

Sociotechnical Conditions for Introducing New Variety of Pineapple: Study of Area Development Program in Kediri District

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ABSTRACT

In order to expand the pineapple market, the government introduced a new variety to Kediri District in 2011. The pineapple market was expanded successfully, but the supply of the new variety was not able to meet the demand, owing to the low production. This study describes the socio-technical aspects of the new variety introduction. The data were collected in two villages in Ngancar Sub-District, providing 86 samples of pineapple farmer households. From the result, for developing pineapple, new variety introduction which promises economic benefit needs to be conducted. Making sufficient seedling available in the early stage of new variety diffusion is substantial. In addition, the role of extension personnel and other parties, e.g. cooperatives, is important to supporting pineapple development.

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1. Introduction

As a tropical country, Indonesia has big opportunity as global tropical fruits exporter. Among the fruit products, pineapple is ranked first as the most exported fruit commodity in Indonesia. Indonesia exports around 10% of its total production. The biggest amount of pineapple export is in the form of canned pineapple. The average of canned pineapple export is 167,392 ton per year. Meanwhile, Indonesia only exports 82 ton of fresh pineapple per year in average (Pusdatin, 2015).

In Indonesia, pineapple production increases annually. Indonesia accounts for about 23% of pineapple production in Southeast Asia. In addition, the pineapple productivity in Indonesia is 116.79 ton/ha which is one of the global pineapple highest productivity (Pusdatin, 2015). It is a chance for Indonesia to develop pineapple and expand its market.

Moreover, in demand side, the data from FAO (in Pusdatin, 2015) showed that the global import of pineapple is increasing annually, especially for fresh

pineapple that increased significantly. Unfortunately, this big opportunity has not been used wisely so that the fresh pineapple exported from Indonesia is still very limited.

The potential of fresh pineapple as Indonesia's main export commodity is actually quite large, but its role is still small. Pineapple development in Indonesia has not received serious attention because it has not used improved varieties, moreover the cultivation technique applied is not optimal yet (Hadiati and Indriyani, 2008).

Sobir and Naibaho (2010) describe how pineapple development has three major problems, namely: (1) a lack of improved varieties and a lack of clarity about the identity of varieties of pineapples in smallholder agriculture; (2) a limited supply of seedlings, because conventional propagation techniques used today have a low multiplication rate; and (3) production techniques not being well implemented. From those literatures mentioned, it is evident that pineapple varieties and

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cultivation techniques need to be improved in order to develop pineapple production.

In Indonesia, smallholder farmers mostly sell their pineapple produce to local and traditional market. Moreover, the variety is still limited. Therefore, new variety introduction to smallholder farmers is important to expand their produce market. Additionally, it also needs cultivation technique improvement.

The Ministry of Agriculture introduced the new variety, Smooth Cayenne, in 2011 in the Kediri District in order to expand their market. In addition to free seedling distribution, they also provided cultivation technique and market expansion assistance. As a result of this effort, the pineapple market in this area has expanded. However, the development of this new variety has not worked as expected. Astoko (2014) in his research argued that “the competitiveness of the producers from Kediri District compared with other regions is very weak, especially for the Smooth Cayenne Variety, due to there is no continuity of production.”

This lack of continuity in the area is related to the low production levels. Data from local pineapple distributors show that the demand for the new variety from modern markets cannot be met by the supply. The limited number of farmers who cultivate the new variety, which is related to the low adoption of the variety, could be an answer to this problem. However, the conditions faced by farmers in the area with regard to adopting the new variety are unclear. Therefore, this study describes the socio-technical aspects of introducing the new variety in this area.

2. Theory

2.1 New Variety Introduction

2.1.1 Pineapple Development Potential

Almost the entire territory of Indonesia produces pineapple owing to the tropical climate (Pusdatin, 2015). Among all provinces, East Java is ranked fifth as a pineapple producer, and makes a meaningful contribution to national production. However, pineapple production in this province is not evenly distributed. The biggest contributor is the Kediri District. According to Pusdatin (2013), data from 2011 show that Kediri is the largest pineapple production center, contributing 88.10% of the pineapple production in East Java.

