Strategic management in the business of agricultural equipment and machinery services in Bandung, West Java

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Abstract. The interest of young people to be a farmer is low. It could become a threat to the sustainability of agriculture in Indonesia. As an effort to prevent that conditions, The Ministry of the Agriculture Republic of Indonesia issued a policy on grant equipment and machinery for farmers. As a requirement, they must be incorporated in Agricultural Equipment and Machinery Services. It shows that Agricultural Equipment And Machinery Services is the spearhead in the successes of those programs. This study aims to measure the performance as a base to determine the strategies management on Agricultural Equipment And Machinery Services. The research analysis uses Structural Equation Modeling (SEM) to build mathematical models that show the relationship between variable research: economic (EKO), organizational (ORG), and technical (TKS). Mathematical model analysis on this research are TKS = 0.99*ORG (t-test: 4.96) and EKO = 0.61*TKS (t-test : 2.79). The goodness of fit test index shows that the model criteria are classified into moderate until a good fit. Therefore, the model can be used to rank each indicator's influence. SWOT analysis results show that Agricultural Equipment and Machinery Services performance on quadrant three. The main strategies take advantage of the opportunity by optimizing strength. It can be concluded that the strategies are developing human capital, building a knowledge management system, and developing a website or android to expand disseminating business information.

1. Introduction

Lack of interest in pursuing agriculture-related occupations among the youth is considering be a threat to Indonesian agriculture sustainability. It has been hard to recruit the youth for placements in field cultivation, maintenance, and harvesting sectors. Only 20\% of the total Indonesian farmers are under 35 years old. Most of the youth prefer to have another job like manufacture works in the cities because agricultural work considered to be less prospective. One of the strategies to solve this issue is to develop an agricultural agro-industry based on technological development [1, 2]. To achieve that, the Ministry of Agriculture provides agricultural equipment and machinery engineering grants as a startup fund for service rent. The number of agricultural equipment and machinery provided by the government in 2018 reached 11,860 units [3]. These units comprise of hand tractor, four-wheeled tractor, transplanter, assembled harvester, and water pump [3]. The grant was delivered to a group of farmers organized in a group called Agricultural Equipment and Machinery Services. The group is formed as a platform to equalize the farmer’s ability related to grant management.

The Agricultural Equipment and Machinery Services is a community-based economic institution that provides economically-oriented agricultural equipment and machinery engineering rent service. It rents agricultural equipment and machinery engineering for field preparation, field cultivation, irrigation
water stock, planting, maintenance, plant protection services such as fire control, harvesting, post-harvesting, and crop processing [2, 3]. The institutional work has to be developed started from its technical, organization, and economic aspects of supporting the agriculture sector development. The public policy shows that Agricultural Equipment and Machinery Services is fundamental for the success of this grant program.

Public policy is a governmental tool to implement transparency and expediency values. The main objectives are: i) to actualize justice and equality welfare, ii) to solve issues faced by the community, iii) to utilize a new opportunity to achieve a better community life, and iv) to protect the community from dangerous practices. However, studies have shown that some public policy implementations have been facing obstacles. There is a number of governmental programs with low success rates. It is due to i) corruption, ii) varied understanding of the policy, iii) lack of government support and iv) premature knowledge of the target group [1, 2, 4, 5]. Based on a previous study [1, 6], the Agricultural Equipment and Machinery Services development in some areas have been facing the same issues such as i) ineffective work ethic of manager, operator, and administrator, ii) misorientation of the Agricultural Equipment and Machinery Services, iii) the startup is not yet developed, and iv) minimum support from the local government.

This research aims to identify and assess internal and external factors’ impact on the Agricultural Equipment and Machinery Services performance. The assessment result is a base to decide agricultural equipment and machinery management strategy that is location-specific. The research has two dependent variables, i.e. economic (EKO) and technical (TKS), and one independent variable, i.e. organization (ORG). Relation among variables is analyzed by structural equation modeling (SEM) Lisrel. The SEM mathematical model is developed to decide a rank based on influence from each indicator structuring the variables. This method can be used as an alternative to determining weights in SWOT analysis replacing the rank determination from the expert group [7, 8].

