International Journal of Sciences: Basic and Applied Research (IJSBAR)

ISSN 2307-4531
(Print & Online)

http://gssrr.org/index.php?journal=JournalOfBasicAndApplied

The Influence of Decision Making of Innovation Technology and Fermentation Cocoa Beans on Farmers Empowerment in West Sumatra, Indonesia

Zulvera[a]*, Zulrasdi[b]

[a]*Department of Extension of Agriculture, Faculty of Agriculture, Andalas University, Padang, 25163, Indonesia*

[b]*Graduate School of Extension and Communication Development, Andalas University, Padang, 25163, Indonesia*

[a]*Email: zulveraunand@gmail.com*

Abstract

This study analyses the factors that influence the decision to adopt innovative technology and ferment cocoa beans, as well as the influence taking that decision, has on the empowerment of cocoa farmers in West Sumatra. 200 people from the Limapuluh Kota and Padang districts were surveyed. Quantitative descriptive methods were used to analyze the data. The factors shown to influence farmers' choice were the intensity of the learning process and the sources of information used by the farmer to learn about cocoa cultivation. The types of decisions made by the farmers were a partial adoption of introduced cultivation and processing technologies and fermentation technology was rarely adopted. Factor analysis shows adopting new cocoa cultivation and fermentation technology has a significant influence on farmer empowerment. Efforts to encourage uptake of this new technology included (1) facilitating farmer education by conducting an ongoing agricultural advisory program, (2) facilitating the formation of farmer cooperatives to market the fermented cocoa beans.

Keywords: Change adoption; farmer empowerment; agricultural training; change resistance.

---

* Corresponding author.

1. Introduction

The horticultural sector is a subsector of agriculture that plays an important role in the development of many national economies. Cocoa is one major commodity produced by this sector that has good export potential. It is planted in 50 countries worldwide and over three million tonnes are produced annually with an average annual production increase of 2.3% per year [1]. Indonesia, which produces 425,000 tonnes, is the third-largest supplier after Ivory Coast (1,315,000 tonne), and Ghana (490,000 tonne). Together these three countries produce 73% of the world supply [1].

Cocoa production is also the third highest foreign exchange earner after coconut and palm oil production. It has a strategic role in the economy as it has a high value on the international market and almost 95% of it is grown by small-scale farmers owning 0.5 ha – 2 ha of land. Hence, directly and indirectly, cultivation of cocoa can influence the grassroots economy.

The Unit for Research and Development (Balitbang) of the Indonesian Agriculture Ministry has developed a range of technologies to improve quantity and quality of cocoa production. The technology developed includes (1) superior varieties with high yields, (2) location specific fertilization (3) tree pruning methods (4) control of most significant cocoa pests, farm hygiene methods and (6) cocoa bean quality improvement through the use of fermentation [3]. Even though the area planted in cocoa is rapidly increasing, the cultivation methods are not optimizing the yield, as evidenced by the low levels of production and quality of crop. [3]. Manti et. al. [2,4] found that the average cocoa production of Indonesia was 600-700 kg/ha/yr, well below the projected potential of more than 2 tonne/ha/yr.

A report of West Sumatra Research and Technology Development (BPPT) [4] quoted in [3] lists a number of reasons for the low yield and quality of cocoa including the range of local varieties used, cultivation methods used and lack of fermentation of the beans. This is evidence that the large scale adoption of the aforementioned cultivation and fermentation methods developed in research institutes has not occurred. The empowerment of the cocoa farmers that is the objective of the government development programs depends on the willingness of the farmers to consider the new technology.

The aim of this study was to analyze the factors that influence farmer openness to consider adopting new cultivation and fermentation technology. Several possible factors related to the openness to change were measured such as the nature of the technologies introduced, certain farmers' characteristics, the way innovations were communicated, and the extension advisors' competence. Secondly, the influence of openness of the cocoa farmers to receive the new technologies on their empowerment was analyzed.

2. Method

Research was conducted in two West Sumatra regions that are centers of cocoa production development Padang Pariaman and Lima Puluh Kota. Samples were taken from members of farmers' associations that were involved in cocoa cultivation development in Guguak, Payakumbuh, Sungai Sarik and V Koto Kampung Dalam, all cocoa farming districts. In each district, a purposeful sample of 50 people was selected, a total sample size of

200 people. This sample size was calculated on the basis of there being ten variables in the study [6]. Key informants were drawn from community leaders in the areas, agricultural advisors and authorities from institutions involved in cultivation.

