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Submission date: 10-Feb-2021 07:22PM (UTC+0700)

Submission ID: 1506207872

File name: Psidium-preneurship Perception of.pdf (203.89K)

Word count: 4321

Character count: 23620

Psidium-preneurship: Perception of Brittle-red Guava Farmer in Sukorejo District toward Post-harvesting Diversification Product as an Alternative-livelihood

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Abstract--- Brittle-red guava is the largest agricultural product in Sukorejo District. The abundant production decrease guava selling prices, especially in certain seasons. Diversification is an alternative solution to solve exceed raw material production and increase the selling price. This study was aimed to identify farmers' preferences towards the diversification of post-harvested brittle-red guava products in Sukorejo District. A total of 120 respondents of brittle-red guava farmers from four villages in Sukorejo District were included in the study. The data were collected through questionnaires and interviews, then analyzed using descriptive qualitative approach and Kruskal-Wallis non-parametric statistical analysis. As many as 80.83% of respondents said they agreed to diversify their product, 5.00% said they disagree and 14.17% was not gave the answer. Furthermore, the respondent's preference for priority program of development of post-harvesting diversification products was the highest at 85.25%. Meanwhile, there was 57.05% or medium category for capacity building of human resources. Then the lowest respondent's preference was found in technology development for diversifying guava processed products, which was only 43.37%. The respondents gave high respond to diversification program of increasing promotion and marketing capabilities. Most of the respondents want to increase selling price and capacity through increasing market penetration. However, it is important to realize that carrying out these two activities requires multisectoral coordination.

Keywords--- Alternative-livelihood, Brittle-red Guava, Diversification Product.

I. Introduction

Brittle-red guava (*Psidium guajava* L) is one of the leading agricultural commodities in Sukorejo District, Kendal Regency, Central Java. Guava plantation in Sukorejo District has an area of 257 Ha with 280,000 planted trees and is the highest guava producer in Kendal Regency. The brittle-red guava production reaches 10,027.1 tons per year and makes Sukorejo District has abundant and stable availability of brittle-red guava stock. But, guava mass-production makes selling price instability. Currently, the brittle-red guava commodity is marketed as fresh fruits, it does not produce added value and instead makes the selling price goes down in certain seasons.

The interviews with farmers reveal, in 2004-2010, the highest selling price of brittle-red guava was reaching Rp 5,000.00 – Rp. 8,000.00. However, after 2010, it decreased significantly to the level Rp 1,000.00. In fact, it can reach the lowest price at Rp 250.00, when the harvesting period same timing with other consumed-fruits. Some farmers even let the fruits rot in farm rather than increasing operational costs. An effort to solve the problem is to diversify post-harvest fresh-fruit become processed products for more economically valuable (Ayenew *et al.*, 2018).

The fruit diversification is conducted by creating new processed products or innovating existing products (Costa *et al.*, 2019; Singh and Tiwari, 2019). However, it must maintain local characteristic and uniqueness. Then the brittle-red guava diversification is expected to give farmers more advantages, through 1) avoiding falling prices and monopolies; 2) stabilizing product price; 3) increasing business resilience; and 4) increasing farmer's income directly (Sharma and Rajan, 2018). Evaluating from the existing market opportunities, the local food industry potentially has good prospects. The local food industry has several advantages in flavor, product diversity, and as a regional tourism supporting commodity (Suryaningrat, 2016).

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DOI: 10.5373/JARDCS/V12SP7/20202211

ISSN 1943-023X

Received: 15 May 2020/Accepted: 15 June 2020

1120

However, local food-entrepreneurs still have obstacles to develop their food industry especially in businessmen skill and capacity. Then, the product diversification needs to be regulated and managed well by considering farmers' preferences in developing the product (Taneja *et al.*, 2014). Low farmers' preferences tend to assume that the provided programs come from policy makers. The top-down empowering model is feared confusing farmers in product development and lead the program failed.