2. Materials and methods
This research objective is to arrange a strategy to improve the Agricultural Equipment and Machinery Services performance in Bandung Regency, West Java Province. The research study case encompasses four districts of Bandung Regency, such as Ciparay, Paseh, Majalaya, and Cicalengka. The field sampling campaign was conducted through interview techniques and focus group discussion (FGD). A merging of those methods was taken to cross-check the data reliability [7, 8]. FGD was organized from the result of the in-depth interviews regarding the research object. This research involved 58 respondents, which consisted of the members of Agricultural Equipment and Machinery Services, civil servants, and farmers as a user.

Questionnaires were modified from a performance index that is made by the government [2]. There are three variables research i.e. organization, technical, and economical. The latent variable and its indicator are shown in table 1. The indicators for each variable are shown below:

1) Organization (ORG) encompasses legality, organization structure, the association, and the regular or annual meeting.

2) Technical (TKS) encompasses agricultural equipment and machinery engineering type that is being managed, number of operated machines, agricultural equipment, and machinery engineering warehouse, agricultural equipment and machinery engineering workshop, training for manager, administrator, and operator

3) Economic (EKO) encompasses an increasing number of agricultural equipment and machinery engineering, gain another grant source, and expanding the farming business.
Table 1. The latent variables of the study and their indicators

| Organization |        |
|--------------|--------|
| X1           | X2     | X3     |
| Organization legality | Business activities plan | Internal supervision |
| Amount of manager | Accountancy plan | External supervision |
| Amount of administration employment | Business development plan | Incidental supervision |
| Amount of technician | Meeting at the district level | |
| Amount of the operator | Annual meeting | |
| Business activities plan | Seasonal meeting | |
| Accountancy plan | Meeting with customer | |
| Business development plan | Meeting with business partner | |
| Meeting at the district level | | |
| Annual meeting | | |
| Seasonal meeting | | |
| Meeting with customer | | |
| Meeting with business partner | | |

| Technic  |        |
|----------|--------|
| Y1       | Y2     | Y3     |
| Management of agricultural equipment and machinery | Manager training | Amount of operator |
| Amount of machinery managed | Administrative officer training | |
| Storage warehouse | Operator training | |
| Agricultural equipment and machinery condition | | |
| Agricultural equipment and machinery belong to | | |
| Agricultural Equipment and Machinery Services | | |
| Y2       | |
| Manager training | |
| Administrative officer training | |
| Operator training | |
| Y3       | |
| Amount of operator | |
| Operator skill | |
| Operator attitude | |

| Economic |        |
|----------|--------|
| Y4       | Y5     |
| Business development | Farmers payment |
| Source of the other income | Down payment |
| Adding customer | Non-cash payment |
| Y5       | |
| Farmers payment | |
| Down payment | |
| Non-cash payment | |
| Besides money payment | |

2.1. Structural Equation Modeling Analysis (SEM)
SEM Lisrel is a method to portray, estimate, and examine relations among research variables. It is a program that represents a combination of some analysis such as factorial analysis, linear analysis, and regression analysis. This method aims to develop and evaluate a complex causality relation (multivariate analysis) [1, 6]. SEM analysis of this research is based on these hypotheses:
H0: there is no relation between ORG, TKS, and EKO
H1: there is a relation between ORG and TKS
H2: there is a relation between TKS and EKO
2.2. Test the suitability of the SEM mathematical model

A relationship among social research variables has a complex structure, so it is hard to portray it in a mathematical model with a high goodness of fit index. Besides, some statistical analysis has a limitation to process no-normality distribution data. However, SEM can handle that by applying the asymptotic covariance matrix \([9, 10]\). Therefore, SEM has several steps to assess a mathematical model that is shown below:

1) Chi-square statistics \((X^2)\) is used to measure model compatibility. Samples number affects the test accuracy. The lower the chi-square value, the better the model.

2) RMSEA is a technical analysis to complement the chi-square test. It shows the covariance level of the population level.

3) GFI (Goodness of Fit Index) is a fitness index non-statistical test to show the model accuracy level.

