THE ADAPTATION OF LOCAL BEEF CATTLE ON DIFFERENT LOCAL FEED RESOURCES

Tiesnamurti B, Widiawati Y, and Shiddieqy, I.
Indonesian Centre for Animal Research and Development, Bogor Indonesia
Jl. Padjadjaran Kav E 59 Bogor West Java Indonesia
e-mail: besstiesnamurti@yahoo.com

ABSTRACT

Livestock products demand is expected to be increased following the increasing in global population. On the other hand, climate change threats livestock production through the temperature, water availability, forage and feed crop quality and quantity, and diseases. All of these have negative impact on livestock reproduction and production. Livestocks also give contribution to greenhouse gases (GHG) as one of factors causes climate change. Thus two strategies, adaptation and mitigation, have to be linked to each other to maintain livestock productivity. Breeds resulted from selection or crossing has to be adjusted to adapt and face higher temperature, low quality feed and new diseases. Indonesia has various of breed for local cattle, sheep, goat and poultry. Local breeds and some new breeds resulted from crossing between local and imported livestock proven can adapt to low quality feed and resist to some new diseases. Bali cattle still gain their body weight when fed low quality feed, compared to Brahman cross. Ongole cattle also produce low methane gas per unit production compared to imported cattle when fed low quality feed. Sheep cross breed has better resistance to new disease in high temperature compared to the origin breed. Bali cattle grazed under palm oil plantation, where the forage available mostly low in quality, can give birth every year, while imported cattle cannot get oestrus again after partus, or must be flushed with high quality feed to get an oestrus. Mitigation actions, by using local sources such as herbs and leguminous leaves have been implemented and reduce methane production in the rumen. In conclusion that, some local breed or cross breed have better adaptability to the effect of climate change, local feeds also potential in reducing methane emitted from livestock.

Keywords: Local breed, adaptation, climate change, mitigation, greenhouse gases

INTRODUCTION

Indonesia is a South-East Asia's largest country (and the world's fourth most populous) has seen a major boom in demand for livestock products such as red meat, milk and eggs. It has fast growing economy, large population and rising middle class, resulting in increasing on demand for livestock products. Therefore continue a representing huge business opportunities across the livestock supply chain, from cattle farming, animal health, feed and nutrition to genetics and breeding (BPKM, 2015).

According to Waldron et al (2015), cattle play an important role in small-holder livelihoods, especially as a source of “savings” and cash income, and secondarily in some areas for cultural purposes and consumption in festivals. Partly because of their role in rural development (and political constituencies), government has sought to stimulate the production sector through a large range of mechanisms (from breeding to cattle distribution to import constraints). In 2014, livestock and its products represented 13% (US$4.5bn) of the overall agriculture GDP, an increase of 0.6 percentage point in 5 years (Fig.1). This increase has been allowed by an annual average growth of 4.6%, higher than the overall agriculture sector growth over the same period, which was 3.5% (BKPM, 2015). The production volume of beef cattle in Indonesia is still far from meeting the consumers' needs. Indonesia has a fast growing middle class demand for beef, of which only one third is supplied domestically.
### BEEF CATTLE AND LOCAL FEEDS

Feeder cattle production systems and cow-calf are not cost-competitive with more extensive systems overseas (especially Australian northern systems), which is highly complementary to the plantation-based fattening systems in northern Indonesia (Waldron et al, 2015). Indonesia has a large import sector, although policy settings have a large bearing on trade flows. Large numbers of producers and consumers are linked through low-cost, rudimentary and largely efficient domestic cattle marketing and processing systems (Waldron et al, 2015).

ICRA (2012) stated animal feed industry has an important role in supporting the animal husbandry industry (including poultry) to provide meat and meat products for the community as an additional source of protein. Feed accounts for around 70% of total cost of livestock production, quite a significant number showing its critical role. Judging from the level of production, animal feed industry has recorded an average annual growth rate of 11% in the last five years (Fig.2).

Indonesia currently still imports more than 30-35% of corn required by animal feed industry. For soybean, the import level is 100%. In 2005, the country only imported about 0.4 million tons of corn and the number grew to 1.7 million tons in 2011. Similarly for soybean, it imported 1.9 million tons in 2005 and 2.5 million tons in 2011. Apparently, the domestic corn and soybean producers have never been able to provide continuous supply of the materials to the animal feed companies (ICRA, 2012). Approximately 85% of the animal feed cost is attributed to raw material cost, and corn alone contributes 50-55% of it, then followed by soybean meal, meat bone meal (MBM) and poultry meat meal (PMM) (Fig. 3).

