International Journal of Fauna and Biological Studies
Available online at www.faunajournal.com

IJFBS
International Journal of Fauna And Biological Studies

ISSN 2347-2677
www.faunajournal.com
IJFBS 2020; 7(3): 97-101
Received: 13-03-2020
Accepted: 15-04-2020

Ni Luh Gede Budiari
Bali Assesment Institut of Agricultural Technology (Balai Pengkajian Teknologi Pertanian Bali), Indonesian Agency for Agricultural Research and Development, Ministry of Agriculture, Denpasar-Bali, Indonesia

I Made Rai Yasa
Bali Assesment Institut of Agricultural Technology (Balai Pengkajian Teknologi Pertanian Bali), Indonesian Agency for Agricultural Research and Development, Ministry of Agriculture, Denpasar-Bali, Indonesia

I Nyoman Adijaya
Bali Assesment Institut of Agricultural Technology (Balai Pengkajian Teknologi Pertanian Bali), Indonesian Agency for Agricultural Research and Development, Ministry of Agriculture, Denpasar-Bali, Indonesia

IGNG Bidura
Faculty of Animal Science, Udayana University, Denpasar-Bali, Indonesia

Corresponding Author:
Ni Luh Gede Budiari
Bali Assesment Institut of Agricultural Technology (Balai Pengkajian Teknologi Pertanian Bali), Indonesian Agency for Agricultural Research and Development, Ministry of Agriculture, Denpasar-Bali, Indonesia

Supplementation of corn waste and peanut shell waste in concentrate on the performance of Bali cow

Ni Luh Gede Budiari, I Made Rai Yasa, I Nyoman Adijaya and IGNG Bidura

Abstract
The purpose of this study was to examine the effect of supplementation of corn waste and peanut shell waste (CPW) in concentrate on the performance of Bali cow. The research used of 30 head Bali cows up to 18 month old with average initial weight for 151.11±10.48 g/head. It used complete randomized block design with three treatment and 10 bloks as replicates. Control diet was local grasses with supplemented of 1 kg rice bran concentrate (RBC) as control (P0); Suplemented of 0.50 kg CRB+0.50 kg CPW concentrate (P1); and Supplemented 0.25 kg CRB +0.75 kg CPW concentrate (P2), respectively. Result of the research showed that the animal fed P2 was lower (P<0,05) than P0 and P1. There were no significantly different (P>0.05) between Group P0 dand P1. It can be concluded that supplementation of mixed concentrate between corn waste and peanut shell waste can be used as a substitute for 50% rice bran concentrate in Bali cows.

Keywords: Bali cow, rice bran, corn waste, peanut shell waste

Introduction
Bali cattle has great potential to be developed, besides producing meat it is also a germplasm whose conservation must be maintained (Bidura, 2019) [3]. Bali cattle development opportunities are inseparable from the increasing need for meat in line with an increase in population and the level of community education. In 2018 domestic meat production was 403,668 tons, while domestic meat demand was 663,290 tons (BPS, 2018) [5]. This shows that the national need for meat cannot be met from domestic production. Seeing this potential, Bali as a cattle producer has a great opportunity to develop cattle.

Efforts to increase meat production can be done by increasing the population and productivity of beef cattle in Bali in particular. Increasing cattle productivity can be done by feeding that is maintained throughout the year both in quantity and quality. The problem faced at the field level is the provision of forage is increasingly difficult due to limited land for the cultivation of forage forage. Yasa *et al.* (2017) [31] reported that the conversion of agricultural land has an effect on the decline in food supply and has an effect on reducing the population of cattle in Bali. Reportedly the cow population in Bali in the last five years has decreased by 5.84%. Cattle population in 2014 was reported to be 553,582 tails, in 2015 there were 543,642 cows, in 2016 there were 546,370 cows while in 2017 there were 507,794 cows (Disnakeswan, 2017) [9]. This is in line with the data on the conversion of agricultural land in Bali, which reaches an average of 1,500 ha per year (Berita Dewata, 2018) [2].

