Local forage development strategies based on beef cattle farmer’s preferences

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Abstract. Indonesia has large potential resource of local forage. However, the utilization is limited. Therefore, a local feed resources particularly on forage development strategy is needed to determine the chosen feed sources based on the needs and preferences of beef cattle farmer. The research objectives were to determine beef cattle farmers’ preferences in choosing forages for their livestock and to determine strategies for developing potential local forages based on beef cattle farmers’ preferences. This research involved 106 beef cattle farmers in Kucur and Arjowilangun Villages, Malang Regency, East Java, who were selected purposively. Descriptive statistical analysis using cross tabulation was used in this study. The results revealed that the three main preferences of farmers in choosing forages were based on the level of cattle palatability, nutrient content, and forage productivity, respectively. The strategy of local feed development can be promoted by developing local feed sources that have a high level of palatability, nutrient content, and productivity.

1. Introduction
Forage is considered as a local feed resource that become one of the main factors in beef cattle farming as it plays an important role in providing most of the nutrients for livestock [1]. The quality and quantity of forage availability affect livestock productivity so that it is one of the main factors in livestock development. Indonesia as an agricultural country has a lot of potential local feed that can be developed, but the utilization is still limited [2,3]. One of the problems faced by farmers is the low ability to manage the available potential local forage [4].

The characteristics of beef cattle farms in Indonesia are managed only as a side business is a challenge in the development of forage [4]. This has an impact on the low adoption of forage processing technology by farmers. The development of the potential forage must be appropriate with the needs of farmers so that it is easy to adopt. It is easier for farmers to adopt a technology that suits their needs and wants [5]. Therefore, the aims of this study were to determine beef cattle farmers’ preferences in
choosing forages for their livestock and to determine strategies for developing potential local forages based on beef cattle farmers’ preferences.

2. Materials and methods
This study involved 106 beef cattle farmers in Arjowilangun and Kucur Village, Malang Regency, East Java as respondents. Respondents were selected using purposive sampling method. Data collection was conducted in August 2020 through personal interviews using a structured questionnaire. Descriptive analysis using cross tabulation was used in this study. Furthermore, the data were analysed with STATA software version 16.

The socio-economic characteristics of farmers may influence the farmers' preferences in choosing forages type. Several variables were used to represent farmers’ socio-economic characteristics. Table 1 showed variables used in this study.

Table 1. Definition of variables and type of measurement.

| Variable Name | Definition | Type of Measurement |
|---------------|------------|---------------------|
| Dependent variable | Preference | Farmer’s preferences in choosing forages | Categorical (1= Palatability, 2= Nutrients, 3= Easy to prepare, 4= Location, 5= Availability, 6= Easy to cultivate, 7= Price, 8= Productivity, and 9= Other properties) |
| Independent variables | Age | Age of the farmers in years | Continuous |
| | Experience | Farmer's experience in agriculture | Continuous |
| | Cattle | Total number of cattle kept by farmer in Animal Unit (AU) | Continuous |
| | Education | Formal education of the farmers in years | Continuous |
| | Size hh | Total number of people in the household | Continuous |
| | Type | Type of beef cattle’s agribusiness | Dummy (1= Fattening, 0= Breeding/rearing) |
| | Participation | Farmer's participation in socio-economic group | Dummy (1= Yes, 0= No) |
| | Location | Farmer’s location | Dummy (1= Kucur, 0= Arjowilangun) |
| | Willingness | Willingness to try new forages | Dummy (1= Yes, 0= No) |

3. Results and discussion
The characteristics of beef cattle farmers in Indonesia, especially in Java, are mostly managed traditionally with cattle ownership about 2-4 head per farmer and integrated with agriculture [6]. Most of the farmers use crop residues and field grass in the surrounding area as animal feed [2,6]. This farmers’ preference might be influenced by socio-economics characteristics shown in Table 2.

Beef cattle farmers in this study had an average age of 47.10 ± 12.06 years with farming experience of about 16.28 ± 14.95 years. However, the education level of farmers is still low, they only take formal education for about 7.45 ± 3.62 years or at the junior high school level. Most of the farmers in Indonesia are classified as elderly with a basic education level [6]. This characteristic affects the preference in choosing forage for their cattle [7]. Moreover, farmer’s socio-economic characteristics are also associated with their ability to adopt technology [8]. The results of cross-tabulation between farmers’ preferences and the type of beef cattle farm agribusiness shown in Table 3.
Table 2. Farmers’ socio-economics characteristics.

| Variable   | Unit       | Obs | Mean   | Std. Dev. | Min   | Max   |
|------------|------------|-----|--------|-----------|-------|-------|
| Age        | Year       | 106 | 47.10  | 12.06     | 25.0  | 75.0  |
| Experience | Year       | 106 | 16.28  | 14.95     | 1.0   | 56.0  |
| Cattle     | Animal Unit| 106 | 2.68   | 1.97      | 0.0   | 14.4  |
| Education  | Year       | 106 | 7.45   | 3.62      | 0.0   | 16.0  |
| Size hh    | Person     | 106 | 4.10   | 1.34      | 1.0   | 8.0   |
| Type       | Dummy      | 106 | 0.69   | 0.46      | 0.0   | 1.0   |
| Participation | Dummy   | 106 | 0.86   | 0.35      | 0.0   | 1.0   |
| Location   | Dummy      | 106 | 0.70   | 0.46      | 0.0   | 1.0   |
| Willingness| Dummy      | 106 | 0.38   | 0.49      | 0.0   | 1.0   |

