The effect of feeding bull Bali cattle kept in extensive husbandry system with concentrates contained gliricidia sepium leaf meal and banana strach tuber meal on their feed consumption and dried organic matter digestibility

S Fattah¹, Y U L Sobang¹, F D Samba¹, E Hartati¹, M M J. Kapa² and Y L Henuk³

¹Faculty of Animal Science, Universitas Nusa Cendana, Kupang, 85361 Indonesia
²Faculty of Agriculture, Universitas Nusa Cendana, Kupang 85361 Indonesia
³Faculty of Agriculture, Universitas Sumatera Utara, Medan, 20155 Indonesia
E-mail: yusuhenuk62@live.com

Abstract. This study aimed to evaluate the effect of feeding bull Bali Cattle kept in extensive husbandry system with concentrates contained gliricidia sepium leaf meal and banana strach tuber meal in their feed consumption and dried organic matter digestibility. Three bull Bali cattle aged 1 – 2 years old with an initial body weight of 135.5 kg – 168.0 kg were used in this study. The three treatments used were T₀ = local feeds (consisted of Leucaena leucocephala, Acasia leochophloea, and Ficus sp. leaves as commonly used by local farmers); T₁ = T₀ + 1 kg concentrate (contained banana strach tuber meal + gliricidia sepium leaf meal); T₂ = T₁ + 2 kg concentrate (contained banana strach tuber meal + gliricidia sepium leaf meal). The results showed that the dry matter intake were: 2.40, 3.52, and 4.14; organic matter intake were: 2.17, 3.32, and 3.62; dry matter digestible was 64.63%, 72.45%, 77.28% and organic matter digestible was 66.79%, 74.66%, 79.33% for T₀, T₁, and T₂, respectively. There was no effect (P>0.05) of treatments on the three parameters observed on bull Bali cattle kept in extensive husbandry system and fed with concentrates contained leaf gliricidia sepium meal and banana starch tuber meal.

1. Introduction
It is well known that beef cattle system in East Nusa Tenggara (ENT) Province is kept under extensive traditional regime. Knowing the characteristics of extensive management system of local cattle (Bali cattle) in ENT is helpful to identify the problem and the formulation of strategies for improving cattle productivity. Extensive traditional management system is defined as a way of husbandry where the cattle released during the day and stabled at night, and or released on grazing day and night. In this condition, the owner intervention is very limited. Population growth will normally followed by increasing demand for meat as a source of animal protein. The increase of demand on the one hand would boost economic growth but on the other hand will cause a negative impact on the sustainability of the local beef cattle reared under the extensive system. With the current husbandry system, the threats to the business sustainability of beef cattle farms in the dryland environment may occur [1]. ENT had been one of the major beef cattle suppliers under traditional management system in Indonesia. The beef cattle farming based on grazing native pasture and the introduction of shrub legumes (Leucaena leucocephala) may contribute to around 15 – 50% of the farmers’ household income. In the last few years, supply of beef
cattle tended to decline due to the decrease in cattle population in ENT [2]. The quality and quantity of feed in ENT is followed by the standard seasonal flow. In the dry season, the content of dry matter forage increases but in the rainy season the moisture content will be higher. In the rainy season, the amount of forage will be abundant while in the dry season is very little available so that the impact on the productivity of fattening cattle in the pattern of rearing breeders on the island of Timor is still low only around 0.25-0.30 kg/head/day. This is because the cattle fattening system conducted by farmers in ENT is still done without adequate technology input, especially in the aspect of feeding, where the livestock is dependent only on forage (grass and legume) without considering the aspect of nutrient adequacy [3]. Bali cattle farmers in ENT Province as a major supplier for domestic meat demand in Indonesia. However, beef cattle production in ENT province still facing constraints that caused low productivity of beef cattle. These constrains are incontinuity availability of forages, traditional breeding system, underutilized available local feed resources. *Gliricidia sepium* is one of legumes commonly found in ENT and well adapted to dry tropical environment and infertile soils such as most of neglected land in this region. *Gliricidia sepium* has not been widely used yet due to its specific smelt of coumarine a compound which lead to its low palatability [4]. This study aims to determine the effect of feeding bull Bali Cattle kept in extensive husbandry system with concentrates contained gliricida sepium meal and banana strach tuber meal on their feed consumption and dried organic matter digestibility.

