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IMPLEMENTASI SISTEM "KEREMAN" DAN PERTANIAN TERPADU PADA PENGGEMUKAN SAPI POTONG DI DUA KELOMPOK TERNAK DI KABUPATEN SOKARAJA

Implementation of "Kereman" System on Beef Cattle and Integrated Farming System (IFS) at Two Smallholder Farming Systems in Sokaraja District

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ABSTRAK

Sistem Kereman dan pertanian terpadu diaplikasikan di dua kelompok ternak yaitu peternakan Berkah dan Peternakan Pondok Pesantren Roudlotul Huda untuk meningkatkan manajemen penggemukan dan meningkatkan produktivitas ternak. Implementasi Sistem Pertanian Terpadu dimulai dengan konstruksi perbaikan kandang, implementasi alih teknologi dalam manajemen penggemukan dan teknologi pakan meliputi: proses produksi silase dan amoniasi jerami padi sebagai alternatif hijauan pakan bagi ternak dengan menggunakan limbah pertanian; suplementasi dedak padi terfermentasi sebagai aditif pakan untuk meningkatkan citarasa pakan serta pengolahan limbah kotoran menjadi pupuk organik, dan sistem irigasi tetes pada pertanian. Transfer teknologi dilakukan dengan memberikan bimbingan teknis bagi Petani. Konsep keberlanjutan adalah elemen penting dalam pengembangan sistem pertanian terpadu karena dengan produk (output) dari satu sistem menjadi input untuk sistem lain. Manajemen yang berbeda di kedua UKM terutama dalam manajemen pemberian pakan menghasilkan perbedaan bobot badan pada sapi potong. Dampak dari kegiatan ini di dua UKM adalah efisiensi produksi yang lebih tinggi yang direfleksikan pada nilai pertambahan bobot badan harian (PBBH) yang dicapai dalam periode lebih cepat dari sebelumnya. Manajemen pakan, pengalaman dalam penggemukan sapi potong akan berpengaruh pada produktivitas ternak. Hal ini ditunjukkan pada kenaikan PBBH yang lebih tinggi di UKM yang menerapkan manajemen pakan yang lebih baik.

Kata kunci: Sapi potong, system kereman, system pertanian terpadu, manajemen pakan

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ABSTRACT

Kereman" systems and integrated farming system applied in two smallholder farming systems Berkah Farm and Pondok Pesantren Roudlotul Huda Farm to improve fattening management and increase the cattle performance. Implementation of Integrated Farming System begins with repair pen construction, technical guidance implementation in fattening management and feed technology include: silage processing; rice straw ammoniation as a forage for animal that used agricultural waste; fermented rice bran supplementation as appetite enhancer additive, manure waste processing into organic fertilizer, and also drip irrigation system on agriculture. Technical guidance for Farmer given by transfer technology. The concept of sustainability is an essential element in the development of integrated farming systems because by-product (output) of one system becomes the input for another system. Different management at both smallholder farming systems, especially in feeding management produce different body-weight on beef cattle. Impact of this activity in two smallholder farming systems is higher efficiency production, which reflects on ADG value reached in less period than before. Feeding management, the experience of fattening beef cattle will be the effect on animal productivity — smallholder farming systems which applied better feeding management shown the higher average daily gain.

Keywords: *Beef cattle, "kereman" system, integrated farming system, feeding management*

INTRODUCTION

Banyumas region has a total population of beef cattle around 14.845 head (BPS Jateng, 2016). Banyumas region has 27 districts, and there are three districts (Kedung Banteng, Karang Lewas, and Sokaraja) that known as developing the area of beef cattle. More than 90% of beef cattle production in Indonesia derived from smallholder farming systems, often with only 2-3 cattle per farmer (Priyanti et al., 2012). Some of them integrated with crop and livestock production (Agus and Widi, 2018). Farmers in Sokaraja district prefer to fattening beef cattle due to its high selling value. However, the constraints of the society in the fattening management of beef cattle still rely on the feeding roughing irrespective of the amount and nutritional value of the feed (Rahmanto, 2004). Consequently, cattle weight gain are not optimal. To achieve the optimal results from beef cattle fattening management program Sokaraja, we introduce the "kereman" system. "Kereman" system is a simple enclosure system where forage that ready to consume was given daily and an additional feeding of concentrates with crude protein content around 15-16%. In other words, this system requires the provision of adequate feed intensified. With "kereman" system, the average daily gain (ADG) could be achieved by a range of 0.6-1.2 kg/head compared to the regular fattening system, which only reached 0.3 kg/head. Reference (Yusdja et al., 2001) stated that the fattening pattern of kereman system capable of providing the benefit-cost ratio (B/C) between 1.29 to 1.35% for six months to one year of the fattening period. Also, the financial analysis indicates more favorable in kereman system characterized by Asset Turn Overvalue faster (Winarso, 2004).