To provide sustainable feeds requires innovation. Innovations that can be made are processing local feed ingredients that are readily available, have high nutritional content and have not been utilized optimally. One of them is by utilizing peanut shell waste and corn waste which are widely available at the study site in Gerokgak District, Buleleng Regency, Bali, Indonesia. Gerokgak District, Buleleng Regency with an area of 35,657 ha, and 4,605 ha planted with corn and 508 ha of peanuts with a potential production of corn waste as much as 137,597 tons and peanut waste as much as 13,436 tons but have not been used optimally for animal feed (BPS Buleleng, 2017) [6].

Fermentation is an effort to increase the nutritional value of feed ingredients so that the quality and availability of nutrients can be improved (Bidura *et al.*, 2008) [4]. Budiari and Adijaya (2012) [7] reported fermented peanut waste containing crude protein by 10.34% and by fermentation the crude fiber content could be reduced from 31.99% to 29.90%. The fermentation process causes the digestive value of nutrients, especially energy, to increase.

Bidura *et al*. (2008) [4] reported that the fermented waste content of protein and energy increased while the crude fiber content decreased. If this potential can be used as animal feed, it will be able to provide solutions for farmers, especially during the dry season when forage is lacking. This study aims to determine the growth and digestibility of Bali cattle that are given rations based on agricultural waste.

Material and Methods

Experimental design, animals, housing and diets. The research used of 30 head Bali cows up to 18 month old with average initial weight for 151.11±10.48 g/head. It used complete randomized block design wit 3 treatment, 10 bloks as replicates. Control diet was local grasses with supplemented of 1 kg rice bran concentrate (RBC) as control (P0); suplemented of 0.50 kg CRB+0.50 kg CPW concentrate (P1); and Supplemented 0.25 kg CRB +0.75 kg CPW concentrate (P2), respectively

Forage feed consists of 40% elephant grass (*Pennisetum purpureum*), 20% Gamelina (*Gmelina arborea* Roxb), 20% coconut milk (*Lannea coromandelica* Merr) and 20% Gamal (*Gliricidia sepium*). Concentrate constituents in this study consisted of rice bran, corn waste, peanut shells waste, molasses, and minerals. The composition and nutritional content of the treatment concentrates as in Tables 1. Before being given feed treatment, cattle were given antiphormes and protozoa to anticipate the presence of intestinal worms in the digestive tract.

Table 1: Ingredient composition and concentrate nutrient content

Feed Composition	Treatments		
	P0	P1	P2
Rice Bran (%)	100.00	50.00	25.00
Corn Waste (%)	-	24.90	37.00
Peanut Shell Waste (%)	-	24.00	36.90
Molases (%)	-	1.00	1.00
Minerals (%)	-	0.10	0.10
Total	100	100	100
Nutrition Content			
Dry Matter (DM) %	93.88	94.96	89.25
Crude Protein (CP) %	8.63	8.15	8.39
Crude Fat (CF) %	7.02	4.11	1.08
Crude Fiber (CF) %	20.87	25.61	38.09
Total Digestible Nutrient (TDN) %	58.30	53.87	48.00

Note: Proximate Analysis of Animal Feed Nutrition, Beef Cattle Lolit, Grati

Forage feeding is given 3 times a day ie. morning, afternoon, and evening, while the concentrate was given once a day, every morning before cow were given forage. Giving concentrate was done by mixed with water (wet).

Weighing livestock was done every month using a digital scale, a capacity of 1,000 kg. Cow growth or cow body weight gain was based on initial body weight and final weight. Initial body weight was obtained by weighing at the beginning of the study (before being given feed treatment), while the final body weight was obtained by weighing at the end of the study (180 days observed). Live weight gains was obtained by reducing the final weight with the initial weight of the study. Weighing was done every month to find out the body weight gain. Feed consumption was calculated every day, by means of the amount of feed was given less the rest of the feed. The total consumption of rations given was obtained by adding up the consumption of rations daily during the study. Feed conversion ratio (FCR) was calculated by comparing the amount of feed consumed with body weight gain during the study.

