

## **THE FEEDING MANAGEMENT OF BEEF COW-CALF ON SMALL-SCALE FARMS: A SURVEY IN EAST JAVA PROVINCE OF INDONESIA**

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### **ABSTRACT**

Beef cattle are the third commodity (6.16%) in providing meat for consumption of the Indonesians. East Java province is the centre of the largest beef cattle population in Indonesia. The management of calf feed is one of the critical points in the production of beef cattle. This study aims to assess the feeding management of beef cow-calf from birth to post-weaning in small-scale beef cattle farms in East Java Province. The survey was conducted on one group of beef cattle farmers (40-60 farmers) in each regency/municipality as many as 475 farmers. Data analysis is carried out descriptively about the activities of the management of cow feeding. The results of the survey of feeding management of beef cow-calf in East Java Province showed that: (1) Management of newborn calf in the condition "Good Enough", (2) Management of colostrum feeding in the condition "Good Enough", (3) Management of milk, milk replace and calf starter feeding in the condition "Bad", (4) Management of forage feeding in the condition "Good", (5) Management of feeding at post-weaning in the condition of "Good", (6) Management of feeding aged 6-12 months in the condition of "Good Enough", and (7) Overall the management of feeding calves from birth to post-weaning in the condition "Good".

**Keywords:** Feeding Management, Beef Calf, Colostrum, Forage, Weaning

### **1. INTRODUCTION**

Beef cattle are the third commodity (6.16%) in providing meat for consumption of the Indonesian population after native chicken (9.59%) and broiler chicken (79.45%). Beef

consumption of the Indonesian population only reached 2.56 kg/capita/year, much lower than the average world beef consumption rate of 6.4 kg. The beef cattle population in Indonesia in 2020 is 17.47 million with beef production of 515.63 thousand tons [1]. Beef production is only sufficient for 83% of domestic beef needs, so the remaining 17% must be met by meat imports and beef imports. One of the efforts to increase the cow population and beef production is the "SIWAB" (Sapi Induk Wajib Bunting) Program which means a cow must be pregnant since 2017.

East Java province is the center of the largest beef cattle population in Indonesia, which is 4.82 million (27.59%) of the 17.47 million beef cattle population in Indonesia. As many as 93% of beef cattle farms are small-scale farms with cattle ownership of 1-10 [2]. Households predominantly manage 2-4 heads by a semi-intensive cut-and-carry system. Many of these cattle are raised by landless households in which the main income sources are from agricultural wage work and raising cattle based on low-quality feeds, such as native grasses, rice straw, and other crop residues [3]. Calves and heifers are the future of every beef cattle operation and getting them off to a healthy start sets up a lifetime of productivity. The management of calf feed is one of the critical points in the production of beef cattle. The success of feed management determines the productivity of calves in the next period. This study aims to assess the feeding management of beef cow-calf from birth to post-weaning in small-scale beef cattle farms in East Java Province.

## **2. MATERIALS AND METHODS**

The survey was conducted in November 2021 in 10 regencies/municipalities in East Java Province, namely Bondowoso, Situbondo, Probolinggo, Malang, Kediri, Malang City, Tuban, Lamongan, Pasuruan, and Batu City. The survey was conducted on one group of beef cattle farmers (40-60 farmers) in each regency/municipality as many as 475 farmers. The majority of farmers managed 2-4 cattle. Farmers generally raise PO (Ongole Grade) cows, PO x Limousin crosses, or PO x Simmental crosses.

Data analysis is carried out descriptively about the activities of the management of cow feeding including (1) Management of Newborn Calf; (2) Management of Colostrum Feeding; (3) Management of Milk, Milk Replacer, and Calf Starter Feeding, (4) Management of Roughage Feeding; (5) Management of Feeding at Weaning (4-6 months); and (6) Management of Feeding at Post Weaning (6-12 months). The activities of the management of the feeding of calves are determined based on the Technical Instructions for the Maintenance and Weaning of Beef Calves by the R&D of the Ministry of Agriculture [4], [5]. Assessment of calf feeding management is grouped based on the percentage of "Yes" answers into four, namely (1) 0.00-20.00, "Worst"; (2) 20.01-40.00, "Bad"; (3) 40.01-60.00, "Good Enough"; (4) 60.01-80.00, "Good"; and (5) 80.01-100.00, "Very Good".