The Integrated Farming System (IFS) concept adopted on beef cattle fattening. Beef cattle fattening with the integrated concept between livestock and agriculture should be enriched with the value of the technology. Henceforth, a technology approach of feed, livestock waste treatment, pen systems, and fattening management are crucial to supports the IFS concept. Optimal productivity and profitability can achieve significantly. IFS is an integrated system of agriculture and livestock that involve all the components, which includes agriculture and

livestock in an integrated system of agricultural enterprises (Soni et al., 2014). These systems promote an economy based on eco-friendly technologies and the optimization of all sources of energy produced. The advantages of these systems, are energy efficiency, increase the effectiveness of land, capital continues rotation, and environmentally friendly.

The concept of IFS applied will produce F4 (Food, Feed, Fuel, and Fertilizer). System integration of agriculture and livestock (IFS), resulting in forage for animal feed and livestock manure as fertilizer for crops (Julendra et al., 2013). IFS concept is already widely applied in Indonesia, both in large and small ruminants. Research Unit for Natural Product Technology, Indonesian Institute of Science (BPTBA LIPI) Yogyakarta had been conducting the initiation of IFS since 2006 in several areas such as Belu NTT (Julendra et al., 2007), Yogyakarta (Febrisiantosa et al., 2007; Anggraeni et al., 2015), Kaur Bengkulu (Karimy et al., 2013), Tanah Datar West Sumatra (Damayanti et al., 2013), and Temanggung and Wonosobo Central Java. The objective of this paper describes the concepts of livestock, especially beef cattle through the implementation of "kereman" system and IFS, and also to determine the critical factor that effects on beef cattle performance.

MATERI DAN METODE

Two smallholder farming systems, namely Berkah Farm and Pondok Pesantren (Ponpes) Roudlotul Huda Farm, conducted the fattening program of beef cattle in the Sokaraja district for four months from July to November 2010. Berkah Farm located in Pliken village, Rt.06/01, Sokaraja sub-district, Banyumas district. These smallholder farming systems chaired by Mr. Guntoro.

Berkah Farm has ten beef cattle, one communal pen-type tail to tail and a land area of this smallholder farming systems about 1.500m^2. Roughage feeder for cattle gets from forage land around the smallholder farming systems. Pondok Pesantren Roudlotul Huda Farm located in Pliken village, Rt.05/03, Sokaraja sub-district, Banyumas district. These smallholder farming systems chaired by Mr. Mujamil.

This smallholder farming systems have 11 beef cattle, two communal pen-type tail to tail and a land area of this smallholder farming systems about 2.100m^2. Roughage feeder for essential gets from forage land and agricultural waste such as rice straw also industrial waste (waste tofu grain) around the smallholder farming systems.

The activities were as follows:

- Technical guidance about pen construction based on layout design that supports the fattening management of beef cattle in both smallholder farming systems.
- Technical guidance (counseling) about fattening management of beef cattle in both smallholder farming systems.
- Technical guidance about feed processing using agricultural waste into complete feed products such as silage (Pondok Pesantren Roudlotul Huda Farm) and rice straw ammoniation (Berkah Farm).
- Technical guidance (training) about manure waste processing into organic fertilizer by composting technology in both smallholder farming systems, and it utilizations for the drip irrigation system in Berkah Farm.
- Technical guidance about Biogas digester construction and it utilizations in Berkah Farm.
- Application of fermented rice bran as appetite enhancers (feeds additives) to support the cattle immune system (enriched amino acids, vitamins, and minerals). The feed additives were given ±40 g/head/day for four months, and body weight gain was observed. Nutrient contents of fermented rice bran shown in Table 1.

