

# THE UTILIZATION OF BEAN SPROUT WASTE AS A SHEEP FEED IN ORDER TO REDUCE WASTE POLLUTION IN INDONESIAN TRADITIONAL MARKET

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**Abstract** Bean sprout waste is scalp of bean sprout that usually removed before being sold to the consumers. Bean sprout is always available in large quantities in Indonesian traditional market because Indonesian people frequently use it as a food. In the other hand, bean sprout waste is considered useless so that many people do not utilize it. The objective of this study was to identify potential of bean sprout waste as sheep feed. In fact, the results of proximate analysis showed that bean sprout waste contains 13.6% protein and 49% crude fiber which are good to be used as sheep feed. The nutrient content of bean sprout waste is also better than concentrate (feed which often used for sheep feed). The advantages of using bean sprout as a sheep feed could make daily weight gain of sheep equal with using concentrate. The study showed that 50 kg of bean sprouts waste could produce 1 kg of meat. This indicates that bean sprout waste is very good to be used as sheep feed. The use of bean sprouts waste has many advantages such as for feeding sheep, at once reducing environmental pollution and also it does not compete with human food needs.

**Key words:** Bean sprout waste, Indonesian traditional market, environmental pollution

## 1. Introduction

### 1.1 Back ground

Feed is the biggest cost in livestock production. Feed cost can reach 60-70% of the total production cost<sup>[1]</sup>. Utilization of agriculture waste is often done by farmers to reduce feed costs but the use of agricultural waste needs to be further processed so that the nutritional content could be appropriate with the livestock needs<sup>[2]</sup> and this requires energy, time, and costs for the process, therefore most of the farmers using concentrate for fattening program which is a mixture of agricultural waste that have been through the treatment process and contains the value nutrition according to the livestock needs. The problem is the price of concentrate is very expensive so we need other ways of using agricultural waste which is more practice and effective for increasing livestock's body weight gain.

Traditional market is where the availability of agricultural waste in large quantities such as waste from vegetables and fruits. One of the vegetables waste is bean sprout waste which comes from mung bean and there are not utilized by people. One ton or even more of bean sprout waste was produced in Bogor every day<sup>[3]</sup> and wasted with useless. In fact it has good nutrient content that is excellent when used as animal feed.

Utilization of this waste doesn't compete with human food needs and always available so we can get it easily. Waste market which is not utilized can cause odor, disease and needs more cost for cleaning waste in traditional market.

### 1.2 Aim

This study aimed to determine the improvement of sheep productivity by using bean sprout waste.

## 2. Observed variables

### 2.1 Nutritional Content of bean sprouts waste

The nutrient analysis of bean sprout waste conducted in Nutritional science and feed technology laboratory Faculty of Animal Science Bogor Agricultural University, Indonesia.

### 2.2 Daily feed consumption

Daily feed consumption reflexes palatability's level. Palatability is level of livestock preference of feed. Daily feed consumption could obtain by calculating feed which given every day (g/head/day) with feed that overed (g/head/day).

### 2.3 Daily body weight gain

Daily body weight gain could obtain by calculating final body weight (g/head) with early body weight (g/head) and divided by maintenance duration (day).

### 2.4 Percentage of bean sprout waste in waste market

In order to obtain percentage of waste market, it is need to calculate the density of waste market (gram/liter) that is obtained by weighing the waste market into a liter of container and measured the weight. The weight of waste market (ton/day) is obtained by multiplying the density and with volume of waste market. Percentage of bean sprout waste (%) in waste market obtained through the weight of bean sprout waste divided by weight of waste market and multiplied by 100%.

## 3. Method

### 3.1 Time and Location

This research was conducted in Mitra Tani Farm Ciampea Bogor, Indonesia from August until October 2010.

## 4. Materials

### 4.1 Livestock

This study used 24 male fat tailed sheep with range of age under 1 year old and range of body weight 9-14 kg with 11.24% of coefficient variability. The sheep were come from East Java. The sheep divided into two groups, the small body weight (9-12.5 kg) and large body weight (12.6-14,6kg).

#### 4.2 Sheep house and equipment

Sheep were housed in individual pens made by woods and bamboo with feeder and gaps floor around 1-1.5 cm. Pens always cleaned every day. The equipments are weighing scales capacity 10kg and 150kg, termohyrometer, bucket, sack, and vat.

#### 4.3 Feed and drink

Feed is combination of bean sprout waste and concentrate depend on composition of treatments, and the drink is fresh water. Figure 1 shows the condition of concentrate and bean sprout waste before mixed.

