Citrus Farmers Institutional Support on Technology Adoption of Integrated Management of Healthy Citrus Orchard in Garut Regency

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Abstract. The study was aimed to identify factors that influence institutional success, to analyze the potential of farmers institutional, and to identify the dissemination level of Integrated Management of Healthy Citrus Orchard (IMHCO). The data were obtained by interviewing 25 citrus farmers in Garut Regency which randomly selected as respondents in 2017. The data taken were primary and secondary data. The data were complemented with the information on the institutional role of farmers and the role of IMHCO. The data were analyzed descriptively and non-parametrically. The results showed that the farmers institutional were considered very important but their human resources (farmers, farmer group and Extension) have not focused on this sustainability. Institutional aspects that required to be considered and implemented were input, production and marketing. The role of IMHCO was very relevant to increase citrus production, but the support of human resources was unreliable. Therefore, it is required a strategy to improve the adoption level of IMHCO technology in Garut Regency.

1. Introduction

Physics Citrus is one of the fruit crops which very popular and become an important commodity. Citrus can support the economy for both domestic and export markets. Indonesia has a diverse citrus type, especially tangerine and siam. Many types of tangerines are known along with their regional names, such as Keprok Tawangmangu (Central Java), Keprok Garut (West Java), Keprok Berasitepu (North Sumatra), Keprok Batu 55 (East Java), Keprok Tejakula (Bali), Keprok Selayar (South Sulawesi), Keprok Sioumpu (Southeast Sulawesi), and Keprok Madura (Madura). However, on later development, it was dominated by types of mandarin citrus [1]-[2]. Garut is the main producer of citrus in West Java. Garut Regency once have been experienced its peak as a producer of citrus. Citrus is a priority for the Garut society, and provide a significant economic contribution to the area. The large demand of citrus from the domestic market is a potential market for national citrus production. The citrus production does not depend on the season and almost available any time. The increasing number of population and improved lifestyle were influenced the demand for various fruits, including
citrus. High demand of citrus encouraged the farmer to cultivate the citrus from one generation to another generation.

Nevertheless, it cannot be denied that the CVPD (Citrus Vein Phloem Degenaration) or so called Huanglongbin (HLB) disease attack was caused damage to citrus plants in Garut Regency. In ref [3], the CVPD attack affect on nutrient deficiencies and citrus quality. The Local Government recommended the farmers to plant the citrus in non-endemic locations, otherwise provide disease preventive strategies. Bassanezi and Gottwald (2008) reveal that it is important to implement the regional control management for the disease immediately after detected [4]. Regional disease management highly affects the probability and efficacy of slowing the epidemic.

In Indonesia, one of the ways to prevent CVPD attack is an integrated management of healthy citrus orchard (IMHCO). The technology of IMHCO comprises five component of technology, namely: (1) using virus-free citrus seeds, (2) pest and disease control, (3) sanitation, (4) Optimal plant maintenance, and (5) Consolidation of orchard management [5]. The use of citrus seeds labeled free of disease, especially CVPD, can minimize damage on citrus plants and ultimately the farmers also saved from the suffer of huge losses. Symptoms of CVPD infection similar to symptoms of nutrient deficiency due to metabolic disorders in plant tissue. However, IMHCO should be supported by skilled human resources and solid institutional. If it is not supported by reliable human resources, the farmers will continue to suffer losses.

Institutions play an important role to support a farm to succeed. The existence of these institutions can get solutions in dealing with problems. The institution is a tendency of interaction in socio-economic matters relating to two or more actors of social interaction which includes applicable rules to be agreed upon [6]. In real terms, the conditions of citrus farming in Indonesia are very diverse and the farms in each location have greatly varied characteristics. Institutional plays an important role in the existence of farmer groups (Poktan) and farmer group associations (Gapoktan). Besides Poktan institutional, there are several factors that can affect the citrus farming institutional, namely input institutional, the existence of citrus seed breeder groups and integrated pest control groups (IPM). Within the institutional aspect, the one important things is the need for partnership between citrus farmers and several companies. The partnership pattern in citrus farming may refer to the nucleus-plasma pattern, the cooperation pattern in providing capital, through the Multi-Business Cooperative and Village Credit Institution. The functions of agricultural institutions are very diverse, including as a mobilizer, collector, distributor of production facilities, and a motivator of interest and attitude [7].

2. Methodology

The study was conducted in Garut Regency in 2017. Primary and secondary data were collected. Respondents of 25 people were chosen randomly. Primary data was collected in a Focus Group Discussion (FGD) using the Rapid Appraisal of Agricultural Knowledge Systems (RAAKS) methodology [8]. Information was carried out by in-depth interviews with competent community leaders. Secondary data includes data obtained from literature, reports, publications and relevant institution, as well as through limited discussions with relevant authorized officials. The data were analyzed non-parametrically.

3. Results and Discussion

3.1 Farmer Respondents Characteristics

Garut Regency is a citrus production center area which spread over several districts. Spread in the sub districts of Samarang, Pasirwangi, Cisurupan, Wanaraja, Karapawitan, Tarogong, Cigedug, Cilawu, Banyuresmi, Bayongbong and Leles. Within 2016-2019, the citrus production in Garut region have been fluctuating, as displayed on Figure 1.
The respondent profile shows that the average of respondents’ age was 42.6 years old. They were sufficient experienced in dealing with their work. Half of respondents have been experienced on citrus farming more than 10 years. Their educational background was varies greatly from elementary to high school, but on average they only had junior high school education. Several reasons related to such conditions namely: (1) they cannot afford school fees, (2) there are limited interesting on school, (3) they want to help their parents earn a living quickly, and (4) they are continue their parents’ work as farmers. The citrus cultivation pattern of the Garut farmers were on average. The data regarding the characteristics of citrus farming in Garut presented in Table 1.

