Palm Oil and Beef Cattle Integration System: A Strategy To Accelerate Beef Production in Indonesia

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Introduction

Indonesia is now experiencing a bonus demographic population characterized by a growing middle class. This phenomenon has caused increasing demand for beef, where more than 98% of beef cattle production is managed by smallholder farmers. The national policy has been focused on achieving beef self sufficiency, though it is not an easy task for the government to accomplish that target. Nevertheless, Java Island where most of the beef cattle have been raised, is now facing very limited land resources. This may cause shortage of cattle feed, especially during dry season. One of the national programs to increase cattle population is by integrating palm oil plantation with cattle production development. One of the policies being pursued by the government is to accelerate the implementation of crop-livestock integration systems. Supporting research outputs provided since 2003 in this field have been very valuable for the government to formulate policies related to or answering the question of whether or not Indonesia has options to increase red meat production from domestic resources.The system is expected to accelerate additional beef cattle and sheep population from currently kept under traditional cut-and-carry system to a larger herd size under an integrated system. The purpose of this paper is to describe the prospect of the integrated palm oil-beef cattle production system, technology development and policy framework.

Prospect of the cattle integration system

The concept of integrated crops and livestock production system in Asia and specifically in Indonesia, has been widely reviewed which mostly discussed an integration between annual crops (rice) and cattle to optimize the use of manure. The system has great potential to generate income, contribute to better crop production system and farmers' livelihood. Smallholder crop-animal production systems will continue to be predominant in Asia, along with intensification, growth and increased contribution of the system in the future. The system utilizes crop by products as feed for the cattle and in return, produce manure as organic fertilizer for the crops.

Since 2003, the Indonesian Agency for Agricultural Research and Development (IAARD) has initiated a research program on Integrated Palm Oil-Cattle Production System which currenty also include Integrated Palm Oil-Sheep Production System. It was estimated that in 2014, palm oil plantation covers an area of 11.3 million ha and grew at 7.25%/year during the period of 2004-2015 (Table 1). Indonesia is the largest palm oil producer in the world, and the second highest exporter of crude palm oil (CPO) after Malaysia. There are three different types of palm oil enterprises, namely: (i) smallholder farm managing less than 25 ha of land; (ii) state-owned enterprises, and (iii) private enterprise. Private enterprise shows the largest share, i.e. 52% (5.66 million ha), followed by smallholder farms of 41% (4.55 million ha) and state-own enterprises of 7% (0.75 million aa). Among private enterprise, there are 1.6% (0.17 ha) owned by of foreign companies.

Palm oil plantation has been spread out in 25 provinces of Indonesia, but mostly in Sumatera and Kalimantan with a total CPO production of 33.5 million tons and average productivity of 3.7 kg/ha/year in 2015. CPO's production has increased during the period of 2004-2015 by 11.09%/year due to a stable CPO price in the international market. More than 60% (2.4 million ha), of the palm oil planted area and production was located in Riau province (Sumatera island), followed by North Sumatera and South Sumatera.

Table 1. Planted area of palm oil plantation based on type of enterprise (000 ha)

Year	Type of enterprises			Total	Growth rate (%)
	Smallholder	State-owned	Private		
2004	2 220.3	605.9	2 458.5	5 284.7	
2005	2 356.9	529.9	2 567.1	5 453.8	3.20
2006	2 549.6	687.4	3 357.9	6 594.9	20.92
2007	2 752.2	606.2	3 408.4	6 766.8	2.61
2008	2 881.9	603.0	3 879.0	7 363.8	8.82
2009	3 061.4	630.5	4 181.4	7 873.3	6.92
2010	3 387.3	631.5	4 366.6	8 385.4	6.50
2011	3 752.5	678.4	4 562.0	8 992.8	7.24
2012	4 137.6	683.2	4 751.9	9 572.7	6.45
2013	4 356.1	727.8	5 381.2	10 465.0	9.32
2014	4 422.4	729.0	5 603.4	10 754.8	2.77
2015	4 575.1	750.2	5 975.1	11 300.4	5.07

Source: DGEC (2015)

Increasing trends of palm oil production in the future indicates the availability of biomass under plantation and by-products of its processing industries. Furthermore, the biomass and by products can be used as feed for ruminants production. Ministerial Decree No. 105/2014 on Integrated Oil palm Plantation with Beef Cattle Production encourages farmers and private sectors to raise cattle under the mature palm oil plantation, or at least after five years of planting. Currently 75% of the palm oil plantation is in its mature stage. The area of immature plantation is also potential as source of biomass.