### 3. RESULTS AND DISCUSSIONS

#### 3.1. Management of Newborn Calf

Healthy starts begin at birth with a clean maternity pen and timely feeding of colostrum. Newborn calf care management is classified as "Good Enough" (Table 1). Treatment shortly after birth is to clean the remains of mucus contained in the mouth, nose, and body of the calf. Navel calves are cut by about 2.5 cm and the marks are given antibiotics so that there is no infection or inflammation of the navel that can cause the death of the calf. Calf born in good health and healthy dam (the mother of the calf) is put together in one cage. It is intended that calves get colostrum and milk in ad-libitum so that nutritional needs are met. In addition, calves can begin to recognize the feed consumed by the dam which will later become its daily feed after weaning. The survey results showed that most farmers do not estimate or weigh calves at birth. The birth weight of PO calves is between 20-35 kg [6], while the cross calf (PO x Limousin or PO x Simmental) is 31.8-35.5 kg [7]. The birth weight of calves is affected by the dam's condition when pregnant such as age, nutrition, body weight, and maintenance management [8].

**Table 1: Management of newborn calf**

No	Activity	Yes (%)	No (%)
1	Cleaning mucus in the mouth, nose, and body of the calf	84.31	15.69
2	Helps the calf breathe when the calf has difficulty breathing	76.00	24.00
3	Cutting and disinfecting the navel	57.88	42.12
4	Giving hay (dry grass) as a bed	68.57	31.43
5	Giving colostrum no later than 30 minutes after birth	78.79	21.21
6	Provide additional milk/colostrum if the mother's milk is lacking	54.12	45.88
7	Weighing/estimating the birth weight of a calf	11.62	88.38
	Average	61.61	38.39

#### 3.2. Management of Colostrum Feeding

Colostrum is milk released from the udder of a cow that has just given birth to a calf, yellowish in color and thicker than normal milk. Often referred to as "liquid gold", colostrum is the essential first feed of the calf. It is rich in antibodies, growth factors, and nutritional properties needed to support the development of the calf. Colostrum contains more energy, six times more

protein, 100 times vitamin A, and three times more rich in minerals than milk. Colostrum contains more energy, six times more protein, 100 times vitamin A, and three times more rich in minerals than milk. Colostrum plays a role in providing these immunoglobulins so that calves have a good defense from diseases that are mostly from the environment. This role is particularly important given the fact that colostrum is the only source of immunoglobulin G (IgG) that largely determines the survival rate of newborn calves [9].

High-quality colostrum should contain at least 50 g/L immunoglobulin G (IgG) alongside adequate fat, protein, vitamins, and minerals that can support calf health [10]. The IgG concentration within the colostrum declines rapidly after calving. Therefore, colostrum should be collected as soon as possible after birth, preferably within 2 hours. The ability of the calf to absorb IgG from the colostrum diminishes as the gut closes during the first 24 hours of life. Any colostrum/transition milk consumed 24 hours after birth will only provide local immunity to the gut and will not be absorbed by the gut. That is why it is essential to feed colostrum quickly after birth and is important to provide the first feed of colostrum ideally within the first 2 hours of birth. Calves should receive a volume of colostrum atleast equivalent to 10 percent of its body weight in colostrum within 4 hours of birth, and a total of 20 percent of its body weight in colostrum within 24 hours [11].