Table 1. Nutrient content in fermented rice bran

Composition,%	Fermented Rice Bran
Dry Matter	88.78 ± 0.25
Ash	8.09 ± 0.02
Crude Protein	15.37 ± 0.07
Fat	17.62 ± 0.12
Crude Fiber	9.09 ± 0.21
Calcium	0.14 ± 0.00
Phosphor	0.08 ± 0.00

Istiqomah et al., 2010

Monitoring of body weight through the chest circumference measurements was routinely performed every month. Then put the data of chest circumference into Scroll method:

$$BW = \frac{(CC+22)^2}{100}$$

BW: Bodyweight (kg)
CC : Chest circumference (cm)

The quantitative data of body weight gain in both smallholder farming systems were analyzed using descriptive methods.

RESULT AND DISCUSSION

Implementation of "kereman" system in two smallholder farming systems

Kereman system is similar to dry lot fattening, where cattle fed forage and concentrates as well as cattle grounded for rearing. The kereman system mostly done by traditional farmers, and the feeding system still depends on the season conditions. In the rainy season, cattle fed plenty of forage while in the dry season, cattle fed concentrates (Nugraha, 2016).

Table 2. visible Impact through implementation Kereman system in two smallholder farming systems

Parameter	Before program	After program
Pen construction	* pen capacity was too crowded so cattle crammed. * roof pen was too low, produced bad air circulation. * floor condition is a little bit wet because cattle urine did not flow well into the drain.	* expansion of pen area (3.75 m2/head). * raising the roof of the pen so make air circulation better. * floor of pen was designed with 30º slope so cattle urine could flow well into the drain.
Composting room	* not available, cattle manure flowed directly into drainage (not use)	* created a composting room, so cattle manure could be processed into organic fertilizer without contaminating the environment.
Fattening and health management	* the average of the fattening period around 7-8 months. * health management was not controlled yet (not given worm medicine and vitamin).	* fattening period around ± six months and achieved ± 0.446 kg/head of ADG. * health management was conducted by giving the worm medicine, vitamin, mineral, and feed additive routinely.
Feed processing management	* rice straw gave without any treatment, so the cattle palatability was low.	* rice straw was processed into silage and rice straw ammoniation to increase the cattle palatability

Smallholder farming systems Berkah Farm

"Kereman" systems have been applied in Berkah Farm. Activities began with the pen construction by design created to support the maintenance of cattle. The construction includes expansion pen area, raised roof of the pen, and also make slope

in floor pen so urine could flow into the drain. Feed processing technology through feed fermentation become silage has been applied regularly in Berkah Farm (production ± 30 kg for one week) as much as ± 1.5 kg/head/day). Silage technology was used to preserve forage as cattle feed. A composting room built to process cattle manure into organic fertilizer. Organic fertilizer from manure waste has been carried out at both smallholder farming systems (production around 205 kg during four weeks of fermentation and used for forage land belonging to smallholder farming systems. A farmer in Berkah Farm was conducted fattening period more than six months (7-8 months), while during the program they start fattening for 4-6 months.

Smallholder farming systems Pondok Pesantren Roudlotul Huda Farm

"Kereman" systems have been applied in smallholder farming systems Pondok Pesantren Roudlotul Huda Farm. Activities began with the pen construction by raised the pen roof enclosure and made the slope of the pen floor to support the maintenance of cattle. The strategic location of smallholder farming systems results in a potential abundance of cattle feed that also supported by the abundant water resources. Also, the region's have wide enough rice field that rice straw could be processed for cattle feed into complete silage and rice straw ammoniation. Moreover, besides feed technology, we also developed manure processing into organic fertilizer by composting. Composting room was built to process the cattle manure into organic fertilizer. Compost can be utilized for agricultural commodities, especially in forage land belonging to smallholder farming systems. A farmer in Pondok Pesantren Roudlotul Huda Farm was conducted fattening period 7-8 month, while during the program they start fattening for 4-6 months.

A cramped pen in both smallholder farming systems did not support animal welfare. This conditions made behavior disorder in fattening cattle, and also decreased cattle productivity — behavior disorder related to inadequate floor space and ventilation (EFSA, 2012). Therefore activities in our program improved and repaired the pen construction, including pen area expansion, raising the roof and made slope in pen. Composting room was built to process cattle manure into organic fertilizer and also to reduce environmental contamination caused by animal waste. Animal manure can help in improving soil fertility and increase production (Walia and Kaur, 2013).

Cattle fattening period depends on rearing and feeding management. In both smallholder farming systems after farmers get guidance about fattening management through "Kereman" system, they obtained a short fattening period with higher ADG compare to previous rearing system. They got more attention in cattle fattening and cattle had better feed than before. Human resources have still relied influence on the sustainability of fattening system it related to ethic work of farmer (Julendra et al., 2013; Anggraeni et al., 2015).

