented every case found in the agricultural activities. The manager must have a diploma or bachelor's degree in agricultural or agribusiness science, and must be

committed to assist and educate farmers. The manager selection was made by a committee involving academics and local government. The salary of the manager was paid by the government or local government in initial years, and produced by the profit from the operational of REC in the following year. The farmer of REC members commits to do the standard functional production, incorporated in a REC, and build the collective company.

3.2.4. The REC's role in the teaching-learning process. The REC is a medium learning and teaching process for farmers in all of the farming processes. The operational of REC will be assisted by multi-discipline experts in technical and non-technical aspects. The expert can come from the university, research institution, practitioner, local government, and the relevant institution. The assistance is done to meet the needs of farmers in the field. The assistantship was done by the learning by doing approach. The first year, the assistance is done to give the understanding of collective company concept, farmer inventory, increase the solidarity, and declaration of REC establishment. The second year, aid is done to upgrade the farmer's ability for technical aspects of the production process. In the third year, the aid is aimed to boost the farmer's ability in the non-technical part. Competency in technical and non-technical would be the capital for the collective company establishment, such as in the form of cooperation or company. Curriculum arranged by an expert team to be the guideline of REC operational. The curriculum is a set of plans and regulations about the content, study materials, and technical or non-technical studies as a guideline for three years. The curriculum is built in bottom-up following the farmers' needs and obtained from the survey need assessment of REC members by the forum for FP4L.

3.2.5. Products. Intensive assistantship for three years would improve farmer's competency in conducting standard operating procedures (SOP) and quality management systems of rice farming. In the fourth year, the REC would produce the product in the form of a joint incorporated company. This collective company could be in the form of a cooperative or company. The business line can be developed in seeds production, rice production, fertilizer and pesticide procurements, machinery workshop, agricultural equipment, and machinery rental services (UPJA), and waste processing and handling.

3.2.6. Benefit for farmers, and Operation of the REC, which was a medium of learning and teaching process, production, processing, and marketing, would give some advantages for the REC members. The teaching and learning process would upgrade the farmer's intelligence and skills. The REC compiling the farmer in large numbers would strengthen the bargaining position, and allow collaborating with the government and other institutions. Collectiveness of the REC members would increase the bargaining position and opportunity to realize the farmers' prosperity. One door government in REC will increase the efficiency of management and business, and create lots of jobs.

3.2.7. Benefit for the farmer, and Operation of the REC, which was a medium of learning and teaching process, production, processing and marketing would give some advantages for the REC members. The teaching and learning process would upgrade the farmer's intelligence and skills. The REC compiling the farmer in large numbers would strengthen the bargaining position, and allow collaborating with the government and other institutions. Collectiveness of the REC members would increase the bargaining position and opportunity to realize the farmers' prosperity. One door government in REC will increase the efficiency of management and business, and create lots of jobs.

3.2.8. The role of government and university to support the REC. Government is responsible for presenting and supporting the effort of farmer empowerment. The REC established awareness of the need for compactness to do agricultural activity become substantial social capital. This social capital will make the government program was adopted easily by the farmer. The REC that is a farmer empowerment program based on social capital will not operate without the supporting stakeholders.

Government and local government can play the role to support the infrastructure for agricultural activities. Irrigation networks and roads were very urgent in helping farmers to facilitate the

production process. The government can provide the rice farmer credit and enforce the warehouse receipt system. As a policymaker, the government make the marketing policies and regulations for price and commerce agricultural products, which were profitable for the farmers and REC. In the legislation and budgeting, government support REC by accommodation the budget to the farmers in REC members. Local government, research institution, and university as a servant institution can play the role by providing fostering the forum for FP4L, manager, and farmers to increase the productivity and collective company. University as a part of the government and scientific institutions, played a role in doing the assistantships. The assistantship could be done by improving cultivation techniques, managerial aspects, institutional, technology, and another competency. University was able to provide a module for technical and non-technical training. Arrangement of module referred to curricula, which were approved by the FP4L. The module contained science needs to answer and equip farmers, who encountered agricultural dynamics, technically and non-technically. The use the modules gave the allowed for the university to make a partnership with other stakeholders in farmer empowerment activities.

3.2.9. How to evaluate the REC

Table 5. The technical and non-technical parameters to evaluate REC performance

Collective business line	Technical parameters	Non-technical parameters*	
Seeds production	seeds for precise variety, time, quality, amount, price, and location	1. 2.	All of the training in one management Technical training follow the quality management security, and the product was licensed by SNI
Rice production	1. Productivity 2. Quality 3. Price 4. Profit 5. Value-added	3.	The collective company incorporated was established
Fertilizer and pesticide production	1. Quality 2. Turnover 3. Profit		
Machinery workshop	1. Turnover 2. Profit		
Agricultural equipment and machinery rental services (UPJA)	1. Performance 2. Turnover 3. Profit		
Waste processing and handling	Zero waste		

*) All of the non-technical parameters was evaluated at the end of the assistantship

The operation of the REC was assessed to measure the development of farmer and their business. The evaluation was carried out by an expert team coming from university and local government related to technical and non-technical aspects. Indicators used to evaluate, namely input (resources use, process (farmer capacity and technology adoption), product (REC establishment), and impact (farmer prosperity and socio-cultural aspects). The evaluation was implemented for six lines of businesses that were developed by the REC, namely: (1) seeds production; (2) rice production; (3) fertilizer and pesticide production; (4) machinery workshop, (5) agricultural equipment and machinery rental services (UPJA); and (7) the waste processing and handling. Evaluation of each line Business

applied different technical indicators, and same non-technical indicators for all of the business lines as presented in Table 5.

Evaluation of technical aspect for seeds production unit was done by the ability to provide the seeds in precise variety, time, quality, amount, price, and location. The productivity, quality, price, profit, and value-added were a technical aspect that was used to evaluate the rice production unit. The fertilizer and pesticide production unit were evaluated a quality product, unit turnover, and the unit profit.

The REC also operated the second line business to support the priority line business,i.e., machine shop services, agricultural equipment and machinery rental services (UPJA), and waste processing. The machine shop services unit was evaluated by the indicators of unit turnover and yield. The performance, turnover, and profit were three indicators to assess the agricultural equipment and machinery rental services and fertilizer and pesticide production unit. Zero waste was an end goal from all of the business lines and used to assess the waste processing unit. Non-technical indicators used to assess six lines of business i.e., management, quality management system, and legal standing of collective company establishment.

4. Conclusion

The farmers in Banjarnegara and Purbalingga were dominated by an old farmer with low educational attainment, small size land ownership, and low income. The existing agricultural institutional were less optimal to support the farmer to reach prosperity in socio-cultural and economy. The REC had been developed based on socio-cultural conditions, land potentials, institutions, and access to capital and market.

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