

# Improving Livelihood of Smallholder Farmer Through Cattle Fattening Based on Forage Tree Legume in the Arid Sumbawa

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**Abstract.** Majority of people in the arid Sumbawa rely on agriculture and mostly practicing integrated farming with maize and cattle being the most common crop and livestock enterprise. While cattle productivity has been low, profit margin from crops is substantial, making large number of people live just on the poverty line. A research for development project promoted the utilization of *Leucaena leucocephala*, to improve cattle productivity hence farmers' livelihood through cattle fattening. This paper provides insight that livelihood improvement has been made possible through cattle fattening and how the innovation has been taken in a wide scope. A case study was conducted in Jatisari and Labangka as an existing and new *Leucaena* feeding practice. The study found that planting and feeding *Leucaena*, farmers were able to earn profit from fattening about IDR. 500,000/head/month. One household were fattened around 4-6 bull/six months period and potentially earn around IDR. 18 million to 21 million/year compares to crops which was about IDR. 3 to 4 million once a year. It is concluded that cattle fattening based on *Leucaena* is an option to improve small holder farmers' livelihood in tropical areas like Sumbawa.

*Keywords: integrated crop-livestock, small holder, traditional system, livelihood improvement.*

## 1. Introduction

Sumbawa island, in the eastern part of Indonesia, is dominated by rain fed areas and hilly topography [3]. Majority of people rely on agriculture and practicing integrated crop-livestock farming system. Maize is the most popular crops planted once or twice a year while beef cattle the most common livestock enterprise. Cattle plays substantial roles to support smallholder families' economy as saving and buffer during harvest failure and for large expenditures. Cattle productivity has been low due to traditional grazing system that relies heavily on natural source for feed in a common land [10]-[12].

The traditional cattle management system with low productivity has provided low income for farmers. While profit margin from maize farming has been narrow too to support family economy throughout the year [16]. As a result, a statistic figure in 2015 shows that many household (17%) live on and just below poverty line in which the poverty bar accounts for IDR 272,274/month [3]. There have been several development initiatives to reduce poverty in Sumbawa, yet the progress has been slow [8]. A research for development project funded by the Australian Centre for International Agricultural Research (ACIAR) promoted the utilization of *Leucaena*, to improve cattle productivity hence farmers' livelihood through cattle fattening. This paper provides insight that livelihood improvement in arid Sumbawa has been made possible through cattle fattening and how the innovation has been taken in a wide scope.

## 2. Material and Methods

An action research as outlined by Stringer [15] was conducted in Sumbawa between 2010-2014 to assess contribution of cattle fattening based on forage tree legume diets on farmers' income. This action research was entwined with a research project entitled "Improving Cattle Fattening Systems Based on Forage Tree Legume (FTL) Diets in Eastern Indonesia and Northern Australia", a collaborative project funded by the ACIAR. The innovation contents in the project included technical aspect of utilizing *Leucaena leucocephala* cv Tarramba for fattening along with cattle improved management and social community aspect of innovation uptake. Two project sites, Jatisari and Labangka were used as study case for this paper. Cattle fattening enterprise of 21 farmers in Jatisari were closely monitored between January 2013 and December 2015. During this period, 566 fattened bull were monitored for live weight, purchasing and selling prices, fattening period, initial weight and last recorded weight. Cattle were weighed monthly but selling system was based on weight estimation and agreement between farmers and buyers. General featured were captured more in Labangka because fattening was a new practice since Labangka is scaling out area. Qualitative and quantitative data were collected through direct observation, focus group discussion and in-depth interviews using several participatory techniques [4]-[5]-[9]. The quantitative data were tabulated and analyzed descriptively, and qualitative data were analyzed using phenomenological thematic analysis [13].