Implementation of feeding management of "kereman" system in two smallholder farming systems

Both smallholder farming systems applied different feeding management during the fattening period. Therefore it influenced the cattle ADG. Comparisons of ADG between smallholder farming systems for 4-months observation shown in Table 3.

Table 3. The mean of initial weight, final weight, and body weight gain for four-month

Parameters	Berkah Farm	Pondok Pesantren Roudhatul Huda
Initial body weight (kg)	334.37	359.33
Final body weight (kg)	309.79	409.21
Average Daily Gain (kg)	0.21	0.89

Smallholder farming systems Berkah Farm

Cattle were reared for four months in pen and fed "komboran" (concentrate feed mix with water thus becoming a watery paste) twice a day in the morning and afternoon, as well as an additional form of forage. Cattle were given fermented rice bran as an additive for appetite enhancer to increase consumption, but it was not given routinely. Feed for cattle could be obtained from the environment around the farms so that it could be developed into an integrated farming system. Monitoring of body weight through the chest circumference measurements was routinely performed every month. The result showed that the achievement of ADG in smallholder farming systems Berkah Farm reached 0.21 kg/head at the fourth month of fattening period (Table 3). The ratio of concentrate in smallholder farming systems Berkah Farm decreased (<30%) of the total feed cattle/day due to cost increase of concentrate feed, whereas the concentrate is a source of energy that can enhance the cattle's ADG.

Furthermore smallholder farming systems Berkah Farm never yet the feedlot management experience so that their knowledge and skills in fattening management still lack and limited. Lack of experience and education of farmer will lead to different management in rearing livestock (Murwanto, 2015; Marhaeniyanto et al., 2019). This condition implicated the unoptimal of body weight gain during the fattening period compare with smallholder farming systems Pondok Pesantren Roudlotul Huda Farm.

Smallholder farming systems Pondok Pesantren Roudlotul Huda Farm

Cattle were reared for four months in pen and fed "komboran" (concentrate feed mix with water thus becoming a watery paste) twice a day in the morning and afternoon, as well as an additional feed rice straw ammoniation. Cattle were given fermented rice bran (40gr/head/day) routinely as an additive for apetite enhancer to increase consumption. Furthermore, in these smallholder farming systems, they also gave nutshell as a fiber source to enriched nutrient for cattle. Monitoring of body weight through the chest circumference measurements was routinely performed every month. The result showed achievement of the ADG in smallholder farming systems Pondok Pesantren Roudlotul Huda Farm reached 0.89 kg/head (Table 3). Smallholder farming systems Pondok Pesantren Roudlotul Huda Farm had ± 1.5 years of experience in the feedlot, so the fattening management was more intensive and produced optimal outcomes. This smallholder farming systems produced better optimal body weight gain during the fattening period compare to smallholder farming systems Berkah Farm.

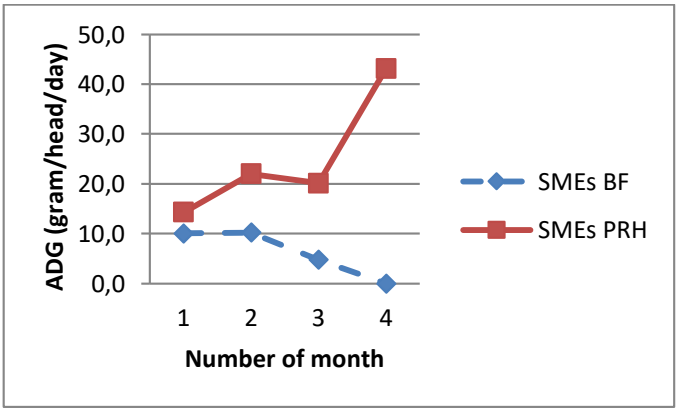

Figure 1. Comparison of ADG between smallholder farming systems Berkah Farm (BF) and smallholder farming systems Pondok Pesantren Roudlotul Huda Farm (PRH).

The average daily gain in smallholder farming systems Pondok Pesantren Roudhatul Huda was higher than smallholder farming systems Berkah Farm. This condition happens probability due to better rearing and feeding management. Firstly, cattle got enough to feed for their maintenance and growth during the fattening period without any feed input reduction as it happens in Berkah Farm during November 2010 due to higher concentrate price. Second, smallholder farming systems Pondok Pesantren Roudlotul Huda Farm had ± 1.5 years of experience in the feedlot, so their fattening management was more intensive and produced optimal outcomes.

