

## Waste Utilization to Increase Productivity Growth Bali Cattle and Coffee Plants

I Nyoman Suyasa and IAP.Parwati

Bali Assesment Institute of Agriculture Technology (BPTP)  
Jl . By Pass Ngurah Rai , Pesanggaran , South Denpasar, Bali, 80222  
Corresponding e-mail: n.suyasa@yahoo.com

**ABSTRACT:** Usually, waste is regarded as having a negative outlook and both crop waste or animal waste is not utilized properly. Developing a natural potency of cattle in Bali is still quite large, especially the in the central region and the marginal land. In Bali, there are some plantations covering an area of 166,454 ha of which consists of the coffee (39,923 ha), cocoa (6,223 ha), and vanilla plantations (448 ha). A research conducted in the Village Catur Kintamani, Bali using 60 heads of cattle fattening phase (*kereman*). As a control (P0) is feeding as usual (local farmers). P1: is P0 + 1% of body weight bran coffee/head/day, P2: is P0 + 1% BB + feed mixtures of rice bran and coffee bran/head/day and P3: P2 + 5 cc is Biocas/head/day. Results showed that the control (P0) reached daily weight gain of 0.33 kg/head/day significantly different from the P1, P2 and P3 that are each gained weight 0.55; 0.56 and 0.58 kg/head/day. Among treatment, P1, P2 and P3 showed no significant differences in daily body weight. Coffee plant compost treatments given in combination with differently biourin give seed yield of red spindle row (P1; P2, and P3) are, 6023.33; 6296.00 and 7771.87 g/tree. Between control P0 to P3 combination treatment showed significant differences.

**Keywords:** Bali cattle, gastrointestinal, bran coffee, fattening

### INTRODUCTION

Developing a natural potency of cattle in Bali is still quite large, especially in the central region and the marginal land. In Bali, there are some plantations covering an area of 166,454 ha of which consists of the coffee (39,923 ha), cocoa (6,223 ha), and vanilla plantations (448 ha), etc. (Disbun, 2007). Coffee and cocoa wastes have the potency to be used as feed material amplifier (concentrate) for livestock. The physical composition of coffee and cocoa waste is quite large at around 48% of coffee fruit pulp and 77% for cocoa fruit shells (Zaenudin *et al.* 1995).

Nowadays the need of nutrition value, especially from animal protein per capita is still inadequate (Bambang Sugeng, 2004). Although the number of livestock increased when compared with the level of demand, which also increased, but there is still a gap. It has also anticipated by the government by launching a Self-Sufficiency Program Acceleration Beef and Buffalo (PSDSK). According Kusumo *et al.* (2010), realizing self-sufficiency in beef and buffalo is one of the main program of the Ministry of Agriculture today. Problems in achieving self-sufficiency in beef/buffalo among other local cattle Indonesia has a relatively low weight cut, one of Bali cattle compared to *Bos taurus* cattle due to cross in (in breeding) (Rasali and Rusdiana, 2013). Bali cattle are excellent cattle, in which the community in Bali mostly raises these cattle. Besides, not only the meat has a good quality, the carcass of Bali cattle also has a high percentage of 56-58%, when compared to other animals, (Guntoro, 2004). Judging from the carcass characteristics and body form compact and harmonious, Bali cattle is classified as ideal, even the value of the meat quality is superior to European beef cattle like Hereford and Shorton (Izhar Eka, *et al.* 2014). Bali cattle, has a privilege in terms of reproduction, carcass percentage and quality of the meat and skin, but has limitations in terms of speed of growth and the size of the body weight (Diwyanto and Priyanti, 2008).

Currently, the population of Bali cattle reaches 553,512 heads, far lower when compared to the population five years ago to reach 683,800 heads, which means every year experiencing a population decline. Within the last 5 years reached 19.05% decrease (Dept.Husb and Health. Prov.

