Farmer response and financial feasibility of corn seed production in Southeast Sulawesi

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Abstract. To support the growth and development of corn in Southeast Sulawesi, information of farmer response and financial feasibility of corn seed production in South East Sulawesi are needed. The paper aims to determine farmers' response and financial feasibility of corn seed production in Southeast Sulawesi. The results of this study are expected to be input for local governments in developing community-based seed breeders and can be useful for corn seedling businesses. The study was conducted in March 2017 in Pangan Jaya Village, Lainea District, Konawe Selatan Regency, Southeast Sulawesi Province. The study was carried out by involving 20 farmers, 10 people for the production of corn seed production technology and 10 non-breeder farmers who carried out according to the patterns and habits of farmers (feed corn production). The data collected consists of (1) corn seed production data based on the results of corn seed real production (2) farmer and non-breeder farm input data, consisting of expenditures for the purchase of production facilities and labor costs. The results of research were (1) Farmers' response obtained, 83% of farmers gave a good perception of the breeding business of corn seeds. It means that corn breeding business is very likely to be cultivated and developed further. (2) Corn seed production business in Southeast Sulawesi is financially profitable and feasible to be developed with a B/C value of 2.15 and MBCR 4.4. These results indicate that the corn seed production business has good development prospects. In order to support the continuous supply and fulfill of the need for quality corn seeds in Southeast Sulawesi, it is necessary to develop breeding of corn seeds, especially in areas of corn development centers. Market support is very much needed for the marketing of seed production. Market certainty will provide opportunities for the growth of new breeders, and will ensure the sustainability of corn seed breeding business at the farm level.

1. Introduction
Strengthening and increasing national production of food crops, especially corn is the main concern and program of the Indonesian government at this time. This cannot be separated from the important role of corn as a strategic commodity as food, feed and industrial raw materials.

Corn demand continues to increase. During the 2006 - 2015 period domestic corn demand increased with growth of 6.40 percent [1]. The increase in corn demand is due to the proportion of corn use by the feed industry has reached 50% of the total national corn needs [2] In addition, the increase in corn demand is also due to the commodity corn has good competitiveness nationally [3] National maize production in the same period also increased by 6.31 percent [4] in line with the increase in harvested area. However, the increase has not been able to meet domestic needs, especially for the feed industry, so the government had to import corn in 2015 amounting to 3.267 million tons [5].
The government continues to promote increased national corn production. However, this is often faced with various obstacles, including the unavailability of quality seeds according to farmers’ demands [6, 7] Seed plays an important role as a technology carrier (delivery system) that contains genetic potential to increase crop production [8] for this reason, seeds must be available in sufficient quantities on a commercial scale, so that all potentials contained in superior varieties can perceived benefits by consumers [9] The availability of high yielding and good quality seeds is very important in agricultural production systems, both to meet their own consumption and commercially oriented [10, 11] and influences productivity and production, yield quality and farm efficiency [12].

To support the availability of quality corn seeds, one of the things that needs to be developed is seed breeding. Community-based corn seed breeding is an alternative supply of quality seeds at the farm level in a timely manner [13] For the development of a system of supplying quality seeds of new high yielding varieties in an area, including requiring handling in terms of growing and developing seed breeders/producers, actual 'market' growth of quality seeds produced by breeders, more importantly, the supply of high-quality superior seeds must meet six precise principles, namely variety, quality, quantity, time, location and price. Furthermore, several things that become the main concern in community-based seed breeding are the types of plants or varieties to be produced, seed sources, breeder skills, quality control, credit/capital required for seed production, processing and marketing [14].

Corn seedling in Southeast Sulawesi is still underdeveloped. The reason is the difficulty in obtaining source seeds, lack of farmers’ skills in breeding corn to seed marketing problems [15], and there are still many farmers who use seeds from the harvest of the previous planting season on the grounds that the price of seeds is expensive [16]. Corn seed producers in Southeast Sulawesi recorded 4 breeders with a production capacity of 24 tons of certified seed [17] The seed production cannot meet the demand for corn seeds in Southeast Sulawesi which reaches 882,900 kg / year (assuming the seed needs are 15 kg / ha with a planting area of 29,430 ha). This means that there is still a very large gap between the needs and available seeds. This is an opportunity to grow and develop maize seed breeding in order to contribute to the supply of high-quality corn seeds in Southeast Sulawesi.