Third, during fattening period smallholder farming systems Pondok Pesantren Roudlotul Huda Farm gave fermented rice bran as appetite enhancer routinely. This is by the opinion of Istiqomah et al.,(2010) which stated that animals that had extra bran fermentation were able to achieve higher body weight. This is reflected in higher ADG than controls. Besides that, protein and fat content in fermented rice bran was highly enough 15.37%; 17.62% (Istiqomah et al., 2010).

This high content of protein and energy could be used for cattle's growth. It depends on reference (Owens et al., 1993) that higher protein and energy content in feed will produce higher growth rate. The growth of cattle that administered with fermented rice bran routinely for four weeks of observation could produce more efficiently in a conversion rate of feed and significantly improve the average daily gain (Istiqomah et al., 2010). The specific odor of fermented rice bran could increase the appetite of feed, and the minerals and amino acid compounds were useful for cattle performance (Sereewatthanawut et al., 2008).

The specific odor increased the palatability ration. During the fermentation processes, there were changes in nutritional values and also arose appetite due to the formation of one or several chemicals compounds which released by fungi in medium fermentation (rice bran) (Wizna et al., 2000; Zhixiong et al., 2010). Sofyan et al.,(2008) reported that physical quality of fermented rice bran by *Rhizopus sp*. inoculums, and chitosan waste addition produced more fragrant appetite characteristic than the unfermented rice bran.

Rhizopus oryzae was capable of producing lipase which able to synthesize *citronellyl esters* compound as appetite forming component in the appetite of food or feed ingredients (Macedo et al., 2003) while *Saccharomyces* produced the alcohol appetite (Thomas et al., 2002) thereby increased the appetite of fermented feed.

Implementation of the integrated Farming system in both smallholder farming systems

Both smallholder farming systems were chosen because the territory is suitable for cattle fattening, viewed from the availability of water, forage, and agricultural wastes that could be used as an alternative feed. Suitability of land was main factor in supporting the success of a livestock business, especially ruminants. The use of agricultural crop waste will increase the efficiency of the farm business (Romjali, 2018).

This is related to land uses and potential food crops and forage that will determine the direction of land development for ruminants (Sumanto and Juarni, 2004). Also, Sokaraja is a development area of fattening beef cattle in Banyumas. Rice straw was processed into silage and rice straw ammoniation as cattle feed. Then manure was processed into organic fertilizer that could be applied to forage land in Pondok Pesantren Roudlotul Huda Farm, while in smallholder farming systems Berkah Farm the organic fertilizer was used for vegetable crops with drip irrigation techniques. The concept of sustainability is an important element in the development of

integrated systems. Integrated Farming Systems (IFS) is a system where nothing is wasted, by product (output) of one system becomes the input for another system (Simonne et al., 2008). The drip irrigation system is the right choice in increasing the efficiency of water and fertilizer use to increase productivity through the appropriate irrigation system. According to reference (Simonne et al., 2010), drip irrigation is a method of giving water to the plants directly; the droplets flow continuously and slowly either in the area of plant roots as well as on the surface of the soil.

Efficient use of water for drip irrigation reaches 80-95% (Yanto et al., 2014; Febrisiantosa et al., 2006). An IFS is very good and healthy if it was developed with the concept of biogas. The cattle manure was put directly into the biodigester so it would not pollute the environment and expected to decrease the spread disease. Biogas fuel, it can be methane-fermented, directly combusted, or made into solid fuel (Owens et al., 1993). The capacity of biodigester was 3 $m^{3,}$ and it used to collect manure from ten cattle. Biogas was used in smallholder farming systems Berkah Farm for cooking need daily (the length time of cooking around 4 hours/day). Methane gas production in this program was less optimal than the study of reference (organics, 2014) that used digester with 4.84 m^3 capacity with manure input from two cattle. This digester could produce biogas for cooking from one household for one day. This condition happens, might be caused too many cattle manure as input while the biodigester capacity was too small, so it released less biogas. The ideal ratio is obtained from cattle manure (C: N = 10-30), and this is an opportunity to develop appropriate methods and compositions to obtain the C: N ratio ideal which is about 25-30 (Devendra et al., 1997). The concept of IFS applied at both smallholder farming systems in Sokaraja district shown in Figure 2.

