

Climate Change Adaptation of Smallholder Livestock Farmers in West Nusa Tenggara Province Indonesia

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Ruminant livestock particularly cattle and buffalo play important roles to support livelihood of smallholder farmers in West Nusa Tenggara Province, Indonesia. The importance of livestock is now becoming more apparent because livestock, compared with crops, are less vulnerable to changes in climate conditions such as longer dry season, shift in wet season or long wet season. Research was carried out by field visits to selected locations in island of Lombok and Sumbawa to observe current situations and to discuss with farmers about the past and current conditions of the production systems. Data were also collected from relevant research reports and secondary data from relevant government offices. The research showed the different biophysical, demographic and socio-economical conditions of Lombok and Sumbawa result in a distinct livestock production system. In general, Sumbawa island still have some space for semi-extensive production system (free or controlled grazing), which is low cost but less productive, while in Lombok, where most of land areas are used for intensive crop production, livestock are raised under cut and carry system. Land available for extensive livestock production has been declining rapidly due to rapid increase in demands for food crops (area for food crop production expanded or crop production becoming more intensive) and land conversion from native pasture to plantation and other non agricultural purposes. In Sumbawa, many farmers have been poorly prepared to change from free grazing to cut and carry system, resulting in sudden decline in their livestock ownership. Under the cut and carry system farmers are constrained by limited availability of feed resources. In many areas, grasses are difficult to grow due to lack of moisture, so tree legumes (*Leucaena*, *Sesbania* and *Gliricidia*) are the most promising livestock feeds especially in dry areas as adaptation strategy to climate change. If farmers' capacity in responding to changes of the ecosystem and socio economic conditions do not improve, livestock population may decline in the near future, so adaptation strategies to climate change should therefore be developed.

Key Words: Ruminant livestock, Smallholder, Cut and carry, Tree legumes,
Climate change adaptation

INTRODUCTION

Ruminant livestock (cattle, buffalo, goats and sheep) play important roles to support livelihood of farmers in West Nusa Tenggara, which consist of two main island Lombok and Sumbawa. In both islands. The importance of livestock is now becoming more apparent because livestock, compared with crops, are less vulnerable to changes in climate conditions

such as longer dry season, shift in wet season or long wet season. However, the existence and productivity of ruminant livestock are also affected by changes in land use and socio-economical conditions.

This study was carried out to characterize the current conditions of livestock production systems in Lombok and Sumbawa. Focus of this study was to understand the current conditions, species distribution and richness within different ecological subregions, dynamics, drivers of changes and potential impacts likely to happen. Profiles of the current system will be very useful in understanding farmers ability to adapt to changes in land use, socio-economic and agro-climate condition.

METHODOLOGY

This survey was carried out by collecting secondary data from relevant government offices, relevant research reports and from expert opinions. Field visits were carried out to selected locations to observe current situations and to discuss with farmers about the past and current conditions of the production systems. Locations visited were within central Lombok and Sumbawa districts which respectively represent Lombok and Sumbawa islands. Farmer information was collected both by individual in-depth interviews and focused group discussions.

Data collected include a) population distribution of each species by district and population growth by species during the period of 1969 – 2010, b) changes in ecological conditions (native pasture production, carrying capacity, soil degradation, weed invasions etc) and c) farmers perceptions on the past and present conditions of the farming systems.

RESULTS AND DISCUSSION

Dynamics of livestock population and associated impact of climate change

In term of relative significance (Table 1), cattle and goats are the most dominant (and have high potential to be developed further) in west Sumbawa, Sumbawa, Dompu and Bima districts. Goats are significant in West Sumbawa, Dompu and Bima districts. Boffalo and sheep are not significant (LQ <1.0). It is clear that while population of cattle and goats are quite high in Lombok island, the potential for further development is constrained by limited availability of land.

District	Cattle	Buffalo	Goats	Sheep
West Lombok	0.62	0.07	0.30	0.02
Central Lombok	0.78	0.14	0.54	0.00
East Lombok	0.52	0.04	0.41	0.04
West Sumbawa	2.89	0.91	1.15	0.09
Sumbawa	2.62	0.90	0.64	0.02
Dompu	2.42	0.56	1.63	0.01
Bima	1.53	0.61	3.00	0.29
Kota Bima	0.89	0.26	1.03	0.03
Mataram	0.02	0.00	0.05	0.01

Table 1. Location quotient (LQ) of livestock in each district of NTB (LQ based on population per 1000 people).

In both Lombok and Sumbawa islands, cattle and goats are the two species that are much higher in number (greater importance) compared to buffalo and sheep (Figure 1). This can be seen as their different ability to cope with change in climatic and socio-economical conditions.

Livestock ownership per household is much lower than in the past when many farmers can raise hundreds of ruminants per household. This is related to the limited access to free grazing and reduced carrying capacity of the communal grazing area. Buffalo are the species that is affected most by reduced availability of wetland area because traditionally they have plenty of space for grazing and wallowing. Buffalo used to be an important ruminant species in south Lombok.