Dry matter digestibility was calculated based on the method of total collection (Tillman *et al*., 1986) [29]. Stool was stored for 7 days, dried in the sun until the air was dried and then dried at a temperature of 60 ^{0}C for 24 hours. Dry matter digestibility was calculated by formulation:

$$\text{Dry matter digestibility} = \frac{A-B}{A} \times 100\%$$

Note:
A : Consumption of dry matter (g)
B : The amount of excreta (stool) (g)

Energy digestibility (ED) was calculated based on the total collection method (Prasad *et al.*, 1996) [21]. Stool was stored for 7 days, dried in the sun to dry air and then dried at a temperature of 60 ^{0}C for 24 hours. Stool was analyzed proximately to determine the energy content of the stool. Consumption of rations during total collection (7 days) in the oven at 60^{0}C for 24 hours to get dry weight. Energy consumption can be obtained by multiplying ration dry matter with ration energy content. Stool energy was obtained by multiplying the stool dry weight by the stool energy content. Digestibility energy (DE) was calculated using the formulation:

$$\text{Digestibility energy} = \frac{A-B}{A} \times 100\%$$

Note:
DE : Energy Digestion (%)
A : Energy consumption (kcal)
B : Energy content in feces (kcal)

Data analysis

Data were obtained were analyzed with one-way variance analysis, if there are significant different between treatment (P<0.05), analysis is continued with Duncan Multiple Range Test.

Results and Discussion

The results showed, the highest body weight gain was produced by Group P0 namely 0.54kg/head/day, then followed by Group P1 and Group P2, ie. 0.50 kg/head/day and 0.45 kg/head/day, respectively (Table 2). Addition of agricultural waste up to 75% in the ration (P2) caused a decrease in weight gain of 16.17% was significantly different (P<0.05) from P0. This is because the ration given for Group P2 is the highest crude fiber content, the lowest energy and protein content so that it affects the digestibility of the feed, so that the nutrients in the feed cannot be utilized optimally for livestock growth. Feed containing high crude fiber will affect the low digestibility of the ration so that more feed will be released into feces (Musnamar, 2003) [16]. Utomo (2012) [30] reports that high protein content can increase feed digestibility which results in increased animal growth. Kurnianto and Nurhayati (2017) [12] stated that cows given CP 13% concentrate as much as 1% of body weight resulted in daily weight gain of 0.56 kg/head/day. Carvalho *et al*. (2010) [8] reported that chemical composition, consumption and type of feed have an influence on growth.

Table 2: The effect of supplementation of corn waste and peanut shell waste in concentrate on the performance of Bali cows up to 18 month old

Variable	Treatments[1)]			Sd
	P0	P1	P2	
Initial body weight (kg)	150.75[a]	151.55[a]	151.15[a]	15.90
Final body weight (kg)	246.50[a2)]	241.00[a]	230.90[b]	65.68
Weight gain (kg/head/day)	0.54[a]	0.50[a]	0.45[b]	0.001
Feed consumption (kg/head/day)	3.87[a]	4.35[a]	5.15[b]	0.04
FCR	7.19[a]	8.70[a]	11.44[b]	0.21

Note:
1. Control diet was local grasses with supplemented of 1 kg rice bran concentrate (P0); suplemented of 0.50 kg CRB+0.50 kg CPW concentrate (P1); and Supplemented 0.25 kg CRB+0.75 kg CPW concentrate (P2), respectively
2. Means within rows with different superscripts are significantly different (P<0.05)