Bali 2014). This indicates that there is a gap between the needs of existing inventory. On the other hand, the ratio between male and female cattle of the total population is 334,180 heads (60.37%) whereas the male cattle is 219,332 heads (39.63%) (Dept.Husb and Health. Prov. Bali 2014). With the touch of leather waste treatment technology in the form of coffee to be used as animal feed and livestock waste treatment either as a solid or liquid organic fertilizer, causing farmers to implement a more passionate integrated farming with good crops of rice fields or plantations. Because the waste rice fields or plantations after processing can be used as animal feed quality and animal wastes can be composted and biourin as fertilizer for crops. So livestock and crops can mutually utilize each waste is a cross, and the presence of cattle farmers can reduce plant maintenance input because it can save the cost of fertilizer (Suprio Guntoro, 2008).The purpose of this study was to examine the use of waste both in livestock and crop cross and mutually beneficial in one location.

## METHODOLOGY

### Productivity Enhancement Technology in Bali Cattle Fattening Phase

This study uses 15 cows for each treatment so that the number of cattle used 60 head weighing 250-300 kg / head. The design is as follows:

- P0: Cows are given feed as usual in the form of grass and forage
- P1: coffee bran feed P0 + 1% body weight+ Biocas 5 ml / head / day
- P2: P0 + 1%body weight (bran rice bran coffee +) / head / day
- P3: P2 + 5 cc Probiotics Bio-cas / head / day.

The animals were weighed every month for the next four months to see an increase in their body weight (daily weight gain). The data were analyzed using a completely randomized design (CRD). If there are any differences, then continued with test duncant (DMRT).

### Coffee Plant Productivity Enhancement Technology Using Organic Fertilizer.

To study the coffee plant, designed experiments in a randomized block design (RBD) with 4 treatments:

- P0: Is coffee plants managed by farmers with fertilizer as usual
- P1: P0 + fermented manure (compost) 25 kg / tree / year
- P2: P0 + bio urine 20 liters / tree / year
- P3: P0 + 25 kg manure bio urine + 20 liters / tree / year

Description:

- Compost used is from cattle manure fermented using RB (*Rumino bacillus*)

- Bio Urine is urine of cattle are accommodated subsequently fermented using RB and Azotobacter

Arabica coffee plant is a treatment given coffee crop farmers aged 4-5 years with each of the 20 clumps in a replay. Giving treatment twice: at the beginning of the rainy season (October) and the end of the dry season (April). Treatment is given ½ dose per application. Parameters measured were yield components like number of productive branches per tree, number of bunch per branch, number of seeds per bunch, weight logs coffee per tree, weight of wet seeds per plant, seed weight per tree drying, seed weight per tree HS.

Variable soil physical and chemical properties were observed in utilization of organic fertilizer (compost and bio urine) in the three crops are as follows.

Data were analyzed by analysis of variance, if the treatment significantly ( $P < 0.05$ ) followed by LSD test level of 5% (Steel, R.G.D, and J.H Torrie. 1991)

## RESULTS AND DISCUSSION

### Increased Productivity Bali Cattle Fattening Phase

The mature male Bali cattle in Indonesia, the red color of his body turned black because of

the influence of sex-linkage with the pigmentation of the coat color gene (Sandhi *et al.*, 1990, in Chalid Talib, 2002).

From Table 1 shows the average weight of cattle were reared reaching 260 kg/head. The weight of an ideal weight is to be going to (prospective fattening). Because if the Bali cattle had weighs 250-300 kg/head with age  $\pm$  2 years, is that cattle ready to be fattened for an adult and will not undergo further development of the body so that the feed given only for charging alone or just to fatten it.

The range of increase in body weight daily is between 17-35 kg/head/maintenance within 4 months, which means an increase in daily weight only reached or 0.21 kg/head/day.

Increased body weight achieved is an increase in body weight below the standard Bali fattened cattle fed traditionally, based on the availability of forage that is on site.

Harimurti *et al* (1977) cited by Harmadji (1990) stated that the increase in daily live weight of male Bali cattle ranged from 0.32 to 0.37 kg/head. While the results of previous studies by Suyasa, et al (2011) daily weight gain increased reach of 0.21 kg/head/day. The relatively low growth (0,21kg/head/day) on a traditionally fattening due to the lack of feed availability, which caused quite a long dry season around the site maintenance.