Those feed materials are expensive for the smallholder farmer. Hence the farmer is dependent on local feed source as main feed for their animals (Djajanegara, 1999). In the subsistence traditional systems, feed for animals is not a particular activity and it is the ability of the farmer to obtain feed that determines the amount of feed available. This has limited the number of farm animals raised by farmers who do not follow any feeding standards. Farmers are more often concerned with keeping the animals alive since they provide a source of income through the selling of the animals. According to Djajanegara (1999), the amount of feed offered does not take into account efficiency measures and depends heavily upon the available forage that grows naturally in the surrounding areas. Feed collected from surrounding areas is not of a guaranteed quality nor is continuity of supply guaranteed. Forage production for ruminant animals is not a common practice due to limitations in land ownership.

Research and experience show that mixed crop-livestock or palm oil-livestock farming is profitable. Livestock complement other farm activities and the interaction between farm animals and farmland can improve soil fertility. Research shows that manure can be an alternative to lime for reclamation of acid farm land (Soetirto and Erwin, 2013). In food crop producing areas, fibrous agricultural residues have become the main feed source for ruminant animals. Materials that can be fed to animals are already used and this is particularly apparent in densely populated areas with high stocking rates like Java. If materials are not fed to animals this is generally due to the distance between the supply area and where the animals are raised (Djadjanegara, 1999).

Straw contributes 60 per cent of available residues, while sugar cane top, bagasse and maize products contribute less than 10 per cent. Sugar cane tops are fed to animals while the bagasse is normally used as fuel in the sugar mill. Only at the time of the sugar cane harvest are animals fed on sugar cane tops, since this is when farmers and plantation workers around the sugarcane plantations have access to the cane tops. Once these are taken from the field these are offered to the animals after the rinds have been removed (Djajanegara, 1999). Nowadays, palm oil plantation and industry become a potential feed source for beef cattle, with the 11.4 million hectare area of palm oil plantation. For efficiency production, beef cattle must be maintained in extensive system.

### ENVIRONMENTAL CONCERN

Environmental concerns and population awareness, which are support a sustainably and bio-livestock industry are increasing. Energy becomes government’s priority because Indonesia depends mostly on fossil fuel (about 70%). The Government of Indonesia committed to reduce the emission up to 26% by 2020. The large Indonesian cattle population represents a significant source of manure which can be used for biogas production (BKPM, 2015).
According to Global Methane Initiative (2015), livestock manure management contributed more than 237 million metric tons of carbon dioxide equivalent (MMTCO2e) of global methane emissions in 2010, which is approximately 4% of total anthropogenic (human-induced) methane emissions. Three groups of animals account for more than 80% of total emissions: swine (40%), non-dairy cattle (20%), and dairy cattle (20%). In some countries, poultry was also a significant source of methane emissions.

Agricultural sector also would suffering from climate change both as victim and vulnerable, although it also acts as contributor to climate change and Green House Gases (GHG). Total emission from livestock in Indonesia is only 0.212% of total emission in global, or 1.275% of total emission from global livestock. Although the contribution of methane from livestock is very small, increasing livestock population in Indonesia might increase methane significantly. Moreover, ruminant animals in Indonesia most depend on fibrous feeds rather than concentrate or grain feeds. These fibrous feeds mostly come from agricultural by-product, which are low quality due to high in fibre and lignin contents. These type of feed produce more methane during the digestibility in the rumen. However, some technologies might be applied to reduce the increasing in methane emission from livestock. Increasing in the population of beef cattle in supporting beef self-sufficient program would increase the total methane emission from livestock (Haryono, 2011).

Feed supplementation is aimed to increase the nutrients and quality of the diet thus increase feed digestibility. Methane emitted during feed fermentation in the rumen is influenced by the digestibility of the feed. Higher digested feed lower methane producer in the rumen. Feed that can be used as feed supplement are high protein source feed such as leguminous leaves, cassava leaves and concentrate. Concentrate might be made from industrial by-product such as palm kernel cake, rice hulls, tofu industry waste, soybean meal, soy-sauce industry waste. These types of high quality feeds are supplemented into low quality basal feed such as grass, fiber sources from plantation and agricultural by product such as rice straw, corn leaves (Haryono, 2011).

LOCAL BEEF CATTLE ADAPTATION

Indonesia has many local breeds of beef cattle, such as Bali cattle, Madura cattle, Pesisir cattle, Donggala cattle, etc. Indonesia also maintain a crossbrees of beef cattle such as ongole breed cattle, which is domesticated and spread through many Indonesia’s provinces. These cattle mostly well adapted to the climate changes as well as local feed source. Bali cattle maintained in extensive system under palm oil plantation can give birth every year. These cattle just fed by forages grown around the palm oil plant. While Brahman and Limousine Cross breed cattle required addition of feed supplement to allow them oestrus after partum. In intensive system, local beef cattle such as Ongole cross breed produce less methane (9.5) when they fed low quality feed compared to those Limousin (10.5) (Table 1) (Purnmoadi et al., 2009). This indicated that local breed more adaptive to local feed as well as more environmental friendly than those imported beef cattle. These have two implications, namely that local breed cattle will have higher productivity when it is fed by local feed (low quality feed) than that of imported beef cattle; other implication is local breed less contribute to green house gasses emission.