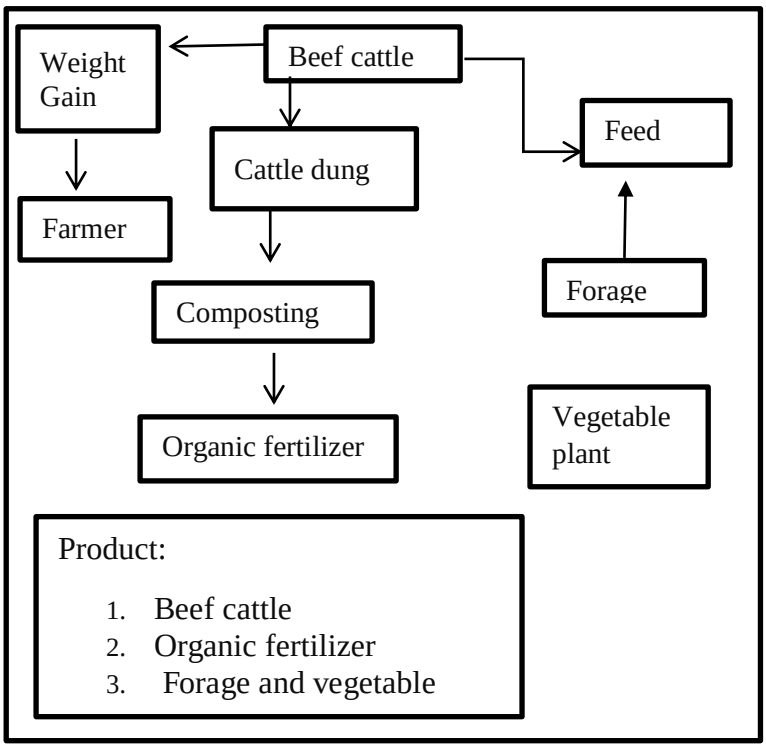

Figure 2. Concept of IFS in Berkah Farm and Pondok Pesantren Roudlotul Huda Farm

According to Devendra et al., (1997) there are two types of system integration commonly developed in Southeast Asia, (1) a system that combines livestock and annual crops of rice, maize, cassava, potatoes, soybeans and peanuts, (2) methods that combine livestock with crop annual plants such as rubber, oil palm, coconut and cocoa. Sokaraja area could be categorized in the first type with the integration of rice crops. Interaction between livestock and crops, either seasonal or perennial, will provide positive benefits. It is directly or indirectly will improve productivity, incomes, and sustainability of the business. This is because there is no output from the fields that are not utilized, due to which the output is input to the other fields.

CONCLUSION

Feedlot management with "Kereman" system supporting with Integrated Farming System has been implemented in two smallholder farming systems in Sokaraja. Kereman system that supports with enough nutrient requirement for cattle and also added feed supplement will give better result in fattening beef cattle. Feeding and fattening management as an essential factor that affected cattle growth.

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REFERENCE

Agus, A., & Widi, T. S. M. (2018). Current situation and future prospects for beef cattle production in Indonesia - A review. *Asian-Australasian Journal of Animal Sciences*, *31*(7), 976–983. https://doi.org/10.5713/ajas.18.0233

Alves Macedo, G., Soberón Lozano, M. M., & Pastore, G. M. (2003). Enzymatic synthesis of short chain citronellyl esters by a new lipase from Rhizopus sp. *Electronic Journal of Biotechnology*, *6*(1), 69–72. https://doi.org/10.2225/vol6-issue1-fulltext-2

Anggraeni, A., Karimy, M., Herdian, H., Sakti, A., & Damayanti, E. (2015). Penerapan Sistem Pertanian Terpadu Berbasis Kambing Peranakan Etawah di Kabupaten Gunung kidul. In *Prosiding Seminar Nasional Teknologi Peternakan dan Veteriner* (pp. 428–435). Jakarta.

BPS Jateng. (2016). *Populasi Sapi potong*. BPS Jawa Tengah.

Damayanti, E., Purwati, E., Julendra, H., Husmaini, Maryana, R., Nasri, Y., & Aritonang, S. (2013). Inovasi Teknologi Fermentasi Silase Campuran Kulit Kakao dan Jerami Sebagai Sumber Pakan Sapi di Kelompok Tani Ternak Tanjung Lurah, Tanah Datar, Sumatera Barat. In *Seminar Nasional & Workshop : Peningkatan Inovasi Dalam Menanggulangi Kemiskinan – LIPI* (pp. 261–268).

