Study of Corn Plant Availability and Beef Cattle Waste Potential

Studi Ketersediaan Tanaman Jagung Dan Potensi Limbah Sapi Potong

Muji Paramuji[1,2], Suprihatin[3], Titi Candra Sunarti[3], Sukardi[3]
[1] Agricultural Industrial Engineering, IPB University Graduate School, Bogor
[2] Agricultural Technology Study Program, Islamic University of North Sumatra, Medan
[3] Department of Agricultural Industrial Technology IPB University Bogor
Corresponding author: paramuji2@gmail.com

ABSTRACT

One of the factors that determine the growth of beef cattle is the supply of feed. The main feed source for beef cattle is forage which is currently increasingly limited in availability. The purpose of this study is to examine and evaluate the utilization of corn waste into forage sources of feed and the potential amount of beef cattle waste in Deli Serdang Regency. The data source used in this study is secondary data covering the planting area of corn and beef cattle population described in a qualitative description. The results of studies and evaluations indicated that the availability of forage production of corn (stover) as a source of forage for beef cattle feed in Deli Serdang Regency, in average is only sufficient of 80.57% of the existing beef cattle population, that is every 20,066.95 Ha of corn plants can provide forage for 75,234 cows. Cattle waste potential in the form of feces is 509,385,066.00 kg/year, urine is 203,479,979.00 L/year and the remaining feed is 34,255,889.00 kg/year.

Keywords: corn, forage, feed, beef cattle

ABSTRAK

Pertumbuhan ternak sapi potong salah satunya ditentukan oleh penyediaan pakan. Sumber pakan utama untuk ternak sapi potong adalah hijauan yang saat ini ketersediaannya semakin terbatas. Tujuan penelitian ini adalah mengkaji dan mengevaluasi pemanfaatan limbah jagung menjadi sumber hijauan pakan dan potensi jumlah limbah sapi potong di Kabupaten Deli Serdang. Sumber data yang digunakan pada penelitian ini adalah data sekunder mencakup luas tanam jagung dan populasi ternak sapi potong diuraikan secara deskripsi kualitatif. Hasil kajian dan evaluasi menunjukkan bahwa ketersediaan produksi hijauan tanaman jagung (brangkasan) sebagai sumber hijauan pakan sapi potong di Kabupaten Deli Serdang hanya mencukupi rata-rata 80,57 % dari populasi sapi potong yang ada, yaitu setiap 20.066,95 Ha tanaman jagung dapat menyediakan hijauan untuk 75.234 ekor sapi. Potensi limbah ternak sapi berupa feses 509.385.066,00 kg/th, urine 203.479.979,00 l/th dan sisa pakan 34.255.889,00kg/th.

Kata kunci : jagung, hijauan, pakan, sapi potong.

INTRODUCTION

One of the resources producing animal protein food is beef cattle in the form of beef. Indonesian people's meat consumption from beef has only reached 1.7 kg/capita/year from the total national demand of 6.5 kg/capita/year. According to Reily (2018), to meet the needs of Indonesian beef, 663,290 tons of beef must be supplied, while the production of beef in Indonesia in 2018 only reached 403,668 tons. The needs of people's meat consumption have only been realized by 60.9% which only comes from local cattle producers, thus requiring Indonesia to import large-scale beef cattle and meat from abroad hence meat and price needs are met.

The growth of cattle is determined by the good and bad factors of the feed provided, hence an increase in cattle population, especially beef cattle is difficult to achieve because of the low productivity of these animals (Prawiradiputra 2011; Elly et al. 2013).

Forage is the main source of cow's feed ingredients which determines the productivity of cattle, hence there is a dependence on quality forage such as grass and legumes (forage), which amounts to around 60-70% of the total dry weight consumption of rations. Provision of good quality forage feed has constraints, including the shrinking of agricultural land and the presence of a dry season which results in decreased availability of good quality forage feed (Langoy et al. 2012; Elly et al (2013).

