Smallholder farmers' perceptions of coffee bean processing using the honey method

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Abstract. Smallholder coffee farmers can increase their income and competitiveness by increasing the quality of green beans produced. One of the suitable coffee bean processing technologies to be adopted in Telemung Village, Banyuwangi Regency, East Java is honey processing method. This method will produce green beans at twice the selling price of traditional processing. This quantitative research involved 15 respondents as smallholder coffee farmers. The sample in this study uses a purposive sampling technique, namely farmers who have received training on the honey processing method. The data were collected using a structured questionnaire with face-to-face interviews. The analysis showed a significant relationship between perceived ease of use and intention to adopt the technology (r= 0.724; p= 0.002), and this result was supported by a significant correlation between perceived ease of use and perceived usefulness (r= 0.730; p= 0.002). It can be concluded that farmers have a positive perception regarding the ease of use and usefulness of the honey process method. However, the barrier to technology adoption is marketing uncertainty and this technology has not been practiced in the local community.

1. Introduction

Banyuwangi Regency has various agricultural commodities and coffee is one of them. The majority of coffee produced is robusta, and there are various robusta variants that are generally named based on the area where the plant is grown. The taste of coffee is determined by 60% from the land, 30% from the drying process to roasting, and 10% from the barista. Each stage has a vital role in determining the taste of coffee[1].

Cultivation of land and maintenance of coffee plants in the Banyuwangi Regency is already quite good, such as the implementation of fertilization methods and routine pruning, the red bean picking system, and the preservation of wild civet (to produce Luak coffee). The application of these methods can be used as a parameter of farmers' awareness of the quality of coffee produced. However, public awareness of coffee bean processing is still not good (post-harvest management). This can be seen from the majority of farmers still selling dry coffee beans (green beans) with minimal or traditional treatment. The majority of farmers process the beans using the hybrid method, this results in longer drying time and gives the coffee a stinking taste effect as a result of uncontrolled fermentation of the coffee skin that is not completely peeled[2]. Some farmers have applied better technology, by peeling it before drying using the honey process method, but the machines used are outdated, so that the large seeds will be
crushed and the skins on the small seeds are not completely peeled. Traditional processing (the hybrid method) will produce dry coffee beans with a price around IDR 22,000, however, using the honey process will increase the price to around IDR 40,000. This price can be achieved because the honey process will give the coffee a different character, sweeter, and a balanced acidity.

The adoption of coffee bean processing technology in smallholders is still low[3], challenges in the form of diverse geographic and multi-ethnic conditions lead to diverse mindsets and technological needs[4]. This study aims to determine the perceptions of smallholder coffee farmers in the Banyuwangi Regency towards coffee processing technology using the honey method and its relationship to their behavioral intention to adopt this technology.

2. Method
This research was conducted in Telemung Village, Kalipuro District, Banyuwangi Regency. The location selection was based on a high degree of suitability of the honey process method to be applied to the area, because the area had water shortages and the honey process method was suitable for these conditions, unlike the full-wash method. In addition, training on the honey process method has been conducted in the area, so that farmers know the whole work process of the method.

The selection of respondents was carried out using purposive sampling, in which all farmers in Telemung Village who had received training in the honey process processing method were selected. The number of respondents collected was 15 people, because this study aims to determine the intention of adoption (behavioral intention), the farmers who become respondents are farmers who have not adopted this method.

Data were analyzed descriptively using frequency, percentage, and mean. Furthermore, inferential statistical tests are carried out to determine the relationship between variables with the Pearson correlation test. The Linkert scale with a value of 1 (strongly disagrees) to 5 (strongly agrees) is used to measure perceptions of usefulness (PU), perceive easy of use (PE), perceived risk (PR), and intention to additive (IN).

3. Result and Discussion
3.1. Description of the Socio-Economic Characteristics of Farmers
The description of the socio-economic aspects of the respondents (Table 1) shows that on average the farmers are still in the productive age category[5], although the highest frequency is shown at the final productive age (41-50 years). In terms of demographics, farmers in Telemung Village have a good age distribution, because the age of farmers is not dominated by post-productive age, this indicates good regeneration.