Devendra, C., Thomas, D., Jabbar, M., & Kudo, H. (1997). *Improvement of Livestock Production in Crop-Animal Systems in RainjedAgro-ecological Zones of South-East Asia*. Nairobi, Kenya: ILRI (International Livestock Research Institute).

EFSA Panel on Animal Health and Welfare (AHAW). (2012). *Scientific opinion on the welfare of cattle kept for beef production and the welfare in intensive calf Farming system*.

Febrisiantosa, A., Maryana, R., Pudjiono, P. I., & Herdian, H. (2007). *Implementasi Teknologi Biogas Sebagai Penyedia Energi dan Pupuk Organik pada Rumah Tangga Petani di Pedesaan. Prosiding Seminar Pemberdayaan Masyarakat Melalui Pemanfaatan Bahan Baku Lokal, Yogyakarta*.

Febrisiantosa, A., Wahono, S., & Pudjiono, P. (2006). *Potensi pemanfaatan limbah peternakan sapi potong*

melalui teknologi biogas sebagai sumber energi alternatif rakyat pedesaan di lahan marginal "studi kasus di Desa Bandung Kab.Gunungkidul". *TENAS V FAM PII*. Yogyakarta.

Istiqomah, L., Febrisiantosa, A., Sofyan, A., & Damayanti, E. (2010). Implementation of Fermented Rice Bran As A Apetite Enhancer Additive and Its Effect On Feed Utilization And Beef Cattle Performance. In *The 5th International Seminar on Tropical Animal Production Community Empowerment and Tropical Animal Industry*.

Julendra, H., Febrisiantosa, A., Damayanti, E., Wahono, S. K., Karimy, M. F., Istiqomah, L., & Herdian, H. (2013). Evaluasi Penerapan Sistem Pertanian Terpadu Berbasis Sapi Potong di Delapan Lokasi dengan Letak Geografis yang Berbeda. *Seminar Nasional & Workshop Peningkatan Pemanfaatan Inovasi Dalam Menanggulangi Kemiskinan*, *2008*, 104–111.

Julendra, H., Pudjiono, P. I., & Maryana, R. (2007). Pemanfaatan Kotoran Sapi sebagai Energi Alternatif dan Pupuk Organik dalam Rangka Pengembangan Sistem Pertanian Terpadu. In *Prosiding Nasional Implementasi Hasil – hasil Riset*. Yogyakarta: UPT, BPPTK LIPI, BPTP Yogyakarta dan UGM.

Karimy, M., Suryani, A., Herdian, H., Damayanti, E., & Febrisiantosa, A. (2013). Potensi Pengembangan Integrasi Agroternak Melalui Instalasi Biogas dan introduksi Silase Pelepah Daun Sawit (PDS) di Kaur, Provinsi Bengkulu. In *Seminar Nasional dan Workshop: Peningkatan Inovasi Dalam Menanggulangi Kemiskinan-LIPI*.

Li, Z., Lee, J., & Cho, M. H. (2010). Antioxidant, antibacterial, tyrosinase inhibitory, and biofilm inhibitory activities of fermented rice bran broth with effective microorganisms. *Biotechnology and Bioprocess Engineering*, *15*(1), 139–144. https://doi.org/10.1007/s12257-009-0142-8

Marhaeniyanto, E., Susanti, S., Siswanto, B., & Trisna Murti, A. (2019). Inventarisasi pemanfaatan daun tanaman sebagai sumber protein dalam pakan kambing peranakan etawa (Studi Kasus di Dusun Prodosumbul, Desa Klampok, Kecamatan Singosari, Kabupaten Malang). *TERNAK TROPIKA Journal of Tropical Animal Production*, *20*(1), 59–69. https://doi.org/10.21776/ub.jtapro.2019.020.01.8

Murwanto, A. G. (2015). Karakteristik peternak dan tingkat masukan teknologi peternakan sapi potong di lembah prafi Kabupaten Manokwari. *Journal of Tropical Animal and Veterinary Science*, *3*(1). https://doi.org/10.30862/JTAVS.V3I1.347

North Country Organics. (2014). *Carbon : nitrogen ratio*.

Nugraha, I. (2016). *Mengenal Manajemen Pakan Sistem Penggemukan Sapi*.

