

## Study on Anoa's Preference to Feed Form Under Ex Situ Conservation

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**Abstract.** The Anoa is potential to be developed as a meat-producing animal. Studies on its preference to certain feed types and form is essential as an initial effort to conserve and cultivate anoa as livestock using feed processing technology. This study was aimed to evaluate the anoa's feed preference to feed physical form, which was processed through feed processing/preserving technology. Latin square design with 3 treatments, and 3 replications was used in this study. The treatments were three different feed form, i.e. fresh, hay and wafers. Three anoas used as replications. Eating behaviour (eating, rumination upon standing, lying and wallowing), total feed consumptions, total dung, protein and crude fibre content of feed were observed. The results showed that the anoa's feed in the ex situ area could be prepared in the form of wafers with protein content, crude fibre and total digestible nutrient of 8.11, 23.11 and 72.85%, respectively. Total digestible nutrients of wafer-shaped feed was higher than fresh and dry feed (72.85 vs 62.25, 60.88%). It could be recommended that wafer feed could be applied in anoa ex situ conservation and cultivation.

**Key words:** anoa, feed preference, wafer, TDN, anoa cultivation

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### Introduction

Law No. 18 issued in 2009 regarding animal husbandry regulates wildlife both from natural habitats and breeding farms that can be cultivated to produce domesticated animals on the condition as stated in the provisions of legislation of wildlife conservation. The Anoa is significantly potential to be developed as meat-producing animals. Unlike other animals, this endemic fauna of Sulawesi Island has some advantages such as their ability to optimize local resources, climatic adaptability, disease resistance and other various advantages (Basri, 2008; Kasim, 2002). Besides, anoa is a germ-plasma stock.

Specifically, this study was aimed to assess anoa's (*Bubalus sp.*) feeding preferences to feed forms which were processed through feed processing/preserving technology. Information gained from this study will support improvement in feeding management, particularly prior to the rearing programs. In

addition, the provision and management of anoa's feeding in ex situ areas will result in more efficient and in accordance with the goals of modern conservation that is to preserve and exploit sustainably (FAO, 2003; Franco et al., 2004). Moreover, the continuation of availability of good quality feed is very important in the breeding of anoas.

An attempt to develop anoa as meat producers-animals requires support from feed processing and preservation technology and need specific feedstuffs (Pujaningsih, 2005). The study on the preference of feed type and form become essential to support conservation and domestication of anoas. Feed processing technology is required for conservation and cultivation of anoa because this technology will be in accordance with the need of providing alternatives feeds.

Feed processing technologies is used to facilitate the preparation, storage and preservation of anoa's feed to be more adaptable under field conditions. Data on feed

forms and feed formulations obtained from the current study will be recommended for alternative feed for the anoa in the location of preservation so that the anoa could be conserved in various ex situ areas without depending on their natural feed.

## Materials and Methods

The main materials were feed and three adult anoa's belong to Ragunan Wildlife Park Jakarta (RWPJ). Diets consisted of elephant grass, cassava, maize and bananas that were prepared in iso-nutrients (CP 8.5%, CF 28%) in the form of wafers, chopping hay and chopping fresh feed.

Wafer shape was formed by using the applicable feed processing technology to the size of 5x3x1 cm, weight of 50 grams per piece, pressed in 100°C temperature, with the pressure of 100 kg/cm<sup>3</sup> for 5 minutes.

Latin square design with three treatments and three replicates was used in the study. The treatments were feeding in the form of fresh, hay and wafer. Three anoa's were used as replicates. Eating behaviour (eating, rumination upon standing, lying and wallowing), total feed consumptions, the total collection of anoa's dung, protein and crude fibre content of feed were observed.

