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## **The Utilization of SIPROMO (*Silage Probiotics Molasses*) Based On Food Crop Waste as Feed Supplements for Bali Cattle on Tidal Swamp**

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### **Abstract**

The purpose of this study was to analyze the effect of SIPROMO (Silage Probiotic Molasses) based on food crop waste as feed supplements for Bali cattle on Tidal Swamp. A randomized block designs used three treatments, Swamp Grass (RR), Waste of food crop (BRPJL) and SIPROMO crop waste (SPJL) with three repetitions. The observed variables were dry matter intake (DMI, crude protein intake (CPI), average daily gain (ADG) and feed efficiency. Result showed that DMI and CPI of SIPROMO (SPJL) as feed supplement differed significantly from those of RR, BRPJL.

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The ADG and feed efficiency did not differ among treatments. Conclusion of this study was SIPROMO crop waste could improve DMI and CPI. The ADG of Bali cattle that was given SIPROMO (SPJL) could achieve 0.30-0.32 kg/h/d, 0.19-0.26 kg/h/d ( BRPJL) and 0.17-0.23kg/h/d within 3 planting season. Furthermore, the utilization of food crops waste as feed supplement of Bali cattle could prevent the burning of food crop waste as well as to avoid environmental pollution.

**Key words:** Silage; feed supplemen; productivity; food crop wast.

## **1. Introduction**

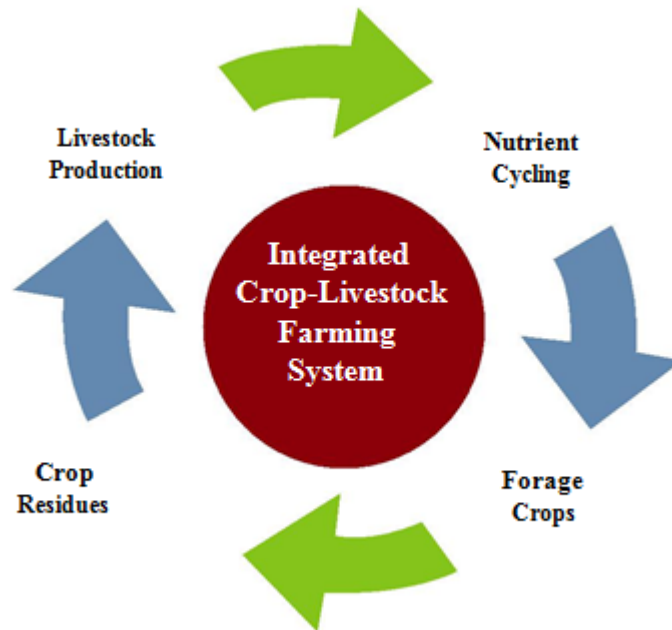
From year to year, the level of meat consumption is increasing. There are several factors behind this increase such as the growing number of population, economic growth, changing of lifestyle and the rising awareness of nutrient and life improvement [2]. Currently, the meat supply capability within the country is not able to fulfill the need of meat consumption in the society; as a result there is a concern whether this condition can increase the dependency of imported beef up to 70% in the near future [6].

Based on this problematic situation, there is a need to formulate a strategy in order to increase the cattle's productivity, particularly Bali cattle, in the rural area since there is a lot of reason in the future where the availability of productive field will be declining along with the increase of population number. Marginal field in Indonesia are being dominated by the tidal swamp, which considered having a potential and huge prospect to become strategic option in order to develop farming production area to support and secure national food resilience [10]. This condition can be an opportunity for cattle development. The potency of swamp grass availability on tidal swamp is quite high and it also can be considered as a source of cattle feed, in the other side, the availability of cattle feed from farming waste also can be considered as the side source after the swamp grass consumption. The waste of farming in the research location has not been fully utilized. Most of waste will be stacked on the field and during planting the waste will be burned. As a result, it will cause pollution and also increase the probability of greenhouse gases production that will contribute to the global warming.

Through this cattle and food crop integration (soybean, corn and paddy/PAJALE)), especially on tidal swamp, it is expected to increase cattle productivity by the utilization of farming waste to become an additional feed for the cattle itself and also can be processed into fermented silage by using probiotics and molasses or known as SIPROMO food crop waste. SIPROMO food crop waste can be utilized as feed supplement for cattle beside from the swamp grass.