## 3. Results and Discussion

### 3.1. Agro-ecology conditions

Agro-ecology of the study sites shared general features of Sumbawa Island with hilly topography and dry climate [3]. Hence, rain fed farming dominates the area with land ownership about 1.5 – 2.0 ha/household with maize and cattle as the main farming enterprises. Farmers generally have two parcels of land, farmland within residential areas to grow crops, and another one in the hills slope and quite far from residential areas. Cattle are still managed under traditional system with low both in-put and intervention. It is a saving and buffer for the family economy, an accumulated asset that will be sold when the family need large amount of capital such as for building house, sending children to school, social ceremonies and when crop farming fails to perform as expected.

### 3.2. Cattle farming system

Cattle farming system in Sumbawa divided into three types; *extensive communal Lar*, *semi-intensive* and *intensive system*, as shown in Table 1. Lar is a local term to describe a communal grazing area.

**Table 1.** Cattle farming system in Sumbawa

Types	Extensive	Semi-intensive	Intensive
Cattle location	In the Lar or common land all year around	In the paddock or private land during crop planting season and in farmland after crop harvest	In the pen all year around
Feeding system	Grazing	Cut-and-carry during crop season and grazing in the farmland after crop harvest	Cut-and-carry system
Cattle control	Once in a month or two	Daily in certain sites, less frequent in other sites	Every day
Enterprise type	Mostly breeding and back grounding	Mostly breeding and back grounding	Mostly for fattening.

**The first extensive Lar system cattle** stay in the LAR throughout the year where owners rarely control the animal. The main problem for Lar system is inadequate feed due to overcapacity thus lead to overgrazing. It has been obvious since Lar is occupied by invasive weed such as *Chromolaena odorata*. This lack of feed for cattle farming during dry season in Sumbawa has been documented previously [12].

**The second semi-intensive system** is the most common cattle management practice in Sumbawa. In this system, cattle are in the private paddock or private land to secure crops from cattle and feed and water are provided. Cattle are mustered to the farmland land either owned or belong to other farmers

following harvest to graze the crops residue. Roadside is another popular grazing area too apart from farmland.

**The third intensive system** is the least practice and mainly for fattening enterprise. Cattle are put in the pen and Leucaena offer 70-100% of the diets. Jatisari was one among the few sites in Sumbawa that has practiced intensive fattening system before the FTL projects began. This fattening system then spread out to other sites in Sumbawa including Labangka.

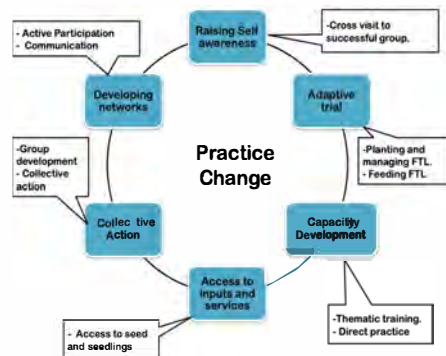
**Jatisari, existing Leucaena feeding practice**, farmers in Jatisari, which are dominated by Balinese ethnic, have practiced intensive fattening since they migrated to Sumbawa. The existence of the Balinese community in Sumbawa was a result of the government transmigration scheme in the 1970s and 1980s [1]. These migrant farmers carried out their inherited cattle farming practice which are intensive, business oriented and implementing cut-and-carry feeding system. Fattening based on Leucaena has played a crucial role as a source of income. The farmland has been turned into Leucaena farm with average land ownership around 2 ha/household. A hectare of Leucaena farm (3x1 m) able to support 8-10 bulls during wet season and 4-5 bull during dry season. The average fattening period was 5 months and varies from 1 to 15 months depends on need to cash and selling prices. The average cattle last recorded weight was 198.2 kg with average daily weight gain of 0.49 kg.

Cash from cattle selling were usually used for large expenditure such as children schooling, building house, purchasing vehicles and social ceremonies and for investment such as buy land. The income generated from fattening around IDR 500,000/head/month. The average fattening hold 3.7 bull/period/household and was able to generate income of IDR 1,800,000/month/household and in accumulation of IDR 21,000,000/year. Limited capital to purchase feeders hamper farmers to achieve potential income of IDR 72.000.000/year. The poverty line for Sumbawa districts for year 2016 lies at an income of IDR 296,914/capita/month [4] with poverty line for one household is IDR 1,187,656/ month. While the income from fattening was IDR 1,800,000/month, a far higher above the poverty line.