4) AGFI (Adjusted Goodness of Fit Index) is adjusted with the available covariance to examine the model acceptance level.

\[
AGFI = 1 - \frac{(1 - GFI)*db}{d}
\]  

(1)

where GFI is the goodness of fit index, \(db\) is a total of sample and \(d\) is degrees of freedom.

5) CFI (Comparative Fitness Index) is a confirmatory index test that is not influenced by the sample number. This test is suggested to test the model suitability.

\[
CFI = 1 - \frac{c - d}{cb - db}
\]  

(2)

where \(c\) is the incompatibility of models, \(d\) is the degree of freedom, \(cb\) is a variance of basic models of freedom, and \(db\) is the incompatibility of basic models of freedom.

3. Result and discussion

3.1. SPSS Analysis

A validity test aims to measure the contribution of a research instrument indicator in building latent variables. A valid tool has a significant value with alpha <0.05 (on the scale of 5%) and <0.01 (on the level of 1%) \([9]\). The validity test was measured using SPSS 22 that the result is shown in table 2.

| Table 2. Validity test result |
|-----------------------------|
| Indicator | Significance level | Information |
|----------|--------------------|--------------|
| X1       | 0.01               | Valid        |
| X2       | 0.01               | Valid        |
| X3       | 0.01               | Valid        |
| X4       | 0.01               | Valid        |
| X5       | 0.01               | Valid        |
| X6       | 0.01               | Valid        |
| Y1       | 0.01               | Valid        |
| Y2       | 0.01               | Valid        |
| Y3       | 0.01               | Valid        |

Based on table 2, the results of the validity test showed that the research instrument has a significance level of 1%. It was concluded that the questionnaire can measure the real condition of Agricultural Equipment and Machinery Services performance. While reliability test shows that the value of Cronbach Alpha is 0.851 (> 0.7). It means that the respondents have answered the questions consistently.
3.2. SEM Analysis
The correlation test among variables was conducted partially and simultaneously using SEM LISREL. The study applied several main tests like t-test, coefficient determination (R²-test), and goodness of fit. The first test aims to quantify a partial relationship significance. The goodness of fit test seeks to determine the model accuracy with its research data.

The last test measures the endogenous variable percentage that can be described together with exogenous variables as the indicator. The value of the R²-test compares the model estimation result. The equation of the indicator measurement model is shown in table 3.

| Equation          | Error var | R²   | Rate |
|-------------------|-----------|------|------|
| Y2 = 0.94*TKS     | 0.08      | 0.91 | 4    |
| X2 = 0.74*ORG     | 0.13      | 0.80 | 4    |
| Y1 = 0.46*TKS     | 0.25      | 0.49 | 3    |
| X3 = 0.34*ORG     | 0.27      | 0.45 | 3    |
| Y3 = 0.50*TKS     | 0.32      | 0.43 | 3    |
| Y4 = 0.46*EKO     | 0.32      | 0.35 | 2    |
| X1 = 0.37*ORG     | 0.28      | 0.32 | 2    |
| Y5 = 0.23*EKO     | 0.26      | 0.08 | 1    |

Table 3. Equation of the indicator measurement model

While, the relationship between each variable was analyzed using linear tests, resulting in visualization of variable interconnection. Besides, the linear test also produced a path analysis model that is shown in figure 1. The coefficient determination analysis of the model is shown in table 4.

![Path analysis from the result of structural equation modeling analysis](image)

Figure 1. Path analysis from the result of structural equation modeling analysis

| Equation of SEM Model | Error var | R²   | T-test | Significance (0.01) |
|-----------------------|-----------|------|--------|---------------------|
| TKS = 0.99*ORG        | 0.0033    | 1    | 4.96   | Sig                 |
| EKO = 0.61*TKS        | 0.28      | 0.57 | 2.79   | Sig.                |