By-products of palm oil plantation could be divided into its sources, i.e. from the plantation areas and from processing factory that produces CPO. By-products of plantation includes leaves and palm fronds besides natural vegetation that easily grow under plantation, such as legumes and natural grasses. Processing factory produces CPO and palm kernel oil (PKO). Some potential by-products from this processing plants that can be used as ruminant feeds are palm press fiber, oil palm sludge and palm kernel cake (PKC). Natural vegetation under plantation is varied depending on the cropping pattern, such as row spacing that may influence intensity of sunshine. The lower intensity of sunshine, the less vegetation grow under plantation due to low photosynthesis. If planted as monoculture, natural vegetation produced 2.800-4.800 dry matter/ha/year.

Oil palm fronds could be used as alternative green feeds for ruminants on maintenance feeds. Palm fronds could be fed as it was or chopped without affected to rate of cattle consumption. Each tree produces 22 palm fronds/year with its weight of 7 kg/plant that is estimated equally to 20 tons fresh palm fronds per year. Each palm frond yields 0.5 kg of leaves or equal to dry matter of 658 kg/ha/year. Based on this estimation, each hectare of oil palm provides 5,872 kg green feed resources. Assumed that only 40% of this feed resources could be fed to one animal unit (AU) of beef cattle (body weight of 250 kg), the availabe feeds may supply around 2 AU per year. Assuming that only 50% palm fronds could be used as feed resources, per hectare of oil palm may accommodate one AU per year of its green biomass from the plantation. PKC as by-products from processing palm oil plantation is very much potential as protein sources of feed with its biological value of around 61-80%. Protein quality of PKC is relatively high, but unfortunately its palatability is considered low, which sometimes still need molasses as supplement.

Innovation on integrated oil palm-cattle production systems

Ruminants farming to produce calves are long period business with relatively high risks and low profit margin. To be more competitive, feed cost need to be minimized, which can be done through horizontal or vertical integration between oil palm plantation and ruminants. Technology application to modify biomass and by-products of oil plantation for ruminants feeds is already available.

Technology innovation to impelement the integrated system is available widely in order to achieve production efficiency for both palm oil and ruminant's production. Feed technology to optimize the use of oil palm leaves and fronds along with its factory by-products as ruminants feeds has been introduced to some oil palm enterprises with a prospective and promising results. The use of organic fertilizers from ruminants manure may enhance oil palm fruits by 0.36-1.03 kg/tree and reduce the cost of fertilizer by roughly 10% . Another

study by Slade (2014) has reported that grazing cattle in the oil palm area may help to restore ecosystem functioning, and provide a positive impact on soil hydrological properties and fertility.

There are three types of cattle production that are integrated with oil palm plantation, i.e. extensive, semi-intensive and intensive systems. These three types of production systems could be implemented by palm oil enterprises with more than 25 ha, while that for less than 25 ha does not allowed for extensive system. Cattle production under the extensive system may be raised through a controlled grazing all day long in the oil palm plantation. This system can be carried out by rotational grazing every day with a minimum of 60-day lag to be in the same area. This will allow grasses and other legumes to be recovered under oil palm trees. The extensive system within 30 ha of mature oil palm plantation with around 500 cows by daily rotational grazing has shown feed availability under natural vegetation and its biomass to gain 0.7 kg/head/day growth rate.

Extensive and semi-intensive systems mostly practice cow-calf operation, while that of intensive system operates for cattle fattening production. There needs to be a guarantee that raising cattle under extensive and semi-intensive systems have to have enough feeds and should not destroy oil palm trees as the main core business. Semi-intensive systems need to have additional supply of feeds when cattle are in the barn, they generally graze during the day, from morning to afternoon and will be back in the barn at night. While that of the intensive system, the cattle would be in the barn all day long and intensively get feeding from cut-and-carry system. This system has been mostly carried out for fattening operation with more and high input from external sources.

Empirical studies have shown that under an intensive systems for fattening operations, growth rate of Bali cattle has reached the range of 0.1-0.9 kg/day/head depending on body condition when they arrive. Meanwhile, Ongole Cross cattle reached additional body weight in the range of 0.1-1.2 kg/day/head. Palm leaves with its fronds combined with PKC and solid decanter had yield average daily gain of 0.6 kg/day/head for Bali cattle under an intensive system. This implies that assessment on feed ration need to be adjusted by its resources that are available locally to reduce outside input costs. Recently, some group of farmers organized into village cooperation units where they operate cattle as their secondary job, and also produce complete feeds and sell their products outside of the group. This has happened in Kotawaringin Barat in Central Kalimantan and Pelalawan in Riau Province, places that are considered as successful farmers' group on integrated oil-palm and cattle production system.

It has been proved that the concept of integrated palm oil and ruminants could be implemented since it is technically accepted. Developing this integration system has an opportunity to fulfill the national beef demand that has been predicted to increase markedly in the coming years. The potential area of Sumatera, Kalimantan, and Papua that currently do not have many cattle should be put as priority program to enhance cattle population in the country. Nevertheless, integrated oil-palm and ruminant application can also be used as supportive factor on vegetative conservation technique and soil organic matter management. Cattle has a potential positive value as source of organic fertilizer and bio-urine that could be very useful for oil palm plantation, besides it could be used as an alternative energy for bio-gas for smallholder household needs. One adult cattle may produce organic compost of 4-5 kg per day.