Pineapple has long been cultivated in Kediri District. The suitability of land and the climate becomes big potential for this district to the development of pineapple. The long period of them cultivating pineapple reconsidered them to have experience as pineapple farmers. Moreover, the farmers there have adopted technology of replanting pineapple every season for productivity consideration. It means that they are ready to accept new technology introduction.

A weakness of pineapple production in this area is the lack of diversity. The Queen was the first variety of pineapple introduced to the area and, today, most farmers in the district cultivate this variety. Moreover, the marketing of pineapple has not expanded, with pineapple produce mostly being sold in traditional markets. As a result, the government introduced a new variety, namely the Smooth Cayenne, which has greater potential for a wider market, including modern and export markets.

2.1.2 The New Variety

The central government, through the local government, has distributed the new variety seedling freely to farmer groups. The budget for the program in the Kediri District was increased significantly from the first allocation in 2011, and is used to deliver the seedling and to provide cultivation technique assistance to the farmers. The budget applies until 2016.

In the first three years of the program, the extension center worked together with a local cooperative to distribute the seedling to farmer groups who asked for the free seedling. In subsequent years, the seedling was delivered by the local government via extension personnel, without using cooperatives. Until now, this new variety seedling has been delivered by the government through the program. The new seedling came from Subang District, West Java, where it is very popular.

The reason the government chose Smooth Cayenne variety was because this variety has bigger size with the grade A's weight reaches 2.5 kg per fruit. Meanwhile the Queen variety only reaches 1.2 kg per fruit. The other reason was its suitability for urban community consumption. With flat eyes on fruit skin and no prickly crown, it eases people to peel and consume it. Moreover, with the bigger size, it opens the possibility for food processed industry.

Since the development in the Kediri District, this variety obtained popularity in this area. With high preference from the communities, the price for this variety is much higher than the old variety. However, this demand which reaches 25,275 kg/week (Data from four main middlemen in the Ngancar Sub District, Interview, April 2016) could not be met by the supply from this area. It is a challenge for the stakeholders to answer the problems faced which may relate to the low adoption by the farmers.

3. Research Method

3.1 Method

Data used in this study were collected from randomly surveyed pineapple farmer household heads using questionnaires. The survey was conducted in March–April 2016 in two villages of the Ngancar Sub-

District, namely Ngancar Village and Pandantoyo Village. Both villages are known as producers of pineapple and are the closest to the extension center in the Ngancar Sub-District.

Ngancar Village consists of four hamlets, and all hamlets have the potential to develop pineapple owing to the suitable land type, namely non-irrigated land. The hamlets are Ngancar, Panceran, Puhrejo, and Purwodadi. On other hand, among the four hamlets in Pandantoyo Village, only Gogorejo Hamlet has the potential to develop pineapple. The sample of this study comprised 86 pineapple farmer household heads in these five hamlets.

The data collected were then analyzed quantitatively and qualitatively. For the quantitative analysis, the factors were analyzed with a T-test value analysis using Stata IC. 14.

3.2 Farmer Household Decisions to Try and Adopt the New Variety of Pineapple

According to Rogers (2003) the innovation decision process is the process through which an individual (or other decision-making unit) passes from first knowledge of an innovation to forming an attitude toward the innovation, making a decision to adopt or reject, implementing the new idea, and confirming this decision.

From the definition, a decision to adopt then implement or trial of a new idea can lead to either a confirmation or discontinuance of adoption. For that reason, this study would like to see whether the discontinuance of new variety adoption contributes to the low adoption of it. For the information gathering, this study adopts the Decision Tree used to assign each household, adopted from Ramaekers, *et al* (2013).

Table 1 Farmer Household Decision to Try and Adopt New Variety of Pineapple (n=86)

No.	Households' Decision Towards New Variety	Yes (%)	No (%)
1.	Aware of new variety	98.84	1.16
2.	Tried new variety for at least one season more than one year ago	47.67	52.33
3.	Still growing new variety in at least one of the last two seasons	24.42	23.36

Source: Direct Survey, 2016

From the data above, only a half of sample has tried to cultivate the new variety. Meanwhile, almost a half of total trial households discontinue adopting the new variety. Rogers (2003) stated that innovations with a high rate of adoption have a low rate of discontinuance. The new variety's high discontinuance in the study locus has meaning that the adoption rate is low. This

condition affects on the delay of new variety development.