The average dry matter consumption for cow in Group P2 was 5.15 kg/head/day which was significantly different (P<0.05) from Group P0 and P1 which were: 3.87 kg/head/day and 4.35 kg/head/day (Table 2). The more waste feed given to cow, the more the consumption of dry matter ration. This is caused by waste containing a lot of crude fiber. High crude fiber content causes a decrease in nutrient levels such as energy, protein, and minerals which causes a decrease in feed consumption which results in decreased body weight of livestock (Setyawan *et al*., 2017) [17]. The composition of the feed ingredients, consumption and type of feed given will affect the growth (Carvalho *et al*. 2010) [8]. Feed consumption is influenced by feed factors, crude fiber content, protein content, nutritional balance and digestibility. Feed factors include shape, nutrient composition, taste and texture. Feeding properties such as bulky can also affect consumption (Mallidadi *et al*, 2019) [14]. Parakkasi (1999) [20] states that, one that affects consumption is the quality of feed, good quality feed has a relatively high level of consumption compared to low quality feed. Puspitasari *et al*. (2015) [22] reported that the level of livestock consumption is strongly influenced by palatability, macro and micro nutrient balance in the ration. Furthermore, it was explained that rations that had high palatability and had a balanced nutrient content would increase the amount of consumption and optimize bioprocess in the rumen by increasing rumen microbes in degrading feed.

Average FCR in Group P2 treatment was: 11.44/head was significantly different (P<0.05) compared to Group P0 and P1, were: 7.19 and 8.70/head, but between Group P0 and P1 did not show any significantly difference (P>0.05). This is because the food consumed is more but has lower digestibility, so that it cannot be used optimally for growth. Nurhayu *et al*. (2011) [19] reported that the feed given to be efficient if the feed can be consumed fully by cows and is well digested as well. According Tillman *et al*. (1998) [29], beef cattle feed efficiency, which ranged from 10-12%. Nanda *et al*. (2014) [18] stated that Bali cattle fed with palm fronds produced efficiencies ranging from 10.32% to 12.86%. Parakkasi (1999) [20] states that digestibility is a factor influencing feed efficiency.

The average digestibility coefficient of dry matter ration for cattle fed concentrate with 50% (P1) as much as 74.04% was not significantly different (P>0.05) from the control (76.34%), but it was significantly (P<0.05) different from Group P2 (58.69%) (Table 3). This is because the crude fiber content in Group P2 ration is higher than the Group P0 and P1 treatments, so the digestibility is the lowest. Irawati *et al*. (2011) [11] stated that cows which are fed with high crude fiber content have low digestibility. The high digestibility coefficient of dry matter ration is caused by the high digestibility of energy and protein ration (Puger *et al*., 2016) [23]. Endrawati *et al*. (2010) [10] reported that cows fed elephant grass feed and concentrates had digestibility values of dry matter and digestibility of organic matter at 65.36±2.19% and 67.10±2.15%, respectively. This shows the better quality of feed given to livestock, the higher the digestibility of feed ingredients. Yusmadi (2008) [32] states that the digestibility of dry matter in cattle shows the high food content that can be digested by microbes and digestive enzymes in the rumen. The higher the percentage of dry matter digestibility of a feed ingredient, shows that the higher the quality of the feed ingredient. Digestion which has a high value reflects the contribution of certain nutrients to livestock, while feed which has a low digestibility indicates that the feed is less able to supply nutrients for basic life or for livestock production purposes.

Feed digestibility is influenced by feed consumption, feed processing, forage age, and types of livestock (Setiawan and Wiryawan, 2015) [27]. Feed ingredients with high digestible food substances are generally high in nutrient values (Lubis, 1992) [13]. The digestibility coefficient value is not fixed for each food or each animal, but is influenced by several factors, namely chemical composition, feed processing, the amount of food supplied, and types of livestock (Maynard and Loosli, 1979) [15].