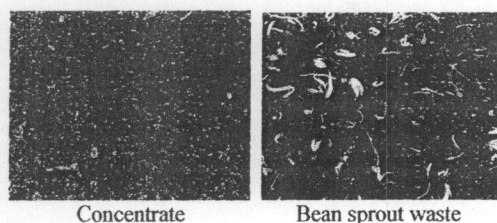


Figure 1. Photo of concentrate and bean sprout waste before mixed.

### 5. Procedure

#### 5.1 Preparation

Preparation for the research includes preparation for pens, equipment and feed. Drugs given directly when sheep arrived then shave the fleece before entering the pens. Sheep divided into two groups. First group is 9-12.5 kg of body weight and the second group is 12.6-14,6kg of body weight. Feed adaptation is given during 14 days with feeding gradually.

#### 5.2 Implementation

This research was taken during two months with four kinds of composition treatment. Pens always cleaned every day. Feed and drink was given unlimited (ad libitum). Measurement of daily feed consumption taken by weighing feed remains every day. Daily weight gain taken by measuring body weight gain every month.

### 6. Experimental design

#### 6.1 Model

The experimental design in this research was using randomized block design. Sheep divided into 2 groups with 4 different compositions treatment. The Experimental design is according to Matjijik and Sumertadjaya<sup>[4]</sup>:

$$Y_{ij} = \mu + K_j + P_i + \epsilon_{ij} \quad (1)$$

Where:

Y<sub>ij</sub>: Observations on the treatment (the addition of bean sprouts waste) at the level of the i-th until j-th group

μ: General average value of the feed consumption and body weight gain of sheep

K<sub>j</sub>: Influence of the group (small body weights and large body weight)

P<sub>i</sub>: Effect of mixed treatment between concentrates and bean sprouts waste at the i-th level

ε<sub>ij</sub>: Random effects in the treatment (the addition of bean sprouts waste) i-th and j-th group

#### 6.2 Analysis of data

Research data has been analyzed by using ANOVA to determine the effect of the treatment. If the treatment significantly influenced the observed variables, it has to compare with using Tukey test to determine the best treatment.

### 7. Treatment

The treatments in this research using concentrate and bean sprout waste. There are some composition feed which divided into four groups:

- P1 = 0% bean sprout waste + 100% concentrate
- P2 = 25% bean sprout waste + 75% concentrate
- P3 = 50% bean sprout waste + 50% concentrate
- P4 = 75% bean sprout waste + 25% concentrate

### 8. Result and Discussion

#### 8.1 Feed Nutrient Content

Concentrate is in the form of food grains, tubers, and waste grain that contains protein, fat, and carbohydrates with crude fiber content (consisting of cellulose, hemicelluloses, and lignin) less than 18% and commonly used as feed in fattening sheep among sheep farmers<sup>[5]</sup>. Bean sprout waste is a part of the bean sprout which has not been utilized by many people. Bean sprout waste is a scalp of bean sprout which has green color and covering the bean. The condition of bean sprout waste are mixed with several of bean sprout because the bean sprout are sifted before sale to the costumers so that some of the bean sprout are not carry over. Bean sprout has a high protein and crude fiber content. Table 1. shows nutrient content between bean sprout waste and concentrate.

Table 1. Nutrient content of concentrate and bean sprout waste based on dry matter (%)

Feed	DM	Ash	CP	CF	CFT	Beta-N	TDN
CS	100	14.11	13.14	16.92	5.97	49.86	62.11
SW	100	7.35	13.63	49.44	1.16	28.42	64.69

Where:

- CS : Concentrate
- DM : Dry matter
- CF : Crude Fiber
- TDN : Total Digestible Nutrient
- SW : Bean sprout waste
- CP : Crude Protein
- CFT : Crude fat

#### 8.2 Palatability of bean sprouts waste

Palatability is acceptance of feed or feed ingredients through taste or level of acceptance to be eaten by livestock which can be determined by appearance, smell, taste, texture, temperature, and other senses to feed<sup>[6]</sup>. The large number of ration consumed by one animal can describe the palatability ration<sup>[7]</sup>. Daily feed consumption could be seen on Table 2.

