The role of institutions in enhancing farmer motivation to carry out corn seed production under corporation system

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Abstract. A farmer corporation-based seed production system is needed to bring seeds closer to farmers. Its development requires support from several institutions related to the policy of providing seeds for farmers. This study aims to determine the role of the institution in the farmer-based hybrid maize production system. Five institutions evaluated for their role, namely Indonesian Cereals Research Institute (ICERI) as a source of seeds and technology, Assessment for Agricultural Technology (AIAT) as assistance for application technology in the field, Agricultural Service Office as a policymaker in available seed for farmers, Seed Certification and Inspection Center (SCIC) as the supervisor of seed quality, and the grower local as an absorber of the results by farmer groups. The role of the institution is observed through: socialization activity, field observations, and discussions. The results showed that all institutions have given various supports. ICERI has provided seeds in a timely manner, the right quality and the right quantity, and also conducts regular training and monitoring to provide instructions for implementing good technology application to farmers and by farmers it is considered very good. AIAT provides field assistance for the application of production technology, but the activities are considered by farmers to be inadequate, the staff of Agriculture Service continue to motivate farmers and farmers are deemed adequate. SCIC as a seed supervisor continues to assist farmers in the field, in addition to monitoring irregularities, it also continues to provide guidance to farmers in accordance with the standard operational procedure of hybrid maize seeds and is considered very good by farmers. Then the seed producers who absorb the results of the farmers have carried out excellent guidance such as placing quality control personnel in the field to control implementation, absorbing farmers’ products at an agreed price, building a processing unit in the site area, and by the farmers it is considered very good. With adequate support from related institutions, farmers continue to be motivated to produce hybrid maize seeds, which were originally only 100 ha in Minahasa district, then expanded to surrounding districts, so that the area production increase from 253.4 ha in 2019 to 480 ha in 2020.

1. Introduction

Programs to provide a certified hybrid corn seed has been considered as the major important step in enhancing national maize production. Various efforts have been made to achieve these goals, such as the village self program and the seed support program (BLBU), as well as empowering breeding program [13]. None of these programs strengthen the bargaining position of farmers towards seed sufficiency [7];[15]. One of the reasons is because the program is only implemented by a limited agencies without involving other related parties, even though the implementation of a community empowerment program requires contributions from many parties [4, 17, 19]. The combination of
a top-down approach with a bottom-up approach is considered more likely to accelerate sustainable adoption [33]. The involvement of the private sector to take on more roles is very much needed in overcoming the problem of seeds at the farmer level [26].

A pilot project for a farmer corporation-based hybrid corn seed production system in Indonesia began in 2019 in five provinces. The partnership model builds on valuable experience in the previous seed programs experiences. IAARD as the producer of seed innovation and technology, which has experience in conducting demonstration plots of seed production and is able to produce quality seeds [5]. Department of Agriculture as policy makers for BLBU seed supply which annually distributes hundred soft on seed to farmers [11], and seed producers who implementing field action. The three institutions, jointly develop a group of breeder farmers to produce hybrid corn seeds [12]. The extent to the benefits of implementing the role of the institution, need to be known for increasing the motivation of farmers to carry out corporate-based hybrid corn seed production activities.

2. Materials and Methods

The research was conducted in 2020 by conducting field survey to five districts implementing pilot project of corporation based seed production in North Sulawesi i.e. Minahasa regency, North Minahasa Regency (Minut) Minahasa Regency South (Minsel), Southeast Minahasa Regency (Mitra), and Tomohon City. Respondents involved in the programs were including 100 farmers engaged in seed production activity.