Most of the agricultural waste products and types of low-quality local forage can be used as a source of cattle feed. One popular agricultural waste is corn stover which consists of leaves and stems that are still soft after the corn is harvested and are usually fed to livestock (Langoy et al. 2012). Corn stover is the waste of corn (Zea mays L) which planted to produce seedlings or corn kernel and left in the field after harvest in the form of stems, leaves and husk with varying proportions (Faesal 2013; Heuzé et al. 2017). The total corn production in 2017 is estimated at 27,951,959 tons, hence Indonesia has the potential to produce corn waste in the form of stems, leaves, cornhusk and corn cobs of 41,930,000 tons (Statistics Indonesia, 2017).

Assuming the need for cattle per day is 7.5 kg/head, then the cattle feed needs that must be met is 15,316,895 head/year (Statistics Indonesia 2017; Lizotte et al. 2015; Taufiq et al. 2017). Furthermore, by utilizing the corn stover can ensure the availability of beef cattle feed especially when the dry season, because in addition to its shelf life can be maintained, the nutritional value also increases (Faesal 2013; Ilato and Bahua 2014).

Explanation from previous research above becomes the basis for considering the use of corn waste, especially corn stover as a source of forage for beef cattle. Therefore, this research examines and evaluates the utilization of corn waste, especially stover, which is a source of forage for beef cattle feed in supporting the development of integrated corn agro-industry.

RESEARCH METHODOLOGY

This research was conducted in Deli Serdang Regency, Sumatera Utara Province. The research was done from April to August 2019.

The tools used in this research were cameras, computers and internet networks. The materials used in this research were the data of corn planting area and the number of beef cattle population in Deli Serdang Regency.

This research is a qualitative research carried out by collecting secondary data

(data on corn planting area and population of beef cattle from an appropriate source).

The data obtained were processed and discussed in the descriptive analysis technique. Descriptive analysis is an analysis technique that is carried out by giving a review or interpretation of the data or the results of the field findings obtained hence it becomes clearer and more meaningful than just numbers.

RESULTS AND DISCUSSION

The Availability of Corn Plants as a Source of Forage Feed

Based on the field observations it can be identified that corn farming in Deli Serdang Regency consists of landowners farmer (large, medium, narrow) and sharecroppers farmer as many as … households. Corn varieties planted include hybrid and composite varieties. Beef cattle breeders in Deli Serdang Regency consist of commercial breeders (cattle breeder companies) and traditional breeders (livestock owners and hired breeders) as many as 18,446 households. The types of cattle bred are Limousin, Friesholand, Angus, Brahman, Ongole and Simental. Corn harvest area and number of beef cattle population in Deli Serdang Regency by year are presented in Table 1.Table 1 showed that 2017 was the most widely harvested year of corn and in 2019 the most

beef cattle population in Deli Serdang Regency. But it is unfortunate that there has been a significant decline in corn planting area in the last three years hence it will affect the potential for corn and stover production. From these data, it can be calculated the number of byproducts of corn harvest in the form of forage corn (stover) which can be used as a forage source for beef cattle feed. Based on the results of research and calculations by Supriadi et al. (2014), stated that the average weight of corn stover is 0.46 kg/plant or 15.508.9 kg/ha for one harvest. According to the custom, the land is usually planted with corn 3 times per year.

.Based on Table 2 it can be identified that the potential for corn stover production each year in Deli Serdang Regency is quite high and is directly proportional to the area of corn harvest each year. The data showed that in 2017 the highest stover was generated compared to other years.

Corn stover production is directly proportional to the harvested area, the wider the corn harvest, the higher the potential for waste produced. Furthermore, the capacity of livestock from available corn stover can be calculated based on dry weight or wet weight. Based on the theory, a cow needs as much as 2-3% dry matter or 10% wet matter from body weight. One Livestock Unit (OLU) weighing 350 kg requires 7-10.5 kg/day of dry matter or 35 kg/day of wet matter. According to Supriadi and Murwati (2009), corn stover contains 22% of dry matter.