Table 1 shows that the control (P0), to obtain an increase in body weight of 29.7 kg within a period of 4 months and a significant increase in daily gain of 0.33 kg/head/day. whereas treatment P1, P2, and P3 respectively produce weight gain 69.6; 72.0 and 75.6 kg/head in the 4-month maintenance period in which the daily weight gain of each is 0.58, 0.60, and 0.63 kg/head/day. These data indicate that treatment of feeding an additional form of waste or waste coffee and rice (bran) influence daily weight gain ( $P < 0.05$ ) compared to controls. And between treatment P1, P2 and P3 treated coffee waste and rice bran showed no significant differences among the treatments, but P3 is added probiotic treatment showed increased Biocas higher weight than the other treatments (P1 and P2).

This shows that the provision of agricultural waste such as coffee and a bran or rice bran has the ability to increase body weight in male Bali cattle fattened. Results of “proximate analysis” shows that through fermentation with “*Aspergillus niger*” coffee waste protein content increased from 7.90% to 18.16%. While the coarse fiber content decreases from 19.1% to 13.31% and it showed that fermentation with *Aspergillus niger* could make such waste as feed material better quality (Parvati *et al.* 2009).

Suyasa, *et al* (1999) obtained an increase daily gain of male Bali cattle are fed an additional 2 kg of complete feed and 5 cc probiotics reach 0.63 kg/head and are fed an additional 2 kg of complete feed without probiotic is only able to achieve an increase in body weight daily 0.61 kg/head. Results achieved today looks higher (P2 and P3) when compared to the Suyasa, *et al* (2004) and Widiyazid, *et al* (1999), which is able to achieve body weight daily for fattened steers 0.60 kg/head/day and 0.62kg/head/day.

**Table 1.** Weight beginning, end weight, the weight difference and the mean increase of Bali cattle fattening phase.

Treatment	Initial Weight (Kg)	Weight Final (kg)	Difference (kg)	Average (kg/head/day)
P0	267.85 <sup>a</sup>	297.55	29.7	0.33 <sup>a</sup>
P1	262.71 <sup>a</sup>	332.31	69.6	0.58 <sup>b</sup>
P2	262.85 <sup>a</sup>	334.85	72.0	0.60 <sup>b</sup>
P3	265.71 <sup>a</sup>	341.31	75.6	0.63 <sup>bc</sup>

Description: The figures followed the same letters in the same column showed no real difference in the level of 5% LSD.

### Increased Productivity Coffee with Organic Fertilization

Average highest seed yield of red logs obtained in the treatment of urine plus compost weighing 777.87 grams were significantly different from the control or an increase of 74.53%, but did not differ significantly with urine and compost treatment alone. The average yield obtained on the lowest red spindle control weighing 4453.07 grams were no significant with urine and compost treatment or tends to increase respectively by 35.26 and 41.39% (Table 2).

**Table 2.** Average grain yield logs of red, wet seed weight, seed coat wet weight per tree (g)

Treatment	Trailers Red Seed Weight Wet Seeds Weight Wet Skin Treatment Results per tree (g) per tree (g) seeds per tree (g)
P0	4453.07 <sup>b</sup> 2302.88 <sup>b</sup> 1844.97 <sup>b</sup>
P1	6023.33 <sup>ab</sup> 3151.68 <sup>ab</sup> 2495.59 <sup>ab</sup>
P2	6296.00 <sup>ab</sup> 3261.79 <sup>ab</sup> 2685.43 <sup>ab</sup>
P3	7771.87 <sup>a</sup> 4035.71 <sup>a</sup> 3255.57 <sup>ab</sup>

Description: The figures followed the same letters in the same column showed no real difference in the level of 5% LSD %.

Similarly, happened to the parameters of the wet seed weight per tree, where the treatment of urinary plus compost provides the highest yield 4035.71 grams only significantly different from the control or an increase of 74.87% but did not differ significantly with the other treatments (Table 2). When compared with the control treatment and composting urine showed no real difference only provide improved wet seed weight respectively 36.43 and 41.33%.

Table 2, where the weight of wet seeds per tree bark highest seed was obtained in the treatment of urinary plus weighing 3255.57 grams of compost were significantly different from the control or increased 76.46%, but did not differ significantly with treatment of urine and composted respectively 35.26 and 45.55%. Control treatment gives skin wet weight of seeds per tree no significant lows the treatment of urine or compost.

