The effectiveness of "Simantri" program in producing organic fertilizer and biourine to organic farming system in Bali, Indonesia

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Abstract. One strategy for the Bali provincial government to produce organic fertilizer to reduce the use of inorganic fertilizers in the agricultural system in Bali through the formation of groups "Simantri". The purpose of this study to determine the effectiveness of the group in support of government programs in the province of Bali in the supply of organic fertilizer and biourine from cattle manure in the group "Simantri". Retrieving data using a survey method and observation in three regencies in Bali namely: Tabanan, Buleleng, and Karangasem. In every district taken three groups of cattle are "purposive sampling" on each different altitude are lowlands, plains, and plateaus so that the number of groups of as many as 27 groups of cattle. The results showed 66.49% herd to process cow manure into organic fertilizer and biourine, and the highest percentage (70.07%) in the lowlands. In the process of fermentation into fertilizer, the majority (45.50%) using EM4 as fermenters and averaging 66.49% said the results are good. Organic fertilizer produced by the group in addition to increasing the income of the group, and the majority (71.78%) use it in their farm system and can be beneficial to farmers. From this study, it can be concluded that the Bali provincial government's efforts in developing organic agricultural products through the establishment of herd program "Simantri" very effective.

1 Introduction

At the time of the Indonesian nation was spurred growth in the field of agricultural development towards the achievement of self-sufficiency in food, the use of various chemicals in farming systems, especially inorganic fertilizer is very high. It can be assumed that in order to obtain the production of various types of food crops is highly dependent on the provision of chemical fertilizers. Entering the 21st century has been recognized by the government that excessive use of chemical fertilizers gives a broad impact on soil conditions and environmental damage. It also will adversely affect plants primarily plant diseases.

The provincial government of Bali began in 2009 through the "Bali clean and green go to organic" farmers formed a group called "Simantri" (Integrated Farm Management System). Simantri is a breakthrough in efforts to accelerate the adoption of agricultural technology is the development model of the pilot transfer of technology to rural communities [1]. This program began in 2009, and until 2016 to have formed 550 groups of 1000 the target group was formed in 2018. Simantri program is integrated the activities of the agricultural sector by sector supporting either vertically or horizontally according to the potential of each region to optimize the utilization of local resources that exist, the main activity is to integrate the cultivation of crops with livestock, where the plant waste is processed for animal feed and animal waste (faeces and urine) processed into organic fertilizer, biourine, and biogas [1].

Agricultural system in Bali cannot be separated from cultural and religious customs that underlie life in a system of social relations: group. Everyone who lives in a rural area will be bound in a group called the ‘Desa Adat’ in which there are many kinds of social groups. Similarly, in the farm system, people who have agricultural land will be bound in a group called "Subak" in the unity of the territory in accordance with the total area. Therefore, the community of farmers in Bali especially those living in rural areas cannot be released to the life of groups, farmers' groups. Farmers Group is a collection of farmers or ranchers formed on the basis of mutual interest, in common environmental conditions (social, economic, resource) and familiarity to improve and develop the business members. The number of members of farmer groups of 20 people or society adapted to environmental conditions and farming operation [2]. The programs implemented by the government in agriculture necessarily involve Subak organizations so as to achieve optimal results in line with expectations. Subak organization in each unit there are some farmers who carry out certain business in agriculture, including farmer groups Simantri [1].

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Through this Simantri program, the government expects to achieve several objectives, namely: an increase in the population of Bali cattle, increase farmers' income, and accelerate the increase in the use of organic fertilizers in farming systems. Therefore, this study aims to determine the effectiveness of the group Simantri in producing organic fertilizer and bio-urine in farming system in Bali.

In general, the level of formal education of farmers is very low, then the level of ability to adopt new technologies, develop skills, and solve problems relatively slow [2]. Therefore, it required additional non-formal education through various types of counseling or training to meet special needs. Organized non-formal education for citizens who require educational services that act as substitutes, enhancer, or complement formal education [3].