Table 1. Corn harvest area and number of beef cattle population by year in Deli Serdang Regency

No	Year	Corn harvest area (Ha)	Total beef cattle population (Head)
1	2016	17.185,30	91.763
2	2017	24.584,30	93.598
3	2018	20.202,40	94.538
4	2019	18.295,81	95.508

Source: Department of Agriculture and Animal Husbandry (2020).

Table 2. Harvested area, stover weight and potential of corn stover production

in Deli Serdang Regency

No	Year	Corn harvest area (Ha)	* Corn stover weight (kg/ha/year)	Potential of corn stover production (kg/year)
1	2016	17.185,30	46.526,70	799.575.297,51
2	2017	24.584,30	46.526,70	1.143.826.350,81
3	2018	20.202,40	46.526,70	939.951.004,08
4	2019	18.295,81	46.526,70	851.243.663,12
Average		20.066,95	46.526,70	933.649.078,88

Note: Ha = Hectare; * = Supriadi *et al.* (2014).

Based on Table 3 it can be identified that the potential for corn stover production in Deli Serdang Regency has not been able to meet the forage of beef cattle feed. It is known that every year the potential for corn stover production in Deli Serdang Regency has not been able to meet the capacity of beef cattle. 2017 is the highest of stover production and the highest capacity of beef cattle. However, as seen from Table 3 data, there are still shortages of production and capacity. It is suspected that this caused by non-optimal land use, climate and weather conditions that affect the suitability of land conditions, the availability of production facilities (seeds and fertilizers) and pest and disease disorders. The same thing relates to the research of Ardiana et al. (2015), stated that the forage production of corn plants at each harvest was influenced by several factors, namely the varieties of corn planted, the distance of planting, fertilizer application, harvesting and postharvest handling. The forages calculated here do not include corn plants that produce as Tebon (young corn plants specifically for cattle feed).

According to Sahuri (2017), the alternative to increase the planting area of maize/corn is to increase the empowerment of cultivated land, paddy fields and rubber plantations that have not produced yet. Another way can also be done by improving corn cultivation by using early maturity varieties (80-90 days) with a spacing of 50 x (20-25) cm that can produce a population of 80,000-100,000 plants/ha (Anonimus, 2015). Along with the development of the corn planting area, the availability of waste is also increasing. Thus the availability and adequacy of corn stover as a source of forage for beef cattle will increase in the capacity (Ardiana et al., 2015).

Table 3. The potential of corn stover production, amount of wet feed, capacity and population of beef cattle and the realization of feed availability in Deli Serdang Regency

Year	The potential of corn stover production (kg/year)	Amount of wet feed (kg/head/year)	The capacity of beef cattle (head/year)	Beef cattle population (Head)	Realization of feed availability (%)
2016	799.575.297,51	12.775	62.589	91.763	68,21
2017	1.143.826.350,81	12.775	89.536	93.598	95,66
2018	939.951.004,08	12.775	73.577	94.538	77,83
2019	851.243.663,12	12.775	66.634	95.508	69,77
Average	935.649.078,88	12.775	75.234	93.852	80,57

Note: kg = Kilogram

Potential of Beef Cattle Waste

Table 1 shows the number of beef cattle population in Deli Serdang Regency, from this data it can be calculated the potential of beef cattle waste produced. Based on the research results of Adijaya and Yasa (2012), it showed that the average of fresh solid waste (faeces) is 14.87 kg, urine is 5.94 liters and 1 kg of feed remains per day from a cow with an average feed consumption of 17.91 kg and drinking water of 7.39 liters. The potential waste of beef cattle in Deli Serdang Regency can be calculated and presented in Table 4.