Table 4. Coefficient of the determination test result

Table 4 shows that ORG affects TKS significantly (4.96), and TKS affects EKO significantly (2.79) because the t-test value is more than 2.00 (t-table). The linear analysis model is one of the outputs of SEM LISREL which facilitates measurement model interpretation. An accepted model has a suitability level that fits the chosen standard. But if the model is not fitting the goodness of fit test result, the model then is not capable to portray an actual condition of the Agricultural Equipment and Machinery Services performance in Bandung Regency. The result of the goodness of fit model is shown in table 5.
Table 5. The goodness of fit model analysis result

| No | Type of test | Critical value | Model Goodness of Fit | Status         |
|----|--------------|----------------|-----------------------|----------------|
| 1  | RMSEA        | < 0.08         | 0.063                 | Good fit       |
| 2  | NFI          | > 0.9          | 0.89                  | Moderate fit   |
| 3  | NNFI         | > 0.9          | 0.90                  | Good fit       |
| 4  | CFI          | > 0.9          | 0.94                  | Good fit       |
| 5  | IFI          | > 0.9          | 0.94                  | Good fit       |
| 6  | GFI          | > 0.9          | 0.88                  | Moderate fit   |
| 7  | AGFI         | > 0.9          | 0.73                  | Moderate fit   |

The result of the goodness of fit test in table 6 shows that the mathematical model has good fit criteria based on RMSEA, NNFI, CFI, and IFI. However, NFI, GFI, and AGFI show that it has moderate criteria. The data is not normally distributed so it is challenging to determine the mathematical model with suitable criteria. However, the model still can be used to measure the performance of Agricultural Equipment and Machinery Services.

3.3. SWOT

Based on the goodness of fit test, the model can be utilized for interpreting a relationship among the latent variables of ORG, TKS, and EKO. The SEM output is a base to determine rank or priority in decision making which is applied in the SWOT analysis. The developed strategy aims to optimize the Agricultural Equipment and Machinery Services performance to establish their farming businesses. A comprehensive SWOT analysis aims to construct the Agricultural Equipment and Machinery Services development strategy. The results of the Internal Factor Analysis Strategy (IFAS) and External Factor Analysis Strategy (EFAS) summary on SWOT are shown in table 6, 7, 8 and 9. This results analysis is depicted at quadrant SWOT in figure 2.

Table 6. Strength analysis result

| Strength                                          | Score | Rating | Total |
|---------------------------------------------------|-------|--------|-------|
| Agricultural Equipment and Machinery Services has legality | 0.14  | 2      | 0.28  |
| High skilled operator                             | 0.14  | 3      | 0.42  |
| Mechanic available                                | 0.14  | 3      | 0.42  |
| Internal and external supervision is held regularly | 0.13  | 4      | 0.52  |
| There is a planning activity in one year           | 0.13  | 3      | 0.39  |
| Agricultural equipment and machinery in good condition | 0.19  | 3      | 0.57  |
| Agricultural Equipment and Machinery Services have a warehouse | 0.13  | 3      | 0.39  |
    | 1       | S      | 2.99   |

Table 7. Weakness analysis result

| Weakness                                                                 | Score | Rating | Total |
|--------------------------------------------------------------------------|-------|--------|-------|
| There is no economic planning                                            | 0.19  | 4      | 0.76  |
| There is no business development plan                                    | 0.19  | 4      | 0.76  |
| Annual meeting at district area is not working                           | 0.21  | 4      | 0.84  |
| Agricultural Equipment and Machinery Services is not implemented occupational health and safety | 0.21  | 3      | 0.63  |
| Financial management is not optimal                                      | 0.2   | 2      | 0.4   |
    | 1       | W      | 3.39   |

S-W -0.4

Table 8. Opportunity analysis result
Opportunity   | Score | Rating | Total |
--- | --- | --- | --- |
Training from the government | 0.3 | 4 | 1.2 |
Information system development | 0.35 | 4 | 1.4 |
Potential market | 0.35 | 4 | 1.4 |

| Threat | Score | Rating | Total |
--- | --- | --- | --- |
Low regeneration of farmer | 0.25 | 2 | 0.5 |
There is no spare part shop nearby | 0.29 | 3 | 0.87 |
Late payment | 0.23 | 1 | 0.23 |
Low responsibility of the customer | 0.23 | 1 | 0.23 |

**Table 9. Threat analysis result**

The determination of IFAS and EFAS from the tables shows that the Agricultural Equipment and Machinery Services performance is located in the third quadrant (-0.4, 2.17). Therefore, the strategy will be focused on the turn around strategy. A detailed Strength-Opportunity, Weakness-Opportunity, Strength-Threat, and Weakness-Threat chart is shown in table 10.