**Table 2: Management of colostrum feeding**

No	Activity	Yes (%)	No (%)
1	Cleaning the udder and nipples of the dam (mother of calf) cow using warm water	60.79	39.21
2	The calf immediately suckles its mother in less than 15 - 30 minutes	84.80	15.20
3	If the calf cannot suckle itself on its mother then the mother is milked colostrum as much as 1 liter and given to the child.	63.35	36.65
4	Feeding colostrum to calves within 15–30 minutes after birth	67.75	32.25
5	Feeding back colostrum in the next two feedings is 1-1.5 liters each within the next 12 - 24 hours from birth.	57.36	42.64
6	The normal capacity of a newborn calf is 1-1.5 liters, thus colostrum cannot be given simultaneously, it needs to be done several times a day.	57.63	42.37
7	For the next 3 days, give colostrum 4-6 liters/day in 3 times each 1.5 - 2 liters.	49.42	50.58
8	Colostrum is given at the time of newborn calf until the calf is	59.22	40.78

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4 days old			
9	The quality of colostrum determines the consumption of calf antibodies in the blood, if there is less chance of life 30% and if good can be 95%.	47.58	52.42
Average		60.88	39.12

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Management of colostrum in the condition of "Good Enough" (Table 2). The survey results showed that farmers do not provide additional colostrum if the mother's milk is insufficient. Consumption of calf colostrum is estimated to be less than 3 liters/day (10% body weight) within 4 days of birth. The cause is the low production of cow's mother milk. This leads to less good growth of calves. The low production of mother milk is related to the lack of nutrients of the mother cow before giving birth. Farmers are less aware of the importance of colostrum to the growth of calves and have no special management for newborn calves [12].

### **3.3. Management of Milk, Milk Replacer, and Calf Starter Feeding**

The first 60 days are important to calf growth. Calves are most feed-efficient during this stage, so providing a high plane of nutrition can result in growing calves that become high-producing herd mates. The feeding of milk to calves begins from the 4<sup>th</sup> day where the period of colostrum has ended. The feeding of milk and feed of calves is done gradually according to the age and weight of the calf. In the feeding phase, the mother cow's milk can be replaced by a calf milk replacer (CMR). Whole milk can have a higher energy density compared with CMR and is superior in terms of digestibility, particularly in calves under 3 weeks of age [10]. Benefits of feeding CMR are the consistency of the energy and vitamin and mineral content of the feed and the lower disease risk, however, when it comes to CMR it is important to assess the quality of the constituents.

A good CMR has a standard protein composition of 20%, 12% fat, less than 0.25% fiber, and also contains antibiotics to prevent diarrhea [5]. A good quality CMR provides the same weight gain as cow's milk until 4 weeks of age. During the first 3 weeks of life energy requirements should be met through whole milk or calf milk replacer (CMR) as calves generally do not consume much concentrate within this period. Historically a newborn calf is provided with two daily feeds of 2-liter milk or milk replacer. This equates to 10% in volume of birth weight for a 40kg calf [10]. However, not all calves are 40kg and lighter calves require fewer nutrients to meet basic energy demands.

Calf starter feeding can be started from 2-3 weeks (introduction phase). The calf starter feeding is intended to familiarize the calf can consume solid feed and can speed up the weaning process until the age of 12 weeks. Calf starter should be easy to digest, palatable, rich in energy, protein content of 18-20%, and fiber content of less than 7% [13]. Weaning can be done if the calf has been able to consume a calf starter of 0.5–0.7 kg/head/day or at the weight of a calf of 60 kg or around the age of 1-2 months. Standard good calf starter quality can able to provide an increase in body weight of 0.5 kg/day within 8 weeks. Calf starter quality required crude protein 16–20%, TDN 75–80%, Ca:P 2:1, fresh condition, and palatable [4].

Management of milk, milk replace and calf starter in the condition of "Bad" (Table 3). The survey results showed that calves depended on the milk of the mother cow whose production was less than 4 liters/day. Improvement of consumed nutrients for calves can be done by feeding replacement milk of CMR calves to overcome the shortage of mother milk. Farmers do not provide additional CRM because the price is quite expensive around IDR 20,000/kg. In general, farmers very rarely feed extra to calves. This causes a very low increase in the weight of cows by about 0.31 kg/day [14]. The addition of concentrate can increase the digestibility of dry rations, increase body weight, and be efficient in the use of rations [15]. If the calf is given enough additional feed, then the daily weight gain of the calf can reach 0.8 kg/day.