Challenges and policies to support an integrated palm oil-beef cattle production systems

The progress on implementation of the integrated palm oil–beef cattle is a bit slow. Started in 2003, a private enterprise in Bengkulu has pioneered this model with around 3000 Bali cows under a nucleus estate model involving plantation workers. A semi intensive system has been practiced with the main goal to help workers in transporting the palm fruits from the remote area to the collection points along the road side. Two years later, private enterprises in Jambi and Riau have also introduced around 2000 Bali cattle under oil palm plantation under an intensive system for the the purpose of getting organic fertilizer. Started in 2007-2008, the Ministry of Agriculture (cq. DG of Estate Crops and DG of Livestock Services) has distributed around 2000 Bali cows to some groups of smallholder farmers, mostly in Sumatera and Kalimantan under an intensive system. In 2012-2013, palm oil enterprises in Central Kalimantan had started to introduce imported Brahman cattle around 3000 head under the extensive system. These initiatives are considered successfull to produce calves and do fattening. The DG of Livestock Services has continued to allocate local cattle to some groups of farmers. In 2015 an MoA has been signed to distribute at least 3800 heads to 12 provinces and around 12,000 imported Brahman cows are scheduled to arrive in 2016.

Compared to total planted area of palm oil, the number of cattles raised under the plantation are still very small. The challenges that could be identified include: (i) difficulties to get a sufficient number of local cattle in the country for massive development; (ii) palm oil enterprises consider that raising ruminants under plantation is a burden both from technical and economic sides; (iii) there is a common mitos that ruminants may cause certain diseases to oil palm,such as ganoderma, and create soil compaction due to cow stamping, and (iv) lack of infrastructure in the remote areas where oil palm plantations are located.

To meet the demand of local cattle for the purpose of integrated oil palm plantation, MoA has launched a program to prohibit productive cows from being slaughtered. It is estimated that around 200,000 productive cows have been slaughtered recently, especially in the eastern island of Indonesia. A program is now being implemented to transfer productive cows from the eastern areas with low carrying capacity to the western areas of oil palm plantation where abundant biomass are available.

Implementation of cattle integrated system should be carried out by plantation workers or staff who are willing to raise cattle. Under private enterprises, this could be managed through partnership with beef cattle enterprises. Government program on cows distribution to smallholders has to follow regulation of local livestock and estate crop services in order to synergize their owned land to minimize social conflicts. Farmers who received cattle aid from the government program has to have their owned oil palm plantation. This will also allow farmers to plant other green forages as feed supplement for cattle. The integrated system has to minimize external input to avoid high feed cost and enhance competitiveness.

To accelerate the development of integrated oil palm and ruminant production, some regulation and policies support have been introduced. These include: (i) Plantation Act No.39/2014 Article 44(1) and 44(3); (ii) Agriculture Ministry Regulation No.98/2013 Article 32-35; (iii) Agriculture Ministry Regulation No.105/2015; and (iv) Agriculture Ministry Decree No.43/2015. In addition, development of the program needs to be gathered into one mission across many institutions from the planning state until action plan. Coordination and synergism across institutions are very crucial to implement. Policies issues that may influence interest of the private sector to implement the integrated programs are import tax of heifer, easiness in getting business license, synergy of regulation between central and provincial government, subsidy on interest rate, and infrastructure investment in the remote area where oil palm plantation are mostly located.

Government needs to facilitate capacity building of human resources, where most of the oil palm farmers are not familiar with raising ruminants. Intensive technical guidance should be carried out in order to achieve the same vision and understanding between oil palm and the ruminant sub-sector. Availability of feeds is the primary factor that has to be understood by farmers, and in the first stage, local cattle is more appropriate for the beginners. Visit to some other successfull farmers should be encouraged to promote enthusiasm and motivation of beginner farmers.

Conclusion

Accelerated domestic demand for beef has motivated the government of Indonesia to pursue self-sufficiency on beef production. However, this policy has been constrained by limited land resources to pursue an efficient, extensive beef production system. Limited availability of local cattle breed makes the problem even more complex. Responding to these problems, implementing a palm oil-beef cattle integration system is considered as an appropriate strategy. The available palm oil plantation provides potential source of biomass and grazing ground for cattle. In return, palm oil production also gets benefit from manure supplied by the cattle. In short, the system is both considered technically and economically feasible and sustainable production system. To accelerate implementation of this system, some government policies are needed on areas such as land allocation, ease of doing business, investments on logistic infrastructures, and trade policy on imported cattle breed.

References

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Date submitted: Jan. 10, 2017
Reviewed, edited and uploaded: Jan.10, 2017