Table 2 Source of First New Variety Seedling (n=41)

No.	Source of First Seedling	Percentage (%)
1.	Program	83
2.	Given from other farmer	15
3.	Bought from other farmer	2

Source: Direct Survey, 2016

Most of the trial households got the new variety seedling for the first time from the program. However, 17% of sample did not receive the first seedling from the program. This shows that even though they do not get the free seedling, they are interested in adopting the new variety.

Those who did not get free seedling, whether group members or not, could only get seedling from other farmers, either given freely or bought. There is no local new variety seedling breeder or seedling seller in the area. Moreover, they do not have access or the intention to buy the new variety seedling from outside the area.

To add the new variety seedling problems, the price of it in this area is much higher than the old variety seedling. Its price is almost fifth times of old variety seedling. This somehow prevents the farmers to try cultivating it.

Table 3 Source of New Variety Seedling for Adoption (n=21)

No.	Source of First Seedling	Percentage (%)
1.	Previous cultivation	81
2.	Program	4
3.	Program and previous cultivation	5
4.	Previous cultivation and bought from other farmer	5
5.	Program and bought from other farmer	5

Source: Direct Survey, 2016

Meanwhile, for the further cultivation or adoption, the farmers use the seedling from previous cultivation through propagation technique. This technique is commonly used for the pineapple breeding especially in this area. However, owing to the availability of the new seedling, farmers relied only on the sprouts of previous cultivations, and cultivation failure risk becomes an obstacle for the next development of the new variety.

In reality, the failure risk happened, caused by some external factors, they are:

- Pests and disease attack since the early years of the program. The pests that are endemic in this area are *Lepidiotia Stigma F.* and mice, while the disease is the Pineapple Mealybug Wilt Associated Virus.

Unfortunately, these pests and disease still harm pineapple cultivation today.

- b) The eruption of Mount Kelud in early 2014. It destroyed many new variety plantations. The destruction of the new variety planting by those external factors also destroyed the seedling source for new cultivation in this area; it leads to the seedling scarcity and contributes to the delay of new variety development.

4. Results and Discussion

4.1 Economic Impact of Adopting the New Variety of Pineapple

4.1.1 The Difference in Produce Selling Technical between the Two Varieties

Both new and old varieties of pineapple produced in Kediri District are commonly sold through middleman. The middleman sells or distributes the pineapple produce to the market, which is either a traditional or modern market.

Through the market chain system in this area, the farmers get an advantage from the system because they do not need to harvest and sell their produce themselves, with middlemen performing these activities. However the price gap between the field price and the market price happens when the farmers do not sell their own produce to the market directly.

The different selling systems defined the different value estimation methods from the middleman to the farmer and it is considered as high risk belongs to the farmer. For the old variety of pineapple, the value estimation can be conducted before the middleman harvests and sells the farmer's pineapple produce. The risk related to the quality and quantity of the produce after the value estimation belongs to the middleman. For the new variety, the value estimation can only be conducted after the middleman has harvested the produce because they have to calculate the weight of the produce. That is why the risk before the produce is harvested belongs to the farmer.

Table 4 The Difference in Produce Selling Technical between the Two Varieties

No.	Old Variety	New Variety
1.	"Bijian" means the pineapple produce selling is calculated per fruit	"Kiloan" means the produce selling is calculated by the weight of each fruit
2.	The produce value estimation is conducted before harvesting, which means low risk for the farmers	The produce value estimation is conducted after harvesting, which means a high risk for the farmers
3.	Price: Grade A: IDR 2,000–3,500 per fruit Grade B: IDR 1,000–	Price: Grade A: IDR 4,000–6,000 per kg Grade B: IDR 3,000–4,500 per kg

No.	Old Variety	New Variety
	2,000 per fruit Grade C: IDR 500–1,000 per fruit	Grade C: IDR 2,000–3,000 per kg
4.	Market chain: Farmer – Middleman – Traditional market (local or other cities)	Market chain: a. Farmer – Middleman – Modern market supplier b. Farmer – Middleman – Modern Market c. Farmer – Cooperative – Modern market supplier

Source: Direct Survey, 2016

4.1.2 Pineapple Farming Analysis of the New and Old Variety

The economic analysis of pineapple farming of new and old variety is shown in table 5.