To support the growth and development of corn in Southeast Sulawesi, information of farmer response and financial feasibility of corn seed production in Southeast Sulawesi are needed. This study aims to determine farmers' response and financial feasibility of corn seed production in Southeast Sulawesi, The results of this study are expected to be input for local governments in developing community-based seed breeders and can be useful for corn seedling businesses.

2. Materials and Methods
The study was conducted in March 2017 in Pangan Jaya Village, Lainea District, Konawe Selatan Regency, and Southeast Sulawesi Province. The study was carried out by involving 20 farmers, 10 people for the production of corn seed production technology and 10 non-cooperator farmers who carried out according to the patterns and habits of farmers (feed corn production). The area of land for the production of maize seed production technology is 10 ha. The data collected consists of (1) corn seed production data based on the results of corn seed reall production (2) farmer and non-breeder farm input data, consisting of expenditures for the purchase of production facilities (Rp / kg; Rp / lt) and labor costs (Rp. / HOK).

To analyze the corn and feed seed production business, use financial analysis with the losses and gains approach through the Marginal Benefit Cost Ratio (MBCR) [21,22]

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MBCR = \frac{(Q_2 \times P_2) - (Q_1 \times P_1)}{C_2 - C_1} \]

Information :
Q1 = feed corn production (kg / ha)
Q2 = corn production in seed breeding (kg)
P1 = price of feed corn production (Rp / kg)
P2 = price of corn production in seed breeding (Rp / kg)
C1 = total cost to produce feed corn (Rp)
C2 = total cost of breeding seeds (Rp)

To decide on the level of eligibility, 80% risk is included [23]. Based on this formula, the decision rule is that farming is considered feasible if the corn farming gets an MBCR value $\geq 1.8$

3. Results and Discussion

3.1 Corn farming performance

Corn farming at the study site is generally carried out on rainfed lowland agro-ecosystems. Maize planting season is usually carried out in the okmar period, after rice planting, but most farmers plant twice a year with MT I planting patterns in November / December - February / March and MT II takes place in June / July - September / October. Corn farming carried out by farmers in the study location is feed corn, while corn seed production / seedling is a technological innovation newly introduced to farmers through the Seed Independent Field school program. As shown in Table 4, there are differences in the application of technology between seed production and feed corn. These differences are found in seed use, fertilizer application rates, more intensive crop maintenance in seed business, genetic quality maintenance (roguing), and seed processing (sorting). Specifically for the production of hybrid corn seeds, the seeds used consist of male elders and seed parents, of which the seeds can only be obtained from the Balitserealia Maros.

| Description      | Seed Production | Feed Corn |
|------------------|-----------------|-----------|
|                  | amount          | price     | amount           | Price     |
|                  | (Kg/l/buah/HOK) |           | (Kg/l/buah/HOK) |           |
| **Production Input** |                 |           |                  |           |
| Seed:            |                 |           |                  |           |
| - male elder     | 5               | 150.000   | 15               | 60.000    |
| - female elder   | 10              | 75.000    |                   |           |
| Fertilizer       |                 |           |                  |           |
| - urea           | 2               | 95.000    | 2                 | 95.000    |
| - phonska        | 8               | 110.000   | 3                 | 110.000   |
| - Manure         | 2000            | 500       | 0                 | 0         |
| Herbicide        |                 |           |                  |           |
| - Calaris        | 2               | 310.000   | 2                 | 310.000   |
| - Roundhup       | 4               | 70.000    | 4                 | 70.000    |
| Insektisida      |                 |           |                  |           |
| - Furadan        | 10              | 35.000    | 10                | 35.000    |
| - Marshal        | 8               | 25.000    | 0                 | 0         |
| Labor            |                 |           |                  |           |
| - land clearing  | 2               | 70.000    | 2                 | 70.000    |
| - land management| 14              | 70.000    | 14                | 70.000    |
| - planting       | 14              | 70.000    | 2                 | 70.000    |
| - fertilizing    | 8               | 70.000    | 2                 | 70.000    |
| - weeding        | 4               | 70.000    | 2                 | 70.000    |
| - Roguing        | 8               | 70.000    | 0                 | 0         |
| - detasseling    | 8               | 70.000    | 0                 | 0         |
| - harvest        | 12              | 70.000    | 12                | 70.000    |
| - threshing      | 450.000         |           | 600.000           |           |
| - drying         | 2               | 70.000    | 1                 | 70.000    |
3.2 Corn farm financing structure

The difference in the application of the technology is also in line with differences in the structure of farm financing for the production of seed and feed corn. Funding in corn farming for seed production and feed corn is presented in Table 2.

