Backward Regression

To Build the Best Model of Developing Agricultural Equipment and Machinery Service Business as Support to Vegetable Production

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Abstract. Agriculture faces a challenge to the success of the zero-hunger program of SDGs. The Ministry of Agriculture has granted farm equipment and machinery service businesses to farmers' organizations. However, these businesses are unsuccessful in increasing the farmer' prosperity. Therefore, the study aims to determine an excellent strategic model to develop these businesses. In 2021, the research was held in Bandung involving members of UPJA in Cicalengka, Ciparay, and Rancaekek. Data were collected using a digital questionnaire platform by google form and were analyzed using the backward multiple regression method to build the best model by eliminating the non-significant variable. This method aims to assess organizational performance, regular meetings, techniques, and training on economic improvement. The study results showed that regular meetings and technics have no significant economic impact. It can be concluded that capacity building and strengthening organizations will have an optimum effect on increasing the economic value of farmers' businesses.

Keywords: Agribusiness · Backward regression · Food security · Mechanization · Vegetables

1 Introduction

Pandemic Covid-19 worsened worldwide poverty and hunger. It triggered an extreme peak over 20 years. More specifically, poverty rose from 119 to 124 million people. Again around 811 million people faced hunger in 2020 [1]. The relationship between agriculture and food security is significant [2–5]. Indonesia has a responsibility to ensure citizens' availability, affordability, and food utilization. It is one of the contributions in achieving SDGs. In line with the target of the Ministry of Agriculture that Indonesia will be a "World Food Barn" in 2045. In conclusion, farmers need to apply efficient food production using optimum input to produce optimal productivity.

Mechanization is a supporting sub-system for the vegetable cultivation process. It aims to increase labor efficiency and agricultural productivity [4–6]. Implementing mechanization significantly affects agriculture production to be more efficient and profitable. It also can increase the interest of the younger generation to become agro-entrepreneurship. The Government has distributed grants like equipment and machinery

of agricultural around 420.000 units to farmers groups since 2014. It consists of a tractor, cultivator, pump, transplanter, and harvester. The main business is to provide agribusiness venture capital in rental services. Grantee candidates must be farmers who cooperate as an Agricultural Machinery Services Business (UPJA) [4, 5].

Based on a previous study, the Government has highly invested in the equipment and machinery of agriculture for UPJA. However, the business is unsuccessful, so it can't increase members' prosperity. A lot of equipment and machinery was broken and abandoned. It is caused by several problems such as low business development ability, member age above 50 years, machinery equipment age above five years, training for operator and mechanic limited, no agricultural workshops, and the type no as needed [2, 3, 6–8]. In summary, organizations face problems such as not producing highly competitive service to consumers, not building a solid capital network, and low managerial ability, moreover, due to the lack of support for capital, capacity building, institutional strengthening, regulatory arrangements, and support for agricultural infrastructure at the rural level [5–7, 9].

In 2021, the Indonesian Society of Agricultural Engineering (ISAE) contributed to the acceleration of mechanization in Indonesia by developing a pilot project of a corporate agriculture development model based on agricultural mechanization. It aims to: i) mechanization-based corporate agriculture optimization, ii) increase the interest of the young people in agriculture, iii) build sustainable modern agriculture, iv) increase in agricultural production, and v) improve farmer business [8]. Therefore, this study aims to measure the effect of organizational performance, regular meetings, training on economic improvement. These results will be used as the basis for developing specific development business strategies.

2 Methods

2.1 Materials

This study aims to develop a strategy for the economic development of the Agricultural Machinery Services Business in Bandung. Data were obtained by in-depth interviews with an Agricultural Machinery Services Business member.

The research questionnaire consisted of 19 questions based on a literature review from a relevant study [2, 3, 5–8]. It aims to get comprehensive information regarding the relationship of organization, regular meetings, technic, and training to the economics of UPJA. Respondents' profiles in this study include names, organizations, and addresses. Respondents are farmers who are joined as a member of UPJA in Bandung, West Java. It was held in 2021 in Cicalengka, Ciparay and Rancaekek of Bandung Regency. Research using a digital questionnaire using the google form platform in the Indonesian language.

2.1.1 Organization

- Have a legality
- Have the statutes and bylaws
- UPJA have an organizational structure.

2.1.2 Regular Meeting

- UPJA held a regular meeting
- Period of meeting
- Member of meeting.