Table 1. Distribution of respondents in North Sulawesi Province, 2020.

| Location       | Farmer Group Name                          | Number of farmers (person) | Implementor | Respondent |
|----------------|-------------------------------------------|-----------------------------|-------------|------------|
| Minahasa       | Suka Maju, Tunas Muda, Minaesaan, Bukit Moria | 80                          | 40          |            |
| Minut          | Merah Cempaka, Sejati, Maju Jaya, Anugerah | 60                          | 30          |            |
| Minsel         | Kelompok Tani Matuari                     | 23                          | 12          |            |
| Mitra          | Kelompok Tani Makapihok                   | 20                          | 10          |            |
| Tomohon City   | Kelompok Tani Maju Bersama                | 17                          | 8           |            |
| Total          | 11 groups                                  | 200                         | 100         |            |

Secondary data were used as guidelines in obtaining primary data. Primary data including the farmer's response to the implementation of various tasks related institutions in the development of hybrid corn seed production system in the region. Various services agencies were involved in the programs including:

1. Provincial Agricultural Agency as a. decision maker in the distribution of seed, b. responsible in field monitoring, and c. Motivate farmers during the program implementation.
2. ICERI is to provide parentseed, technology supervision and field monitoring.
3. IAIT is to take responsibility in the supervision of technology.
4. SSOIs to take responsibility in seed supervision since planting until certification.
5. Seed grower is to process the F1 seed and marketing to the stakeholders.

Three types of farmer responses were observed, namely cognitive responses, affective responses, and conative responses. Response cognitive and affective responses respectively measure the level of knowledge of farmers and the level of assessment of farmers to the duties and authority of institutions related and its implementation in the field, while the response conative measure the attitudes of farmers towards the results of task execution institution, whether motivated to improve their performance or even decline because negative assessment [8].
Data was analysis by using three models i.e:

1. Analisis Fishbein by using formula [1]:

\[ Ao = \sum_{k=0}^{n} (bi. ei) \]

Note: Ao: Response; b: Confidence; e: Evaluation; i: Index

Ao value based on Likert scale:
- 1 = Bad (B)
- 2 = Not Good (NG)
- 3 = Slightly Good (SG)
- 4 = Good (G)
- 5 = Very Good (VG)

According to Rangkuti [28], a scale of 1-5 is a scale that can show a response to a new innovation being introduced. The answer to each variable asked has a gradation from very negative to very positive and can be in the form of words. The concentration of the average value (mean) is calculated using the Sturges formula [37] as follows:

\[ Z = \frac{X - Y}{K} \]

Z = Interval; X : Max value, Y : Min value; K : number of class

Based on this formula, the value of the interval \( Z = (5-1)/5 = 0.8 \), so that the response interval in this study is determined as follows:

- B = 1.00 -1.80;
- NG = 1.81-2.60, SG = 2.61-3.40;
- G = 4.41-4.30;
- VG = 4.31-5.00

The confidence level arises from positive information that develops and then a desire to verify and evaluate the truth of that information arises. The results of the search process determine a person's attitude whether interested or not. This process is the beginning of the birth of attitudes [3].

2. Analysis of correlation which measure any positive or negative correlation between the role of institutions in improving the motivation of farmers to implement hybrid corn seed production based corporate farmers. The correlation analysis is formulated as follows [34].

\[ R = \frac{\Sigma XY}{\sqrt{\Sigma X^2 \Sigma Y^2}} \]

3. Regression Analysis, measuring the contribution of each institution's role to increase the motivation of farmers to carry out hybrid corn seed production with the following formula [36]

\[ Y = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \ldots \beta_nX_n. \]

Y : farmer motivation; \( \alpha \) : Constant; \( \beta \) : Regression coefficient
X1 : Agriculture office contribution
X2 : ICERI contribution
X3 : IAIT contribution
X4 : BPSB contribution
X5 : Seed grower/private contribution,

n: sum of independent variable

3. Results and Discussion
Product activity of the hybrid maize seed-based corporate farmers in North Sulawesi began in late 2019, involving four farmer groups in Minahasa district to produce hybrid corn seed. The four groups succeeded in producing quality seed candidates, thus benefiting the groups and seed producers. This success, draw attention to developing a broader scope by enhancing the role of each party builder.