Table 5 New and Old Variety of Pineapple Farming Analysis per Hectare

	New Variety (n = 11)			Old Variety (n = 73)		
	Vol.	Unit	Value (1,000 IDR)	Vol.	Unit	Value (1,000 IDR)
Seedling	48,378	Seedling	0 *)	94,677	Seedling	19,063
Organic Fertilizer - Petroganik	1,658.47	kg	829	301.37	kg	153
- Organik	8,863.64	kg	750	11,493.46	kg	926
Chemical Fertilizer Liquid	1,006.33	kg	2,016	385.90	kg	715
Fertilizer Ethrel	207.50	package	5,603	313.96	package	8,477
	31.56	package	450	87.10	package	1,054
Total Labor	374.86	day*people	9,633	421.47	day*people	11,149
Land rent	1	Hectare	14,545	1	hectare	15,399
Total Cost			33,826			56,936
Output	53,265.77	kg		44,921.02	kg	
Total Revenue			205,528			118,578
R/C Ratio			6.08			2.08
R/C Ratio if the seedling Purchased			2.50			2.08

*) New variety seedling price is IDR 1,000 per seedling in case it is bought from breeder or other farmer. Old variety seedling price is IDR 201 per seedling in average.

Source: Direct Survey, 2016

The significant different between two varieties cultivation is the seedling cost. Even though the new variety population per hectare is a half of the old variety, however the seedling price is much higher. In this area, due to the sample did not buy the new variety seedling but obtained it from the program, the seedling cost is zero. However, either the new variety cultivation needs to buy the seedling or not, the revenue from this variety is still higher than the new variety. It is because the price of new variety produce is higher. That is why this variety is economically promising to be developed.

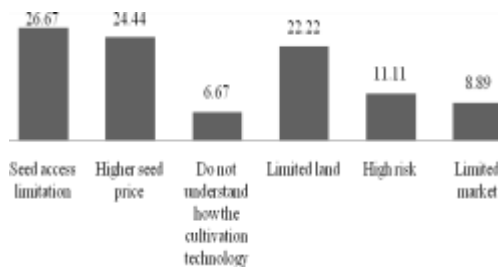
4.2 Determinants of New Variety Trial and Adoption

4.2.1 Trial Condition

From the result, only a half of sample households have tried to cultivate this new variety. Even though the new variety brings more economic benefit, however it does not affect on their preferences to try cultivating it. To see the real condition, this research also studies the

reason why those households did not try to cultivate the new variety of pineapple.

Figure 1 Reasons not to Try New Variety for Non-Trial Households (n=45)



Source: Direct Survey, 2016

From the figure above, we can conclude that the seedling access limitation is a major reason they did not try the new variety. The other reason is the higher seedling price of the new variety. Farmers who want to try the new variety but do not have seedling can buy the seedling from other farmers in the area or from outside breeder in the Subang District. In fact, the price of the new variety from both sources is high, which prevents them from trying the new variety.

The limited land faced by the farmers is also a problem. Most farmers prefer cultivating the old variety as their main crop to avoid risk. For those who are interested in the new variety, but having limited land, the risk is higher, making them reluctant to do so.

From the condition in the field, the high risk of cultivating the new variety by farmers in this area can be described by the following points:

- The different selling technical of new variety produce means the produce value is estimated by the middleman after harvesting; therefore the high risk belongs to the farmers in a longer time;
- The seedling population per hectare of the new variety is less than that of the old variety. The population is almost a half of the old variety. Thus, a failure in cultivating new variety means they can lose a bigger proportion of total pineapple plant; and
- There are fewer middlemen who buy the new variety produce from the farmers than for the old variety, leading to market uncertainty. Moreover, fewer middlemen mean less bargaining power for farmers.

In addition, some of the non-trial households sample does not understand the cultivation method of the new variety. Most of them are not farmer group members, and are less likely to attend field school activities. To support the program, the government gives the budget for new variety field school in order to provide knowledge and understanding of cultivating the new variety method. Non-group members have less opportunity to attend field school.