Table 3: The effect of supplementation of corn waste and peanut shell waste in concentrate on the feed digestibility in Bali cows

Variable	Treatment[1)]			SD
	P0	P1	P2	
Digestion coefficient of dry matter (%)	76.34[a2)]	74.04[a]	58.69[b]	27.07
Energy Digestion (%)	56.05[a]	55.73[a]	43.84[b]	27.07
Protein Digestion (%)	54.03[a]	52.19[a]	35.86[b]	59.68

Note:
1. Control diet was local grasses with supplemented of 1 kg rice bran concentrate (P0); suplemented of 0.50 kg CRB+0.50 kg CPW concentrate (P1); and Supplemented 0.25 kg CRB+0.75 kg CPW concentrate (P2), respectively
2. Means within rows with different superscripts are significantly different (P<0.05)

Cows in Group P1 treatment produced an average energy digestibility of 55.73% not different (P>0.05) than control or Group P0 (56.05%), but significantly higher (43.84%) than Group P2 (Table 3). This is caused by the higher energy content in the ration, the higher the energy digestibility. Suwandyastuti *et al*. (2011) [3] 28 states that energy digestibility is influenced by ration consumption, physical form, and energy content in ration. High ration consumption causes an increased rate of movement of digesta and the rate of emptying the contents of the rumen, thereby increasing

consumption of dry matter. The low content of crude fiber will facilitate penetration of rumen microbes (bacteria, protozoa, and fungi) to digest feed nutrients. Low crude fiber content will increase digestibility and energy digestibility. Feed with high crude fiber causes cattle to eat longer and ruminants and the rate of degradation in the reticulo-rumen slows down, which influences the low digestibility of energy. Puger *et al.* (2016) [23] reported that energy digestibility is strongly influenced by high energy consumption and less stool energy so that energy digestibility is higher.

The protein digestibility in cow Group P1 was 52.19% treatment was not significantly (P>0.05) different than Group P0, but it was significantly different (P<0.05) than Group P2 (Table 3). This is due to the protein content of the rations in the Group P0 and P1 treatments higher than Group P2 (Table 1). Riswara *et al.* (2019) [25] states that the higher the crude protein content in the ration will increase the digestibility value of crude protein. Muhammad (2000) [16] states that, the higher the level of CP ration, the palatability of livestock and feed digestibility also increases, this can be interpreted that by giving different levels of CP ration to livestock, the palatability and response to consumption are also different. Riswandi *et al.* (2015) [24] stated that rations containing high crude protein will cause increased rumen microbial activity, so that digestibility of organic materials such as nitrogen compounds, carbohydrates, fats and vitamins also increases. Furthermore Astuti *et al.* (2009) [1] states that the high nutrient content and low crude fiber in the ration allows increased protein digestibility, because there is a by-pass protein so that the protein used by rumen microbes is less.

Conclusion

From the result of the research could be concluded that supplementation of mixed concentrate between corn waste and peanut shell waste can be used as a substitute for 50% rice bran concentrate in Bali cows.

Acknowledgements

The author would like to thank the head of the Center for Agricultural Technology Research and Development for the funds that have been given for the implementation of this research, and for the entire team that the authors were unable to mention one by one for their assistance in conducting this research.