2.1.3 Training

- Farmer attend the training
- Material of training
- Training held regularly
- Speakers of training
- Benchmarking.

2.1.4 Facilities and Infrastructure

- Have machinery
- Have a computer or laptop
- Have a mobile phone
- Have access to the internet network.

2.1.5 Economy

- Support farmers' agricultural products
- Have a good cooperative
- Assist farmers to get Micro Credit Program Capital (KUR).

The previous study indicated that organization, meeting, technic, and training have a direct effect on business development [4–7, 10–12]. Therefore, the research hypothesis of the study is following:

- H1: Organization (ORG) positively affects economic performance (ECO).
- H2: Regular meeting (MEET) positively affects economic performance (ECO).
- H3: Training (TRAIN) positively affects economic performance (ECO).
- H4: Equipment (EQP) positively affects economic performance (ECO).

2.2 Methods

The performance of the questionnaire was assessed using a validity and reliability test before it is used to evaluate the performance of the Agricultural Machinery Services Business. The validity test aims to measure the accuracy of the research instrument in describing the actual conditions in the field. In addition, the reliability test is used to measure the consistency of respondents' answers in answering questions in the questionnaire [10, 11].

Descriptive analysis will describe or provide an overview of the object under study through data or samples that have been collected [10]. Backward regression has been used

in several studies to construct the best model. Backward regression efficiently analyzes experimental data [13]. The numerical calculation also has a stable ability. Therefore, this study uses backward regression to research the best model to develop the business of UPJA.

3   Results and Discussion

Based on the reliability test results, the Cronbach alpha value is 0.869. It can be concluded that the questionnaires have excellent ability to describe the respondents' answers consistently. At the same time, the validity test is done by asking experts in farmer organization development and using the validity test by SPSS. Based on the survey results, it was found that all questionnaire items had a validity value <0.01, so that all questions have good validity. It can be concluded that questioner is suitable to assess the condition of Agricultural Machinery Services Business. In addition, the results of the descriptive analysis are shown in Figs. 1, 2, and 3.

The total equipment and machinery show that UPJA can successfully manage and maintain the grant. It will increase the business capacity independently [6]. Based on Fig. 1, around 48% of group farmers have six equipment and machinery agricultural. While those with seven types are 28%, the remaining 8% have two types, and 16% have one style. It will be the investment of farmers to develop their business.

Figure 2 shows that 82% of farmers have telephone cellular while 8% don't have. Nowadays, it is the primary need to easily access information regarding machinery and equipment or develop business. Furthermore, farmers can create a business network with other coworkers such as spare parts shops, agricultural workshops, and other agricultural businesses.
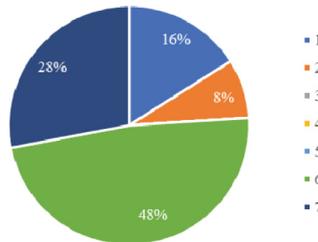

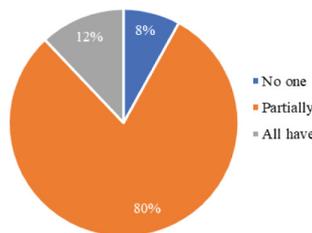**Fig. 1.** Amount of equipment and machinery ownership by UPJA.

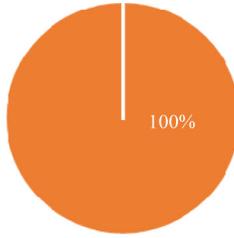**Fig. 2.** The ownership of telephone cellular.

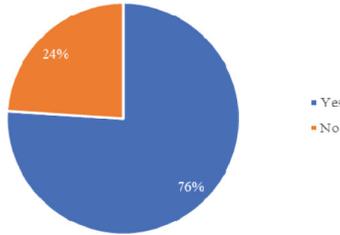**Fig. 3.** The capability of farmer on internet access.
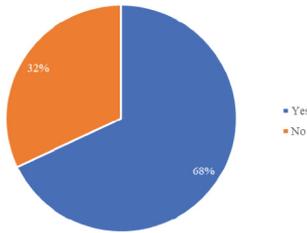

Fig. 4. Organization legality.

Fig. 5. Already trained.

Figure 3 shows that all farmers have access to the internet. In addition, farmers can also access various sources of knowledge from public sources independently. It is crucial for business development. At the same time, during the Covid-19 pandemic, many pieces of training and seminar were held online. Nowadays, internet-based information technology needs to be applied to attract the younger generation to agriculture.