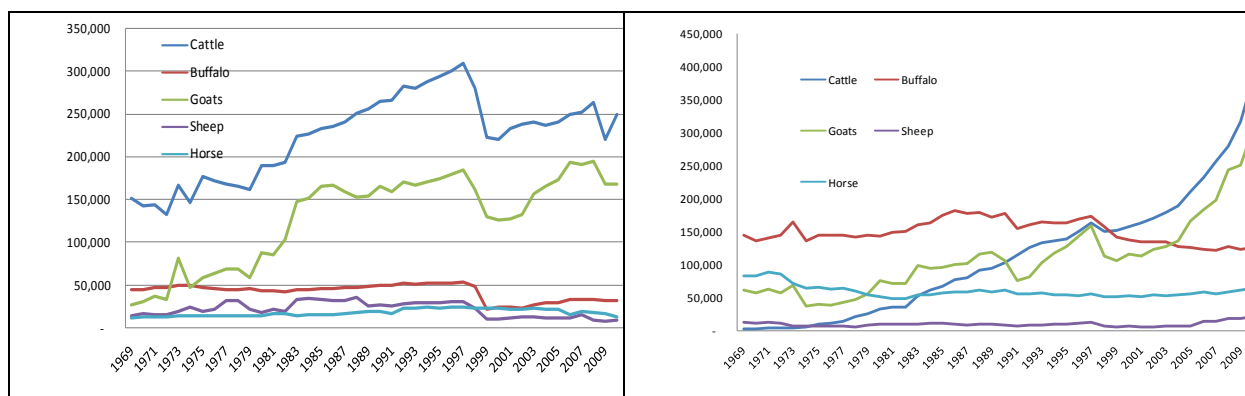


Figure 1. Livestock population in Lombok (left) and Sumbawa (right) (Dinas Peternakan dan Kesehatan Hewan NTB, 2010)

Farmers generally perceive that the dynamics in livestock population growth have been influenced by a) Government buy and redistribute mostly cattle and goats but not buffalo and sheep, b) market demand is much higher for cattle than buffalo, goats or sheep, c) reduced

area for wetland for free grazing so less preferable for buffalo that require wallowing and d) cattle and goats are more adaptable to changing climates

Adaptation to change in climate conditions

The most important implication of changes in climatic and socio-economical conditions in the reduction in size and carrying capacity of wet land used for free grazing. This is very apparent in Lombok, the smaller island with more people, but the trend is happening rapidly in the less populated island of Sumbawa.

Farmers in Lombok and Sumbawa have different adaptation strategies to change in climatic and socio-economical conditions. Most of productive lands in Lombok are used for crop production, so there is very small area for livestock. Land ownership is very small (about 0.3 Ha per household) and declines in size (especially in the irrigated areas). In central Lombok (Van wensveen et al, 2010), almost 40% cattle growers do not have access to land. The strategy to cope with this biophysical condition is to increase animal turn off rate while maintaining the herd size.

Collective housing is very common in Lombok. In this system, a group of livestock growers house their animals collectively in a common place (typically an area of 100 – 1000 m²) either all day or only at night. Feeding and managing the animals remain the responsibility of each farmers, but they collectively work to maintain security and sanitation (Dahlauddin et al, 2005).

In Sumbawa island, there is a growing trend to change from extensive system to more controlled system. The changes vary from simply utilizing parts of farmers land (mostly rain-fed rice field or dryland) to keep their livestock. This private area used to keep livestock ranges from 1 to 40 Ha. Livestock are kept in this area all year round and farmers collect feeds from outside to meet feed requirements. Typically, the area used for this purpose ranges from 1 Ha to 5 Ha. With this size of land, the carrying capacity will not be more than 10 adult cattle if they kept their animals in the area all time. Because they do not have enough feed resources their animals will be let out to graze in the surrounding areas after crop harvest.

The more advanced change is by housing the animals at night in pens and fed by cut and carry system. In this system, farmers have started to plant grasses or tree legumes so they can feed more animal per Ha of land. A farmer in west of Sumbawa district, for example, is able to keep 20 cattle in his 3.5 Ha dry land. Cattle feeding has been improved by 0.50 Ha planted king grass in alley cropping with *Sesbania grandiflora*, especially to be used when cropping land in surrounding areas are used for planting crops. After harvest, livestock are tethered around but still housed at night.

A more intensive system was found in Rhee sub district of Sumbawa where typical household with 2 Ha of planted *Leucaena leucocephala* and some *Gliricidia sepium* are able to fatten

more than 10 bulls at any time. This family also collect leucaena at roadsides by a small truck. This community evolved from typically fishermen to crop producers before decided to change to cattle growers.

IMPLICATIONS

Land available for extensive livestock production has been declining rapidly due to rapid increase in demands for food crops (area for food crop production expanded or crop production becoming more intensive) and land conversion from native pasture to plantation, fisheries or non agricultural purposes. Communal grazing areas are heavily overgrazed that dramatically reduces the carrying capacity of the native pastures (due to soil degradation and weed invasions). As a result, many farmers who used to have large herd or flock have been forced to reduce their livestock ownership.

Some farmers have evolved successfully into productive cut and carry system. However, many farmers have been poorly prepared to change from free grazing to cut and carry system, resulting in sudden decline in their livestock ownership. Under the cut and carry system farmers are constrained by limited availability of feed resources. In many areas, grasses are difficult to grow due to lack of moisture, so tree legumes (*Leucaena*, *Sesbania* and *Gliricidia*) are the most promising livestock feeds especially in dry areas.

If farmers' capacity in responding to changes of the ecosystem and socio economic conditions do not improve, livestock population may decline in the near future. Adaptation strategies should therefore be developed by adopting best-bet options from relevant research activities, empirical experience from similar conditions and utilizing the local wisdoms.

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