The quality and quantity of non-formal education have been followed by farmers will greatly influence the knowledge and skill in conducting farming operation [4]. Non-formal education for farmers generally extension is intended to develop the potential of farmers with an emphasis on the mastery of technological and functional skills in the field of agriculture and the development of professional attitude and personality for the farmers themselves [4]. Knowledge farmers are also highly support the farmers in adopting an innovation as well as the permanence of farming [5].

2 Research methods
Of the nine districts in Bali, three counties served as a test site each that can represent the characteristics of the agricultural area of rice fields, fields or plantations, and dry areas. In each district is determined by stratified random sampling of lowlands, plains, and plateaus. Each elevation is determined by purposive sampling groups of farmers as much as 3 groups, and each group is taken 3 farmers so that the number of the sample was 81. In collecting data using survey and observation methods. Data obtained then tabulated and analyzed descriptively to obtain a conclusion.

3 Results and discussion
3.1 Members group profile
As farmers in general in Bali, the majority (61.90%) a primary school education, mostly in the highlands. While those with undergraduate education is only 2.47%. This suggests that the interest of the younger generation educated middle-class to plunge in the agricultural sector is very small. Conducting activities in the agricultural sector are considered unprofitable so that the younger generation is more pleased with the job in the service sector. Similarly, judging from the workgroup members Simantri 80.25% were farmers and only 4.94% of employees or employees who participated in the group (Table 1).

| Variable                  | %Member of the group |
|---------------------------|----------------------|
|                           | Lowland | Plains | Plateau | Average |
| 1 Level of education      |         |        |         |         |
| - Primary school          | 44.44   | 66.67  | 74.60   | 61.90   |
| - Secondary school        | 25.93   | 3.70   | 9.52    | 13.05   |
| - High school             | 29.63   | 25.93  | 12.17   | 22.57   |
| - University              | 0       | 3.70   | 3.70    | 2.47    |
| 2 The main work           |         |        |         |         |
| - Farmer                  | 70.37   | 70.37  | 100     | 80.25   |
| - Laborers or artisans    | 18.52   | 14.81  | -       | 11.11   |
| - Employees               | 3.70    | 11.11  | -       | 4.94    |
| - Entrepreneur            | 7.41    | 3.70   | -       | 3.70    |

With this level of education that the average is low, then it will be slower in implementing the innovation given [6] and most are on a plateau with 100% primary job as a farmer. However, 3.7% of the farmers in the highlands of university education, because of the potential for farming land tenure > 50 acres (Table 2).

In general, the level of formal education of farmers is very low, the level of ability to adopt new technology, develop skills, and solve the problem is relatively slow [2]. Non-formal education is intended to develop the potential of farmers in the mastery of technology and skills in agriculture [4]. Non-formal education is conducted for community members who need education services that serve as a substitute, enhancement, or complement to formal education [3]. Non-formal education for farmers is generally counseling intended to develop the potential of farmers with emphasis on mastery of technology and functional skills in the field of agriculture and the development of professional attitude and personality for the farmers themselves [4].

3.2 Agricultural land ownership
Bali Island has an area of 5636.66 km2, with as many as 80 542 ha rice area. The average farmer has land only 0.3 ha of rice fields and most farmers do not have agricultural land just as sharecroppers belonged to someone else [1]. From the research data showed 72.13% of group members do not own their own land, and only 16.40% of the group has a land with an area of 20-50 acres (Table 2).
Table 2. Agriculture land ownership.

| Variable                        | %Member of the group |
|---------------------------------|----------------------|
|                                 | Lowland | Plains | Plateau | Average  |
| 1 Agriculture land (paddy)      |         |        |         |          |
| - Do not have                   | 66.67   | 59.26  | 90.48   | 72.13    |
| - < 20 Acre                     | 3.70    | 3.70   | 4.76    | 4.00     |
| - 20-50 acre                    | 18.52   | 25.93  | 4.76    | 16.40    |
| - > 50 Acre                     | 11.11   | 11.11  | 0       | 7.41     |
| 2 Dry land or plantation        |         |        |         |          |
| - Do not have                   | 25.93   | 29.63  | 14.29   | 22.02    |
| - < 20 Acre                     | 11.11   | 18.52  | 3.70    | 11.11    |
| - 20-50 acre                    | 51.85   | 14.81  | 26.98   | 31.22    |
| - > 50 Acre                     | 11.11   | 37.04  | 55.03   | 35.65    |