Table 2. Farm financing structure for corn seed production and feed corn in Southeast Sulawesi, 2017

| Description             | Seed Production | Feed Corn | Different |
|-------------------------|-----------------|-----------|-----------|
|                         | Score (Rp)      | Proportion (%) | Score (Rp) | Proportion (%) | (Rp) |
| **A. Costs**            |                 |           |           |               |      |
| 1. Production Facilities|                 |           |           |               |      |
| - Seed                  | 1.500.000       | 11.82     | 900.000   | 13.62         | 600.000 | 40.00 |
| - Urea fertilizer       | 190.000         | 1.50      | 190.000   | 2.87          | 0      |       |
| - Phonska fertilizer    | 880.000         | 6.93      | 330.000   | 4.99          | 550.000 | 62.50 |
| - Manure                | 1.000.000       | 7.88      | 0         | 1.000.000     | 100    |       |
| - Herbisda              | 900.000         | 7.09      | 450.000   | 6.81          | 450.000 | 50    |
| - insecticide           | 550.000         | 4.33      | 350.000   | 5.30          | 200.000 | 36.36 |
| **1. Labor**            |                 |           |           |               |      |
| - land clearing         | 140.000         | 1.10      | 140.000   | 2.12          | 0      |       |
| - land management       | 1.200.000       | 9.45      | 1.200.000 | 18.15         | 0      |       |
| - planting              | 980.000         | 7.72      | 980.000   | 14.83         | 0      |       |
| - fertilizing           | 560.000         | 4.41      | 140.000   | 2.12          | 420.000 | 75.00 |
| - weeding               | 280.000         | 2.21      | 140.000   | 2.12          | 140.000 | 50.00 |
| - Roguing               | 700.000         | 5.51      | 0         | 700.000       | 100    |       |
| - harvest               | 840.000         | 6.62      | 840.000   | 12.71         | 0      |       |
| - threshing             | 450.000         | 3.54      | 600.000   | 9.08          | -150.000 | -33.33 |
| - drying                | 140.000         | 1.10      | 70.000    | 1.06          | 70.000 |       |
| - seed sorting          | 1.000.000       | 7.88      | 0         | 1.000.000     |        |       |
| - packaging             | 210.000         | 1.65      | 0         | 210.000       |        |       |
| **Etc**                 | 0.00            |           |           |               |       |       |
| - Sack                  | 175.000         | 1.38      | 280.000   | 4.24          | -105.000 |       |
| - Packaging @ 5kg       | 800.000         | 6.30      | 0         | 800.000       |       |       |
| - Certification         | 200.000         | 1.58      | 0         | 200.000       |       |       |
| **A. Total Cost**       | 12.695.000      |           | 6.610.000 |               | 6.085.000 |       |
| **B. Revenue**          | 40.000.000      |           | 13.300.000|               | 26.700.000 |       |
| **C. Profit**           | 27.305.000      |           | 6.690.000 |               | 20.615.000 |       |
| **D. B/C**              | 2.15            |           | 1.01      |               |       |       |

Table 2 showed that, the main difference in the application of corn farming technology for seed production with feed corn lies in the stages of activities in the production of corn seeds that are not carried out in feed corn farming, namely roguing, seed sorting and seed packaging. Next from the aspect of financing shows that financing in corn farming includes the purchase of production facilities such as
seeds, fertilizers, pesticides, labor costs and other costs such as sacks. Likewise with the corn seedling business, except for additional labor for roguing, seed sorting and seed packaging.

Based on the financing structure, between the seed production business with feed corn, it appears that the total funding for the seed production business is higher than the feed corn. That is because there are additional costs for purchasing seeds, fertilizing, pesticides, labor and other costs such as certification which is not found in the feed corn business.