Owens, F. N., Dubeski, P., & Hanson, C. F. (1993). Factors that alter the growth and development of ruminants. *Journal of Animal Science*. https://doi.org/10.2527/1993.71113138x

Priyanti, A., Hanifah, V. W., Mahendri, I. G. A. P., Cahyadi, F., & Cramb, R. A. (2012). Small-Scale Beef Cattle Production in East Java , Indonesia. *The 56th AARES Annual Conference*, 1–22.

Rahmanto, B. (2004). Analisis Usaha Peternakan Sapi Potong Rakyat. *ICASERD WORKING PAPER No.59. Pusat Penelitian Dan Pengembangan Sosial Ekonomi Pertanian (Indonesian Center for Agricultural Socio Economic Research and Development) Badan Penelitian Dan Pengembangan Pertanian Departemen Pertanian Working*, (59), 1–23.

Romjali, E. (2018). Development of beef

cattle innovation through "field laboratory" approach. *Indonesian Bulletin of Animal and Veterinary Sciences*, *28*(2), 69. https://doi.org/10.14334/wartazoa.v28i2.1797

Sereewatthanawut, I., Prapintip, S., Watchiraruji, K., Goto, M., Sasaki, M., & Shotipruk, A. (2008). Extraction of protein and amino acids from deoiled rice bran by subcritical water hydrolysis. *Bioresource Technology*, *99*(3), 555–561. https://doi.org/10.1016/j.biortech.2006.12.030

Simonne, E., Hochmuth, R., Breman, J., Lamont, W., Treadwell, D., & Gazula, A. (2012). Drip-Irrigation Systems for Small Conventional Vegetable Farms and Organic Vegetable Farms. *IFAS Extension*, 1–23.

Sofyan, A., Damayanti, E., Julendra, H., & Febrisiantosa, A. (2008). Physical quality evaluation and essential amino acids index of fermented rice bran for animal feedstuff. In *Proceedings Development of Agro Industrial National Seminar* (pp. 1–8). Yogyakarta.

Soni, R., Katoch, M., & Ladohia, R. (2014). Integrated farming systems - a review. *Journal of Agriculture and Veterinary Science*, *7*(10), 36–42.

Sumanto, & Juarni, E. (2004). Potensi kesesuaian lahan untuk pengembangan ternak ruminansia di propinsi Nusa Tenggara Timur. In *Prosiding Seminar Nasional Teknologi Peternakan dan Veteriner*.

Thomas, K. C., Hynes, S. H., & Ingledew, W. M. (2002). Influence of medium buffering capacity on inhibition of saccharomyces cerevisiae growth by acetic and lactic acids. *Applied and Environmental Microbiology*, *68*(4), 1616–1623. https://doi.org/10.1128/AEM.68.4.1616-1623.2002

Walia, S. S., & Kaur, N. (2013). Integrated farming system - an ecofriendly approach for sustainable agricultural environment – a review. *Greener Journal of Agronomy, Forestry and Horticulture*, *1*(1), 001-011. https://doi.org/10.15580/GJAFH.2013.1.071813740

Winarso, B. (2004). *Prospek pengembangan usaha ternak sapi potong di Kalimantan Timur* (No. 27). Jakarta.

Wizna, Mirnawati, N., Jamarun, & Zuryani, Y. (2000). Utilization of fermented bean products rubber (Havea brasilliensis) with Rhizopus oligosporus on the diet of laying hens. In *Proceedings. National Seminar of Animal Husbandry and Veterinary. Center of Agricultural Research and Development* (pp. 296–299).

Yanto, H., Tusi, A., & Triyono, S. (2014). Aplikasi sistem irigasi tetes pada tanaman kembang kol (Brassica Oleracea Var. Botrytis L. Subvar. Cauliflora DC) dalam greenhouse. *Jurnal Teknik Pertanian Lampung*, *3*(2), 1–14.

Yusdja, Y., Malian, H., Winarso, B., Sayuti, R., & Bagyo, A. (2001). Analisis Kebijaksanaan Pengembangan Agribisnis Komoditas Unggulan Peternakan. In *Pusat Analisis Sosial Ekonomi dan Kebijakan Pertanian*. Bogor: Badan Litbang Pertanian.

Zotarelli, L., Dukes, M. D., Liu, G., Simonne, E. H., & Agehara, S. (2011). Chapter 3. Principles and Practices of Irrigation Management for Vegetables. *University of Florida, IFAS Extension, AE260*, (May 2010), 17–27.