Primary data collected was data related to the research variables; openness to change, factors influencing this openness and internal characteristics of the farmer (age, formal education, non-formal education, number of cocoa trees owned, farming experience, exposure to new ideas), nature of the proposed change (relative increase in profits, suitability, complexity, proven-ness of new method, observability of the innovation being used in practice), farmer's own self-study efforts, agricultural advisor support (use of appropriate methods by the advisor, use of appropriate materials, effectiveness of communication model used, advisor competence and frequency of provision of advice) and the empowerment of the cocoa farmer.

This data was recorded using a Likert scale and converted into numerical scores for analysis. Data was also collected using focus group discussions and interviews using a questionnaire. Processing and analysis of data used descriptive and inferential statistics. Differential statistical analysis included Pearson correlation and Path Analysis to discover direct and indirect influences for each variable. Pearson correlation was used to investigate the existence of a relationship between the various indicators, while Path Analysis determined whether the influence was direct or indirect. SPSS version 16 was used for quantitative analysis of data.

Research framework

The framework of this research refers to the diffusion of innovation theory by Rogers [5] and some results of previous researches [7, 8].

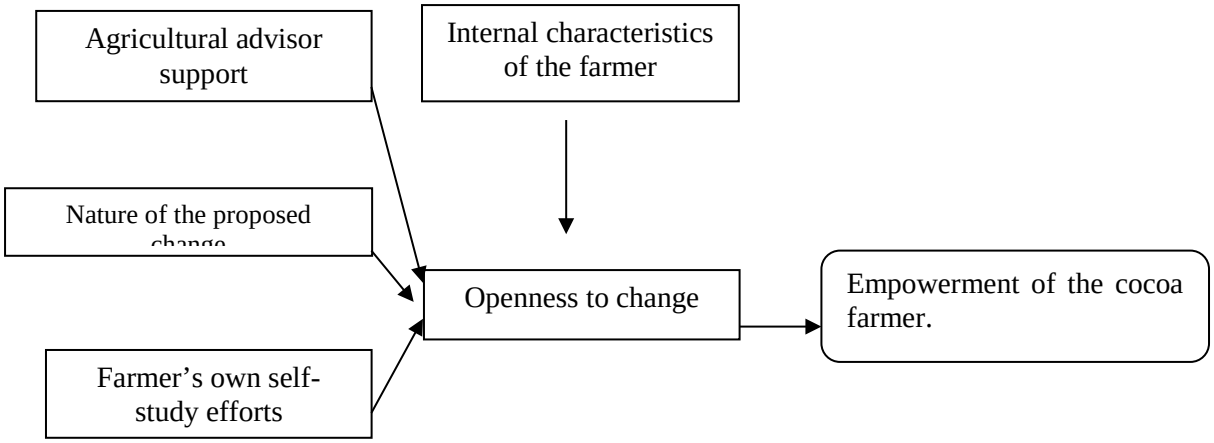

Figure 1: The research framework on the influence of Decision Making of Innovation Technology and Fermentation Cocoa Beans on Farmers Empowerment

3. Results and Discussion

Characteristics of respondents

Results showed that on average cocoa farmers were between 20 and 50 years old. 35.5% had elementary education only and 33.5% had high school education. All farmers had received non-formal education although 95% of these reported that this education was only occasional. 44% had 6 to 10 years farming experience. Although such farmers might be regarded as experienced they were conservative in outlook and suspicious of new ideas. The spread of internal characteristics of farmers is presented in table 1

Table 1: The spread of internal characteristics of farmers.

No	The internal characteristics of farmers.	frekuensi	percentage
1	Age (year)		
	20-30	11	5.5
	31-40	46	23
	41-50	60	30
	51-60	51	25.5
	>60	32	16
2	Formal education		
	Elementary school	71	35.5
	Junior high school	54	27
	Senior high school	67	33.5
	University	8	4
3	Non Formal education		
	Never	0	0
	Rarely	190	95
	Often	10	5
4	The number of cocoa trees		
	<=100	52	26
	101-200	59	29.5
	201-300	33	16.5
	301-400	20	10
	401-500	19	9.5
	>500	17	8.5
5	Farming Experience		
	1-5 years	19	9.5
	6-10 years	88	44
	11-15 years	32	16
	16-20 years	29	14,5
	21-25 years	8	4
	>25 years	24	12
6	Level of cosmopolitan		
	Low	166	83
	Medium	32	16
	High	2	1

Farmer willingness to consider adopting new cultivation technology and use fermentation

Most farmers expressed willingness to adopt new technology and use fermentation. However, more than 75% gave reasons why it was not possible to adopt them completely including, insufficient time or resources, lack of skills and knowledge and lack of a price advantage for fermented beans over non-fermented ones. The spread of responses related to openness to change in farming practice is shown in Table 2.