**Table 3: Management of milk, milk replacer, and calf starter feeding**

No	Activity	Yes (%)	No (%)
1	Mother calf milk is given to calf post colostrum (not CMR)	74.22	25.78
2	Post-colostrum milk can be started from 4 to 5 days of age.	62.00	38.00
3	Milk feeding is limited to 8- 10% of the calf's body weight.	46.99	53.01
4	Milk feeding is given gradually twice a day.	51.56	48.44
5	The amount of milk given increases until the age of 2 months (8 weeks) adjusted the weight of the calf and decreased to the weaning phase at 4 months (16 weeks).	51.10	48.90
6	Avoid excessive milking and changing time suddenly	53.95	46.05
7	Do not give milk to a calf from a sick mother.	55.17	44.83
8	Calf starter feeding can be started from 2-3 weeks to 12 weeks of age.	45.13	54.87
9	Weaning (cessation of milk) is done if the calf has been able to consume a starter calf concentrate of 0.5 - 0.7 kg/head/day or at a weight of 60 kg or around the age of 1-2 months.	44.44	55.56
Average		53.84	46.16

### 3.4. Management of Forage Feeding

Cattle have a ruminant digestive system. Their stomachs are made up of four parts: rumen, reticulum, omasum, and abomasum. The development of the digestive organs begins at the age of two weeks. Its microbial population begins to develop after the calf consumes forage or roughage. Forage to calves that are still breastfeeding aims for introduction or adaptation to stimulate the growth of rumen. The forage is actually not perfectly digestible and has not contributed to supplying food substances. Roughage provides a high protein/low-fat diet and remains the cheapest source of high-quality feed in ruminant livestock systems.

The inclusion of a roughage fiber source early in calf development is important as it facilitates the growth of the muscular layer of the rumen whilst encouraging mastication at a young age. Roughage provision is observed to enhance natural and social behavior needed to prepare animals for grazing and promotes salivary production to improve rumen pH which helps to prevent acidosis (bloat). Studies have also shown improvements in rumen pH, average daily gain (ADG), and up to 30% increase in solid feed intake when calves were supplemented with forage [10].

Management of forage feeding on calves in "Good" conditions (Table 4). The survey results showed that calves were fed rice straw and forage available in the local area. The rice straw is the most important roughage feed for the ruminants in the tropic countries [16], [17]. Almost all farmers fed rice straw to their cattle. Most farmers dried the rice straw for 3-4 days, before storing it in lofts over the animal pens [3]. Planted grasses and legumes were also fed to cattle, but there appears to be potential to increase their production and utilization, especially shrub legumes.

**Table 4: Management of forage feeding**

No	Activity	Yes (%)	No (%)
1	Introducing hay/grass feeding can be started from 2-3 weeks of age	70.46	29.54
2	Forages feeding in the form of dry forage/hay	54.20	45.80
3	Do not give silage to calves.	70.29	29.71
4	Forage should begin to be added after entering the weaning phase.	79.58	20.42
Average		68.64	31.36

### 3.5. Management of Feeding at Post Weaning (Ages 4-6 Months)

Weaning is accomplished by separating calves from their mothers. The main goal of a weaning program is to separate the calves from their mothers and to get them established on their own as easily and efficiently as possible. Calves should be old enough to use feed sources other than milk to gain weight. The actual time of weaning should be when the cow's milk declines and the calf's gain begins to decrease in response to milk availability. When not started on a grain-based starter ration near birth, the calf's rumen is normally functioning at 120 days of age and can able to provide enough nutrients for the calf to achieve satisfactory gains without milk or milk replacements[18]. Calves need an ample supply of fresh water and feed. Some producers prefer to creepfeed (feed calves in an enclosure accessible only to them) before weaning. This may help calves gain weight more quickly and begin eating more readily from a feed bunk after weaning.