An integrated system between cattle and crop will later create a cycle. The waste production coming from a component can be a source for another component. For the example, cattle feces can be utilized to increase crop production, crop waste and its side result can be processed into cattle feed to fulfill the supply need. As a result, the crop waste can contribute in increasing feed nutrient and cattle productivity [4]. The cattle business will become more efficient if the maintenance management can be integrated with crop as the source of cattle feed itself. Cattle produce fertilizer that can increase crop productivity, while crop also can provide green feed for cattle [3]. It is expected from this integration concept there will be an increase of productivity and income for the

farmer. The integration cycle between cattle and crop showed in Image 1.



**Figure 1:** The Cycle of Cattle and Crop Integration

The purpose of this research on this stage is to analyze effect from the waste and SIPROMO (PAJALE) as the supplement feed towards Bali cattle in the cattle and crop integration model on tidal swamp.

## **2. Materials and Methods**

### **2.1 Research Location and Time**

This research was the next stage from the implementation of cattle and food crop integration which was conducted in three planting season, consisted of three commodities (soybean, corn and paddy/PAJALE). The research was implemented in Simpang Village, Berbak sub-district, Tanjung Jabung Timur District. This research was conducted from April 2014 until August 2015.

### **2.2 Materials and Methods**

In this research, it included 9 male Bali cattle in the range of 2.5 years of age and weight range around 102-130 kg. Later, they were divided into three different kind of treatments, based from the farmers profile on rising the cattle, particularly their behavior on feeding the cattle with swamp grass. After food crop harvest (soybean, corn and paddy/PAJALE), the cattle were being feed with food crop waste and SIPROMO PAJALE as feed supplement other than swamp grass. The addition of swamp grass was conducted in *ad libitum*, at least 10% from body weight, while PAJALE waste and SIPROMO PAJALE were given around 2 kg day<sup>-1</sup>. The composition of SIPROMO PAJALE were food crop waste, probiotics, molasses, rice bran, fine salt, vitema and then all elements were added into 250 liters capacity barrel for three weeks.

There were nine individual stalls with 1 m<sup>2</sup> x 3 m<sup>2</sup> dimensions in accordance with given treatment, equipped with place to eat and pail for drinking place. During the research, the weighing cattle's body weight process were using portable scales with 1000 kg capacity, and a 40 kg capacity portable scale for weighing the swamp grass, PAJALE waste and SIPROMO PAJALE. To increase cattle healthiness, ivomex and B1 vitamin injections were given.

### 2.3 Research Procedure

Nine male Bali cattle with range of age around 2.5 years and body weight around 102-110 kg were being used in this research and being put on Randomized Block Design (RBD) with three treatments and three repetitions as a group. The given treatment were:

- a. RR : Swamp Grass *ad libitum* (Existing)
- b. BPJL : Swamp Grass *ad libitum* + 2% PAJALE Waste
- c. SPJL : Swamp Grass *ad libitum* + 2% SIPROMO PAJALE

The research was being implemented after harvest for all commodities were completed (soybean, corn and paddy). The adaptation toward PAJALE waste and SIPROMO PAJALE feed was conducted for 10 days in order to determine cattle capabilities in consuming PAJALE waste and SIPROMO PAJALE feed. From previous research observation, it was shown that cattle could only consume 2 kg of feed and was being observed for around three months for each commodity. The drinking water were given in *ad libitum*. The feed ingredients for SIPROMO food crops waste (PAJALE) was shown in Table 1.

**Table 1:** SIPROMO PAJALE Feed Ingredients / 100 kg

No.	Feed Ingredients	Amount
1.	PAJALE Waste	100 kg
2.	Rice Bran	10 kg
3.	Molasses	0.25 kg
4.	Salt	1 kg
5.	Viterna	10 cc
6.	Probiotics	20 cc

**Note:** The SIPROMO PAJALE Formula was based on NASA (2014) recommendation.

In the early research, a body weight scaling was conducted as a benchmark to see the increase of body weight that could be obtained during data observation in three planting seasons. The increase of body weight gain produced during the research also determined the income that farmers could have gained from raising cattle in the integrated cattle and food crop model (PAJALE).