Increased crop yield components of coffee can not be separated from the treatment given. The addition of nutrients available from the compost and urine can increase the size significantly, where the organic fertilizer can help plants prepare better conditions for produce.

Kartini (1997) states that fertilization ideal is to use organic fertilizer twice a year at the beginning and end of the rainy season of at least 50 kg per tree for perennial crops. The proper use of organic fertilizer will be able to increase the fertility of physical, biological and chemical weathering of soil and is able to accelerate other organic materials become more readily available to plants. The assessment results Munier, *et al.*, (2006) showed an increase in the average productivity of dry cocoa reached 345.5 kg/0.5 ha/4 months, or 1,382 kg/ha/year (introduction pattern) while the peasant habits just 153.7 kg/0.5 ha/4 months or 614.8 kg/ha/year. Adijaya research results, *et al.*, (2009) showed that the treatment of cow manure, bio urine and combinations improve yield component that is the result of Arabica coffee beans oven dried rose 37.91% - 55.28% with organic fertilizer. Cow manure, bio urine or a combination thereof, can be used as organic fertilizer to increase production of Arabica coffee.

Some results of the study indicate organic fertilizer can increase growth and yield components on annual crops, due to decomposition and nutrient supplies available originating from organic fertilizers rather slow and low but able to suffice the needs during seed filling. Dose manure (cow or buffalo) given to plant cloves between 5-10 kg / tree / year (Anon, 2011). Application of liquid fertilizer (biourine and biocultural) on coffee and cocoa crops with a dose of 6 liters plus 4 kg

of compost/tree/year produces 30-35% higher production than the use of conventional compost dosage of 10-12 kg/tree/year (Sinar Tani, 2011). Further explained that cow urine N element content increased from 0.23% to 0.71% and the content of potassium increased from 202 ppm to 598 ppm. For goat urine N element content increased from 0.34% to 0.89% and the content of potassium increased from 759 ppm to 1,770 ppm. In addition to the biourine also contain stimulants of growth. While the biocultural (liquid fermented feces) has a higher P content.

Fertilization consistently and continuously with organic fertilizer that has been processed (higher quality) can increase soil fertility fertility seen from several variables such as pH, organic C, CEC and NPK land in the village Belanga (Sunanjaya and Parvati, 2010). According Nurhayati Hakim, *et al* (1989) suggest that organic fertilizer can increase the reserves of nutrients in the soil, improve soil structure and increase soil organic matter content. Its effect on soil chemical properties which can improve soil pH, increasing the content of C-organic increase soil CEC as organic material having a cation jerap power greater than colloidal clay and can release P from P fixed to be P-available to plants.

## CONCLUSION

Bali cattle feedlot phase can be started with the initial weight 250-300 kg per cow, assuming the weight of the final weight of the growth that the rest stayed charging only or fattening. With additional food waste and coffee or rice bran daily weight gain of Bali cattle feedlot phase can be increased significantly reaching 0.58 to 0.63 kg/head/day. While the utilization of livestock waste either solid or liquid that has been processed to increase production, grain yield per plant red spindle, wet seed weight per plant, and seed coat wet weight per tree compared to the production of fertilizing the way farmers. Utilization of waste in the form of integrated agriculture will be able to increase the productivity of livestock or farm crops and will be environmentally friendly and sustainable for the long term.

## REFERENCES

- Adijaya I Nyoman, Ida Ayu Putu Parvati and Nurul Istiqomah, 2009. The increase in Arabica Coffee Production Through Organic Fertilization. Prossiding National Seminar on Innovation for Farmers and Competitiveness Improvement of Agricultural Products, Malang - East Java. ISBN 978-979-3450-28-5.P. 79-84.
- Bambang Sugeng. 2004. Beef Cattle. Penebar Organization. Jakarta.
- Ngaji Bambang Utomo., Ermin Widjaja., And Ermia Komala Dara. 2009. Effect of Local Probiotics (Jamu EKD) Against Added Daily Body Weight (PBBH) Bali cattle Males in South Kalimantan. Journal of Agricultural Technology Assessment and Development Vol. 12 # 1. P. 11-20.
- Chalid Talib. Cattle Bali in 2002. Regional Seed Source and Development Opportunities. WARTAZOA Vol. 12 No. 3 Th. 2002.
- Department of Animal Husbandry and Health Province of Bali. 2014. Information Data Animal Husbandry Department of Animal Husbandry and Animal Health Province of Bali.
- Dwiyanto K and A. Priyanti. 2008. The success of the Utilization of Bali Cattle Feed Locally-Based Enterprises in the Development of Cattle in Indonesia.
- Guntoro, S. 2002. Growing Cattle Bali. Canisius. Yogyakarta.
- IM, Parvati., IM Rai Yasa and Suprio Guntoro. 2009. Livestock Farmers' Income Level Waste Giving Skin With Coffee In The Cattle. Proceedings of the National Workshop on Network Development Litkaji Crop-Livestock Integration System.
- Munier.FF, A.Ardjanhari, U.Fadjary, Syafruddin and S.Wiryadiputra, 2006. The development of