2. Materials and Methods
The research was conducted in Desa Binaan Fapet Undana in Oelatsala Village, Taebenu Sub-district, Kupang District. Three bull Bali cattle aged 1 – 2 years old with an initial body weight of 135.5 kg – 168 kg were used in this study. The experimental design used was a Latin square design (3x3) consisted of 3 treatments and 3 replicates. The three treatment were $T_0$ = local feeds (consisted of leaves of *Leucaena leucocephala*, *Acasia leochophloea*, and *Ficus sp.* as commonly used by local farmers); $T_1$ = $T_0$ + 1 kg concentrate (contained banana strach tuber meal + *gliricidia sepium* leaf meal); $T_2$ = $T_1$ +2 kg concentrate (contained banana strach tuber meal + *gliricidia sepium* leaf meal) (Table 1).

Table 1. Ingridients of concentrate as a suplement for fattening Bali cattle (DM).

| Ingredients                     | $T_0$ | $T_1$ | $T_2$ |
|----------------------------------|-------|-------|-------|
| Rice bran                        | 50    | 50    | 40    |
| Corn meal                        | 24    | 24    | 20    |
| Banana Starch Tuber Meal         | 0     | 15    | 15    |
| Gliricidia Sepium Leaf Meal      | 15    | 0     | 15    |
| Fish Meal                        | 5     | 5     | 4     |
| Urea                             | 2.5   | 2.5   | 2.5   |
| Salt                             | 3     | 3     | 3     |
| Starbio                          | 0.5   | 0.5   | 0.5   |
| Total                            | 100   | 100   | 100   |

All cows were given *ad libitum* feed and water and used individual cages consisting of 3 plots measuring 1.20 m x 2.10 m cement floor, coconut-shaped roof and equipped with feeding and drinking water. Variables assessed were dry matter (DM) intake (kg/day) and organic matter (OM) intake (kg/day) of the experimental animals. Data were analyzed using analysis of variance according to R G D Steel, and J H Torrie [5]. The difference between treatments was tested by Duncan’s Multiple Range Test (DMRT).

3. Results and Discussion
3.1. The effect of treatments on DM and OM
Consumption is a major factor affecting the supply of nutrients in cattle so that generally used as the main reference in assessing the capacity of livestock in utilizing feed with different quality. The effect of treatment on DM and OM is presented in Table 2. Average digestibility of dry-matter and organic matter of Bali cattle is presented in Table 3.

| Parameter     | T0   | T1   | T2   |
|---------------|------|------|------|
| DM intake     | 3.40 | 3.22 | 4.14 |
| OM intake     | 3.17 | 3.12 | 3.62 |

| Parameter     | T0   | T1   | T2   |
|---------------|------|------|------|
| DM intake     | 69.22| 63.15| 76.00|
| OM intake     | 68.90| 64.66| 76.33|