The management of feeding calves at post-weaning in "Good" conditions (Table 5). In East Java farmers wean calves between the ages of 4 months to 8 months. The beginning of the cow has begun to function like an adult animal but has not reached its maximum capacity. Since weaning the calf starter ideally as much as 1 kg, then increased to 2 kg until the age of 6 months. The calf starter is limited to 2 kg/head/day, so that the calf is not too fat. However, the survey results showed that a small percentage of farmers only provide additional feed in the form of rice bran or pollard in amounts less than 1 kg/head. Grass consumption increases from day to day starting from 6-8 kg/head/day (since weaned) to approximately 10-12 kg/head/day (at the age of 6 months). The grass is given as given to its mother in the form of a mixture of rice straw, field grass, and leguminosae. In addition, calves in this phase need to be given water in ad-libitum.

**Table 5: Management of feeding at post weaning (ages 4–6 months)**

No	Activity	Yes (%)	No (%)
1	Calf starter/concentrate feeding continues as much as 1 kg, then increased to 2 kg until the age of 6 months	57.45	42.55
2	Grass consumption increases from 6-8 kg / day (since weaning) to 10-12 kg/day (at 6 months of age).	74.07	25.93
Average		65.76	34.24

### 3.6. Management of Feeding Aged 6-12 Months

Feeding is an important factor in livestock production [19]. After the age of 6 months, the rumen will develop and function optimally. At this time the consumption of forage can be maximized.



The levels of food substances needed at the time of cow enlargement are coarse protein 9%, TDN = 56%, Ca 0.37, and P 0.32. The grass is not enough to meet the nutritional needs in this growth phase so the addition of concentrate is needed. At the age of 6-12 months, cows will be given concentrate as much as 2-3 kg/head/day and water ad-libitum. The estimated consumption of grass is 15-25 kg/head/day. Such giving allows for optimal cow growth.

The management of feeding calves aged 6-12 months in the condition of "Good Enough" (Table 6). The variety of feedstuffs fed to cattle among smallholders in East Java was roughages feed and concentrate feed. More than 90% of surveyed farmers used cut and carry grass, natural grass, and rice straw for cattle. The rice straw is the most important roughage feed for the ruminants in the tropic countries [16], [17], including in the East Java Province of Indonesia. Cut and carry grassland is very small and fragmented, only accounting for 10 of the agricultural land. It is one of the constraints of the cattle farming system. However, the biggest limitation of rice straw is its low energy, crude protein, and mineral contents.

The survey showed that the farmer fed roughages feed to cattle supplemented with concentrates such as cassava meal, rice bran, and maize meal. Concentrate types were mixed then mixed with water before being offered for cattle. The proportion of surveyed farmers who used concentrate feed for cattle was no more than 10%. This survey shows that land is not an advantage factor for the development of grazing cattle production systems in East Java. The land is limited for grazing, thus intensive production is more likely, therefore cattle are kept in cages most of the time of the day and receive cut grass and concentrate at a stall. Grazing is the most extensive form of production, on the other hand, stall-feeding is based on feeding such feeds as grass, crop residues, concentrates, and rice straw. These surveys are similar to the results reported in Vietnam [20].

**Table 6: Management of feeding aged 6-12 months**

No	Activity	Yes (%)	No (%)
1	At the age of 6-12 months give concentrate as much as 2-3 kg/head/day and drinking water ad-libitum.	45.63	54.37
2	Grass consumption is 15-25 kg/head/day.	72.98	27.02
	Average	59.31	40.69

#### 4. CONCLUSION

The results of the survey of feeding management of beef cow-calf in East Java Province showed that: (1) Management of newborn calf in the condition "Good Enough", (2) Management of

colostrum feeding in the condition "Good Enough", (3) Management of milk, milk replace and calf starter feeding in the condition "Bad", (4) Management of forage feeding in the condition "Good", (5) Management of feeding at post-weaning in the condition of "Good", (6) Management of feeding aged 6-12 months in the condition of "Good Enough", and (7) Overall the management of feeding calves from birth to post-weaning in the condition "Good".

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