The preference of brittle-red guava farmers to the verified empowerment model of processed products needs to be explored to find out exactly how farmers want to develop their potential (Terfa *et al.*, 2019). This was conducted to increase program achievement and improve farmers' welfare. Hence, this study was aimed to identify farmers' preferences in brittle-red guava processed product diversification program in Sukorejo District. The results are expected to be considered as a reference for developing policy or similar programs in other regions in Indonesia.

II. Method

This research was an observational study to see the preferences of guava-farmers in diversifying brittle-red guava products. The respondents were all brittle-red guava farmers in the four main villages of brittle-red guava producers in Sukorejo District, there were in Kalipakis Sub-district (110°2'17.52" E – 8°53'50.71" S), Bringinsari (109°58'46.92" E - 8°50'49.20" S), Trimulyo (110°1'53.76" E - 8°54'16.78" S) and Pesarean (110°1'33.24" E - 8°53'7.58 "S) (Figure 1).

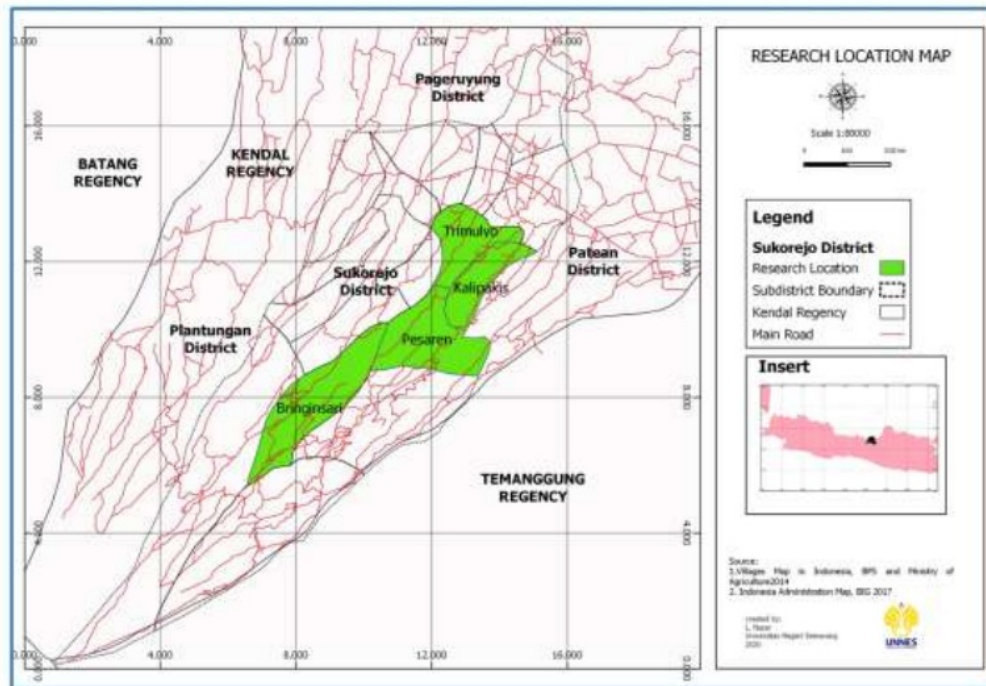


Figure 1: Four sub-districts (green) of the Research Location in Sukorejo District

The sample of respondents was selected by proportional-clustered random sampling, by taking 30 respondents from each village. A total of 120 brittle-red guava farmers were included in this study. Respondents' preferences for the post-harvested diversification of guava products were obtained through a Likert scale closed questionnaire. The preference aspects calculation was followed Taneja *et al.*, (2014) and Agre *et al.*, (2017). The priority aspects were identified, included priority training in 1) development of post-harvesting diversification products; 2) capacity building of the human resources; and 3) technology development for diversifying guava processed products (Table 1).