**Table 1. Characteristics of farmer respondents**

| Characteristics                                           | Percentage (%) |
|-----------------------------------------------------------|----------------|
| Farm size (ha)                                            |                |
| < 1                                                       | 58.33          |
| 1                                                         | 16.67          |
| > 1                                                       | 25.00          |
| Main source income                                        |                |
| Citrus cultivation                                       | 8.33           |
| Crops cultivation                                        | 66.67          |
| Entrepreneur                                             | 16.67          |
| Government Employee                                      | 8.33           |
| The distance from house to the farm (km)                  |                |
| < 1                                                       | 8.33           |
| 1                                                         | 58.33          |
| > 1                                                       | 33.33          |
| Know the IMHCO                                            |                |
| Yes                                                       | 33.33          |
| No                                                        | 66.67          |
| Problem                                                  |                |
| Pests attack and diseases                                | 100.00         |
| Labelled seeds                                           | 33.33          |
| Drought                                                  | 33.33          |
| The main determinant on farming decision                 |                |
| Government officials                                     | 33.33          |
| Self initiative                                          | 33.33          |
| Fellow farmer groups                                     | 33.33          |
The farm size and land management vary widely, but they remain consistent in farming citrus. Generally the respondents earn primary income from crops cultivation, and only less than 10 percent dependent their income on citrus farming. Regarding the farm size, more than half of the respondents cultivate the citrus on small scale, with the farm size less than one hectare. Regarding the distance from the house to the farm was averaged less than one kilometer, only a few farmer have more than one kilometer away. There are no problems faced regarding the accessibility to the farm. Likewise the ease of access to agricultural input such as labeled seeds and fertilizers. Nevertheless, the pest attack, diseases and environmental stress were the essential problems faced by the citrus farmer. Pests attack of mites and trips commonly faced in the citrus field. Whereas the diseases often found were sooty mildew and aphids. In some area, the farmer faced problem to get water and experienced the drought.

Regarding the technology of IMHCO to improve the citrus productivity, more than half of the respondents did not know about the IMHCO. It is indicated that the dissemination of IMHCO technology need to be accelerated. The similar condition has been reported in South Sulawesi [9]. Citrus farmers required to understand and implement the IMHCO on their citrus farming practices. The respondents argued that the socialization of IMHCO was insufficient. That was impacted on the unequal implementation of IMHCO among farmers. One program to improve farmer’s skill and knowledge is farmer field school (FFS) training program. Victor et al. (2017) reported that FFS training program was efficient to increase farmer’s knowledge level significantly [10]. The government recommendation, the self-initiative, or the suggestions from fellow group members were equally influenced the farmer on making decision. It was indicated that the role of human resources may have great effect to the institutional sustainability.

3.2 Institutional Performance of the Farmer Groups (Poktan) and Farmer Groups Association (Gapoktan)

The farmers institutional that exist in five sub-districts have the similar performance. Generally, all of the respondents have desire on the regular group meetings, an increase in farmer income, and higher quality of citrus yields. Recording was the one important thing in farmer group. Nevertheless, almost all farmer groups still have weaknesses in terms of recording, both production and financial records. The performance of farmer group institutional displayed on Table 2.

| No | Activities                              | Performance (%) | Significance Level¹ |
|----|-----------------------------------------|-----------------|---------------------|
|    |                                         | Agreed | Disagreed |                |
| 1. | Intensive of farmer group meetings      | 40     | 60        | **               |
| 2. | Farmer group benefits the member        | 68     | 32        | **               |
| 3. | Numerous problems in farmer group      | 28     | 72        | **               |
| 4. | Communication ease in farmer group      | 68     | 32        | **               |

¹Test with binomial non-parametric method. * = significantly different, ** = highly significantly different

The results showed that only 40% respondents stated that the farmer group meetings was active, while 60% respondents did not perform the active farmer group meeting because there was no problem in the group. They can solve the problem privately without involving other groups. The
statement that the existence of farmer groups was considered benefits the farmers stated by 68% respondents. Whereas other respondents considered that it was useless because there were self-centered of each farmer groups. There were still many citrus farmer groups that carried out their own management. Only 28% respondents stated that there was no serious problem, because the respondents were already independent and had broad insights. While the most of the respondents faced numerous problems on their farming business. It is the government's role to assist the farmer to overcome their problems. The extension agent or assistant capability on group coaching also affected on the institutional sustainability.

Regarding communication in farmer group, only 32% respondents faced the difficulties on communication in the farmer group. The respondent’s background seemed effect on the response of the farmer on the information. The likelihood of adoption on agricultural technology increase until 20% when the educational background of the recipient at least a high school education. Victor et al. (2017) revealed that the age, farm size, and educational background may influence on the farmer response on the agricultural technologies [10]. The young farmer and the large land holders were tended to be more receptive to adopt the innovation.

Farmers’ marketing institutional in Garut Regency seemed to be very weak. The farmers did not have a strong bargaining position, and the price was controlled by collectors and outside traders. On financial institutional, there were some difficulties faced by the farmer to access existing capital institutions.

4. Conclusion

The farmer institutional plays an important role toward the sustainability of citrus farming in Garut. Nonetheless, human resources capacity is the main key to achieve the institutional success. Besides human resources capacity, there were several factors which determined effects on institutional success, then need to be considered seriously, namely input, production and marketing. The number of input, the plants management to improve the production, and the wide market for the product has been concerned as the essential factors on citrus farming sustainability. The farmers institutional seemed potential to organize the farmers to obtain the target. Lastly, the intensive assistance on IMHCO technology was required to support the citrus sustainability.

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