Table 4. Number of beef cattle populations, potential feces production, urine and beef cattle feed residue by year in Deli Serdang Regency

No	Year	Total beef cattle population (head)*	Potential of Feces (kg/year)**	Potential of Urine (L/Year) **	Potential of Residual Feed (kg/year)**
1	2016	91.763	498.048.270,65	198.951.360,30	33.493.495,00
2	2017	93.598	508.007.824,90	202.929.823,80	34.163.270,00
3	2018	94.538	513.109.721,90	204.967.837,80	34.506.370,00
4	2019	95.508	518.374.445,40	207.070.894,80	34.860.420,00
	Average	93.852	509.385.066,00	203.479.979,00	34.255.889,00

Note: * Department of Agriculture and Animal Husbandry (2020); **Adijaya and Yasa (2012).

Based on Table 4 it can be identified that the potential for beef cattle waste production in Deli Serdang is quite high, increasing each year with the increasing number of beef cattle available. 2019 is the highest year of beef cattle waste production in Deli Serdang Regency. The waste has the potential to be used as a source of raw materials for solid organic fertilizer (compost), liquid organic fertilizer (LOF) and biogas (Okoroafor *et al*. 2013).

the needs of forage feed of 75,234 beef cattle, or only an average of 80.57% of the entire existing beef cattle population in Indonesia. The production of beef cattle waste in Deli Serdang Regency is quite high in the form of faeces 506,388,605.82 kg/year, urine 202,283,007.30 l/year and feed residue 34,054,378.33 kg/year, potentially being used as a source of raw material for manufacturing solid organic fertilizer (compost), liquid organic fertilizer (LOF) and biogas.

CONCLUSIONS

Based on the previous description it can be concluded that in Deli Serdang District there are corn farmers, consisting of landowners and sharecroppers, beef cattle breeders/households consist of commercial and traditional breeders. Maize/corn varieties planted include Hybrid and Composite varieties. The beef cattle breed is Limousin, Angus, Brahman, Ongole and Simental. The harvested corn crop area of 20,657.33 hectares can meet

SUGGESTION

Ensuring the availability of forage for beef cattle feed in Deli Serdang Regency, it is necessary to realize the target of corn planting area accompanied by the improvement of the cultivation of the same and simultaneous corn plants each year. The integration of corn cultivation and cattle farming has the potential to provide

various benefits, both economic, social and environmental benefits.

ACKNOWLEDGEMENT

REFERENCES

Adijaya IN dan Yasa IMR. 2012. Hubungan Konsumsi Pakan dengan Potensi Limbah pada Sapi Bali untuk Pupuk Organik Padat dan Cair (Relationship Of Feed Consumption With Waste Potential In Bali Cow For Solid Organic Fertilizer And Liquid). Bali (ID): Balai Pengkajian Teknologi Pertanian. Pages 7.

Ardina IWK, Widodo Y, dan Liman. 2015. Potensi pakan hasil limbah jagung (*Zea mays* L) di desa Braja Harjosari Selebah Kabupaten Lampung Timur (Feed potential of waste corn (Zea mays L.) in th Braja Harjosari village Braja Selebah subdistric East Lampung). *Jurnal Ilmiah Peternakan Terpadu* Vol 3(3):170-174

Department of Agriculture and Animal Husbandry. 2020. Luas panen jagung dan populasi sapi menurut kecamatan di Kabupaten Deli Serdang tahun 2019 (Corn harvested area and cattle population by subdistrict in Deli Serdang Regency in 2019). Laporan Kerja Dinas Pertanian dan Peternakan Kabupaten Deli Serdang. Lubuk Pakam (ID): Kabupaten Deli Serdang

Elly FH, Waleleng POV, Lumenta IDR, Oroh FNS. 2013. Introduksi hijauan makanan ternak sapi di Minahasa Selatan (Green introduction of cow food in South Minahasa). *Jurnal Pastura* Vol. 3(1):5-8.