**Table 2:** Green Nutritional Content and SIPROMO PAJALE from Dry Ingredients

Nutrient Compositions (%)	Treatments		
	RR	BRSB	SPSB
<b>Beef Cattle-Soybean</b>			
Dry Matter	21.61	89.23	90.49
ash	7,46	3.51	6.93
Extract Ether	1,17	1.34	2.87
Crude Protein	6,02	3.25	8.72
Crude Fiber	28.11	43.57	41.71
TDN	20.49	58.22	49.92
<b>Beef Cattle-Corn</b>			
	<b>RR</b>	<b>BRCn</b>	<b>SPCn</b>
Dry Matter	23.66	90.37	91.54
Ash	10.52	11.77	12.67
Extract Ether	2.41	0.59	0.78
Crude Protein	6.69	5.34	2.79
Crude Fiber	26.66	24.52	29.28
TDN	17.54	42.54	37.69
<b>Beef Cattle-Paddy</b>			
	<b>RR</b>	<b>JRPd</b>	<b>SPPd</b>
Dry Matter	26.86	90.65	86.45
ash	10.01	16.16	20.87
Extract Ether	1.25	1.01	0.84
Crude Protein	6.82	5.54	10.65
Crude Fiber	25.96	27.25	26.28
TDN	23.18	40.10	51.60

**Notes:** Analysis Proximate of PAU-Laboratorium IPB, Bogor

RR; Swamp grass, BRSB; Soybean Waste; SPSB; Soybean SIPROMO, BrCn; Corn Waste

SPCn; Corn SIPROMO, JRPd; Paddy Straw, SPPd; Paddy SIPROMO

#### 2.4 Observed Variable

##### a. Food Crop Waste production (paddy, corn and soy/PAJALE)

Part of crop that available and can be utilized as feed Bali cattle after main product were being harvested (ton ha<sup>-1</sup>)

##### b. Dry Matter Intake (DMI)

The data were being obtained from a calculation between the amount of ration given reduced by the remaining amount of ration in dry matter (DM). The calculation was conducted every day during research and stated in  $\text{kg h}^{-1}\text{d}^{-1}$ . DMI was being calculated by:

$$\text{DMI (kg h}^{-1}\text{d}^{-1}) = \text{amount of ration given} - \text{remaining amount} \times \% \text{ ration DM}$$

**c. Crude Protein Intake (CPI)**

Crude protein intake was the amount of dry matter intake multiple by percentage of protein ration content.

$$\text{CPI (kg h}^{-1}\text{d}^{-1}) = \text{amount of DMI} \times \% \text{ ration protein}$$

**d. Average Daily Gain (ADG)**

The data were being obtained from the scaling result during the observation. The scaling were conducted before the feed were given to cattle and stated in  $\text{kg h}^{-1}\text{d}^{-1}$ . Average Daily Gain (ADG) measured with:

$$\text{ADG (kg h}^{-1}\text{d}^{-1}) = \frac{\text{latest body weight} - \text{early body weight (kg)}}{\text{Duration of observation (day)}}$$

**e. Feed Efficiency**

The data were being obtained by calculating the increase of body weight divided by the amount of ration consumed in similar interval. The ration efficiency measured with:

$$\text{Feed Efficiency} = \frac{\text{ADG (kg)/time scale}}{\text{DMI (kg)/time scale}}$$

## 2.5 Design and Data Analysis

The experimental design that being used in this research was Randomized Block Design 3x3 ( three groups and three repetition).

The mathematical formula that being used was:

$$Y_{ij} = \mu + T_i + \beta_j + \epsilon_{ij}$$

All data were analyzed using one-way analysis of variance (ANOVA) according to General Linear Model (GLM) procedure for randomized block designs by using SAS 9.3[9]. If a significant difference was observed, the data were further analyzed using Duncant's multiple range test [5].