The result showed that addition of bean sprout waste significantly affect (P<0.05) on feed intake. The further test result showed that P1 and P2 are significantly different with P3 and P3 is different with P4. The highest consumption is P4 then continuous to P3, P2 and P1. The result shows that feed with contains more of bean sprout waste has a higher consumption than feed with contains less of bean sprout waste. The composition of 75% bean sprout waste with 25% concentrate (P4) has the highest of daily feed consumption which is 1669.9±165.5 g/head/day so that P4 has the highest palatability. The average of concentrate daily intake for sheep is 580 g/head/day<sup>[8]</sup> and the average of daily intake in this research is 1136.3±4326 g/head/day, so it means that bean sprout waste is

Table 2. Daily Feed Intake and Weight Gain during Research

Parameter (g/head/day)	Treatment				Average
	P1	P2	P3	P4	
Consumption	645.6±69.8 <sup>C</sup>	871.9±194.4 <sup>C</sup>	1358.0±131.0 <sup>B</sup>	1669.9±165.5 <sup>A</sup>	1136.3±432.6
Weight Gain	96,3±27,1	112,1±63,4	145,83±21,59	105,7±30,9	114,97±41,32

more palatable than concentrate. Palatability reflected by organoleptic such as appearance, smell, taste (sour, salty, sweet, bitter), texture, temperature which gives the attractiveness and stimulation to eat<sup>[9]</sup>. The bean sprout waste has a fresh green color, smoother texture than concentrate and not dusty. The Palatability of bean sprout waste can be affected by the color, appearance and texture.

### 8.3 Daily weight gain

Body weight gain is the most common parameters used in the measurement of growth<sup>[10]</sup>. Livestock's body weight gain affected by the total protein obtained per day, type of livestock's, age, state of genetics, environmental and management condition of each individual governance<sup>[11]</sup>. The result of daily weight gain according to Wandito<sup>[15]</sup> could be seen on Table 2.

The result showed that the addition of bean sprout waste are not significantly affect (>0.05) on daily weight gain<sup>[12]</sup>. The average of daily weight gain in this research is 114.97±41.32 g/head/day. The amount of daily weight gain in this research is closed to Maryati's research which reached 119.26±58.41 g/head/day<sup>[13]</sup>. She used full of concentrate in her research. According to National Research Council<sup>[11]</sup>, 10-20 kg of sheep body weight could reach 200-250 g/head/day of body weight gain. In this research, the average of body weight gain is still below from National Research Council because the research held on a different environmental condition between the tropic and the temperate.

The thing that may cause daily weight gain were not significantly different is the content of anti-nutrient which called anti-trypsin in the bean sprout waste which can inhibit the growth process. Anti-trypsin is a compound of trypsin enzyme inhibitor which naturally present in nuts including mung bean<sup>[15]</sup>. The enzymes are protein, so protein intake that goes along with the feed consumed by sheep cannot be utilized by them even they would lose protein from the body through the excess of enzyme so that the sheep with high consumption of bean sprout waste like sheep on the treatment of P3 or P4 couldn't increase the body weight gain too much. National Research Council<sup>[11]</sup> also stated that the daily body weight gain is influenced by total protein obtained every day. However, we can state that bean sprout waste is useful for sheep feed because it could make daily weight gain equal with using concentrate which is costly than using bean sprout waste.

### 8.4 Conversion of bean sprouts waste into meat

According to Wandito's<sup>[15]</sup> research about daily weight gain, we can calculate that if 356.2 gram of bean sprout waste consume by sheep, it will produce 49.53 gram of daily weight gain and it will produce 7.13 gram of meat, according to Herman's<sup>[16]</sup> research which the meat is 14.4% from the life weight of sheep. The elaboration are the average of daily weight gain of sheep which fed by combination of 50% bean sprout waste and 50% concentrate was 145.83 gram/head/day, whereas the average of daily weight gain without addition of bean sprout waste in feed was 96.3 gram/head/day, so the average of daily weight gain due to the addition of bean sprout waste is 49.53 gram/head/day. The average of daily feed intake which fed by combination of 50% bean sprout waste and 50% concentrate was 1358 gram/head/day, whereas the average of

daily feed intake without addition of bean sprout waste in feed was 645.6 gram/head/day, so the average of daily feed intake due to the addition of bean sprout waste is 712.4 gram/head/day and the average of bean sprout waste intake is 356.2 gram/head/day. The percentage of meat from life weight of sheep was 14.4% so 14.4% from the 49.53 gram of daily weight gain will be 7.13 gram of meat with 365.2 gram of bean sprout waste intake.