Solidarity between the Agricultural Equipment and Machinery Services administrators and its members is fundamental for group development. It is strengthened by a true understanding of the Agricultural Equipment and Machinery Services vision and missions. The concept of togetherness is enhanced through formal and non-formal regular meetings. The synergy would increase a sense of belonging and facilitate coordination among farmers and stakeholders. Besides, the issue related to the farming system has to be discussed through the group, so the organization bond is stronger. Therefore, human resources is an essential factor in the farming business group [5]. This research has shown that the dominant role of the chief was not complemented by proper knowledge transfer. There is a potential for information loss if a management replacement is not being done correctly.
Human capital has a massive impact on the farming business group. Human capital is knowledge and individual skill. Development of human capital can be applied through SECI method which comprises of 1) socialization of group knowledge from each administrator or member, 2) externalization to write down the knowledge in a document or file, 3) combination to compiles all the farming-related knowledge, and 4) internalization to internalizes the knowledge into each individual. It is a continual process that needs to be controlled and evaluated [5, 11, 12].

The Agricultural Equipment and Machinery Services in Bandung Regency has been implementing administration record and SOP making regarding agricultural equipment and machinery engineering rental, yet the filing is not optimum. The consequences are lost administration document, less accurate financial recording system, and uneven information distribution in a group. An information management system can handle a tacit or explicit issue related to knowledge processing. It is not only to store and publish the information widely, but it also provides considerations for making a decision [3, 13].

| Table 10. SWOT strategies analysis |
|-----------------------------------|
| **S** Agricultural Equipment and Machinery Services has legality | There is no economic planning |
| **W** High skilled operator | There is no business development plan |
| **W** Mechanic available | Annual meeting at district area is not working |
| **W** Internal and external supervision is held regularly | Agricultural Equipment and Machinery Services is not implemented occupational health and safety |
| **W** There is a planning activity in one year | Financial management is not optimal |
| **O** Training from the government | Improving human capital by regular meeting and training |
| **O** Information system development | Expand the business by utilizing the management information system |
| **O** Potential market | Build a knowledge management system |
| **T** Low regeneration of farmer | Customer should responsible for fixing the damage |
| **T** There is no spare part shop nearby | Develop business cooperation with related agencies |
| **T** Late payment | Explain the rule of services agricultural and equipment machinery to customer |
| **T** Low responsibility of the customer | |
Therefore, the Agricultural Equipment and Machinery Services needs to apply an information management system that aims to: 1) expand the agricultural equipment and machinery engineering service promotion, 2) store the group information, 3) simplify tools rental transaction, dan 4) simplify decision making to improve the Agricultural Equipment and Machinery Services. The strategy of Agricultural Equipment and Machinery Services development based on SWOT analysis was conducted step by step.

Community behavior and the quality of human resources have a dominant influence on improving public organization performance. Human capital development is a strategic plan that must be carried out for the development of Agricultural Equipment and Machinery Services. It requires cooperation from stakeholders. The government can support through strengthening the empowerment of Agricultural Equipment and Machinery Services through capacity building. The same vision, togetherness, and such cohesiveness can be fostered through routine meetings both formally and non-formal. It will increase farmers' sense of belonging and growing ease of coordination between stakeholders. The planning to develop Agricultural Equipment and Machinery Services is shown in figure 3.

Figure 3. Strategic management phase

4. Conclusions
The mathematical model about Agricultural Equipment and Machinery Services performance has suitability with moderate to good fit criteria. The value of the t-test is significant, proving a significant relationship among variables of organization, technical, and economical. The SWOT analysis reveals that the Agricultural Equipment and Machinery Services performance is located in the third quadrant, with a development focus of market opportunity optimization and human capital development of the Agricultural Equipment and Machinery Services members. The strategy management is being implemented gradually, started from knowledge mapping analysis to map out the knowledge and determine the gap between the current performance indicator and the expected one. Moreover, the group and individual knowledge management are suggested to implement the knowledge management system. As the final step, information system improvement would be based on a website or android application.

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