3.2. The effect of Treatments to DM Consumption

The result of analysis showed that the treatment of T0 and T1 had no significant effect on DM consumption. However, T1 – T2 showed a significant effect (P <0.05). This proved that the use of concentrate feed containing gamal leaf flour and banana cobs can increase the consumption of DM in the system of fattening patterns of breeders. The average consumption ability of ruminant livestock is 2-3% of body weight or 2.5 to 3.2%. Based on the mean score in table 3, the average DM consumption in this study was between 3.22-4.14 kg/head/day. Mean T1 (3.22 kg/head/day) is the lowest dry ingredient consumption. This is due to the consumption of feed is very dependent on the provision by farmers without regard to the aspect of nutritional adequacy characterized by low body weight so that the addition of constrates containing banana tubers as energy sources can not increase consumption of DM rations. DM consumption between T1 - T2 is not significant, this is due to the nutrient content of the feed is relatively the same between the treatments of DM feed pattern breeders that cause consumption is not significantly different. This is an accordance with N Silanikove, Z Nitsan and A Perevolotsky [6] they who reported that the ability of cows to consume DM is relative the same, cause no difference in feed consumption [7]. The unbalanced feed nutrient will affect feed consumption. The duration of feed ingredients in the rumen, will slow the rate of food so that the consumption level becomes low [7]. There was significant difference (P <0.05) in T1-T2 with the addition of concentrate containing gamal leaf and banana flour in feed pattern of breeder characterized by DM consumption (T1 = 3.22 kg/head/day T2 = 4.14 kg/head/day), this is due to the level of concentrate and the concentrated nature of the palatability so that the cattle consume more and in the presence of the use of concentrate feed can improve DM digestibility in feed pattern breeders, so the rate of feed speed in the channel Digestion increases so that feed consumption increases. According to P Faverdin, R Baumont, and K L Ingvarsten [8] the palatability of feed is a major factor explaining the difference in DM consumption between feed and low-yielding livestock. Consumption of DM between T1 - T2 is not significant, this is due to the nutrient content of the feed is relatively the same between the treatment of DM feed pattern that cause consumption is not significantly different. This findings is in line with N Silanikove, Z Nitsan and A Perevolotsky [6], they reported that the ability of cows to consume the same relative DM had given no difference in feed consumption. T R Preston and R A Leng [7] also described that the unbalanced feed nutrient will affect feed consumption, it further states that the duration of feed ingredients in the rumen, will slow the rate of food so that the consumption level becomes low. There was significant difference (P <0.05) in T1-T2 with the addition of concentrate containing gamal and banana leaf banana on feed pattern of breeder characterized by consumption of DM (T1 = 3.22 kg/head/day; T2 = 4.14 kg/head/day), this is due to the
level of concentrate and the concentrated nature of the palatability so that the cattle consume more and with the use of concentrate feed can improve DM digestibility in feed pattern breeders, so the rate of feed rate in the digestive tract increased, so the consumption of feed increases. Our findings supported by P Faverdin, R Baumont, and K L Ingvartsen [8], they reported the palatability of feed is a major factor explaining the difference in DM consumption between feed and low-yielding livestock. S D M Prawirodigidgo dan D Andayani [9] stated that palatability affects the amount of feed consumed. R B Widyawati [2] also explained that with the use of supplement feed, microbial synthesis on the feed increases. With the increased synthesis of microbes in the rumen, the feed digestibility will increase, the feed rate in the rumen becomes faster and stomach will be empty quickly and feed consumption increases. A D Tillman, H Hartadi, S Reksohadiprojo, S Prawirokusumo. dan S Lebdosaokejo [10] reported that the easier the digestible feed in the gastrointestinal tract means that nutrient feed is absorbed faster so that feed flow leaves the digestive tract faster and causes more room to be available for feed growth. The faster the feed rate in the digestive tract, the consumption will increase. C Devendra [11] also reported that DM consumption has a strong relationship with undigested energy consumption. The stomach becomes empty faster and stimulates the cattle to consume the feed again. The standard DM requirement of livestock research is 4.04-4.85%/head/day from the mean body weight of 161.75kg which is characterized by daily weight gain of livestock receiving T0 (0.38kg/head/day) and then T1 (0.36kg/head/day) followed by T2 (0.64kg/head/day). The results are slightly better than the findings of Y U L Sobang [12] that the addition of local concentrate feed can increase the consumption of ration DM and the productivity of Bali cattle fatten. The addition of local concentrate feed can increase the consumption of DM ration and cattle productivity Bali fattening pattern of breeders reaches 0.45-0.50 kg/head/day.

3.3. The Influence of Treatments on DM Consumption
The result of the study showed that T1 - T2 had no significant effect but T2 - P3 treatment had significant effect (P <0.05) on OM consumption. This is in line with the consumption of DM, the consumption of OM at low T1 (3.12 kg/head/day) is characterized by a daily weight gain of 0.36 kg/head/day. This is due to the consumption of feed is highly dependent on provision by the owner and the existence of what feeding trends are met that are cut and given to livestock regardless of the nutritional adequacy aspect. T0 = 3.17 kg/head/day with daily weight gain of 0.38 kg/head/day. The high OM consumption in animals treated with T2 and T1 is influenced by the level of palatability and concentrate, thus stimulating the animal to consume more feed. The increase of OM consumption of this ration along with the increase of consumption of DM. The organic material in T2 consumption is high (3.62 kg/head/day) which is indicated by adding T2 as much as 3.62 kg/head/day was followed by T0 = 3.17 kg/head/day with daily weight gain of 0.38 kg/head/day. The high consumption of OM in animals treated with T2 and T0 was influenced by the level of palatability and concentrate, thus stimulating the livestock to consume more feed. It was found that the increase of OM of this ration along with the increase of consumption of OM ration. This result is supported by A A A Astuti dan P S B1 [13], they reported that consumption of OM is closely related to the consumption of DM, the higher the consumption of DM then the consumption of OM also increases. Nutrients contained in OM are the components of DM. The organic composition consists of fat, crude protein, crude fiber, and BETN. DM, plus ash [14]. So the amount of consumption of DM will affect the amount of consumption of OM. The amount of consumption of DM will affect the amount of nutrients consumed so that if the consumption of OM increases it will increase the consumption of nutrients. From this result that feeding pattern of breeder plus concentrate, give better effect to the productivity of cattle research.

