Sustainability of Forage Systems in Small Holder Dairy Cattle in The Plateau in East Java

L Rahardjo* and MF Wadjdi

Faculty of Animal Husbandry, Islamic University of Malang, Jl. MT Haryono 193 Malang, East Java, Indonesia

Corresponding author email: rhardjo_unisma@yahoo.co.id

Abstract. This study aimed to describe the sustainability of forage system in the small holder dairy cattle in the plateau in East Java, in particular related to the nutrient content. The method used was survey (interviews, questionnaires, field observations and sampling) at the cooperation unit, farmers, livestock and farming location in one of the areas of dairy cattle cooperation in the plateau (Cooperation of SAE Pujon-Malang). The data obtained were analyzed through descriptive and regression statistics. The results showed that forage system dominantly given during dry and rainy seasons are elephant grass and corn stalks. Linear regression equation for the nutrient content of elephant grass is TDN= 40.516 + 1.404 CP, while corn trees is TDN= 56.212 + 0.740 CP. The conclusion showed that the dependent variable is largely influenced by external factors (environment). Improved continuity of availability of forage can be done by increasing the feeding system in the region (plateau) as well as the support from outside the region.

Key words: plateau, dairy cattle, forage

Introduction

East Java becomes one of Indonesian dairy farm centers since the total population of dairy cattle in the area is approximately ± 612,939 head (Dirjen. Peternakan dan Kesehatan Hewan, 2013). The farms are generally run by farmers who become members of dairy cooperatives (Rahardjo, 2012). 37.34% of the total numbers of dairy cattle are spread in East Java Plateau, 17.83% of them are in plains and the remaining 44.84% are spread in the lowlands (Rahardjo, 2010). Populations of dairy farms in an area grow with the establishment of new dairy cooperatives. Cooperatives established more than 30 (thirty) years ago are generally located in plateaus or highlands.

In general, dairy cattle’s feed are concentrates and grass but the main feed still the grass. Dairy cattle main consume grass so that the sustainability of a dairy farm depends heavily upon farmers’ ability in collecting the grass. Highland generally has relatively high rainfall and low temperature which makes the area an ideal place for FH and PFH dairy cattle. Grass and leaves as food sources for cattle can also grow well. However, such area is steep, and as the effect the management of a dairy
farm located in such area is quite expensive, not to mention, landslide which becomes a common phenomenon in mountainous areas.

Due to some issues encountered by dairy farms located in highlands, a study on the sustainability of forage in locally-owned dairy farm in East Java Plateau should be conducted.

**Materials and Methods**

Determination of the study area based on dairy cooperative working area. There are eight cooperatives in East Java, obtained by simple random sampling SAE Cooperative Pujon-Malang. The characteristic of the study areas can be seen in Table 1.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cooperative</th>
<th>District</th>
<th>Village population[n]</th>
<th>Altitude ± ≥ 1,200 m</th>
<th>Temperature [°C] &lt;21</th>
<th>Dairy farmer population</th>
<th>Dairy cattle population[n]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SAE</td>
<td>Pujon-Malang</td>
<td>30</td>
<td></td>
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<td>6,551</td>
<td>1,497</td>
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<td></td>
<td>15,109.29</td>
</tr>
</tbody>
</table>

**Figures**

- **Figure 1a. Monthly rainfall in Pujon-Malang and East Java**
- **Figure 1b. Monthly temperature in Pujon-Malang and East Java**

Location studies is based on: the population in general is dairy farmers; easy access to information and cattle density is relatively high, but allow to be developed (Rahardjo, 2012 and Rahardjo et al., 2014). Furthermore, the selection of samples by simple random sampling. Data description comes from questionnaires with 160 respondents and observation data with 40 samples. The data obtained were analyzed by descriptive statistics, regression and correlations are used in data analysis (Steel and Torrie, 1991) employing SPSS version 13.0.

**Result and Discussions**

**Climate and height of a location.** Two elements of the climate that play important roles in farm animal life and forage crops are rainfall and temperature. Figure 1a and 1b show monthly rainfall and temperature in the plateau which becomes the study area and East Java.
temperate climate and low temperature. The cattle are sensitive to the change of temperature (Yani and Purwanto, 2006). The production of milk is going to be disturbed when the cattle are not placed in comfortable zone (Echeverri et al., 2015).

Highlands have 3 (three) characteristics namely high rainfall, low temperature, and fertile soil which is the result of the two former characteristics of the highlands (Soemarno, 2004). Leaves and grass also grow well in the area (Kocho and Geta, 2011).

The total area of highlands in Pujon-Malang is 15,109.29 ha (Table 1) which consists of residential area, agricultural area, plantation, forest, meadows and so on (Table 2).