### 3. Results and Discussion

#### 3.1 Food Crop Waste Production (PAJALE)

Food crop waste (PAJALE) production from this research were coming from soybean, corn and paddy crop which were the result of cattle and food crop integration model implementation on tidal swamp, where most of the crop waste were being burned by the farmers without any thoughts to optimized the potency. This kind of condition was usually found before the planting season. It can be shown from Image 1:



(a) Soybean waste could be utilized as Source of SIPROMO



(b) Food crop waste were being burned before planting

**Figure 2**

Food crop waste production (PAJALE) during three planting seasons with various ameliorant treatments in the cattle and food crop integration model were provided in Table 3. The data explained that potency of cattle feed was coming from food crop waste in the form of soybean, corn waste, and paddy straw, during three planting season, food crop waste production from each treatment in each hectare were  $19.64 \text{ DM t}^{-1}$  (NA),  $22.49 \text{ DM t}^{-1}$  (LA),  $23.88 \text{ DM t}^{-1}$  (CA) and  $24.24 \text{ DM t}^{-1}$  (SA). These food crop waste were showing a huge potencies to become feed supplement for 7 cattle (NA), 8 cattle (LA), 9 cattle (CA) and 9 cattle (SA) [11;4]. If the food crop waste (PAJALE) were given to Bali cattle that being kept as the source of feed supplement, it was expected that it could increase the productivity. Bali cattle productivity that consumed food crop waste and SIPROMO PAJALE were shown in Table 4.

**Table 3:** Crop waste production (PAJALE) from the Result of Various Ameliorant Treatments in Cattle and Crop Integration Model on Tidal Swamp (DM ha<sup>-1</sup>)

No	Commodities	Treatments			
		NA No- Ameliorant	LA Dolomit Amelioran	CA Compost Amelioran	SA Bio-slury ameliorant
<b>1. Beef Cattle-Soybean Integration</b>					
a.	Waste food crop production (ton ha <sup>-1</sup> )	4.32	5.41	5.45	5.59
b.	Dry Matter (%)	89.11	89.11	89.11	89.11
c.	<b>DM Production (ton ha<sup>-1</sup>)</b>	<b>3.84</b>	<b>4.82</b>	<b>4.85</b>	<b>4.98</b>
<b>2. Beef Cattle-Corn Integration</b>					
a.	Waste food crop production (ton ha <sup>-1</sup> )	11.40	12.73	12.92	12.64
b.	Dry Matter (%)	90.32	90.67	89.2	91.54
c.	<b>DM Production (ton ha<sup>-1</sup>)</b>	<b>10.30</b>	<b>11.54</b>	<b>11.52</b>	<b>11.50</b>
<b>3. Beef Cattle- Rice Integration</b>					
a.	Waste food crop production (ton ha <sup>-1</sup> )	6.06	6.65	8.29	8.59
b.	Dry Matter (%)	90.59	92.15	90.62	90.31
c.	<b>DM Production (ton ha<sup>-1</sup>)</b>	<b>5.50</b>	<b>6.13</b>	<b>7.51</b>	<b>7.76</b>

Table 4. showed that the Bali cattle productivity which were being integrated with food crop (soybean, corn and paddy) by utilizing food crop waste from soybean, corn and straw from paddies (BRSB, BRCn and JRPd) and then being processed into silage form by utilizing probiotics, molasses and also rice bran (SIPROMO) presented a significant difference (<0.05) towards dry matter intake (DMI) and crude protein intake (CPI) compared to cattle that only consumed swamp grass (RR). A high rate of DMI and CPI from Bali cattle that consume SIPROMO as feed supplement could increase the DM content and also became more palatable compared to waste of food crop (BR) and swamp grass (RR). This food crop waste processing into SIPROMO could increase the nutrient value since SIPROMO was being produced from various feed ingredients, such as rice bran, molasses and probiotics so it could increase feed nutrient content. One of the benefits of silage was to increase the nutrient content, especially protein in the forage of agricultural waste so that the value became better [8].