3.1. The role of the department of agriculture

In the partnership scheme, the Provincial Agriculture Office and its staff are tasked with motivating farmers by guaranteeing that the seeds produced will be absorbed into the assisted seed program. Based on observations, until now the Department of Agriculture has carried out various activities that support the sustainability of seed production based on farmer corporations, including:

1. Socialize hybrid corn seed production program to the staff of the Provincial and District/City Agriculture Offices, all extensions and SSO staffs. The results of the socialization motivated PPL and BPSB officers to provide guidance to foster program implementation.

2. Develop CPCL/farmers candidate lists for seed users from the fostered groups. In 2019, the program was implemented in 10,000 ha area and increased to 45.108 ha in 2020 [10]. Half of this amount (20,000 ha) is supplied from captive breeding based on farmer corporations in North Sulawesi [22].

3. Conducting demonstration plots, including assisted seed program during the implementation. Such efforts have a positive impact on farmers' confidence that the seeds produced by breeders can compete with other hybrid maize seeds [18]. The number of seed quote increased from 150 tons in 2019 to 300 tons in 2020 [10].

Fishbein's analysis shows that the attitude of farmers towards the support of the Department of Agriculture is adequate with a score of 3.90. As many as 10 respondents (10 %) was classified as Very Good (VG), 70 respondents (70 %) who rate Good (G), and the remaining 20 respondents (20 %) which assesses relatively good (RG) (Table 2).

The steps and efforts of the Ministry of Agriculture are considered positively by local seed producers and ICERI. Correlation analysis indicated that the role of the Ministry of Agriculture is...
closely related to increasing the motivation of farmers to produce hybrid corn seeds with a fairly strong correlation with a value of 0.29 (Table 3).

### Table 3. Correlation of supported between institutions in increasing the motivation of farmers, 2020.

|                     | Guidance | ICERI  | IAIT    | SSO     | Producer | Motivation |
|---------------------|----------|--------|---------|---------|----------|------------|
| Guidance            | 1        | .322** | .202*   | .139    | .101     | .295**     |
| ICERI               | 1        |        | .201*   | .491**  | .228*    | .632**     |
| IAIT                | 1        |        |         | .271**  | -.267**  | .164       |
| SSO                 | 1        |        |         |         | .321**   | .606**     |
| Producer            |          |        |         |         | 1        | .632**     |

**. Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).**

The results of the regression analysis also indicated that the calculated F value of 50.62, much greater than the Ftable (sig 0.000) which means that there is at least one dependent variable (institution) that has an effect on increasing the motivation of farmers to carry out seed production based on farmer corporations (Table 4).

### Table 4. Analysis of the variance of the effect of institutional support on farmer motivation, 2020.

| Model       | Sum of Squares | df | Mean Square | F      | Sig.     |
|-------------|----------------|----|-------------|--------|----------|
| Regression  | 11.188         | 5  | 2.238       | 50.062 | .000     |
| Residual    | 4.202          | 94 | 0.045       |        |          |
| Total       | 15.390         | 99 |             |        |          |

Then the further tests indicated that the regression coefficient of each independent variable is varied but all of them contribute positive value for improving the motivation of farmers in implementing corporate-based seed production by farmers. The equations of these coefficient values are:

\[ Y = -0.018 + 0.18X_1 + 0.29X_2 + 0.07X_3 + 0.17X_4 + 0.42X_5 \]

Based on *t-test* there are three independent variables are highly significant, including: ICERI support (X2), SSO support (X4) and the support of private seed company (X5). Then the support from the Department of Agriculture (X1), statistically only has a significant effect, and the least perceived support by farmers is IAIT (Table 5).

### Table 5. Regression of coefficient on effect of institution support on farmer’s motivation

| Model                  | coefficient | t     | Sig.  |
|------------------------|-------------|-------|-------|
| Constant               | -.018       | -.053 | .958  |
| Government office (X1) | .177        | 2.567 | .012  |
| ICERI (X2)             | .290        | 5.479 | .000  |
| IAIT (X3)              | .070        | 1.152 | .252  |
| SSO (X4)               | .170        | 3.135 | .002  |
| Private company (X5)   | .422        | 8.285 | .000  |
3.2. The role of ICERI

In the partnership scheme, ICERI is responsible to provide parentseeds and field assistance during the seed production stage. The task implementation in various form including:

1. Providing parentseed of females seed (MAL-03) and male (CLYN231) to produce F1 seed of JH-37 variety, or G102612 to produce F1 seed Nasa-29 variety. PT. TWINN as the private partner has been distributed over 6335 kg of parent seed to North Sulawesi Province in 2019 and increased to 12,000 kg in 2020 (Table 6).