3.4. The Effect of Treatments to DM Digestibility
The result of variance analysis showed that the treatment had no significant effect (P> 0.05) to DM digestibility percentage. The DM digestibility of the rations using a forage counterpart - concentrates
with different compositions other than those caused by the increase in DM digestibility is also due to the increased proportion of concentrates in the ration so as to give an indication that the feed is of good quality. Empirically the cattle that consume forage feed added to the concentrate containing banana herbs (T2) has a lower DM digestibility than those added to the concentrate containing gamal leaf and banana flour, this proves that the use of concentrate feed can improve the digestibility of the ingredients Dry in the system of fattening pattern of breeders. There was a significant difference in T2 and T3 with the addition of concentrate containing gamal and banana leaf flour in feed pattern of breeder characterized by DM digestibility (T1 = 63.15; T2 = 76.00). This is because the addition of gamal and banana leaf powder in the concentrate and the concentrated nature of the palatability so that the cattle consume more and with the use of concentrate feed can improve DM digestibility in feed patterns of breeders, so the rate of feed speed in the digestive tract increases. According to P Faverdin, R Baumont, and K L Ingvartsen[8], palatability is a major factor explaining the difference in DM consumption between feed and low-yielding livestock. It is also said that the palatability of feed is generally associated with high digestibility of a feed. The high DM digestibility of ruminant livestock shows high levels of digested nutrients primarily by rumen microbes. This is in line with A D Tillman, H Hartadi, S Reksohadiprojo, S Prawirokusumo and S Lebdosoekokojo [10] that the digestibility of a feed material depends on the harmony Food substances contained therein, feed ingredients with high digestible ingredients are generally high also the value of nutrients and digestibility can be the first measure of the high nutrient value of a feed material.

3.5. The effect of Treatment on OM Digestibility
The results of analysis of variance showed that the treatment had no significant effect (P> 0.05) or in other words the treatment application did not give a significant effect on the percentage of OM digestibility in the fattening cattle breeder system. This is due to the nutrient content of feed consumed is relatively same, so that the digestibility result is not much different. The digestibility of OM was low at T1 (64.6 %). It is well known that feed consumption is highly dependent on the feed provision method by the owner and feed types given to the animal. At T2 the digestibility of OM is high (76.33 %) and it is caused by high OM intake by animal. The high digestibility of OM in animal given T2 and T1 is influenced by the addition of gamal leaf powder as a source of protein and banana cobs as a source of energy so that needs is sufficient and leads to increase the activity of rumen microorganisms in digesting feed material. The digestibility level of OM feed material has the same pattern with DM digestibility. The level of digestibility of OM is relatively higher than DM digestibility in all treatment rations. This is because the DM still contains ash, while the OM does not contain ash, so the material without ash content is relatively easier to digest. This result is supported by A D Tillman, H Hartadi, S Reksohadiprojo, S Prawirokusumo and S Lebdosoekokojo [10] they stated that the DM digestibility value is closely related to the digestibility value of OM, as most of the DM component consist of organic material, the difference is only in the ash content. This result proven that the addition of concentrate into the ordinary ration gives good effect on animal performance. The digestibility value of OM is relatively the same among treatments. This happens due to the OM component and the extra materials without nitrogen as well as the crude fiber content of the ration treated are relatively similar. This is presumably because the microbes are unable to digest the crude fiber components contained in the feed optimally. The coarse fiber content in the feed will cause a low degradation value, since crude fibers in the form of cellulose and hemicellulose often bind to lignin and will be difficult to break down by digestive enzymes. The digestibility rate of OM is influenced by feed particle size, easy digestibility of carbohydrates, cellulose content, hemicellulose, lignin, and protein. The digestibility of OM in the digestive tract of livestock includes nutrients in the form of components of organic materials such as carbohydrates, proteins, fats and vitamins.
4. Conclusions
The feeding of concentrate containing gamal and banana flour concentrate is not significantly influenced (P> 0.05) the consumption and digestibility of Dry Matter, Organic Matter in Bali cattle male under farmer rearing systems. However, empirically there is an increase of consumption and Dry Matter, Organic Matter digestibility due to the addition of gamal flour and banana flour at a level of 15%.