Table 3. Cross tabulation between farmers’ preference and type of beef cattle agribusiness.

| Type of beef cattle agribusiness | Preference | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Total |
|----------------------------------|------------|---|---|---|---|---|---|---|---|---|-------|
| Fattening                        | Count      | 35| 17| 3 | 1 | 7 | 0 | 4 | 2 | 4 | 73    |
|                                  | %          | 47.9%|23.3%|4.1%|1.4%|9.6%|0.0%|5.5%|2.7%|5.5%|100%  |
| Rearing/breeding                 | Count      | 13| 5 | 1 | 0 | 1 | 2 | 1 | 9 | 1 | 36    |
|                                  | %          | 39.4%|15.2%|3.0%|0.0%|3.0%|6.1%|3.0%|27.3%|3.0%|100%  |
| Total                            | Count      | 48| 22| 4 | 1 | 8 | 2 | 5 | 11| 5 | 106   |
|                                  | %          | 45.3%|20.8%|3.8%|0.9%|7.5%|1.9%|4.7%|10.4%|4.7%|100%  |

Pearson chi²(8) = 21.0926  Pr = 0.007

Table 3 shows that the considerations of farmers in choosing forage feed are cattle palatability (45.3%), nutrient content (20.8%), and forage productivity (10.4%). Previous research on the preferences of sheep farmers in choosing forages also showed that the level of palatability was the farmers' main preference in choosing forages [9]. It shows that palatability is an important aspect of animal feed [10].

The farmers’ preferences in choosing forages based on the type of beef cattle agribusiness cultivated by the farmers have several differences. Palatability is a main priority either beef cattle fattening or beef cattle rearing/breeding agribusiness. The second and third priority for beef cattle fattening farmer respectively are nutrient content (23.3%) and forage availability (9.6%), while beef cattle rearing/breeding farmer are forage productivity (27.3%) and nutrient content (15.2%). This difference occurs because the two types of businesses have different goals. The fattening business program is focused on increasing cattle body weight so that it requires forage feed with high nutrient content, whereas in the rearing/breeding business, it focuses on reproductive performance and tends to maintain livestock conditions [1,10].

The willingness of farmers to try new types of forage will affect the developing process of forage potency. The development of local forage potency will be easier to do if the farmers have a willingness to try innovation. A comparison between farmer preferences in choosing forage and their willingness to try new types of forage showed in Table 4.

Most of the farmers in this study (62.26%) not interested in trying new types of forage. Farmers who are interested in trying new types’ forage mostly prefer to the forage with high nutrient content (40%). Otherwise, farmers who are not interested in trying new types' forage mostly have a preference for forage with high palatability (51.5%). This result shows that the development of new types' forage might be adopted by farmers who prefer to the forage containing high nutrient feed.
Table 4. Cross tabulation between farmer's preference and willingness to try new forages.

| Willingness to try new forages | Preference | Total |
|-------------------------------|------------|-------|
|                               | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | Count | %   |
| No                            | 34 | 6  | 2  | 0  | 7  | 3  | 8  | 4  | 66 |    | 51.5% |
| Yes                           | 14 | 16 | 2  | 1  | 1  | 0  | 2  | 3  | 1  | 40  | 35.0% |
| Total                         | 48 | 22 | 4  | 1  | 8  | 2  | 5  | 11 | 5  | 106 | 45.3% |

Pearson chi2(8) = 19.4440 Pr = 0.013

The strategy for developing local forage potency must pay attention to the needs and preferences of farmers in choosing forages. Information regarding farmers' preferences in choosing forage can be used as a basis for developing the potential of local forage [9]. Efforts to develop local forage will be more effective and efficient if it is appropriate with existing conditions, including potentials, challenges, and prospects [11]. Based on the preferences of beef cattle farmers, local forage development strategies can be carried out by developing animal feed that has high palatability, nutrient content, and productivity. Animal feed with high palatability is the main factor for farmers in choosing forage for their cattle. However, based on the level of willingness of farmers to try new types of forage, the development of new types' forage will be more effective if targeted at farmers who have a higher preference for nutrient content. Farmers in this group have a higher willingness to adopt new types' forage.

4. Conclusions
The priority of farmers when choosing forage is based on the level of palatability of the cattle. Beef cattle fattening farmers choose forage based on the level of cattle's palatability, nutrient content, and forage availability. Otherwise, beef cattle rearing/breeding farmers choose forages based on the level of cattle's palatability, forage productivity, and nutrient content. New types of forage are easier to develop for farmers who prioritize forage nutrient content. Developing local feed that have a high level of palatability, nutrient content, and productivity can be appropriate strategy at farm level.

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