Table 6. Parent seed allocation in corporation farm, North Sulawesi, 2020.

| district   | ParentSeed         | Total (kg)  | Area (ha) | Total (kg)  | Area (ha) |
|------------|--------------------|-------------|-----------|-------------|-----------|
|            | Female MAL-03      | 2,000       | 100       | 3,000       | 150       |
| Minahasa   | Clyn 231           | 500         |           | 750         |           |
|            | Female MAL-03      | 600         | 30        | 1,200       | 60        |
| Minsel     | Clyn 231           | 150         | 30        | 300         |           |
| Minut      | Female MAL-03      | 1,668       | 83.4      | 100         | 50        |
|            | Clyn 231           | 417         |           | 250         |           |
| Partner    | Female MAL-03      | 400         | 20        | 400         | 20        |
|            | Clyn 231           | 100         |           | 100         |           |
| Please     | Female MAL-03      | 400         | 20        | 1,060       | 53        |
|            | Clyn 231           | 100         | 20        | 1,060       | 53        |
| Manado     | Female MAL-03      | -           | -         | 940         | 47        |
|            | Clyn 231           | -           | -         | 235         |           |
| Bolmong    | Female MAL-03      | -           | -         | 2,000       | 100       |
|            | G.102612 Jan male  | -           | -         | 500         |           |
| Amount     |                    | 6,335       | 253.4     | 12,000      | 480       |

Source: ICERI, 2020

2. Conduct training to implementing farmers and field workers on the application of production technology. The training was carried out in two stages, i.e. hands on training in both room and corn field by involving AIAT, SSO, MoA with the aim to provide understanding and methods and steps in coaching to farmers to apply technology. The material include selection/determination of isolated locations, arranging female and male planting ratio, fertilization, weeding and pest control, roguing, detasseling. Second; training at the farmer level is carried out on farmer's land identify the color of male and female plants be removed and proper harvest timing. Thus, the implementation of training several times that adapted to the topic will positively affect the increasing of employment, and strengthening farmer group [16].

3. Monitoring and Evaluation (Monev). Monitoring and evaluation activities are not only addressed to the executive farmers, but also to field officers to ensure the appropriate SOP implementation to produce high quality seed. Efforts to show a real condition in the field [23]. Farmers introduce a new paradigm and affect their attitudes in the adoption process [24]; [21].

The response of farmers to the implementation of the functions and tasks of ICERI is varies from good to very good. The number of farmers who gave a good rating was 37 people (37 %) and 63 people (63 %) gave a very good rating. Analyst a Fishbein shows a score of 4.63 which means it is in the category of very good response according to the interval sturges formula (Table 2).

Correlation analysis shows that the relationship between the assistance provided by ICERI and the enthusiasm of farmers to produce hybrid corn seeds is very good, the correlation value is quite strong with a value of 0.632 (Table 3). The role of ICERI is also positively correlated with the performance of other institutions. Where ICERI contributed a correlation value of 0.322, and to SSO. ICERI and AIAT collaboration on seed production was through intensive coordination and communication in
order to ensure the application of seed production technology in accordance with SOPs. Intense coordination with one goal can change a negative attitude into a positive one [9]; [14]. Regression analysis showed that, ICERI contributed very significantly to the increased motivation of farmers carry out the production of hybrid corn seed corporation based farmers (Table 5).

3.3. The role of North Sulawesi AIAT
AIAT has provide sufficient human resources and funding to support the seed production activity. Fishbein's analysis shows that the response of farmers to AIAT support is at a score of 2.94 which means it is inadequate. Farmers' assessment of the role of AIAT is the lowest compared to other institutions, which only has a correlation of 0.16 and is in the uncorrelated category (Table 3). Likewise, regression analysis shows that the effect of AIAT support on increasing farmer motivation is very small, only 0.07 and not significant according to statistical tests (Table 5).

