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Changes in Bali cattle production systems in Sumbawa, Eastern Indonesia and the implications on feed supply systems

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Introduction

About 70% of beef in Indonesia is produced domestically. One of the production centers is Sumbawa Island of West Nusa Tenggara province. Sumbawa Island was declared a center for Bali cattle purification for Indonesia in 1976 and a Livestock District in 2005 to strengthen this region as a major producer of beef. However, the development of beef cattle in Sumbawa has faced many constraints due to limited feed resources (Dilaga, 2014).

Traditionally, cattle in Sumbawa have been raised by an extensive system in communal land during the wet season while cropping lands have been used to plant food crops. In the dry season, after crop harvesting, the cropping lands, including rice fields, are open for free grazing of livestock. This system has been a very efficient way of producing beef that enables the region to supply beef to other areas of Indonesia at competitive prices.

Recently, the communal areas have been declining in size and carrying capacity due to overgrazing, which has stimulated invasions by weeds (Sutaryono et al., 2012). Rice fields cannot be utilized optimally for livestock grazing due to crop intensification and diversification. These changes have been stimulating farmers to allocate their private lands for cattle production, especially in the wet season. This has implications on the cattle feed supply and feeding system. This paper discusses factors contributing to the change in the production system and its implication on systems of feed supply and cattle rearing.

Materials and methods

To obtain information on changes due to declining availability of communal grazing area, in-depth interviews were conducted with key farmers in the Empang and Tarano subdistricts, who migrate their cattle to a nearby small island during crop planting season. In-depth interviews were also conducted with key farmers in the Moyo Hulu subdistrict, who experienced changes in the production system due to the development of large dam named Batu Bulan Dam. To identify drivers for the shift into more intensive cattle production, a survey was conducted involving 35 farmers in the Sumbawa and West Sumbawa districts who have been raising cattle by extensive system (free grazing on communal lands), but have recently changed their cattle raising system to a more controlled system by planting leucaena on their own land, or utilizing wild leucaena and other tree legumes.

Results and discussion

Declining availability of communal grazing land

There are 60 sites (27,783 ha) of communal grazing areas in Sumbawa Districts, but only 5 of them have clear legitimation (with government decree) for livestock grazing (Dinas Peternakan Sumbawa, 2012). Many of these areas are under land conflict between crop farmers and cattle farmers. Some have been converted into cropping land, fish ponds and used for transmigration. Sutaryono et al (2012) reported that communal grazing areas in Sumbawa are heavily invaded by weeds especially *Chromola odorata*, *Lantana camara*, *Ziziphus jujuba* and *Jatropha sp.* As a result, the carrying capacity has significantly declined.

Based on in-depth interview with key farmers, due to declined availability and carrying capacity of communal grazing area in the Empang and Tarano subdistricts, local farmers migrate their cattle to a nearby island when cropping lands are cultivated (December - May). However, this does not completely solve the problem because this island is now also overgrazed and livestock are susceptible to theft.

Intensification of cropping land

The best example of change in land use in Sumbawa Island is the development of a large dam in Batu Bulan village (Moyo Hulu sub district of Sumbawa). According to key farmers in Batu Bulan, this Batu Bulan dam was

established in 2002, providing irrigation for about 5,000 ha of rice field in the region. As described in Table 1, establishment of this dam has dramatically altered cattle production system in the surrounding area.

Table 1. Change in land use due to establishment of large dam (case study of Moyo Hulu sub district of Sumbawa)

Variable	Before the dam	After the dam
Land use	1 rice season (Dec-May) then fallow (for grazing)	Crops all year round
Type of livestock	Mainly buffalo	Mainly cattle
Buffalo/cattle ownership	Many farmers have more than 50 per household	max 15 heads/household
Buffalo/cattle rearing system	In the forest during wet season (December – May), in the rice field in dry season (May – December)	Cows and calves on private land, small-scale fattening of bulls in pens

Drivers of change in the cattle production system

Based on interviews with farmers who have changed their cattle raising system to a cut- and-carry system, farmers confirm that this change is mainly due to declining availability of grazing areas driven by changes in land use. Other factors that contributed to these changes include improved farmer knowledge on cattle fattening, availability of suitable land to plant forages and increased cattle price.

Improved knowledge on cattle fattening system

All respondents interviewed have been involved in an Australian Centre for International Agricultural Research (ACIAR) - funded project on cattle fattening based on tree legumes since 2011, so they have improved knowledge on cattle fattening, especially regarding the value of using leucaena to increase cattle growth rate.