References

1. Astuti A, Agus A, dan SPS, Budhi. Pengaruh Penggunaan High Quality Feed Supplement Terhadap Konsumsi dan Kecernaan Nutrien Sapi Perah Awal Laktasi. Buletin Peternakan. 2009; 33(2):81-87.
2. Berita Dewata. 2018. Alih Fungsi Lahan Pertanian Bali sangat Memprihatinkan. https://beritadewata.com 22 Juli 2018.
3. Bidura IGNG, Sumber Daya Genetik Ternak, Plasma Nutfah Provinsi Bali. Penerbit Swasta Nulus, Jln. Batang Hari VI.B No. 9, Denpasar-Bali, Indonesia, 2019.
4. Bidura IGNG, Susila TGO, dan IBG. Partama. Limbah, Pakan Ternak Alternatif dan Aplikasi Teknologi. Udayana University Press, Unud., Denpasar.
5. BPS. 2018. Badan Pusat Statistik Provinsi Bali. CV. Bhineka. Denpasar, 2008.
6. Buleleng BPS. Buku Statistik Pertanian dan Lingkungan Hidup Daerah. Dinas Statistik Kabupaten Buleleng, Provinsi Bali, 2017.
7. Budiari NLG, dan IN, Adijaya. Daya Dukung Limbah Jagung dan Kacang Tanah Untuk Pakan Ternak di Lahan Kering. Bulletin Teknologi dan Informasi Pertanian. 2012; 10(31)
8. Carvalho M, Da C De, Soeparno, Ngadiyono N. Pertumbuhan dan Produksi Karkas Sapi Peranakan Ongole dan Simmental Peranakan Ongole Jantan Yang Dipelihara Secara Intensif. Bulletin Peternakan. 2010; 34(1):38-46.
9. Dinas Peternakan dan Kesehatan Hewan Provinsi Bali. Informasi Data Peternakan di Provinsi Bali, 2017.
10. Endrawati E, Endang B, dan PSB, Subur. Performans induk sapi silangan Simmental-Peranakan Ongole dan induk sapi Peranakan Ongole dengan pakan hijauan dan konsentrat. Buletin Peternakan. 2010; 34(2):86-93.
11. Irawati E, Widyaningrum A, Purbowati E, Adiwinarti R, Dartosukarno S, dan WS, Dilaga. Penampilan Produksi dan Parameter Pertumbuhan Kerbau yang diberi Pakan Konsentrat dengan Frekuensi yang Berbeda. Prosiding Seminar Nasional Teknologi Peternakan dan Veteriner. Bogor 7-8 Juni 2011. Hal. 2011, 135-140.
12. Kurnianto H, dan R, Nurhayati. Respon Pemberian Pakan Konsentrat Berbahan Lokal yang Difermentasi dengan Mikro Organisme Lokal (MOL) Rumen Sapi terhadap Sapi Peranakan Ongole (PO) Jantan. Prosiding Seminar Nasional. Penyediaan Inovasi dan Strategi Pendampingan untuk Mencapai Swasembada Pangan. Balai Besar Pengkajian Dan Pengembangan Teknologi Pertanian Bekerjasama Dengan Balai Pengkajian Teknologi Pertanian Jawa Tengah Fakultas Pertanian Dan Bisnis Uksw Salatiga, 2017, 990-996
13. Lubis DA. Ilmu Makanan Ternak. Cetakan Ulang. PT. Pembangunan, Jakarta, 1992.
14. Mallidadi H, Nikolaus TT, dan Enawati LS. Pengaruh Level Serat Terhadap Konsumsi dan Kecernaan Nutrien Sapi Varian Genetik dan Sapi Bali Normal (Effect of Fibre Levels on Nutrient intake and digestibility of Variant and Normal Genetic Bali Cattle). Jurnal Peternakan Lahan Kering, 2019; 1(3):410-416.
15. Maynard LA, Loosli JK. Animal Nutrition. 6th ed. Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 1969.
16. Muhammad. Fermentasi dan Peranan Mikrobia Bagi Pertambahan Bobot Badan Sapi Perah Fries Holstein. Jurnal Peternakan dan Lingkungan. 2000; 6(01):60-72
17. Musnamar EI. Pupuk Organik Padat, Pembuatan dan Aplikasi. Cetakan Pertama. Penebar Swadaya. Jakarta, 2003.
18. Nanda DD, Purnomoadi A, dan LK, Nuswantara. Penampilan Produksi Sapi Bali Yang Diberi Pakan dengan Berbagai Level Pelepah Sawit. Agromedia 2014; 32 (2):54-63.
19. Nurhayu A, Sariubang M, Nasrullah dan A, Ella. Respon Pemberian Pakan Lokal terhadap Produktivitas Sapi Bali Dara di Kabupaten Bantaeng, Sulawesi Selatan. Prosiding Seminar Nasional Teknologi Peternakan dan Veteriner. Bogor 7-8 Juni 2011. Hal. 2011, 115-120.
20. Parakkasi A. Ilmu Nutrisi dan Makanan Ternak Ruminan. Universitas Indonesia Press, Jakarta, 1999.
21. Prasad R, Karim SA, Patnayak BC. Growth Performance of Rabbits maintained on Diets with Varying Levels of Energy and Protein. World Rabbit Science. 1996; 4(2):5-78.