3.4. Role of Seed Sertification Office (SSO)
SSO member on inspection duty in all districts showed a very good attention. The knowledge they gained from training from ICERI coupled with technical instructions obtained from the quality control personnel (PT.TWINN quality manager) made them feel challenged, because it was considered a new and interesting thing to convey to farmers. The activities of SSO staff are highly appreciated by farmers due to the intensive supervision activities. For example, when the plants was attack by pest, the control method is immediately offered. In addition to the roguing and detasseling, SSO staffs put high attention to keep the quality of the seed. This way of working has made the progress of breeding hybrid corn seeds based on farmer corporations advanced. Early treatmente very problem that arisesisindispensable in seed production activities [2].

Fishbein's analysis shows that the response of farmers to assistance carried out by SSO is very good with a score of 4.61 (Table 2). A total of 61 respondents rated it very good and 39 respondents rated it good. The assessment of related institutions and farmers on SSO's performance in carrying out supervision is good to very good, even the correlation value within creasing farmer motivation reaches 0.61 andis classified as strong relationship (Table 3).

3.5. Role of seed producers
Seed producers are among those who benefit on this corporation business. The production cost is comparatively low as compared to the self production as we need more facilities and a large amoun to flabor. Several efforts have been made and continue to be developed by producers in order to develop seed systems, including:

1. Intense communication with all related institutions. Communication with ICERI regarding theavailability of parent seeds, Department of Agriculture regarding the all ocation of the required seeds, SSO and extension officers regarding the application of technology and quality control. Such communication is needed in strengthenand enlarge the business and technology adoption [35]; [30].
2. Organize and ensure the allocation of parentseed to farmers who are ready to land, according to the area, so the parentseed quite to the target area are planned. The need for parentseeds depends on the ratio of male and female rows [5].
3. Monitor the development of plant growth in the field by placing a quality controller to ensure that the crops are not contaminated with other varieties. According to Raikwar. R. S [27], if there are plants that deviate, they will pollinate the surrounding plants and that means the seeds produced are of poorquality [25]; [39];[31].
4. Forming a control team in charge of detasseling. In this way, it is ensured that the proper detasseling is implemented, sothat the genetic quality of the seeds produced is guaranteed.
5. Monitor time of harvest and provide special sacks (sack of onions), so thecobs were harvested remains in contact with fresh air, not accumulate and . A grand freshly harvested should be processed immediately to avoid damage to viability [5]; [20].
6. Absorb farmers' produce on time in an affordable place with a 4-wheeled vehicle to be immediately transported to the processing unit, because if the processing is delayed, it is feared to be infected with fungi and damage growth power [32];[38].

7. Seeing this opportunity, producers continue to improve their performance, both in terms of improving communication with related institutions, as well as in terms of developing planting area and building processing units located in producer areas. Producers absorb farmers’ produce in the form of selected cobs at harvest, so farmers do not need to dry and peel, farmers do not need to look for markets which have always been a dilemma because the market is already available. This kind of attention needs to be continuously developed in order to motivate farmers to plant more widely [29].

Based on field observations, some interesting findings in hybrid corn seed production including (a). The parent seeds are supported by the government; (b) There is a technology assistant in the field who always provides guidance and encouragement to produce quality seeds; (c) the market is guaranteed with a good price, Rp. 5,500/kg; (d) The technology is easy to apply. Factors that relieve farmers in their work can affect adoption attitudes [9].

4. Conclusion
Intra-institution support in hybrid corn seed production activities is varies in the corporation program with indicators is remain inadequate to very good. Three institutions that contribute significantly are Seed Producers, SSO and ICERI. All three contribute significantly in increasing the motivation of farmers to work well in producing hybrid corn seeds. Three factors that motivate farmers to actively carry out corporate-based seed production are assistance from related institutions that increase farmers' knowledge and skills, availability of quality seed sources, and certainty of favorable prices.

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