Table 2: The spread of responses related to openness to change in farming practice

Level of adoption innovation	amount	Percentage
Apply all the innovations gained	34	17
Apply some of the innovations gained	164	82
Not applying innovation	2	1

Fermentation is a post-harvest process recommended to farmers to improve the quality of the beans. Few farmers surveyed used fermentation as the bean buyer that came to their area paid the same price whether the beans were fermented or not. The fermentation process requires time and energy which the farmer regarded as wasted if there was no corresponding increase in compensation. To get a better price for fermented beans, farmers must take them directly to the market and that also requires extra cost. When the production is small, the higher price of fermented beans is not enough to justify the extra cost of transportation. Hence farmers chose not to ferment beans.

Significant individual factors influencing the decision to adopt new methods were the intensity of non-formal education and the farmer's own self-directed learning and experimentation. Support of the agricultural advisor, the nature of the technology, the intensity of non-formal education within the association and the intensity of the farmer's own self-directed learning and experimentation were also significant variables. The degree of influence of the advisor's support, the nature of the innovation and the farmer's own self-directed learning about farming innovations and fermentation are shown in Table 3.

Table 3: The degree of influence of the advisor's support, the nature of the innovation and the farmer's own self-directed learning about farming innovations and fermentation

Independent variable	The decision to adopt innovation
Support of the agricultural advisor, the nature of the technology and the intensity of non-formal education and the farmer's own self-directed learning and experimentation	0.04*
Support of the agricultural advisor	0.738
The Nature of the technology	0.270
the intensity of non-formal education and the farmer's own self-directed learning and experimentation	0.001**

Table 3 indicates that internal characteristics of the farmer that influence willingness to consider innovative farming methods are non-formal education, with a value of 0.006. This means that, generally, the more

frequently a cocoa farmer attends non-formal education events the more willing that farmer will be to consider new farming technology. This sort of education includes activities initiated by the agricultural advisor and practical exercises. Through these, the farmer will gain knowledge and experience that can increase confidence in the technological innovations studied. The results of this study are in line with the research of Zulvera et. al [8] which discusses on the factors that influence farmers in the application of organic vegetable innovations.

Relationship between the willingness to consider adopting new technology and the empowerment of cocoa farmers

Farmers' level of empowerment was measured as moderate to low. The weakest area of empowerment was the ability to work together. More that 80% stated that they did not work together in their farming. Willingness to use new technology had a real influence on farmer empowerment; the more receptive the farmer the more likely the farmer was to score highly on the empowerment scale.

Table 4: Relationship between the willingness to consider adopting new technology and the empowerment of cocoa farmers.

Independent variable	Level of the empowerment of cocoa farmers	
The willingness to consider adopting new technology	0.037* (sig)	0.148 (R)

The influence of decision making of innovation technology and fermentation cocoa beans on farmers empowerment can be illustrated as follows.

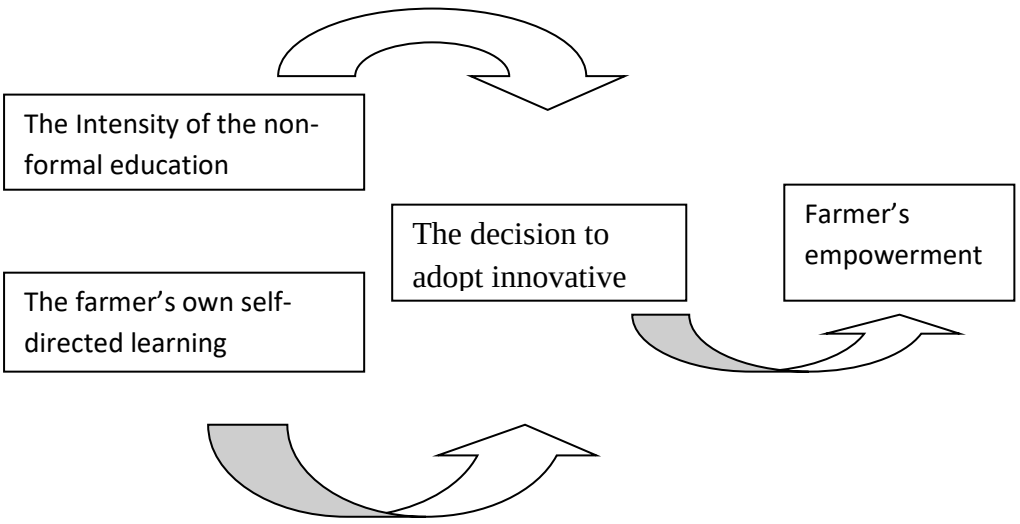

Figure 2: The model the influence of decision making of innovation technology and fermentation cocoa beans on farmers empowerment.

