

Social Engineering Design for Food Security

Study on Apple Farming in Kota Batu, East Java

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Abstract—The aim of this research was to explore the problem of apple farmers sustainability for food security and to test the design of social engineering to strengthen the food security of Apple's farmer in Malang. Kartono's Identity theory is being used in this research, which stated that identity is always negotiable in the human interaction. The location of this research is located in Kota Batu, East Java. The method used in this research is participatory action research. The instrument that are being tested was the design of social engineering précek 01.0816. Data are being collected through interview, observation and literature review. The sampling technique used in this research is snowball sampling. The aim of social engineering in this research to strengthen the food security through Apple's farmer's sustainability. The results explained that apple crisis in Kota Batu is caused by external and internal factors. External factors include the transfer of land that has not been planted by apples, while the internal factor is the dissolution of regeneration of apple farmers and the shift of work orientation among apple farmers. Thus, social engineering functional identity for food security of apple farmers became one of the efforts to maintain the existence of apple farmers in Kota Batu.

Keywords—*food security; functional identity; identity; social engineering*

I. INTRODUCTION

As with many developed and developing countries, Indonesian youth are less likely to be engaged in the sector. Only 12 per cent of the country's 35 million farmers are under the age of 35. A failure to attract young people into the industry will lead to labour shortages and a lack of innovation and institutional change, which is vital for future agricultural productivity [1]. One of the main key to achieve the food security is farmer's sovereignty. Farmers and peasant were goes along the word "poverty", therefore to be a farmers is not the dream most of Indonesian youth [2]. As goes in Batu, Central bureau of statistics data of 2015 shows the population aged 15 years and over of Batu who work in the agricultural sector as much as 27% from a total of 27.697 people.

Apples agriculture in Batu has been built for a long time, and in its development went through many ups and down from time to time. In the economic structure of Batu, agriculture has become an important role in economic growth. Since 1980 until the year 1990, the production of apple Batu City

experienced its heyday. But since the monetary crisis in 1997 the production of apples tended to decline even production achieved in 2005 is lower than in the 1970s

The focus of the study on Apples in Batu city is based on the fact that apple crisis is getting more and more serious. The crisis of apple production has occurred in Batu Town which once became the center of apple production in Indonesia. Kartono's research finding on apple crisis in Batu City shows that the tendency is getting worse [3]. The data shows that the tendency of Apple farmers to keep working on apples farming drops drastically from 2009 by 37% of land loss in 2010 and continued to 58% of apple land lost in 2011. The condition of 2011 also did not show optimum condition, because of the total land area apples planted only about 42% are really good conditions, the rest are in moderate and damaged condition.

Although apple crisis is continuing in Batu City, it seems that until now there has not been a systematic crisis recovery strategy [3]. The government develop agricultural strategy in the apple crop sector by providing the quality and quantity of apple tree planting, while the strategy to overcome the increase of non domestic apple infiltration and the migration of apple farmers to other job sectors still has not received special attention. That is why the functional identity engineering required to apply for apple farmers and their son/daughter. This will be necessary condition for creating food (apple) security. The identity conception in this study refers to the identity conception of Kartono which identity is consisted of knowledge social construction on status and role to differentiate (demarcation) with other and legitimate socially [4]. The identity is mixed and negotiable.

II. RESEARCH METHOD

The approach used is qualitative research with Participation Action Research (PAR) strategy. Through the PAR approach this study combines research and work activities of change or empowerment of community organizing [5]. Data about apple agriculture crisis are being collected through interview, observation and literature review. Meanwhile social engineering data are being collected through questionnaire. The sampling technique used in this research is snowball sampling. The aim of social engineering in this research to strengthen the food security through Apple's farmer's sustainability. Social

engineering refers to the idea that people can be manipulated into social structure [6].

This research was to test the social engineering prototype instrument of précek 01.0816 that has been developed in 2015-2016. This social engineering instrument consist of 7 installation or steps, they were: his engineering consists of seven stages of installation diagnosis. The seven installations consist of: (1) installation of farmer behavior; (2) institutional installation of farmers; (3) farmer regeneration installation; (4) installation of farmers' access to external resources; (5) installation of farmland quality; (6) installation of market conditions; (7) installation of ecological changes.