References
[1] Kapa M M J, Soemarno, Bagyoayunuwiyadi and Suyadi 2017 Sustainability status of biology dimension of local beef cattle development in the dryland region, Indonesia J. Econ.Sustain. Dev. 8(6): 102-108
[2] Wirdahayati R B 2010 Penerapan teknologi dalam upaya meningkatkan produktivitas sapi potong di Nusa Tenggara Timur (Technology application to increase productivity of beef cattle in Nusa Tenggara Timur Wartazoa 20(1): 12-20.
[3] Fattah S 2012 Produktivitas Ternak Sapi Bali (Bali cattle productivity) (Yogyakarta: Penerbit The Phinisi Press)
[4] Fattah S, Sobang Y U L, Ratuwalo J J A, and Henuk Y L 2014 The Effect of feeding concentrate containing Gliricidia Sepium leaves meal and addition vitamine B-Complex and worm medicine on dry matter intake and daily body weight gain of Bali Cattle raised based on local farmers’ raising pattern. In: Proceedings of the 16th AAAP Animal Science Congress, 10-14 November 2014, Gadjah Mada University, Yogyakarta, Indonesia, II: 2291-2294.
[5] Steel R G D and Torrie J H 1995 Principles and Procedures of Statistics. 2nd Edition (London: McGraw-Hill International Book Company)
[6] Silanikove N, Nitsan Z and Perevolotsky A 1994 Effect of daily supplementation of polyethylene glycol on intake and digestion of tanin-containing leaves (Cernatonia siliqua) by sheep J. Agric. Food Chem. 42: 2844 – 2847
[7] Preston T R and Leng R A 1984 Supplementation of diet based fibrous residues and by products. in: sundstol f and owen e (eds) Straw and Other Fibrous by-Products as Feed. Elsevier, Amsterdam pp 373-409
[8] Faverdin P, Baumont R, and Ingvartsen K L 1995 Control and prediction of feed intake in ruminants. in: m. journet, e. grenet, m. theriez, and c. demarquilly (eds), proceedings of the 4th international symposium on the nutrition of herbivores. Recent Development in the Nutrition of Herbivores INRA Paris pp 95-120
[9] Prawiroidigo S D M and Andayani D 1995 Subtitusi bungkil kedelai dengan bungkil biji kapok (ceip petandra) dalam ransum kelinci sedang tumbuh (Substitution of soybean seed with cotton seed (Ceip petandra) into growing rabbit ration) J. Ilm. Tern. Klepu 1(3): 26-31
[10] Tillman A D, Hartadi H, Reksohadiprojo S, Prawirokusumo S and Lebdoesoekojo S 1991 Ilmu Makanan Ternak Dasar (Basic Animal Food Science) (Yogyakarta: Universitas Gadjah Mada Press)
[11] Devendra C 1983 The energy and protein requirements during pregnancy of katjang goats in Malaysia Mardi Res. Bul. 11(2): 193-205
[12] Sobang Y U L 2005 Karakteristik sistem penggumakan sapi pola gaduhan menurut zona agroklimat dan dampaknya terhadap pendapatan petani di kabupaten Kupang NTT Bulletin Nutrisi Maret, 8(2): 1-8
[13] Astuti A A A and Subur P S B 2009 Pengaruh penggunaan high quality feed supplement terhadap konsumsi dan keceranaa nutrien sapi perah awal lactasi (The effect of high quality feed supplement addition on the nutrient consumption and digestibility of early lactating dairy cow J. Pet. 33(2): 81-87
[14] Kamal M 1994 Nutrisi Ternak (Animal Nutrition) (Yogyakarta: Laboratorium Makanan Ternak Fakultas Peternakan)