The education variable of respondents shows good results, the majority of farmers (66.6%) have the education that exceeds the minimum standard of education in Indonesia (9 years; junior high school). This value is also above the average education in Banyuwangi Regency which is at the elementary education level (40%)[6].

The variable of the land area owned by farmers shows that the majority of farmers 'land ownership is ≤ 0.5 ha, while on average, farmers' land ownership is 1.05 ha. This value classifies the average coffee farmers in Telemung Village into small (<0.5 ha) to medium (1 ha) farmers with their main income not from a single commodity[7]. It can be interpreted that the coffee commodity is not the main income for farmers.
Table 1. Respondents Socio-Economic Characteristics

| Variable      | Frequency | Percentage (%) | Mean |
|---------------|-----------|----------------|------|
| Age           |           |                |      |
| 19-30         | 5         | 33.3           |      |
| 31-40         | 3         | 20             | 37   |
| 41-50         | 6         | 40             |      |
| 51-60         | 1         | 6.7            |      |
| Education     |           |                |      |
| Elementary    | 4         | 26.7           |      |
| Junior High   | 3         | 20             |      |
| High School   | 8         | 53.3           |      |
| College       | 2         | 13.3           |      |
| Land area (ha)|           |                |      |
| 0-0.5         | 6         | 40             |      |
| 0.6-1         | 5         | 33.3           |      |
| 1.1-1.5       | 1         | 6.7            | 1.05 |
| 1.6-2         | 1         | 6.7            |      |
| >2            | 2         | 13.3           |      |

3.2. Smallholders’ Perceptions of Honey Beans Processing Technology

In this study, three perceptions were used, namely farmers' perceived usefulness (PU), perceived ease of use (PE), and perceived risk (PR). Data related to the adoption intention of smallholders of honey process technology were also collected. Small farmers' perceived usefulness of technology is influenced by several factors, including the level of farmers' understanding of the technology, as well as the ease of technology adoption[8]. In this study (Table 2), small farmers have a good understanding of the benefits of honey process technology, the high scores on the related questions (PU3, PU6) prove this. However, farmers' perceived usefulness of technology have low scores, perhaps this is influenced by the unclear benefits of certain processes (PU2).

Table 2. Farmers' perceptions about the usefulness of Honey processing technology

| Code | Statement                                           | Mean Score |
|------|-----------------------------------------------------|------------|
| PU1  | Pulper processing improves coffee quality          | 3.73       |
| PU2  | Pulper processing makes production easy            | 2.43       |
| PU3  | Honey process technology improves green bean quality| 4.07       |
| PU4  | The application of the honey process increases the farmer income | 3.43   |
| PU5  | Honey process green bean have a higher price       | 3.36       |
| PU6  | Honey process technology is generally advantageous | 4.21       |

The average score on the PU variable shows above average results, in the range of Doubt and agree. This shows that, in general, smallholder perceptions of the usefulness of the honey process are at a medium level. This range shows that the honey process can be accepted by the farmer with sufficient possibilities[9].

Smallholder perceptions of ease (PE) towards honey process technology show an average value, this is similar to the results on the PU variable (Table 3). Farmers' perceptions with the lowest scores are shown in the answers to the PE6 statements, which reflect the general perception that the honey process
is not easy to implement. However, this is contrary to the perception of the use of a production machine (pulper) (PE1).

Table 3. Farmers' perceptions about the ease of use of Honey processing technology

| Code | Statement                                                      | Mean Score |
|------|---------------------------------------------------------------|------------|
| PE1  | It is easy to learn how the pulper machine work              | 4.13       |
| PE2  | The honey process technology is easy to learn                 | 3.57       |
| PE3  | Honey processing is clear and easy to understand              | 3.28       |
| PE4  | Easy to be skilled in honey process technology                | 3.43       |
| PE5  | The whole honey method process is easy to do                  | 3.36       |
| PE6  | In general, the honey method is easy to do                    | 2.71       |
| Mean |                                                               | 3.41       |

Perception of risk is a farmer's view of the threats that might occur if a technology is applied. It can be seen from this study (Table 3), that in sequence, the highest values are shown in PR6, PR4, and PR5, this shows that farmers perceive these aspects as a possible source of risk. It can be observed that farmers' perceptions of risk are not caused by technical factors (PR3), but rather due to marketing factors and the uncommon technology used.