Table 1: Observed Variable of Priority Program in Post-harvesting Diversification Product

| Priority Program | Activity | Outcomes |
|--|--|--|
| Development of post-harvesting diversification product (P1) | Business skill training | Improving the capacity of guava farmers to manage post-harvest businesses effectively. |
| | Technology development | Application of diversified guava processed product technology to increase selling prices |
| | Development of product promotion and marketing | Expansion of the target market for guava products to maintain the selling price |
| Capacity building of the human resource (P2) | Product diversification training | Increased expertise in processing guava into various types of products |
| | Establishment / development of processing group institutions | Establishment of a business group for guava farmers |
| | Improvement of product quality | Improving guava farmers' expertise in maintaining product quality |
| Technology development priority for diversifying guava processed products (P3) | Developing user-friendly equipment | Developing appropriate technology that is easily operated by guava farmers |
| | Developing economical equipment (low-cost fuel and energy) | Developing appropriate technology that has low operation cost and energy efficient |

After questionnaire data was collected, continued with triangulation, screening, tabulation, and coding for further analysis. Preference score were analyzed using criteria Taneja *et al.* (2014) to find out the respondents' preference criteria (Table 2). The preference score was analyzed using Kruskal-Wallis non-parametric one-way analysis of variance with the SPSS 23 software. The data was presented using Microsoft Excel 2019 software, then interpreted in a descriptive analysis. Data confirmation was conducted through in-depth interview and focus group discussions. The information obtained was then tabulated and clustered to analyzed the causality relationships.

Table 2: Rating and Ranking Criteria for Evaluation of Farmers' Preferences by Scoring Method

| Rating scale | Level of preference | Ranking scale (of level-3 scores) (%) | Class / assigned value |
|--------------|---------------------|---------------------------------------|------------------------|
| 0 | Zero | 0.00 – 25.00 | Poor |
| 1 | Low | 25.00 – 50.00 | Low |
| 2 | Medium | 50.00 – 75.00 | Medium |
| 3 | high | 75.00 – 100.00 | High |

Note: The rating and ranking criteria was developed and followed previous research of Taneja *et al.* (2014)

III. Result and Discussion

All respondents involved in this research were brittle-red guava farmers who manage their own plantations. The majority of respondents were adult males aged over 40 years and have the highest education only in junior high school or lower (Table 3). From the total respondent, around 90.76% was claimed to have never attended training and conducted guava cultivation by autodidact. A total of 8.4% of the respondents had attended training 1-2 times, and 0.84% of respondents had attended for than 2 times.

Table 3: Demographic Information of the Respondents in four Targeted Sub-districts

| Respondent characteristic | | Kalipakis | | Bringinsari | | Trimulyo | | Pesaren | | Total | |
|---------------------------|------------|-----------|-------|-------------|-------|----------|-------|---------|-------|-------|-------|
| | | f | % | f | % | f | % | f | % | f | % |
| Gender | Male | 22 | 73.33 | 21 | 70.00 | 25 | 83.33 | 29 | 96.67 | 97 | 80.83 |
| | Female | 8 | 26.67 | 9 | 30.00 | 5 | 16.67 | 1 | 3.33 | 23 | 19.17 |
| Age | < 25 year | 2 | 6.67 | 1 | 3.33 | 0 | 0.00 | 2 | 6.67 | 5 | 4.17 |
| | 26-40 year | 9 | 30.00 | 7 | 23.33 | 5 | 16.67 | 7 | 23.33 | 28 | 23.33 |
| | 41-55 year | 12 | 40.00 | 13 | 43.33 | 17 | 56.67 | 13 | 43.33 | 55 | 45.83 |
| | >55 year | 7 | 23.33 | 9 | 30.00 | 8 | 26.67 | 8 | 26.67 | 32 | 26.67 |
| Education | Uneducated | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 1 | 3.33 | 1 | 0.83 |
| | Elementary | 15 | 50.00 | 14 | 46.67 | 19 | 63.33 | 12 | 40.00 | 60 | 50.00 |
| | Junior HS | 7 | 23.33 | 6 | 20.00 | 9 | 30.00 | 6 | 20.00 | 28 | 23.33 |
| | Senior HS | 8 | 26.67 | 8 | 26.67 | 2 | 6.67 | 11 | 36.67 | 29 | 24.17 |
| | University | 0 | 0.00 | 2 | 6.67 | 0 | 0.00 | 0 | 0.00 | 2 | 1.67 |