Table 4 shows the degree a willingness to accept new cocoa farming technology influences a farmer's

empowerment. Figure 2 is a model showing this in diagrammatical form. Influences included the intensity of the non-formal education the farmer received and the farmer's own self-directed learning and experimentation. Farmers who were open to all technological innovations that they had learned about had higher levels of empowerment than those who did not want to consider adopting any changes. The study shows that more than 75% of the farmers were willing to consider only some of the technological innovations related to cultivation and fermentation of cocoa that the advisor informed them about and this was the reason for their lack of empowerment.

Hence, the following steps may improve farmer empowerment: increasing instructor support for farmers to learn new methods by offering practical training and further training support. This will require improving instructors' skills so they can train cocoa farmers more effectively. (2) setting pricing policies and supplying facilities to support cocoa cultivation and facilitating the growth of local cocoa farmers' associations facilitating cocoa agribusiness. (3) establishment of learning centers that could encourage farmers to study effective cultivation techniques more thoroughly from successful farmers, (4) advisors involved in cocoa cultivation must work closely together to study the issues faced by farmers especially those related to the pests and diseases that are a cause of farmers' lack of motivation to adopt new cultivation methods.

4. Conclusion

Farmers' decisions on cultivation technology innovations and fermented cocoa are in the receiving category, but most farmers (more than 75 percent) apply only part of the innovations received. Factors that significantly affect the innovation decision making by farmers is the intensity of non-formal education followed by farmers and the intensity of the learning process undertaken by farmers. The factors of extension support, the nature of innovation, and the intensity of the learning process of farmers together have a significant effect on innovation decision making by farmers. Innovation decisions made by farmers on cocoa cultivation and fermentation technology significantly affect the level of farmers empowerment. This means that the higher the farmer's acceptance of technological innovation, the higher the level of farmer's empowerment.

Farmers' empowerment can be improved by: (1) Increasing extension support to the learning activities undertaken by farmers, by conducting training and learning of sustainable farmers. Increased extension support should also be done through enhancing the extension of the extension agents so that they can facilitate the farmers' learning process effectively, (2) enhancing the government's role in facilitating pricing policies and the availability of cocoa farming support facilities; (3) learning intensity of farmers should be encouraged by (4) coordination and cooperation among related institutions to examine the problems facing cocoa farmers today, especially those related to pest and disease attacks, which is one of the triggers of the lack of motivation of farmers to apply the technology.

References

[1] Damanik S, Herman. 2010 . “Prospek Pengembangan Perkebunan Kakao Berkelanjutan di Sumatera Barat”. Jurnal Perspektif. 9(2), pp. 94-105.

[2] Hasan N, Roswita, Syafril, Zulrasdi. 2012. "Kajian Percepatan Adopsi Inovasi Teknologi Budidaya Dan Pasca Panen Kakao Melalui Diseminasi Multi Channel Mendukung Gernas Kakao Di Sumatera Barat". Prosiding Seminar Insentif Riset SINas. Bandung, pp. 110-116.

[3] Jastra Y. 2014. "Profil, Usahatani Dan Status Teknologi Kakao Di Kabupaten Padang Pariaman". Jurnal Penelitian dan Kebijakan Publik. 2(2), pp. 76-389.

[4] Manti I. Hasan N, Salim Y, Nusyirwan, Muir J, Syafril. 2009. "Pengendalian hama Utama Kakao menggunakan serei Wangi di Perkebunan Rakyat Sumbar". Laporan Hasil Pengkajian Teknologi kerjasama Balai Pengkajian Teknologi Pertanian Sumbar dengan Kementerian Ristek.

[5] Rogers EM. 2003. Diffusion of Innovations. Fifth Edition. New York: The Free Press.

[6] Sugiyono. 2009. Statistika untuk Penelitian. Alfabeta. Bandung.

[7] Zulvera, Sumardjo, M. Slamet, B.S. Sugihen. 2014. The Behavior of Vegetable Farmers in Responding to the Organic Vegetable Farming System in Agam and Tanah Datar Districts of West Sumatra. International Journal of Sciences: Basic and Applied Research. 16(1), pp. 24-31.

[8] Zulvera, Sumardjo, Margono Slamet, Basita Ginting. 2016. Factors Influencing the Adoption of the Organic Vegetable Farming System in Agam and Tanah Datar Districts of West Sumatra. International Journal of Sciences: Basic and Applied Research. 26 (1), pp. 425-432.