The data being analyzed through exploration of identity change of Apple's farm then compose the identity crisis construction, after that, compose the pattern and characterization, the explanation of contextual factor of crisis, and the development of social engineering instrument.

III. RESULT AND DISCUSSION

A. Batu, City of Apple

Batu city that is famous for its tourism potential. Located at an altitude of 862 masl, and most of its territory is on the slopes of the mountains with an average temperature of 23-24 degrees Celsius and rainfall of 154 mm/month. Batu city were crowded by tourists. Batu city is divided into 3 districts, 24 villages, 231 hamlet and 1,092 neighbourhood. Although administratively Batu is city, but ecologically Batu are consist of villages with mountain topography, forest land and rice field. The community of Batu City had livelihoods as farmers thus led Batu become both agropolitan city and tourism city. Therefore it becomes obligations for the Regional Government of Batu to prioritize synergy between agriculture and tourism sector in economic and regional development.

The area of rice field in Batu at 2015 is 2,480 Ha. Based on the distribution of the area in Batu City, The widest farmland (non ricefield) located in Bumiaji Subdistrict which is 10,931 ha, while in District of Batu and District of Junrejo are 2,061 Ha and 1,404 Ha respectively. The number of companies engaged in agriculture sector there are 13 companies with a workforce of 649 people. Recorded in 2014, the contribution of the agricultural sector in the formation of gross domestic product reached 17%. Bumiaji District is the largest sub-district compared to the other two sub-districts, it's the geographical condition is a hill area mostly used for apple agriculture and forest conservation.

The history of apples in Batu is also related to the history of apples in Indonesia. The first apple that being planted were come from Australia back then in 1934, it's planted in Tebo Pujon Malang village with 20 varieties. It's led Batu, Malang and Nongkojajar Pasuruhan East Java became the center of apple production in Indonesia, in 1950 apple plantation were wholly at farmers hand and after 1960 the apple plantation continues to grow rapidly. During 1984 - 1988 apple crops in East Java showed a rapid development, in 1984 there were 7303,372 trees expanded to 9,047,276 trees in 1988 or an increase of 4.7% annually. While production increased from 146,690 tons in 1984 to 275,065 tons in 1988 or an increase of

17.5% per year. From the data of the agricultural service (2008), before 2000 the number of apples in Batu was 3.107.195 trees. Those amount trees produces 147 thousand tons of fruits per year.

In Batu, apple plant in 2000 recorded there were 3,107,195 trees with production of 147,000 tons. Decreased in 2004 the number of apple plants became 2,137,314 trees with production of 46,000 tons. This apple commodity has an important role for the dynamics of prosperity and the economic benefit for Batu. The development of apple agriculture was also favor the development of the tourism sector because the apple agriculture become tourism agriculture.

Participatory Rural Appraisal (PRA) participatory rural awareness activities conducted in 2006 formulated that this phenomenon was caused by, among others, the decreasing of soil fertility due to excessive use of pesticides, unoptimal maintenance due to the rising prices of production, and some of the apple productivity decreased because of its old age [7].

Since the monetary crisis in 1997, the apples agriculture has begun to experience lethargic phase in recent years. Along the line with Suhariyono In general there's four important problems faced in the development of apple agribusiness, which are (1) land degradation, (2) fluctuating market place, (3) access to capital for farmers small is difficult, and (4) institution is not optimal yet [7].

Decline rate of apple farmland quality in Batu region occurs relatively quickly due to its topography that consist of steep mountainous region that are sensitive to erotion. In addition, the forest area is getting narrower, because farmers do not apply the rules of land conservation, to make matter worse, farmers use high number of chemicals pesticide that further worsen the soil condition.

The ability of farmers to keep the quality and quantity of apple production were also depend on the market price. On the high price market of harvest season, farmers able to collect the money (capital) to keep their quality and quantity of apple production. Consequently, on the low price harvest season (around november-december) farmer's ability to keep apple production care is not optimal. On the other hand, there's problem on farmers knowledge on soil conservation in the long term. Most of small apple farmers do not take care of their apple farmland according to conservation rules.