Feed was weighed before it was given to animals twice a day at 08:00 and 16:00 hours. The remaining feed and total collected anoa's dung were weighed every morning on the next day. Data was collected for seven days after a two-week of adaptation period (Soita et al., 2000). Nutrient contents of each diet were analyzed using Kjeldahl proximate analysis method (AOAC, 1975) and fibre components

analysis method of Van Soest (Goering and Van Soest, 1970). The measurement of feed digestibility performed in vivo using lignin indicator according to the method for assessing nutrient digestibility of Sales et al. (2004).

Data were processed using SPSS 16 for Windows to determine the influence of each treatment followed by Duncan's test multiple areas and T-paired test.

## Results and Discussion

### Feed compositions

Based on the type of Anoa's preference to feedstuffs, diets were prepared in the form of fresh, hay and wafer (Table 1) with protein and crude fibre content of 8.5 and 28%, respectively. This percentage refers to the range of protein and crude fibre content of anoa's natural feed plants (Pujaningsih et al. 2009). Diets for anoa's were consisted of feed preferred by anoa obtained from the ex situ locations.

Table 2 shows that the average of protein and crude fibre content of diets was 8.65 ± 0.49% and 25.93±2.5%, respectively. The content of crude fibre of the diet was lower than that of crude fibre of anoa's natural diet due to the alternative feed ingredients in the current study had relatively low content of crude fibre.

Compare to anoa's natural feed, the nutrition content (DM, ash, crude protein, crude fibre, crude lipid, NFE and TDN) of fresh feed, hay and wafer was not significantly different. This was due to the preparation of the diet was referred to the range of anoa's natural feed nutrients that was reported by Pujaningsih et al. (2009).

Table 1. Feed ingredients of Anoa's feed types

| Feed type | Cassava | Banana | Corn       | Elephant grass | Tapioca meal |
|-----------|---------|--------|------------|----------------|--------------|
|           |         |        | (100 % DM) |                |              |
| Fresh     | 10.04   | 14.99  | 34.99      | 39.99          | 0            |
| Hay       | 10.04   | 14.99  | 34.99      | 39.99          | 0            |
| Wafer     | 10.33   | 15.11  | 35.10      | 39.11          | 0.50         |

Table 2. Chemical compositions of Anoa's feed types

| Feed type | DM    | Ash   | Crude Protein      | Crude Fibre | Crude Lipid | NFE   | TDN   |
|-----------|-------|-------|--------------------|-------------|-------------|-------|-------|
|           |       |       | ..... (% DM) ..... |             |             |       |       |
| Fresh     | 59.03 | 11.33 | 9.04               | 28.89       | 2.57        | 48.17 | 62.53 |
| Hay       | 67.32 | 11.34 | 9.47               | 28.31       | 2.01        | 48.87 | 61.00 |
| Wafer     | 91.10 | 7.71  | 8.11               | 23.11       | 3.14        | 57.93 | 72.98 |