Based on Fig. 4, the percentage of legal entities is 76%, and the remaining 24% are not. The Government routinely develops UPJA by providing machinery, assistance to obtain people's business loans, and training. One of the main requirements is that UPJA needs to have legality.

Through the Agricultural Training Center, the Ministry of Agriculture regularly conducts training related to agriculture from pre-harvest to post-harvest. Based on Fig. 5. 68% of farmers have attended training related to machinery operation, machine tools maintenance, machine tools repair, agricultural cultivation, agricultural product processing, agricultural business management, animal husbandry. However, there are still 32%
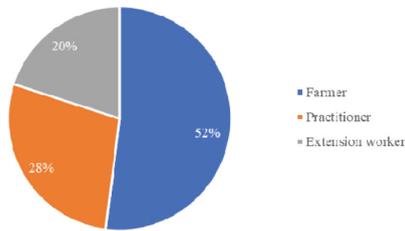
Fig. 6. Trainer.

Table 1. T-test result

No	Variable	T-test	Sig.
1	MEET	0.225	0.825
2	ORG	2.073	0.051
3	TRAIN	3.458	0.002
4	EQP	1.160	0.260

of farmer groups who have not attended the training. It shows that socialization and raising awareness to develop UPJA's business are still not optimal.

Training is an activity to increase the human resource capacity of farmers. The variety of training materials must be according to the needs of farmers. Therefore, it needs an experienced and competent speaker to train farmers professionally. Trainers are farmers, practitioners, and extension workers. Based on Fig. 6, the dominant trainers are farmers 52%, while trainers from practitioners are 28% and extension workers are 20%.

Based on the descriptive analysis, it can be concluded that farmers already have the principal capital: equipment and machinery from the government. Moreover, the successful UPJA can independently develop their business to buy other equipment and machinery. In addition, farmers also have access to communication technology internet-based. It becomes the primary basis for farmers to collect information, learn technical skills, and develop business relating to UPJA.

The study uses backward regression to prove the research hypothesis based on t-test analysis. It aims to measure the relationship between research variables partially. The result is shown in Table 1.

In Table 1, the MEET and EQP variables are not significant, as seen from the results of the significance value >0.05, while the ORG and TRAIN variables are significant. In summary, organizational performance and training positively affect the business development of UPJA. Therefore, the primary strategy will be focused on organizational development and capacity building through training. The process of organizational development are follows [4, 6, 8, 12]:

Table 2. Training needed by the farmer

No	Type of training	Percentage (%)
1	Operation	50
2	Maintenance	46
3	Reparation	46
4	Agricultural processing	35
5	Agribusiness management	35

- The government helps and facilitates the legality of UPJA;
- There must be precise tasks and functions of a manager, administrator, technician, and member; and
- There must be policies related to financial management.

Based on Table 1, the second variable that should be enriched is TRAIN. Similar to the previous study, training is the best strategy to strengthen the human capital of farmers [7, 8]. Farmers who desire to improve themselves should be encouraged to become trainers, operators, or managers. Farmers also need to be trained to browse agricultural information updates online. The facility should support internet access in UPJA. Therefore, further analysis is carried out to determine the training needs of farmers. The result analysis is shown in Table 2.

Based on Table 2, farmers are interested in improving their skills in operation 50%, maintenance 46%, reparation 46%, agricultural processing 35%, and agribusiness management 35%. The Ministry of Agriculture has developed the UPJA Mobile to plan, manage, and monitor business. The customers can connect to the closest UPJA using the application. However, if the equipment and machinery are unavailable, customers will be directed to another UPJA. Application has some menu such as the availability of equipment and machinery, rent cost, rice milling service, training service, and information about the spare part store. In summary, the Government has technologies that can support UPJA. However, the socialization and training related to operational applications are still low. It is needed massive dissemination and collaboration among the stakeholders.

4   Conclusion

Agricultural mechanization is highly dependent on the performance of the UPJA. The best strategies based on this research are to strengthen the organization with government assistance. In addition, it also requires training, especially about the operation, maintenance, and reparation of equipment and machinery. Farmers are also interested in studying agricultural processing and agribusiness management. An analysis of training needs should be based on regional-specific. It is essential to fulfilling the requirement of farmers.

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