The small size of wetland ownership caused by inheritance is done within the family in accordance with the number of families each generation. In accordance with the geographic, on a plateau mostly members of the group (55.03%) owns the plantations with an area > 50 acres, but topographically mostly hilly land. On this plantation land mostly planted with coffee and cocoa with good production results. If the empowerment wants to develop human capital, it will be better if the empowerment is supported by apply the developing ability of subject empowerment [7].

3.3 Ownership of cattle

In general, farmers in Bali other than work as farmers also work as a cattle rancher. This is shown in Table 3 the data contained 40.56% have had veal other than assistance from the government in Simantri program, more stabled outside the cage Simantri program.

Table 3. Ownership of Cattle.

| Variable                        | %Member of the group |
|---------------------------------|----------------------|
|                                 | Lowland | Plains | Plateau | Average  |
| 1 Has other cows                | 37.04   | 40.74  | 43.92   | 40.56    |
| 2 Number of cows owned          |         |        |         |          |
| a 1 cow                         | 25.93   | 22.22  | 36.50   | 28.22    |
| b 2 cow                         | 14.82   | 0      | 22.22   | 9.87     |
| c more than 2 cow               | 0       | 3.70   | 11.11   | 7.40     |
| 3 Raising cattle                |         |        |         |          |
| A Reared in cage “Simantri”     | 18.52   | 14.81  | 3.70    | 12.35    |
| B Keep outside in cage “Simantri”| 18.52  | 25.93  | 40.22   | 28.21    |

If the calculated number of groups Simantri now 550 groups, each of which contained 20 cows and beef cattle accounted for owned, the number of cattle that exist in groups Simantri of as many as 11,950 cows. Assuming each animal feces produce as much as 12 kg/day, the number of raw materials to be processed into organic fertilizer as many as 191,400 kg/day.

3.4 Activities group members

Most members of the group Simantri (81.13%) first-time participants are members of the group. In Table 4, the majority of members of the group are active in the activities that have been programmed, and 87.65% had attended training processing techniques organic fertilizer (compost and biourine).

Important efforts to increase social capital are through group training, character education, school and family education [8]. The role of the farmer group has the most important contribution to the income generating effort of the members of the farmer group as a production unit [9].

Table 4. Cattle Ownership.

| Variable                        | %Member of the group |
|---------------------------------|----------------------|
|                                 | Lowland | Plains | Plateau | Average  |
| 1 Position in the group         |         |        |         |          |
| a Caretaker                     | 18.54   | 14.81  | 12.17   | 15.15    |
| b Member                        | 81.46   | 85.19  | 87.83   | 84.83    |
| 2 First-time participants group | 85.19   | 77.78  | 80.42   | 81.13    |
| 3 Active in group               | 88.89   | 51.85  | 95.24   | 78.66    |
| 4 Attended training             | 59.26   | 59.26  | 71.26   | 63.49    |
| 5 Fertilizer processing technique training | 66.67 | 96.30  | 100     | 87.65    |

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With the raw material for making fertilizers quite a lot and activities of the group members were very nice, the role of group Simantri in the Bali provincial government program successful in realizing the potential of organic farming. Because of the level of education of farmers is low, then the non-formal education is indispensable through counseling and training. Non-formal education has been followed by farmers will greatly influence the knowledge and skill in carrying out farming activities [10]. Non-formal education is intended to develop the potential of farmers on the acquisition of technology and skills in the field of agriculture [4]. Organizations are viewed as a unit of a social system to achieve a common goal through business / group. An organization can work effectively required the ability of work management and management of people associated with the implementation of communication functions to be able to work effectively and efficiently in achieving organizational goals. The behavior of individuals in the group is influenced by several factors such as environment, background experience, and ability [2].