Moreover, non-group members rarely get visitation or have initiative consultation to extension personnel.

Information about new variety cannot reach them unless they get it from their peers. For this condition, the non-group members do not have the knowledge of new variety cultivation method, preventing them from trying the new variety. In this step, the role of extension personnel and other parties (e.g. cooperative) is very important as the communication channel of new variety diffusion.

4.2.2 Adoption Condition

The condition that there is high discontinuance of adopting the new variety should be considered as the delay of this new variety development. To understand the condition behind this discontinuance, this study provides the difference of sample households' perception between adopter and non-adopter.

Table 6 The Difference of Farmers' Perceptions of New Variety between Adopter and Non-Adopter (Compared by T-test) (n = 41)

Parameter	Adopter Mean	Non Adopter Mean	T-value	Sig.
1. More pest resistance	0.2857	0.35	0.4317	
2. Longer time of cultivating period	0.7143	0.4	-2.0798	*
3. Need more intensive care	0.4762	0.35	-0.8071	
4. Hard to get seedling	0.8095	0.7	-0.7996	
5. Higher produce price	0.9048	0.85	-0.5217	
6. Easy to sell the produce	0.7619	0.55	-1.4255	

Source: Direct Survey, 2016

The data above indicates that most of both adopters and non-adopters perceive that the new variety produce price is higher and it is easy to sell. However, they also feel that it is less pest resistance than old variety and hard to get seedling. This condition determines the non-adopters to discontinue adopting it.

The hardness to get the new variety seedling means the seedling availability and access in this area are still limited. The seedling problem once again becomes one obstacle to introduce the new variety. From this condition, we can see that to introduce the new variety, the seedling is one crucial thing to be considered.

5. Conclusion

From the data and analysis of this study, we can figure that almost all farmers are aware about new variety of pineapple, however, limited trial households

and high discontinuance of new variety adoption leads to the delay of new variety development.

The seedling access limitation and higher seedling price is one of reasons behind this condition. The dependency to propagation technique could not meet the need of new variety seedling due to failure risks became obstacle which destroy the seedling source of further adoption and leads to the seedling scarcity.

From the analysis we can also see that there are many risks facing the farmers to adopt the new variety. However, it brings more economic benefit than the old variety. Therefore this new variety is still promising to be developed.

From those conditions, we can conclude that making sufficient seedling available in the early stage of diffusion is substantial. The government's role to develop access to cheaper seedling should be conducted either through developing local breeder or improving stakeholders' roles to fulfill their needs of new variety seedling. In addition, owing to the importance of information distribution to overcome the risk and uncertainty, the role of extension personnel and other parties, especially cooperatives as communication channels of new variety information is needed to supporting pineapple development.

Daftar Pustaka

- Astoko. (2014). Strategi Pengembangan Agribisnis Nanas (*Ananas comosus* L. Merr.) di Kabupaten Kediri Propinsi Jawa Timur. Kediri: *Jurnal Manajemen Agribisnis*, Vol 14, No. 2, pp: 89-103.
- Hadiati, S., dan Indriyani, N.L.P. (2008). *Petunjuk Teknis Budidaya Nenas*. Solok: Balai Penelitian Tanaman Buah Tropika.
- Pusdatin. (2013). *Outlook Komoditi Nanas* (ISSN 1907-1507). Jakarta: Kementerian Pertanian.
- Pusdatin. (2015). *Outlook Nenas 2015*. Jakarta: Kementerian Pertanian.
- Ramaekers, et al. (2013). Adoption of climbing beans in the central highlands of Kenya: An empirical analysis of farmers' adoption decisions. *African Journal of Agricultural Research*, Vol. 8(1), pp. 1-19.
- Rogers, Everett. (2003). *Diffusion of Innovations: Fifth Edition*. New York: Free Press.
- Sobir and Naibaho. (2010) *Peningkatan Daya saing Buah Nasional Melalui Riset Strategis: Pengalaman 10 Tahun RUSNAS Buah Unggulan Indonesia*. Bogor: IPB PRESS.