One ton of bean sprout waste was produced in Bogor every day<sup>[3]</sup> so according to the calculation, 1 ton of bean sprouts waste could produce 20 kg of meat. It means that in order to produce 1 kg of meat, it has to use 50kg of bean sprout waste as a sheep feed. The utilization of bean sprout waste is very useful to increase daily weight gain and it will produce meat with cheaper feed costs meanwhile if there are not utilized, it will add 1 ton per day as a waste market and it will produce pollution such as air pollution which can cause odor, disease and needs more cost for cleaning waste in traditional market and if 1 ton of bean sprout waste are utilized every day as a sheep feed it will produce 20 kg of meat every day.

### 8.5 Reduction contaminants of bean sprout waste

Market waste in Bogor is around 119 m<sup>3</sup> per day<sup>[17]</sup> and comes from seven traditional markets. Density of waste was 410 gram/l so it will be 48.79 ton per day of waste market produced in Bogor. In the other hand, there are 1 ton of bean sprout waste in Bogor everyday<sup>[3]</sup>, so it means that bean sprout waste is 2% of total wastes market in Bogor and if we utilized all of the bean sprout waste in Bogor, it will reduce 1 ton or 2% of market waste in Bogor city every day.

## 9. Conclusion

The utilization of bean sprout waste could improve sheep productivity because of the nutritional content and palatability. Daily weight gain of sheep using bean sprout waste could be equal with using concentrate which is more costly. If the bean sprout waste is not utilized, it may cause pollution such as air pollution which can cause odor, disease and also needs more cost for cleaning waste in traditional market and if it is utilized as a sheep feed it will produce meat every day.

## 10. References

- [1] Destiana, M. 2010. Indonesian Feed Industry Prospect. [30 August 2011]
- [2] Saenab, A. 2010. Evaluation of the utilization of vegetable market waste as ruminant animal feed in Jakarta. Institute for Agriculture Technology Jakarta, Jakarta.
- [3] Rahayu, S. 2010. Survey the Potential availability of bean sprouts waste as an alternative fodder in the municipality Bogor, Bogor.
- [4] Matjijk, A. A., and Sumertaja, I.M. 2002. Design of Experiments with Minitab and SAS Applications Volume I (2<sup>nd</sup> eds). Department of Statistics, Mathematics and Natural Sciences, IPB, Bogor.
- [5] Parakkasi, A. 1999. Science and Nutrition ruminants. University of Indonesia Press, Jakarta.
- [6] Church, D. C. and W.G .Pond. 1998. Basic Animal Nutrition and Feeding. 3<sup>rd</sup> Ed. Jhon Wiley and Sons, New York.



- [7] Lawrance, T.L.J. 1990. Influence of Palatability's and Diet Assimilation in Non Ruminants In: J. Wiseman and P.J.A. Cole (Editor). 1990. Feedstuff Evaluation. University Press. Cambridge. 115-141.
- [8] Martawidjaja, M. 1986. Effect of season on feed consumption and growth in sheep. Journal of Science and Animal Husbandry, Livestock Research and Development Center, National Agricultural Research and Development. Vol 2 (4) : 19-22
- [9] Yusmadi, Nahrowi and Ridla. 2008. Quality and Palatability studies of silage and hay-based complete rations on primer organic waste of Etowah goat.
- [10] Maynard, L.A., & J. K. Loosly. 1979. Animal Nutrition. 4<sup>th</sup> Edition. Mc Grow Hill Book Co., Inc., New York.
- [11] National Research Council. 1985. Nutrient Requirements of Sheep. 6<sup>th</sup> Revised Edition National Academy Press Washington.
- [12] Wandito, D.S. 2011. Performance and morphometric fat tailed sheep with feeding concentrates and waste of bean sprouts on a different level. Thesis. Faculty of Animal Husbandry. Institute Pertanian Bogor, Bogor.
- [13] Maryati. 2007. Nation and Gender Influence of Performance during Fattening Sheep. Thesis. Faculty of Animal Husbandry. Institute Pertanian Bogor, Bogor.
- [14] Smith, J. B., & S. Mangkoewidjojo, 1988. Maintenance, Breeding and use of Animal Experiments in the Tropics. University of Indonesia Press. Jakarta.
- [15] Widodo, W. 2011. Toxic Plants in Livestock Life [13 August 2011]
- [16] Herman, R. 1993. Carcass composition and muscle distribution in fat tailed sheep. Thesis. Faculty of Animal Husbandry. Institute Pertanian Bogor, Bogor.
- [17] Bogor City Office Market. 2010. Volume of waste market in Bogor City, Bogor.

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