22. Puspitasari NM, Partama IBG, dan IGLO, Cakra.. Pengaruh Suplementasi Vitamin Mineral Terhadap Kecernaan Nutrien dan Produk Fermentasi Rumen Sapi Bali Yang Diberi Ransum Berbasis Rumput Gajah. Majalah Ilmiah Peternakan 2015; 18(3):83-88.
23. Puger AW, Nuriyasa IM, Puspany E dan IM, Mastika. Kecernaan Pakan Kelinci Lokal (*Lepus nigricollis*) yang Diberi Pakan Multi Nutrient Block Berbasis Rumput Lapangan. Majalah Ilmiah Peternakan. 2016; 19(3):121-124.
24. Riswandi, Muhakka, dan M Lehan. Evaluasi Nilai KecernaanSecara*In Vitro* Ransum Ternak Sapi Bali Yang Disuplementasi dengan Probiotik Bioplus. Jurnal Peternakan Sriwijaya. 2015; 4(1):35-46.
25. Riswara AD, Nuswantara LK, Achmadi J. Kecernaan Nutrien Secara *In Vitro* Pada Fodder Jagung Hidroponik dengan Media Perendaman dan Penggunaan Dosis Pupuk yang Berbeda (The In Vitro Nutrient Digestibility of Hydroponic Maize Fodder with Different Soaking Medium and Fertilizer Doses). Jurnal Ilmu dan Teknologi Peternakan, 2019; 6(2):110-114.
26. Setyawan S, Hidayat IR, dan D Yulistiani. Ketersediaan Hasil Samping Tanaman Tebu di Propinsi Jawa Barat dalam Mendukung Ketersediaan Pakan Ternak Ruminansia. Prosiding. Seminar Nasional Penyediaan Inovasi dan Strategi Pendampingan untuk Pencapaian Swasembada Pangan. Semarang 14 Desember 2016. Balai Besar Pengkajian Dan Pengembangan Teknologi Pertanian Bekerjasama Dengan Balai Pengkajian Teknologi Pertanian Jawa Tengah Fakultas Pertanian Dan Bisnis UKSW Salatiga 2017. hlm 2017, 1051-1058.
27. Setiawan D, dan Wiryawan KG. Kecernaan Nutrien Pakan Tepung Daun Murbei pada Sapi Peranakan Ongole. Jurnal Ilmiah Peternakan Terpadu, 2015; 3(4).
28. Suwandyastuti SNO, dan Rimbawanto EA. Pemanfaatan Limbah Berserat Dalam Konsentrat Untuk Sapi Jantan Umur Satu Tahun. Jurnal Agripet. 2011; 11(1):1-4.
29. Tillman AD, Hartadi H, Reksohardiprodja S, dan L, Soekamto. Ilmu Makanan Ternak Dasar. Gadjah Mada, University Press, Yogyakarta, 1986.
30. Utomo R. Evaluasi Pakandengan Metode Non invansif. Citra Ajiprama. Yogyakarta, 2012.
31. Yasa IMR, dan IN, Adijaya. Potensi Dampak Negatif Alih Fungsi Lahan Sawah Terhadap Produksi Pakan untuk Keberlanjutan Pengembangan Ternak Sapi di Kabupaten Tabanan. Prosiding. Seminar Nasional Inovasi Teknologi Pertanian Spesifik Lokasi “Inovasi Pertanian Spesifik Lokasi Mendukung Kedaulatan Pangan Berkelanjutan”. Banjarbaru, 20 Juli 2017. Balai Besar Pengkajian dan Pengembangan Teknologi Pertanian, Badan Penelitian dan Pengembangan Pertanian, Kementerian Pertanian 2017. Hlm. 2017, 1395-1405.
32. Yusmadi. Kajian Mutu dan Palatabilitas Silase dan Hay Ransum Komplit Berbasis Sampah Organik Primer Pada Kambing PE. [Tesis]. Bogor: Program Pascasarjana, Institut Pertanian Bogor, 2008.