Interestingly, this practice did not spread to the neighboring villages that dominated by local Sumbawane farmers who practice extensive low in-put grazing system. They had limited information that Leucaena is a good quality feed for cattle as the Balinese farmers did not share their experience. This condition was exacerbated by cultural perspective of which collecting feed was totally uncommon and considered enslaved by cattle. Yet, they were wondering why cattle from Jatisari had much better performance and always gained much better prices.

### 3.3. Labangka, new Leucaena feeding practice.

Labangka's farmer practiced integrated crops-cattle farming under traditional management, relied on nature and crops residue and mainly breeding. The FTL project introduced fattening concept based on Leucaena, which in the beginning was totally alien and doubtful for most of the farmers. There was a significant level of rejection for the numerous reasons. Among those reasons were land competition between maize and Leucaena planting, waiting period to harvest the Leucaena and perception of Leucaena as weed and unpalatable feed.



For scaling out purpose, the FTL project used innovation development framework that was developed with farmers and other stakeholders through community-based situation analysis [7] as shown in figure. Labangka was selected as case study in this paper for its obvious practice change of the FTL innovation uptake. The FTL project employed several strategies to alter these perceptions and change farmers' practices. The first strategy was *raising awareness* by showing video of Jatisari and farmer cross visits. This was a tipping point to change Labangka farmers' perception and motivated them to change practices. The second strategy was *thematic learning* facilitated by the project's field researcher. Farmers were trained gradually in themes based on field needs. The third strategy was *adaptive trial* where farmers practice and experience

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themselves on planting and fattening based on *Leucaena* that allowed farmers to make adjustment based on their local conditions. The fourth strategy was to *facilitate and connect farmers to government loan schemes* which suitable for fattening enterprise and low rate return.

Implementation of the FTL projects was made possible by well-trained project field researchers (FRs) who worked closely with farmers. They were trained both on facilitation skills and knowledge and technical aspects. The approaches and strategies that provide large space for farmer involvement and adaptation have seemed to be effective to change farmers' practices. This is consistent with previous studies [6]-[7]-[14]-[17] that more intensive stakeholder participation in planning processes resulted in a greater sense of ownership over achievements, followed by faster, more sustainable and self-motivated practice change. Sustainable practice change is likely to lead to higher productivity, in turn enhancing farmers' livelihoods.

The results of farmers' innovation uptake in Labangka have been promising. Most farmers have planted *Leucaena* and practiced fattening. The practices have spread to neighboring villages from farmer-to-farmer information and experience sharing. During the FGD with Labangka farmer, they reported to earn income of around IDR. 500,000/head/month. One household was able to manage 4 to 6 bull, which means the income between IDR. 2,000,000 and 3,000,000/month. Although nearly half of the respondent in Labangka did not own the cattle but managed someone else with sharing profit scheme (40% owners: 60% manager), the average income under the profit-sharing scheme around IDR 1,200,000 – 1,800,000/month. An economic study of maize farming in Sumbawa District [11] reveals that income from maize farming accounted for IDR 10,500,000 per hectare. The other downside of maize farming is that the income only comes once a year due to dry climate conditions which means IDR 875,000/month. Another similar study in Labangka [16] shows much lower figure of IDR 6,693,000 per/ha or IDR 557,750/month. Farmers' experience in Labangka has demonstrated that fattening based on *Leucaena* is a promising strategy to survive in dryland to make a better livelihood.

#### 4. Conclusions

Cattle fattening based on *Leucaena* is one of feasible strategies to improve farmers' livelihood in dry areas such as Sumbawa. Scaling out innovation uptake from research and development initiative was attributed to participatory design and approaches. Allowing partner farmer involvement in making decisions and learning processes had nurtured farmer critical skill to make best options on their conditions and take up innovation into their daily practice voluntarily in sustainable manner.

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