**Table 4:** Bali Cattle Productivity from Crop Waste and SIPROMO PAJALE Consumption

Parameters	Treatment		
	RR	BRSB	SPSB
<b>Bali Cattle-Soybean</b>			
DMI (kg h <sup>-1</sup> d <sup>-1</sup> )	4.96±0.003 <sup>C</sup>	5.55±0.133 <sup>B</sup>	6.87±0.382 <sup>A</sup>
CPI (g h <sup>-1</sup> d <sup>-1</sup> )	298.61±0.17 <sup>B</sup>	302.63±7.82 <sup>B</sup>	406.72±23.02 <sup>A</sup>
ADG (kg h <sup>-1</sup> d <sup>-1</sup> )	0.17±0.06 <sup>A</sup>	0.19±0.06 <sup>A</sup>	0.31±0.12 <sup>A</sup>
Feed Efficiency	0.034 <sup>A</sup>	0.035 <sup>A</sup>	0.046 <sup>A</sup>
<b>Bali Cattle-Corn</b>			
DMI (kg h <sup>-1</sup> d <sup>-1</sup> )	4.68±0.08 <sup>C</sup>	5.66±0.03 <sup>A</sup>	5.04±0.15 <sup>B</sup>
CPI (g h <sup>-1</sup> d <sup>-1</sup> )	319.47±5.36 <sup>C</sup>	381.56±0.01 <sup>B</sup>	427.63±0.01 <sup>A</sup>
ADG (kg h <sup>-1</sup> d <sup>-1</sup> )	0.17±0.03 <sup>A</sup>	0.26±0.08 <sup>A</sup>	0.30±0.05 <sup>A</sup>
Feed Efficiency	0.036	0.046	0.059
<b>Bali Cattle-Paddy</b>			
DMI (kg h <sup>-1</sup> d <sup>-1</sup> )	5.41±0.08 <sup>B</sup>	7.19±0.14 <sup>BA</sup>	7.93±0.04 <sup>A</sup>
CPI (g h <sup>-1</sup> d <sup>-1</sup> )	370.32±21.65 <sup>C</sup>	499.28±10.04 <sup>B</sup>	635±95 <sup>A</sup>
ADG (kg h <sup>-1</sup> d <sup>-1</sup> )	0.23±0.06 <sup>B</sup>	0.26±0.06 <sup>B</sup>	0.32±0.12 <sup>A</sup>
Feed Efficiency	0.043 <sup>A</sup>	0.036 <sup>A</sup>	0.041 <sup>A</sup>

Note: The different alphabet in the same row showed a significant difference (<0.05),

Similar alphabet from the same row showed insignificant difference (>0.05)

There were no differences in ADG among treatments group for all integrated food crop and cattle implementations, the addition of food crop waste (PAJALE) and SIPROMO food crop (PAJALE) as feed supplement could produce ADG each around 0.19-0.26 kg day<sup>-1</sup> and 0.30-0.32 kg day<sup>-1</sup>, while Bali cattle which given swamp grass produce 0.15-0.23 kg day<sup>-1</sup>. [1] Explained that the ADG of Bali cattle that consumed forage without any additional feed was 175.8 g day<sup>-1</sup>, however the rate of average daily gain growth (ADG) could increase if it was given additional concentrate 1.8% from live weight, which was 313.9 g day<sup>-1</sup>. Based on feed efficiency of Bali cattle integrated with food crops in Table 4, there was no significant difference among the treatments group. This was alleged due to the feed supplement given only limited as additional feed other than swamp grass. The amount given also only 2 kg day<sup>-1</sup>, either for waste of food crop or SIPROMO PAJALE. This research was expected to produce a formula for the future in the form of *complete feed* that based on location-specific feed ingredients that exist around the farmers through the addition of other types of plant waste and increased the percentage of feed ingredients to be used in making *complete feed* with 12-13% crude protein content and 65-70% TDN content. In this study, the crude protein content of SIPROMO only reached 10.65% (rice straw) and TDN 57.28% (SIPROMO of corn waste). Nevertheless, the results of this study can illustrate that the utilization of food crops (PAJALE), has been discarded by farmers have the potential to be a source of additional feed supplements in addition to swamp grass, by farmers of food crops waste is thrown and burned without any use at all. At the time of this food crop waste abundant, when used for cattle feed in the form of silage or complete feed, will provide benefits for farmers when the rainy season and drought occur. [12] States that if the ration has a good protein and energy balance then the increase of livestock weight will increase, apart from the amount of protein consumed, palatability ration can also affect the weight gain. [7] Stated that the requirement of cattle feed for fattening requires a minimum protein of 12% and TDN should be more than 65%.

#### 4. Conclusion

Based on the research, the utilization of food crop waste (PAJALE) as feed supplement for Bali cattle had several effects, such as:

- a. Increase dry mater (DMI) and protein intake (CDI)
- b. Average daily gain (ADG) for Bali cattle that given SIPROMO food crop waste (PAJALE) could reach 0.30-0.32 kg day<sup>-1</sup>, food crop waste 0.19-0.26 kg day<sup>-1</sup> and swamp grass 0.15-0.23 kg day<sup>-1</sup> in three planting season.
- c. Utilization of crop waste as cattle feed could prevent pollution in environment.

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