Table 2. Use of land in the highlands

<table>
<thead>
<tr>
<th>Use of Land</th>
<th>Width (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential area</td>
<td>569.28</td>
</tr>
<tr>
<td>Agricultural Area</td>
<td>3,183.13</td>
</tr>
<tr>
<td>Plantation</td>
<td>102.28</td>
</tr>
<tr>
<td>Forest</td>
<td>10,628.95</td>
</tr>
<tr>
<td>Meadows</td>
<td>-</td>
</tr>
<tr>
<td>Others</td>
<td>525.65</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15,109.29</strong></td>
</tr>
</tbody>
</table>

Source: Rahardjo dan Wadjdi (2014)

The data in Table 2 shows that most of the area of the highlands is protected forests of which sustainability should be kept. Only about 21.07% of the area of the protected forests is used for agriculture. Landslides and high cost for management are two setbacks for dairy farms in areas located >1.200 m above the sea level (Ritung et al., 2007). The higher altitude an area has, the smaller chance it has to use as agricultural area (Kocho and Geta, 2011).

Dairy production and the cooperative’s concentrated. The population of dairy cattle in the areas that become the setting of the study is approximately ± 18,038 head; 55.83% of them are milking cows, 20.45% of them are heifers, 15.42% of them are calves and the remaining 8.30% are bulls (Koperasi SAE, 2014).

Support and guidance are vital in the development of traditionally-managed dairy farms (Rivera et al., 2015). The roles of the cooperatives include marketing and providing concentrated (Rahardjo, 2012). The cooperatives have positive contribution in the development of the dairy farms so that they can produce up to 32,803 thousand liters of milk per year (Anonymous, 2014). The comparison between the milk the cooperatives has sold and the concentrated meal it distributed has met the requirements of cooperative regulation in terms of selling concentrated meal to farmers that is 2:1. The comparison means each 2 (two) liters of milk a farmer sells, he buys a kilogram of concentrated (Figure 2a and 2b).

The shortness of forage generally occurs in the dry season (Manyeki et al., 2015). The
amount of forage is plentiful in the rainy season and as the result, the production of milk is increasing. However, the amount of milk production is relatively stable (Figure 2a). The condition is caused by relatively stable use of the concentrate (Figure 2a) and guidance from the cooperatives (Figure 2b). In the dry season, the availability of forage in the plateau is decreasing. Buying the forage from other areas is the solution to overcome the shortness of forage in the dry season.

This is in line with Tjatur et al. (2011) study which states that the meal consumed in the East Java Plateau has met the cattle’s need in terms of DM and is in line with NRC 2001. However, during dry season from May to October, the price of forage is increasing and, as the effect, some forage has to be imported from other areas.

**Quality of the farmers’ forage.** The forage crops available in the pastures during the rainy seasons generally has better nutrient content than those during the dry seasons (Mayouf and Arbouche, 2015).

Elephant grass, corn stalk, nature grass, *Calliandra calothyrsus*, *Laucena glauca* (lamtoro), crop waste or fruits are some examples of forage the farmers gave for the cattle. However, elephant grass, and corn are the ones used most commonly in dry season. Based on their nutrients, those two types of meal has relatively good nutrient (Figure 3a and 3b).

The result of regression analysis of the nutrients elephant grass, and corn stalk with TDN as dependent variable and CP as independent variable results in TDN = 40.516 + 1.404 CP as linear regression equation with $R^2 = 0.141$ as determination coefficient. On the other hand, the linear regression equation of the corn is TDN = 56.212 + 0.740 CP with $R^2 = 0.360$ as determination coefficient. Low determination score on forage shows that only small percentage of TDN scores being influenced by PK and most of them is influenced by the external factor or the environment. Furthermore, the fact that the determination score of elephant grass is lower than that of the corn may possible be caused by the places these two grow. The elephant grass grows in rice fields/moors, dykes, *galengan sawah/tegalan*, river banks, side of the roads and wildlife reserve, while the corn grows in rice fields/moors only. In general, forage crops grown by the dairy farmers have better sustainability of nutrient content compared to those come from communal land (Manyeki et al., 2015).

**Conclusion**

Elephant grass and corn are the dominant forage during dry and rainy seasons. The linear regression equation of the elephant grass nutrient is TDN = 40.516 +1.404 CP, meanwhile that of the corn nutrient is TDN = 56.212 +
0.740 CP. Dependent variable of the elephant grass is \( R^2 = 0.141 \) and that of the corn is \( R^2 = 0.360 \) and most of them are influenced by the environment as external factor. Developing meal system within the area of the Plateau and adding that from areas outside the Plateau are two methods that can improve the continuity of the forage.

**Acknowledgment**

The writers would like to thank the Ministry of Research, Technology and Higher Education and the Directorate of Research and Public Service for the funding they provide.

**References**