Faesal. 2013. Pengolahan limbah tanaman jagung untuk pakan ternak sapi potong (Processing of corn crops waste for beef cattel feed). Seminar Nasional Inovasi Teknologi Pertanian. Jakarta (ID): Balai Penelitian Tanaman Serealia. Pages: 181-190

Heuze V, Tran G, Edouard N, Lebas F. 2017. *Maize stover*. A programme by INRA, CIRAD, AFZ and FAO. Https://www.feedipedia.org/node/16 072 [Internet]. Accessed on 2019/Nov/10.

Ilato R, dan Bahua MI. 2014. Analisis rantai nilai komoditas jagung serta strategi peningkatan pendapatan petani jagung di provinsi Gorontalo (Analysis of the maize commodity value chain and strategies to increase the income of maize farmers in Gorontalo province). [Laporan Tahunan ke 2]. Penelitian Prioritas Nasional Masterplan Percepatan dan Perluasan Pembangunan EkonomiIndonesia 2011-2025. Gorontalo (ID): Universitas Negeri Gorontalo. Pages 109.

Langoy W, Kanunang C, Najoan M. 2012. Straw nutritional value of corn hybrid varietas bisi 2 and Manado yellow fermented with EM4. *Eugenia* Vol.18(1):49-57.

Lizotte PL, Savoi P, Lefsrud M, Alland G. 2015. Yield and moisture content of corn stover componen in Quebec, Canada. *Biosys.Engin*. Vol.56 (1): 81-89.

Okoroafor IB, Okelola Eo, Edeh O, Nemehute VC, Onu CN, Nwaneri TC and Chinaka GI. 2013. Effect of

organic manure on the growth and yield performance of maize in Ishiagu, Ebonyi State Nigeria. IOSR *Journal of Agriculture and Veterinary*. Vol.5(4):28-31.

Prawiradiputra B. 2011. Pasang Surut Penelitian dan Pengembangan Hijauan Pakan Ternak di Indonesia (Tides of Research and Development of Forage in Indonesia). Bogor (ID): Animal Research Institute

Reily M. 2018. Indonesia diprediksi masih kekurangan pasokan daging sapi tahun ini (Indonesia is predicted to have a shortage of beef supply this year). Https://kadata.co.id/berita/2018/02/19-indonesia-diprediksi-masih-kekurangan-pasokan-daging-sapi-di-2018 [Internet]. Accessed on 2018/Mar/25. Jakarta (ID): Directorate General of Animal Husbandry and Health.

Sahuri. 2017. Pengembangan tanaman jagung (*Zea mays* L.) di antara tanaman karet belum menghasilkan (Corn (*Zea mays* L.) farming inside the juvenile rubber plantation). *Analisis Kebijakan Pertanian* Vol. 15(2):113-126. Doi:http://dx.doi.org/ 10.21082/akp.v15n2.2017.113-126

Statistics Indonesia. 2017. Luas panen jagung menurut provinsi (ha) tahun 1993-2015 (Corn harvested area by province (ha) 1993-2015). Https://www.bps.go.id/linktabledinamis/view/id/867 [Internet]. Accessed on 2017/Feb/20. Medan (ID): Statistics Indonesia – North Sumatera Province

Supriadi anda Murwati. 2009. Model penyediaan hijauan pakan ternak (HMT) melalui penanaman jagung pola rapat di lahan kering (The model of providing forage through planting corn in a dense pattern on dry land). [Proceedings]. Seminar Nasional Kebangkitan Peternakan. Semarang (ID):Universitas Diponegoro

Supriadi, Izhar L, Safitri OI. 2014. Potensi ketersediaan hijauan pakan dan limbah tanaman jagung manis di Provinsi Kepulauan Riau (Potential for availability of food from sweet corn waste in Riau islands province) [Proceedings]. The 40th National Seminar on Agricultural Research and Development Aniversary and the 20th BPTP of South Sumatra on September 16, 2014. Palembang (ID).

Taufiq MN, Dewi C, Mahmudy. 2017. Optimasi komposisi pakan untuk penggemukan sapi potong menggunakan algoritma genetik (Optimization of feed composition for fattening beef cattel using genetic algorithms). *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer* Vol.1(7):571-582