B. Apple Crisis in Batu: The Phenomenon of Structural Vulnerability of Food Security

In contrast to the assessment from the agricultural and economic perspectives above, Kartono uses perceptive sociology, analyzes the conditions of the apple cultivation above as a result of structural problems and social identity [3]. Kartono said that the crisis of apple production not only illustrates the decrease production of apples but also decreased the confidence of farmers to the production of apples [3]. This decrease of farmers trust towards the future of apple agriculture caused many apple farmers to migrate their work to tourism sector. Symbolic apple plantations in the form of apple cultivation for apple agrotourism are basically done for tourism purposes. Likewise, the distribution of apples fruits has been

replaced by the distribution of apples goods, such as chips, apple cider, and others goods that oriented as souvenir for tourists visiting Batu.

This condition were reflection of Batu government in 2007 until 2017, making Batu city which was originally an agrarian city to become an international tourism city, has become an important influence on the vulnerability of social identity of apple farmers and change of apple farmer orientation and finally happened crisis of apple production in Batu . This condition is sociologically called structural susceptibility of food security.

The food security vulnerability in Batu city indicated in this article by apple crisis has been explained Kartono is not only related to apple farming system but by identity crisis that happened to farmers and children farmers [3]. This view explains that food security can not only be met with the availability of superior seeds, pesticide and the availability of markets and capital, much more important than the agricultural aspect is the functional identity of human resource or farmer owners and farmers who still want accept and acknowledge as farmers and farmers of apple farming. Identity migration from apple farmers to tourism workers that occurred in Batu led to the occurrence of cultivation to plant apples and will lead to crisis because farmers are reluctant to maintain the apples farmland and switch to other plant that they think more suitable for market nowadays.

The transformation of identity mainly occurs in the children of apple farmers, the result of interviewing children of apple farmers admitted not interested to continue the their parents apple farm because they want to work in other fields. In addition, most of apple farmers parent support their children not to be apple farmer, due to their pessimism of apple agriculture in the future. Failure to ensure the social identity of apple farmers can be passed down to future generations or to farmers' children poses a threat to identity that led to identity crisis.

In food security theory, there are three main elements known as the "triad concepts" of food security [8], namely: (1) food availability; (2) access to food (food access) and (3) food utilization. Similarly raised by Hanani, food security subsystem consists of three main subsystems namely availability, access, and food absorption [9]. The apple farmer crisis analysis of Batu farmers as shown in the table below:

TABLE I. APPLE FARMERS CRISIS ANALYSIS

Indicators	Identity security of Apple Farmers	Identity crisis of Apple Farmers
Food availability	Ecology changing	Temperature increase from cold to hot
	The average production of farmland	Decline rate of Apple production
	Farmland	Changing of apple farmland use

Indicators	Identity security of Apple Farmers	Identity crisis of Apple Farmers
Accessibility	Area	
	Human resource of farmers	Farmers behaviour on using chemicals pesticide
	Production infrastructure	Production device is limited
	Distribution of production	Decrease of supply
Food utilization	Farmers institutions	Weak institution
	Market	Domination of imported apple
	Farmers income	Farmers income is decreasing

The results of research on institutional apple farmers were also showed unfavorable situation for the collective movement to maintain apple farming. Interview on apple farmer group shows the reality that at this time the number of apple farmer groups in Batu has reached 26 groups, but those who joined in *Gapoktan Apel Batu Lestari* only 16 groups, then from the active gapoktan members only 13 farmer groups. Another problems such, asymmetrical information, were also happened in the apple farmer group, the information include, the effective way to plant and harvest, the use of pesticide, the rule of conservation and such. Actually this problem can be reduced if related officers done such intensive coaching towards apple farmer. Weak institutional at the farmer level can lead to weak bargaining position of farmers. Strengthen the farmers institutional can led to improvement of bargaining position, for example in determining the sale price of fruit, access to capital, and others.

C. Social Engineering Design for Food Security

The distance between the conception of self and the reality that must be faced or expected, leads to a functional identity crisis. This crisis includes conditions of the occurrence of Implosion, the anomic uncertainty of social rules), alienation, reification, meaningless space and cultural tragedy (cultural gap with social development) [4]. Functional identity crisis were measured by the social engineering design for food security.

This engineering consists of seven stages of installation diagnosis. The seven installations consist of: (1) installation of farmer behavior; (2) institutional installation of farmers; (3) farmer regeneration installation; (4) installation of farmers' access to external resources; (5) installation of farmland quality; (6) installation of market conditions; (7) installation of ecological changes. Furthermore, the diagnostic results are scored to measure the extent to which the crisis is faced to decide on right treatment to deal with the problems.