In all four sub-districts, there were established farmer groups, but has not been maximally utilized. Interestingly, as many as 62.39% of respondents were not enrolled as a member of the farmer groups. Guava farmers consider that the farmer groups were not too important for supporting their business. The majority respondents were self-subsistent intensifying their plantations to increase guava production. Then, the farmers who were already member feels they have low contribution or were not too concerned about the farmer group development. The farmer was decided to not get involved in farmer groups was allegedly due to the low educational background they have (Helitzer *et al.*, 2014). The researchers were made a prediction that low education causing farmers to have difficulty in information access about the benefits of farmer groups. Low education makes farmers have limited experience of cognition and skill development. Therefore, the empowering program in post-harvesting diversification of brittle guava have to consider the farmers acceptances and comprehension.

Based on observations, the majority of guava farmers assume that guava businesses do not have precise revenue. Farmers can experience a loss or profit each time depending on the season and market conditions. However, in terms of farmers' preferences, they mostly chose to improve the sales system, while the product diversification became the second choice (Table 4). This shows that farmers prefer to improve sales and markets, then as an alternative solution they prefer to diversify their guava products (more than 80%).

Table 4: Respondent's Perception of Profitability and Business Expectation of Brittle-red Guava

| Respond | Kalipakis | | Bringinsari | | Trimulyo | | Pesaren | | Total | | |
|---|-----------|-------|-------------|-------|----------|--------|---------|-------|-------|-------|--|
| | f | % | f | % | f | % | f | % | f | % | |
| <i>Operating revenues (profitability)</i> | | | | | | | | | | | |
| Income loss | 8 | 26.67 | 0 | 0.00 | 0 | 0.00 | 5 | 16.67 | 13 | 10.83 | |
| Balance | 18 | 60.00 | 26 | 86.67 | 30 | 100.00 | 15 | 50.00 | 89 | 74.17 | |
| Profitable | 2 | 6.67 | 4 | 13.33 | 0 | 0.00 | 10 | 33.33 | 16 | 13.33 | |
| Abstain | 2 | 6.67 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 2 | 1.67 | |
| <i>Expectation of business development</i> | | | | | | | | | | | |
| Changing plant variety | 7 | 23.33 | 1 | 3.33 | 1 | 3.33 | 6 | 20.00 | 15 | 12.50 | |
| Market improvement for original plant variety | 12 | 40.00 | 14 | 46.67 | 25 | 83.33 | 8 | 26.67 | 59 | 49.17 | |
| Product diversification for post-harvesting guava | 9 | 30.00 | 14 | 46.67 | 4 | 13.33 | 16 | 53.33 | 43 | 35.83 | |
| Abstain | 2 | 6.67 | 1 | 3.33 | 0 | 0.00 | 0 | 0.00 | 3 | 2.50 | |
| <i>Post-harvesting product diversification</i> | | | | | | | | | | | |
| Disagree | 3 | 10.00 | 0 | 0.00 | 0 | 0.00 | 3 | 10.00 | 6 | 5.00 | |
| Agree | 21 | 70.00 | 20 | 66.67 | 30 | 100.00 | 26 | 86.67 | 97 | 80.83 | |
| Abstain | 6 | 20.00 | 10 | 33.33 | 0 | 0.00 | 1 | 3.33 | 17 | 14.17 | |

For guava farmers, the understanding of the diversification products is still limited. The diversification product was interpreted as an activity to produce goods that have never been created or produced before. In fact, diversified products can be designed through modification of original products as a result of technological advancements. Meanwhile, in marketing, diversification can be interpreted more broadly, so it is not merely a new product but which involves aspects of design, and innovation of the product is also considered new (Slocum and Curtis, 2017). It was stated that food and nutrition diversification can be seen from the following aspects: 1) consumption aspects; 2) aspects of production (Beltrame *et al.*, 2016); 3) aspects of business development; and (4) aspects of food independence (Firdaus and Cahyono, 2017; Mango *et al.*, 2018). It is important to realize that diversification activities of local food production, especially the intensification program from outside, should be adjusted to the farmer's preferences for ensuring the success.