One research on the utilization of palm oil leaves by some different breeds of beef cattle indicated that, local Indonesian beef cattle, Bali cattle, has better response on live weight gain and less methane production from enteric fermentation compared to ongole cattle and ongole cross breed cattle (Table 2) (Yulistiani et al., 2014). When Bali cattle fed by palm oil leaves, it can grow 586 gram/day compared to that ongole cross breed (307 gram/day) and imported cross breed cattle (298 gram/day). The local breed also more effective in feed utilization as shown by low feed conversion ratio (FCR). The Bali cattle only require 6.96 gram palm oil leaves to gain 1 gram of body weight, while ongole crossbreed required more dry matter (10.47 gram palm oil leaves/1 gram of body weight gain). While the imported beef cattle required about 8.26 gram palm oil leaves for every 1 gram of weight gain.

CONCLUSION

It can be concluded that Indonesia has local beef cattle, which is more adaptive to local feed sources such as crop and palm oil plantation by-products. These adaptability are shown by higher daily gain, less methane emmision and high feed efficiency as shown by low feed conversion ratio.
REFERENCES

Djajanegara, Andi. 1999. Local Livestock Feed Resources. Livestock Industries of Indonesia Prior to the Asian Financial Crisis. FAO


Indonesia Investment Coordinating Board. 2015. Investing in Indonesia’s Livestock sector An overview of opportunities, capabilities and provisions.


Table 1. Different breed cattle response on similar feed of crop by product

<table>
<thead>
<tr>
<th>Beef cattle</th>
<th>Feed Conversion ratio (Kg/day)</th>
<th>Body weight (kg)</th>
<th>Dry matter intake (kg)</th>
<th>Crude protein (%)</th>
<th>Gross Energy intake (MJ/day)</th>
<th>Methane conversion Ratio</th>
<th>Average Daily gain (kg/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ongole Cross Breed</td>
<td>10.8</td>
<td>108</td>
<td>2.66</td>
<td>15.2</td>
<td>50.4</td>
<td>9.5</td>
<td>0.24</td>
</tr>
<tr>
<td>Limousine</td>
<td>7.2</td>
<td>113</td>
<td>3.20</td>
<td>15.2</td>
<td>61.1</td>
<td>10.5</td>
<td>0.47</td>
</tr>
</tbody>
</table>

Source: Purnomoadi et al., (2009)

Table 2. The response of different Breed cattle on difference feed type of grass and palm oil leaves.

<table>
<thead>
<tr>
<th>Feed type</th>
<th>Breed of cattle</th>
<th>Dry matter digestibility (%)</th>
<th>Average daily Gain (gram)</th>
<th>Dry matter intake (gram)</th>
<th>Feed Conversion ratio (gr DM/gr ADG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grass</td>
<td>Bali cattle</td>
<td>65.37</td>
<td>414</td>
<td>2795</td>
<td>6.77</td>
</tr>
<tr>
<td></td>
<td>Ongole cross breed</td>
<td>62.05</td>
<td>334</td>
<td>2267</td>
<td>7.84</td>
</tr>
<tr>
<td></td>
<td>imported Cross breed</td>
<td>68.53</td>
<td>416</td>
<td>2772</td>
<td>8.43</td>
</tr>
<tr>
<td>Palm oil leaves</td>
<td>Bali cattle</td>
<td>58.67</td>
<td>386</td>
<td>2581</td>
<td>6.96</td>
</tr>
<tr>
<td></td>
<td>Ongole cross breed</td>
<td>62.52</td>
<td>307</td>
<td>2743</td>
<td>10.47</td>
</tr>
<tr>
<td></td>
<td>Imported Cross breed</td>
<td>63.14</td>
<td>298</td>
<td>2389</td>
<td>8.26</td>
</tr>
</tbody>
</table>

Yulistiani et al., 2014

Source: BPS (Indonesia bureau of statistics)
* Preliminary figures
** Very preliminary figures

Fig. 1. Livestok and its products’ contribution to real GDP base year 2000 (Rp. Billions)
Fig. 2. Indonesia’s beef meat production (in thousands metric tonnes)

Fig. 3. Animal Feed Raw Material Consumption 2010. Source: Association of Animal Feed Producers (GPMT)