Each installation was scored from 0-10. Furthermore, the results of the diagnosis of each installation are presented in the polygon model. Bellow were ideal type of functional identity for food security will produce polygon model as follows:

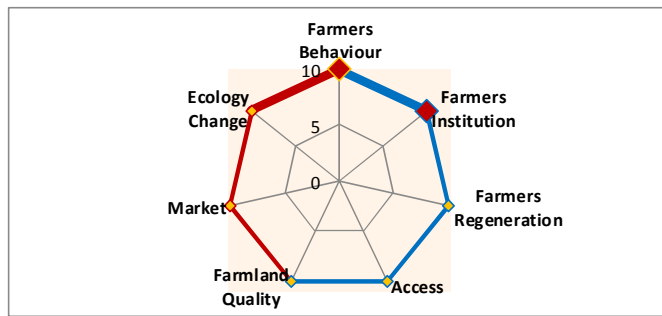


Fig. 1. Model polygon ideal identity for food security.

The above polygon model shows that the results of engineering tests yield a high value on each installation that is on score 10. For analysis of farmers' internal factors marked with a blue line while the external factor is marked with a red line. These steps are carried out to produce validity and fi cibility of a linear identity engineering design with the objective of food security.

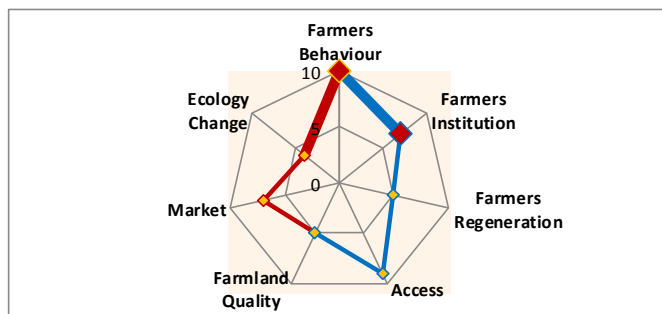


Fig. 2. Model polygon of farmer's identity for food security.

As we can see above, the farmers identity face such crisis where the problem arise in several aspects such as, farmers regeneration, farmland quality, market and ecology change, meanwhile in the children of apple farmers , we can see the model polygon as listed below;

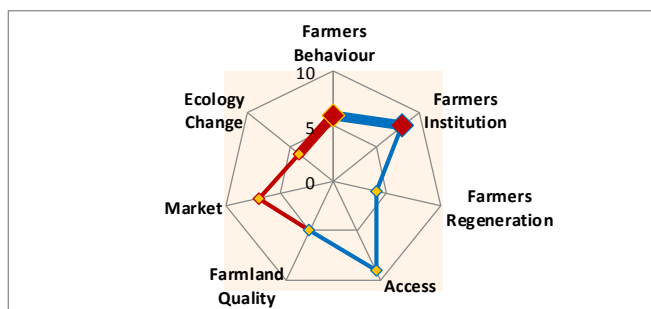


Fig. 3. Model polygon of children of farmer's identity for food security.

Biggest problem on children of apple farmers polygon, we can see, the lowest score in the polygon is for aspect farmers regeneration and ecological change.

IV. CONCLUSION

Food security not only requires agriculture strategies to agribusiness but also needs attention to social dimensions related to human resources. The dimension of human resources that need attention is identity. The results show that the functional identity of agriculture becomes an important factor that can be added in renewing the food security theory which includes food availability, access and food absorption. Social engineering development of functional identity for food security especially apple commodities, covering 7 installations, namely: (1) availability of food in the form of ecological change, average production of agriculture, (2) agricultural land area; (3) access to farmers' resources, means of production infrastructure, distribution of production, (4) regeneration of farmers, (5) farmer institutions; and (6) food absorption in the form of market and (7) farmer's income. The design of functional identity engineering of farmers' food security is abstracted into the polygon model. The engineering consists of seven installations with a crisis diagnosis. This article presents the results of engineering design at an early stage. The next stage plan is finalization of functional engineering instrument for food security of farmers through pre-trial of engineering in the field on a large scale.

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