- cocoa farming systems integration and goats in the village of Jono Oge District of Sirenja-Dongala regency, Central Sulawesi. National Seminar on Animal Husbandry and Veterinary Technology. It 598
- Kadarsih. 2004. Performance of Bali Cattle Altitude Based on Growth Performance of Regional Transmigration Bengkulu. *Journal of Agricultural Sciences* 6 (1): 50-56.
- Kartini, N.L. 1997. Effect Vascular arbuscular Mycorrhizae (VAM) and the Organic Fertilizer Kascing against P available soil as well as the levels of P and Crop Garlic (*Allium sativum* L.) on the ground Inceptisol. (Dissertation). Padjadjaran University.
- Nurhayati, H.M., Joseph Nyakpa, A.M. Lubis, S.G. Nugroho, M. Rusli Saul, M. Amin Dika, Go Ban Hong and HH Bayle. 1986. *Fundamentals of Soil Science*. University of Lampung. 488p.
- Panjaitan, T., Kurtz, E., and Mashur, M. 2002. Mating Management to Improve Performance of Bali Cattle reproduction in Lombok Island. *Proceedings of the seminar Animal Husbandry and Veterinary Technology*.
- Sinar Tani, 2011. The use of inoculants RB and Azotobacter for Liquid Organic fertilizer production. 3-9 August 2011 issue No.3417 Year XLI-14. *Agroinovasi IAARD*. Page 13. <http://www.litbang.deptan.go.id/download/one/116/file/RB-Untuk-Produksi-Pupuk-Or.pdf>, accessed August 26, 2012.
- Sunanjaya I Wayan and Ida Ayu Putu Parvati, 2010. Effect of Organic Fertilizer to the development of pH, C-Organic, CEC, NPK Belanga Land in the village of Bangli Kintamani District. *Prossiding Seminar on Organic Farming Issues and Challenges* “, Ubud August 12, 2010. BPTP Bali. ISBN: 978-602-98658-0-6. P. 587
- Steel, R.G.D, and J.H Torrie. 1991. *Principles and Procedures of Statistics*. Translated Bambang Sumantri. PT. Gramedia Pustaka Utama. Jakarta.
- Suprio Guntoro. 2008. *Make Livestock feed from Waste Plantation*. Printed books Ed. I. Agromedia Library ..
- Suyasa; Suprio Guntoro; Parvati; Suprpto; and Widiyazid.S. 1999. Use of Probiotics In Beef Cattle Development Perspective Agribusiness in Bali. *Journal of Agricultural Technology assessment and development*. Volume 2. No. 1. Social Research Center, Bogor Agricultural Economics.
- Widiyazid Soethama, I Kt; Parvati, IA Pt; Suyasa, NYM; Suprio Guntoro; Londra, Md; Tri Agastia, Km. Adnyana, AA Gde (1999). *The final report based beef cattle farming dry land ecoregion*. IP2TP. Denpasar. IAARD.
- Winugroho, M, Y. Widiawati and A. Talib. 1995. *Cattle Productivity Improvement*. Procurement support the National Meat. *Animal Husbandry and Veterinary*. Research and Development Center Ranch 7-8 November 1995. Bogor.
- Rai Yasa, M. (2004). “Waste Utilization Coffee fermented For Cattle Bali in the village of Satra-Bangli.” Denpasar: Institute for Agricultural Technology-Bali, Denpasar