The diversification priorities assessment this study cannot be separated from the agricultural transformation form towards modernization which is marked by industrial society formation. It is characterized by high productivity, efficient use of natural resources and technology, and producing high quality output with added value, Holmes and Mirmohamadi, 2017) In other words, modern agriculture is a manifestation of farming system with diverse product specializations, higher tradable inputs and practicing efficient farm management system. The statistic results also shown that, some priorities were not significantly different in several sub-district. These results were indicated that farmers may still not be able to determine which programs should be taken between the two priorities (Table 5). The demographic factors such as educational background may also contribute to the selected priorities made by farmers (Morris *et al.*, 2017).

Table 5: Priority Program Preference Score of Post-harvesting Diversification of Brittle-red Guava based on Sub-district Areas

| Priority | Kalipakis | | Bringinsari | | Trimulyo | | Pesaren | | Total | |
|----------|--------------------|-------|--------------------|--------|--------------------|-------|--------------------|--------|--------------------|--------|
| | Rating (%) | Crit. | Rating (%) | Crit. | Rating (%) | Crit. | Rating (%) | Crit. | Rating (%) | Crit. |
| P1 | 75.56 ^a | high | 77.78 ^a | high | 97.78 ^a | high | 70.00 ^a | medium | 85.25 ^a | high |
| P2 | 42.22 ^b | low | 55.56 ^b | medium | 45.56 ^b | low | 54.44 ^b | medium | 57.05 ^b | medium |
| P3 | 33.33 ^b | low | 30.00 ^c | low | 37.78 ^b | low | 47.78 ^b | low | 43.37 ^c | low |

Note: the alphabetic letter (a-c) indicates significantly different among priorities

Because of the massif production of raw materials, made the farmers interested to create diversification activities.

But it shall be highlighted that the first priority training was conducted to increase marketing activities and product promotion. Important finding is that respondents have low preference for technological development. Another assumption is, actually, the guava farmers was not ready enough to modernize their plantation. Then, the interview with the farmers revealed that majority of the guava farmers assumes using technology to increase production is still not important. This assumption is quite reasonable, because the diversification program is still in the initiation phase and has not yet been massively improved.

The three priorities chosen by guava farmers are specifically described in various activities (Table 6). In the first priority, more than 70% of the respondent chose the promotion and marketing development activities of diversified products.

This is linear with farmers' expectations where the main thing to improve was product marketing. It was reasonable, because marketing has an important value in ensuring business sustainability (Plakias *et al.*, 2019). That is because massive product marketing, will increase sales and profits. The preference also indicates that the main problem faced by guava farmers in Sukorejo District is the difficulty in marketing post-harvest products. Therefore, the form of product diversification that will be carried out must considering to targeted audience and consumer preferences.

Table 6: Respondent's Preference of Post-harvesting Diversification Program in Different Sub-district

| Priority/ Program | Kalipakis | | Bringinsari | | Trimulyo | | Pesaren | | Total | |
|---|-----------|-------|-------------|-------|----------|-------|---------|-------|-------|-------|
| | f | % | f | % | f | % | f | % | f | % |
| <i>Development of post-harvesting diversification product (P1)</i> | | | | | | | | | | |
| Business skill training | 3 | 10.00 | 10 | 33.33 | 1 | 3.33 | 10 | 33.33 | 24 | 20.00 |
| Technology development | 1 | 3.33 | 0 | 0.00 | 0 | 0.00 | 1 | 3.33 | 2 | 1.67 |
| Developing product promotion and marketing | 21 | 70.00 | 20 | 66.67 | 29 | 96.67 | 17 | 56.67 | 87 | 72.50 |
| Abstain | 5 | 16.67 | 0 | 0.00 | 0 | 0.00 | 2 | 6.67 | 7 | 5.83 |
| <i>Capacity building of the human resource (P2)</i> | | | | | | | | | | |
| Product diversification training | 12 | 40.00 | 6 | 20.00 | 23 | 76.67 | 14 | 46.67 | 55 | 45.83 |
| Establishing/ developing of processing group institutions | 7 | 23.33 | 10 | 33.33 | 3 | 10.00 | 4 | 13.33 | 24 | 20.00 |
| Improving diversified product quality | 4 | 13.33 | 8 | 26.67 | 4 | 13.33 | 9 | 30.00 | 25 | 20.83 |
| Abstain | 7 | 23.33 | 6 | 20.00 | 0 | 0.00 | 3 | 10.00 | 16 | 13.33 |
| <i>Technology development priority for diversifying guava processed products (P3)</i> | | | | | | | | | | |
| Developing user-friendly equipment | 14 | 46.67 | 19 | 63.33 | 26 | 86.67 | 13 | 43.33 | 72 | 60.00 |
| Developing economical equipment (low-cost fuel and energy) | 8 | 26.67 | 4 | 13.33 | 4 | 13.33 | 15 | 50.00 | 31 | 25.83 |
| Abstain | 8 | 26.67 | 7 | 23.33 | 0 | 0.00 | 2 | 6.67 | 17 | 14.17 |