3.5 Waste faeces and urine treatment

With the potential for fertilizer raw materials are much in Simantri program, and an active member of the group, the effectiveness of the group members to produce an excellent organic fertilizer. It can also be seen in Table 5 that 66.49% of the group claimed to process cow manure waste into fertilizer, and all waste can be processed.

| Variable | %Member of the group |
|----------|----------------------|
|          | Lowland | Plains | Plateau | Average |
| 1 Sewage treated by the group | 74.07 | 66.67 | 58.73 | 66.49 |
| 2 Directly use for the plant (untreated) | 3.70 | 11.11 | 9.52 | 8.11 |
| 3 All manure can be processed into fertilizer | 51.85 | 48.15 | 47.62 | 49.21 |
| 4 Fermenter type used: | |
| A. EM4 | 74.07 | 29.63 | 32.80 | 45.80 |
| B. Rumino bacillus (RB) | 22.22 | 18.52 | 22.22 | 20.99 |
| 5 Increasing the income of the group | 62.96 | 66.67 | 69.84 | 66.49 |
| 6 Fertilizer used by group members for crop | 70.37 | 59.26 | 85.71 | 71.78 |

Currently, the organic fertilizer produced by the group in Bali Simantri have economic value because a government subsidy funds to buy the manure produced by the group. Therefore 66.49% of group members said that they could increase their income. But more important is the 71.78% member of the group has been utilizing the manure produced on the farm. The percentage of cattle manure waste processing in the “Simantri” group is very good, when compared with other areas that the integration of agriculture sector with farm in Ngino Kediri Village only 5% processing of animal waste into organic fertilizer, because there is no group [11].

The effectiveness of a media group in implementing the government program in organic agriculture program is supported by several factors: 1) the "Subak" as the cultural roots in farming systems in Bali, 2) group as the media increase the knowledge and skills of farmers in technology innovation through education and training, and 3) support for government assistance in the infrastructure for the group. The response of the community is very good to have knowledge and skills of making liquid organic fertilizer from cow urine, and have positive impact to the plant [12].

4 Conclusions

The organic farming system in Bali is supported by the Simantri group through the transfer of organic fertilizer technology to farmers. The ability and effectiveness of the group in producing organic fertilizer and bio-urine is quite good because most of Simantri group do the activity of cattle waste processing into fertilizer with good enough quality.

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References

1. Dinas Pertanian Tanaman Pangan Provinsi Bali. http://distan.provinsi.bali.com/syarat-Gapoktan-simantri, (2010)
2. K Suradisastra Startegi Pemberdayaan Kelembagaan Petani (Forum Penelitian Agro Ekonomi. (Pusat Analisis Sosial Ekonomi dan Kebijakan Pertanian, Bogor, 2008)
3. S I Wahjono, Perilaku Organisasi (Cetakan Pertama Edisi Graha Ilmu, Yogyakarta, 2010)
4. A G Kartasapoeutra, Teknologi Pembangunan Peternakan (Fakultas Peternakan IPB, Bogor, 1987)
5. Supriyanto Adopsi Teknologi Baru di Kalangan Petani Tanaman Hias di Kelurahan Sukabumi Hilir Jakarta Barat (Agroekonomika, Bogor, 1978)
6. Soekartawi Prinsip Dasar Komunikasi Pertanian (Universitas Indonesia, Jakarta, 1988)
7. K. Widjajanti J. Ekonomi Pembangunan, Kajian Masalah Ekonomi dan Pembangunan 19 2 (2018)
8. D. Ancok J. Psikologika 8 15 (2003)
9. A. A. Hakam J. Mahasiswa Fakultas Ekonomi dan Bisnis (2016)
10. A. Priyanti Dampak Program Sistem Integrasi Tanaman-Ternak terhadap Alokasi Waktu Kerja, Pendapatan dan Pengeluaran Rumah Tangga Petani (Disertasi Sekolah Pasca Sarjana Institut Pertanian, Bogor, 2007)
11. N. Solikin J. Riset dan Konseptual (BRILIAN) (2016)
12. J. Jasmidi, M. Zainuddin and P. Prastowo J. Pengabdian Kepada Masyarakat 24 1 (2018)