From the results of an analysis of corn seed production business, it is known that the total cost / hectare incurred for the production of corn seeds (hybrid) is Rp. 12,695,000, with a profit of Rp. 27,305,000. With a B / C value of 2.15, this indicates that the business of propagating corn seeds is feasible. Bunch states that the single most decisive factor in generating enthusiasm for a program is an increase in income [24]. Furthermore, a partial budget analysis is performed to determine the change in the application of feed corn technology to corn seed technology. The results of the analysis of losses and gain of corn farming are presented in Table 3.

**Table 3.** Analysis of losses and gains of corn farming in Pangan Jaya Village, Konawe Selatan District, 2017

| Losses       | Amount (Rp) | Gains            | Amount (Rp) |
|--------------|-------------|------------------|-------------|
| Additional fee: |             | Additional income | 26,700,000  |
| a. Seed      | 1,550,000   | b. Fertilizer    | 650,000     |
| c. Pesticide | 2,390,000   | d. Labor         | 895,000     |
| Total Losses | 6,085,000   | Total Gains      | 26,700,000  |
| Additional Profit 26,700,000 - 6,085,000 = 20,615,000 | MBCR : 26,700,000/6,085,000 = 4,4 |

Table 3 shows that for seed production businesses, farmers need to spend an additional cost of Rp. 6,085,000, from the previous business (corn feed). Additional costs are allocated for the purchase of seeds, fertilizers, pesticides, labor costs and others (packaging and certification). However, these additional costs can provide a substantial additional income of Rp. 20,615,000.

The acquisition of an MBCR score of 4.4 shows that an additional Rp. 1,000 can generate an income of Rp. 4,400. This means that the business of breeding corn seeds (hybrid) is very feasible to be developed. The feasibility of corn seed breeding business can be an indicator for further development of corn seed breeding business.

### 3.3 Farmers' Response of Corn Seed Production Technology

Although from the financial aspect, corn seed production business is feasible to be developed, but for further development of seed breeding, it is necessary to know the farmers' perception of the seed production business. Complete results of the analysis of perceptions of corn seed breeding efforts are shown in Table 4.
1) Farmers are interested in breeding corn seeds.

2) Farmers are interested in becoming corn seed breeders independently.

3) Corn seed breeding business is more profitable than feed corn.

4) Market availability is an important factor in the sustainability of corn seed breeding business.

5) Corn seed breeding technology is well understood by farmers.

6) Corn seed breeding technology is easily implemented by farmers.

7) The corn seed breeding technology has compatibility with existing technology.

8) Characteristics of corn seed breeding technology favored by farmers.

| No | Statement | Agree | doubt | disagree |
|----|-----------|-------|-------|----------|
| 1  | Farmers are interested in breeding corn seeds | 100   | -     | -        |
| 2  | Farmers are interested in becoming corn seed breeders independently | 50    | 25    | 25       |
| 3  | Corn seed breeding business is more profitable than feed corn | 75    | 25    | -        |
| 4  | Market availability is an important factor in the sustainability of corn seed breeding business | 100   | -     | -        |
| 5  | Corn seed breeding technology is well understood by farmers | 80    | 20    | -        |
| 6  | Corn seed breeding technology is easily implemented by farmers | 90    | -     | 10       |
| 7  | The corn seed breeding technology has compatibility with existing technology | 90    | -     | 10       |
| 8  | Characteristics of corn seed breeding technology favored by farmers | 75    | 25    | -        |

|              | Average |           |       |
|--------------|---------|-----------|-------|
|              | 83      | 12        | 6     |

Based on farmers' response of the corn seed production business, 83% of farmers obtained a good perception of the statements related to corn seed breeding business. This illustrates if the corn breeding business is very likely to be empowered and further developed, taking into account market availability factors for the marketing of breeder seed production.

4 Conclusion

Farmers' perceptions obtained, 83% of farmers gave a good perception of the breeding business of corn seeds. It means that corn breeding business is very likely to be cultivated and developed further. Corn seed production business in Southeast Sulawesi is financially profitable and feasible to be developed with a B/C value of 2.15 and MBCR 4.4. These results indicate that the corn seed production business has good development prospects.

In order to support the continuous supply and fulfill the need for quality corn seeds in Southeast Sulawesi, it is necessary to develop breeding of corn seeds, especially in areas of corn development centers. Market support is very much needed for the marketing of seed production. Market certainty will provide opportunities for the growth of new breeders, and will ensure the sustainability of corn seed breeding business at the farm level.

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