Around 20% of the total respondents were assumed that farmers need training to improve the capacity and skills to develop the business promotion and marketing. Some farmers feel constrained in developing post-harvest products following horticultural products and their processed products development. Farmers were assumed that the experiences of guava cultivation is still lacking and requires to be increased because of the low information related to product development and technology. The low information access may be related to the educational background, skill, and limited internet access in some respondent environments (Mango *et al.*, 2018).

The facts above, confirmed by the respondents' answers that were reliable on the second priority (P2) which is about increasing the capacity and skills of human resources. Possibly, guava farmers did not realize that the farmer groups can be used to increase production capacity and product sales. In addition, the majority of farmers also do not see product quality as a matter that must be prioritized. Whereas farmer groups can be used as a marketing strategy to increase the income of its members (Kusmana *et al.*, 2019).

The third priority (P3) offered in this study is the development of user-friendly technologies and / or low operating cost and energy efficient. Utilization of agricultural technology or mechanization is intended to: 1) increasing productivity by producing higher outputs, with the same input; 2) increasing the efficiency of the process both in agricultural resources, and economic efficiency; 3) increasing quality and added value through process improvements that make the products more durable and adorable (Kowalska *et al.*, 2017); and 4) increasing income through the achievement of the three aspects before. However, farmers' preferences for technological development were very low. The use of technology is considered as a hassle because it requires special skills, assistance and care (Morris *et al.*, 2017).

A common problem that was often encountered in the process of product diversification down-streaming is the farmer's attitudes and behavior about new brand innovation. The experience of failure in trial stage was contributed in deterring farmers or reluctant to innovate new technologies even though it actually provides better hope. To increase the success of product commercialization process the farmers must continue to increase market penetration but not ignoring the technologies. In addition, multi-sectoral collaboration is needed to guarantee the value chain of brittle-red guava processed products (Omayio *et al.*, 2019). The efficiency of diversification business can also involve academicians by conducting research and development, the government may also support the farmers by providing fund, assistance and empowering programs, as well as private sector support in marketing activities.

IV Conclusion

The results of this study have important implications for the needs of stakeholders and policy makers to better understand the preferences of brittle-red guava farmers. That is because the farmers have many goals in production, such as increasing access to marketing capacity of themselves to developing the products. This study also shows that

the majority of respondents agreed with the post-harvest brittle-red guava diversification program in Kalipakis, Bringinsari, Trimulyo and Pesaren Sub-districts in Sukorejo District. The respondents strongly willing that the diversification program must be followed by promotion and marketing capabilities to ensure the value chain. It may cause by respondents' thought that concerns on potential failures when diversifying products are not sold in the market properly. Respondents also wanted training in strengthening the capacity of business actors and the farmer groups' management to improve business resilience. Both of these activities are considered to be the locomotive of the development of the brittle-red guava product diversification program. However, it must be realized in carrying out the two activities need to involve various parties. Both of these activities must be developed (by involving local government, agriculture services, etc.). Before doing so, the researchers suggesting to conducting several analysis of the diversified product especially about benefit-cost ratio (BC ratio) analysis, market analysis and consumer acceptability.

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