There were 31 of 33 respondents interviewed (94%) stated that they experience lack of feeds during September to December each year. To overcome this feed scarcity, farmers are willing to travel up to 5 km away from home using a motor bike to collect tree legumes (mostly wild leucaena), a practice they never did before.

Table 2. Number of respondents feeding forages as 1st, 2nd and 3rd preference for cattle fattening in Sumbawa and West Sumbawa districts

Forages	1 st preference	2 nd preference	3 rd preference	Total
Leucaena	28	2	2	32
Grass	5	9	10	24
Gliricidia		15	8	23
King grass		1	1	2
Sesbania grandiflora			1	1
Rice straw		1	1	2
Corn stover		1	3	4
Rice bran		1	1	2

Limited availability of wild leucaena stimulated farmers to plant leucaena on their own land. 32 of 33 (97%) respondents interviewed planted leucaena on their own land. 69% of respondents plant leucaena on non-irrigated low land, 28% respondents plant leucaena on irrigated low land and 3% respondents planted leucaena on other lands.

Availability of private lands for planting forages

Table 3 shows that respondents who adopt cattle fattening and plant forages have land that is more suitable for

planting tree legumes. These lands include unirrigated low land and highlands

Table 3. Land ownership and land use of farmers with intensive cattle production system

Type of land	No of respondents	Land area (ha)	Land use
Rice field, irrigated and rainfed	12	1.1	2 x rice, 1 x cash crop
Low land, no irrigation	29	3.2	cash crop (mainly corn) one crop a year, leucaena all year round
Up land	3	1.4	Leucaena all year round

Land ownership of farmers in Sumbawa is much larger than that of farmers in Lombok. Dahlanuddin *et al.* (2016) reported that only 60% of cattle farmers in Central Lombok have access to land, with average land ownership at 0.4 ha per household. Therefore, farmers in Sumbawa have much higher potential to feed a large number of cattle compared with their counterparts in densely populated islands like Lombok.

Increase in cattle price

Trends in cattle prices in Sumbawa and West Sumbawa districts are presented in Table 4 price of cattle (all class) increased in the last 2 years. The biggest increase occurred for mature males and females mainly due to increase in demand from other provinces, especially Kalimantan.

Table 4. Average increase of cattle price in Sumbawa in the last 2 years.

Cattle type	Two years ago (IDR)		2016 (IDR)	
	Male	Female	Male	Female
Calves	2,833,000	2,180,000	3,833,000	3,030,000
Young	4,145,000	3,368,000	5,495,000	4,405,000
Mature	6,163,000	4,943,000	9,117,000	7,566,000

Increase in cattle prices occurred throughout eastern Indonesia due to an increase in beef prices. Waldron *et al.* (2013) reported that beef prices in eastern Indonesia have been increasing steadily in the last 10 years. Male cattle are always more expensive than females, and that price increase is highest during festive periods such as *Idul Fitri* and *Idul Adha*.

Implications of the change on feed supply and feeding system

A consequence of the change in Sumbawa's cattle rearing system from semi-extensive to a more controlled system such as fattening cattle in pens is that farmers should produce forages on their own land. It has been identified that the most suitable high protein forage type to be developed for cattle feed in Sumbawa is *Leucaena leucocephala* (leucaena). Demonstration farms and farmer-to-farmer training activities were facilitated by an ACIAR-funded project. Subsequently, a project funded by the Applied Research and Innovation Systems in Agriculture project is now supporting the scale-out the use of leucaena for cattle fattening involving key market actors such as local government and a traders association.

The scale-out of this leucaena feeding system has been constrained by a) farmers' perception that they still have enough grazing area so they do not have to plant forages, b) lack of labor to do cut-and-carry, c) the mistaken notion of some farmers that it is safer to let cattle free grazing that putting them in pens and d) farmers find it difficult to securely fence planted leucaena from free-grazing animals (Kana Hau *et al.*, 2013).

Support from local government and private sector to overcome these barriers are required to scale out the leucaena feeding system in the dry areas of Sumbawa. Failure to improve farmer capacity to produce forages on

their own land will change cattle production system into unprofitable small-scale systems, resulting in high costs of production and making the production system less competitive.

Concluding remarks

Farmers in Sumbawa have started to change their cattle rearing system from semi-intensive system to cut-and-carry. This change has been driven by declining carrying capacity of communal grazing areas and availability of irrigation that drives intensive crop production. Other drivers of this shift include improved knowledge of farmers on good cattle fattening practices, availability of dry land suitable for planting leucaena, and increases in cattle price. These factors suggest that in order to remain competitive, farmers in Sumbawa should have the capacity to produce high-quality forages on their own land.

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KEYWORD : Bali cattle, intensive production systems, feed supply

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