Table 4. Farmers' perceptions about the risks of Honey processing technology

| Code | Statement                                                                 | Mean Score |
|------|---------------------------------------------------------------------------|------------|
| PR1  | Implementing process honey technology may decrease revenue                | 2.53       |
| PR2  | Applying honey process technology causes discomfort                        | 2.86       |
| PR3  | The risk of product failure is higher                                     | 2.07       |
| PR4  | The risk of marketing difficulties is higher                               | 3.21       |
| PR5  | Generally more risky than traditional methods                              | 3.07       |
| PR6  | Not safe to implement because this method is uncommon                      | 3.71       |
| Mean |                                                                           | 2.91       |

On average, the intention of farmers (Table 6) shows a relatively low value, which is in the Disagree-Doubt level range. The lowest score is shown in IN1, namely the intention to buy a pulper machine. A pulper machine is a must-have machine for producing coffee beans with the honey process. If the intention of farmers at this point is still low, it is certain that the intention to adopt technology will also low. The adoption of technology is also closely influenced by social factors[10], as implied in the PR6 statement so that the presence of other nearby farmers using similar technology will have a positive effect on the level of technology adoption[11].

Table 5. The smallholder intention to adopt honey process technology

| Code | Statement                                               | Mean Score |
|------|---------------------------------------------------------|------------|
| IN1  | Intend to buy pulper in the near future                | 1.87       |
| IN2  | Intend to put honey process technology into practice   | 2.50       |
| IN3  | Intend to make honey process technology into priority  | 2.21       |
| IN4  | Intend to recommend honey process technology            | 2.86       |
| IN5  | Intend to put honey process technology into practice as soon as possible | 2.36         |
| Mean |                                                        | 2.36       |

3.3. The correlation between Perception and Intention to Adopt Honey Process Technology

The results of the analysis (Table 7) show a positive correlation between the perception of ease of use and the intention to adopt technology, with a strong correlation coefficient ($r = 0.724; p = 0.002$). This
positive and strong relationship indicates that ease of application of honey process technology correlates strongly with smallholder adoption of this technology. The same thing is shown in the adoption of agricultural technology in smallholders [8][9][10]. The ease of technology to be applied is one of the important factors so that small farmers adopt the technology[12], because small farmers generally have a middle-to-lower level of education who find it difficult to apply complex technology[5], even though this technology actually has good uses.

A positive correlation is also shown between the perception of ease of use and usefulness, with a strong correlation coefficient ($r = 0.730; p = 0.002$), this shows that perceptions of ease and usefulness influence each other, with increasing one perception, will increase the perception of another. Opportunities for technology adoption can be enlarged by increasing the value of both PE and PU[9]. Perceptions of risk are negatively correlated with other variables, although not at a significant level.

It is possible that there are other factors that cause the adoption of honey process technology to be minimally applied at the smallholder level in Telemung village. Referring to Table 6, product marketing factors and this technology is not commonly used by local farmers can be the main factors in the adoption of this technology. Because the mindset of small farmers tends to follow the majority [13], it is possible because they do not have the power to build their own market, do not have advanced production tools, and do not have savings[14]. Further studies are needed to explore farmers' perceptions regarding this matter by focusing on risk perceptions, and the factors therein. Technology adoption at the smallholder level has many factors that must be considered, such as government support for facilities and infrastructure, technology dissemination, training, and market certainty[15].

4. Conclusion
The perception of small farmers in Telemung Village, Banyuwangi regarding the honey process technology is at a medium positive level. Meanwhile, the intention to adopt technology has a strong correlation with the perceived ease of technology. As well as the perception of ease of use has a strong correlation with perceived usefulness. Although the risk perception is not correlated with the intention to adopt technology, its negative value, and a low score on market sustainability and the honey process is uncommon technology used by the farmer, that aspect may be the inhibiting factor for technology adoption.

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