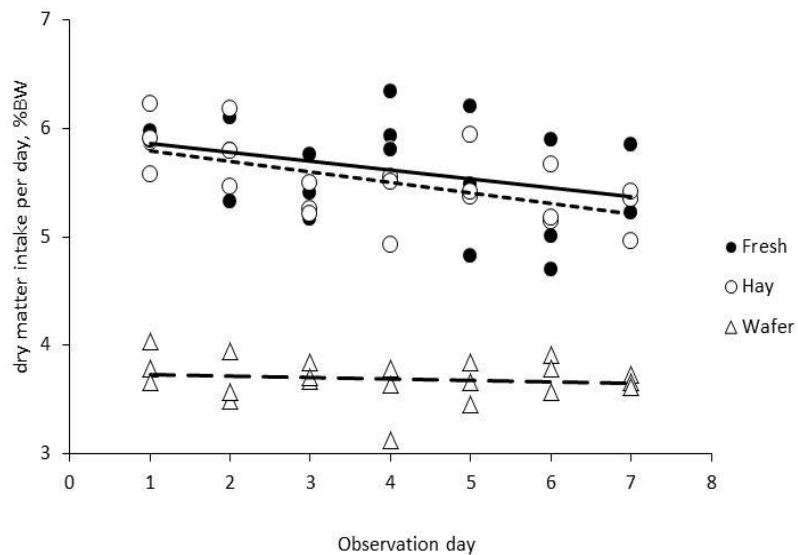


Figure 1. Dry matter intake based on Anoa's live weight

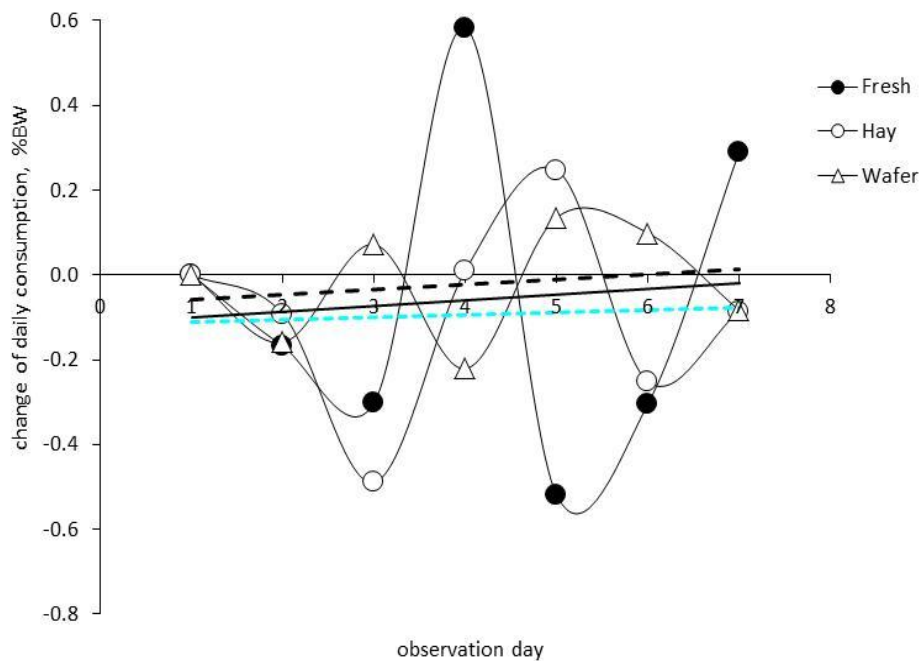


Figure2. Variation of Anoa's daily consumption of feed types

Wafer processing reduced protein and crude fibre content on the diets. It is predicted that the heat and pressure used in the process of wafer making has caused protein underwent denaturation and has broken the lignocellulose linkage (Retnani et al., 2009). Trisyulianti et al. (2002) reported that the process of wafer making with pressure of 120 kg/cm<sup>3</sup> at temperature of 120°C for 10 minutes changed the content of nutrition of complete feed. However, the nutrient content of the diet of the current study was still in the safe range.

#### **Daily feed intake**

Daily dry matter intake was calculated based on the percentage of body weight of each anoa depicted in Figure 1. Figure 1 shows that consumption of fresh feed and hay tended to decrease while consumption of wafer was stable. This means that nutrients contained in wafer was able to continue to meet nutritional needs of anoa in a balanced condition. The chance of anoa to select feed when they were given feed in the form of hay and fresh feed may imply that in both forms of the feed nutrients content consumed could not be balanced. Smelling feed for selection was normally done by animals before they eat so that animals can refuse a feed ingredient before tasting it (Parakkasi, 1999).

The Variation of dry matter consumption was higher in fresh feed compared to wafer feed (Figure 2) that means anoa prefer fresh feed. These conditions caused the fluctuation in fulfilment of nutrients which was influenced for example by the stability of feedstuffs, nutrient content of the diet and environmental temperature. Data showed in Figure 2 were obtained by subtracting the consumption of the previous day (day x-1) from the consumption on the days of observation (day x). The range between minimum and maximum values of consumption variation of fresh feed was mainly due to slow rate of passage in the rumen that caused anoa stop eating. Thus, there was a

possibility that this had not fulfilled nutrient requirements.

Hay had a range of minimum and maximum values relatively smaller than that of the fresh feed. This condition indicated that the physical form of hay has a better flow rate of passage than that of fresh feed so that the rumen was able to accommodate feed equivalent to the nutritional needs. The range of minimum and maximum value of the wafer was relatively more stable than those of fresh feed and hay which means that the passage rate of wafer is more constant. It could be expected that anoa could achieve nutritional intake which was equivalent to their need and more stable than in the form of fresh feed or hay.

#### **Anoa's preferable feed types**

Table 3 presents data on the anoa consumption of fresh feed, hay and wafer. Results of data analysis showed that the shape of wafers significantly different ( $P < 0.05$ ) in reducing anoa feed intake compared with that of hay and fresh feed. Hay and fresh feed were not significantly different ( $P > 0.05$ ) in affecting the anoa feed intake. Feed consumption was calculated based on the weight percentage of each anoa. Each feed types given in the same amount (1 kg dry matter).

The observation of anoa eating behaviour was presented in Table 4 which shows that the time required by the anoa to perform rumination of wafer was faster than that of fresh feed and hay. This condition was possible because wafer was made from feedstuffs that have been mashed. This treatment causes particles of feed material becomes easier to be further digested by the animal so that it can pass through the omasum orifice and subsequently undergo an enzymatic digestion in the abomasum (Bhatti et al., 2008). According to Ruckebush (1988) feed texture, feed consistency and the amount of feed in the rumen affected rumination activity. A brief rumination activity affects the physical

Table 3. Average of feed intake expressed as percentage of live weight of Anoa

| Feed type  | Months of observation |                   |                   | Average           |
|------------|-----------------------|-------------------|-------------------|-------------------|
|            | 1                     | 2                 | 3                 |                   |
|            | ..... (%) .....       |                   |                   |                   |
| Fresh feed | 5.43 <sup>a</sup>     | 5.97 <sup>a</sup> | 5.44 <sup>a</sup> | 5.62 <sup>a</sup> |
| Hay        | 5.43 <sup>a</sup>     | 6.21 <sup>a</sup> | 5.35 <sup>a</sup> | 5.66 <sup>a</sup> |
| Wafer      | 3.75 <sup>b</sup>     | 3.66 <sup>b</sup> | 3.67 <sup>b</sup> | 3.69 <sup>b</sup> |

Values bearing different superscript at the same column differ significantly ( $P < 0.05$ ).

Table 4. Effects of feed type on Anoa feeding behaviour

|                                                 | Feed type |      |       |
|-------------------------------------------------|-----------|------|-------|
|                                                 | Fresh     | Hay  | Wafer |
| Average of feed consumption per day (kg DM/day) | 4.40      | 4.43 | 2.89  |
| Eating time (minutes/day)                       | 260       | 280  | 220   |
| Rumination time (minutes/day)                   | 515       | 540  | 365   |

quantities of dry matter feed intake. If it is well managed with good nutritional diet, feed efficiency can be improved.

Although Anoa consumed less amount of wafer, its nutritional intake was equivalent to those fresh feed and hay. Total digestible nutrient of wafer (72.85%) was higher compared with the total digestible nutrient of fresh feed (62.25%) and hay (60.88%). The increasing of nutrient digestibility was due to processing of wafer making (Trisyulianti et al., 2002). Reduction of particle size in the processing of wafer making could improve nutrient digestibility (Soita et al., 2000). According to Church (1988) if feed particle size is smaller than 1 mm it will pass easily into the omasum.

## Conclusions

The study revealed that wafer significantly decreased feed intake compared to hay and fresh feed. Forms of hay and fresh feed did not significantly affect feed intake. Total digestible nutrients of wafer are higher than those of fresh feed and hay. Anoa's feed in the ex situ location could be formulated with the respective contents of crude protein, crude

fibre and total digestible nutrients of 8.11, 23.11 and 72.85% in the form of wafers.

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