Adoption processes to enhance uptake of forage tree legumes in Indonesia

Evaluation case study report

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Contents

1 Introduction

This report presents an evaluation case study that was done as part of the ACIAR funded project 'Adoption processes to enhance uptake of forage tree legumes in Indonesia' (LPS/2013/020), which in turn was linked to the project 'Improving smallholder cattle fattening systems based on forage tree legume diets in eastern Indonesia and northern Australia' (LPS/2008/054). Phase II of the FTL project involved the pilot roll-out of the outreach strategy that was designed during the first phase of the project (see final report of project LPS/2008/054). The evaluation case study served the following three objectives:

1. To analyse the effectiveness of the scale out processes leading towards farmer uptake of the Forage Tree Legume (FTL) feeding systems.
2. To analyse the effectiveness of the communications strategy and media that were tested to support the scale out processes.
3. To make recommendations based on 1 and 2 above for future scale out of FTL systems in Eastern Indonesia.

The study primarily relies on reports by and itnerviews with various local stakeholders in the FTL project: farmers in the project areas, extension officers, field researchers, government officials and counterpart researchers. It was conducted through three rounds of data collections by an external consultant, Dr Bambang Budiwiranto, lecturer at the Department of Community Development, Faculty of Communication, Institute of Islamic Studies of Lampung, with support from the SRA counterpart Dr Nurul Hilmiati of NTB Assessment Institute of Agricultural Technology (AIAT – or locally known as BPTP NTB), and under the supervision of the SRA Project Leader, A/Prof. Elske van de Fliert of the Centre for Communication and Social Change, The University of Queensland.

This report will first present the methodology of the study in Chapter 2, followed by a description of the FTL outreach strategy, as experienced by the study respondents. Chapter 4 elaborates on the extent of the outreach of FTL practices as a result of the project's pilot roll-out efforst, while Chapter 5 provides an analysis of the effectiveness of the outreach processes towards uptake of the FTL systems, and Chapter 6 of the effectiveness of media in support of outreach processes. Lastly, some lessons learned in relation to uptake of FTL systems, outreach processes, media use and institutionalisation of outreach processes are provided in Chapter 7.

2 Methodology

2.1 Study approach and scope

This evaluation research used a case study methodology to generate in-depth, multi-faceted understanding of the change processes in a complex farming context. A case study enables a researcher to capture real-life events in a holistic and meaningful way and is a suitable method to *describe, explore* and *explain* events that occur in everyday life. A case study is able to capture more explanatory information, such as *what, how, and why* questions, such as *why* are certain development interventions undertaken, *how* do they come about, and *what* consequences do they have. Therefore, a case study offers additional insights into *what* gaps map exist in a project delivery or *why* a particular

project implementation is chosen over another, and *why* it may or may not have considerable impact on people.

The case study approach used in this research falls within the category of comparative case study design. This study focused on three FTL project cases, investigating the adoption process to enhance uptake of forage tree legumes for cattle in the districts of Kupang (East Nusa Tenggara, NTT), Sumbawa and North Lombok (West Nusa Tenggara, NTB), Indonesia. Comparative cases enabled the researchers to gain a better understanding of the cases investigated.

The research relied on qualitative data collected at FTL project sites in Kupang, Sumbawa and North Lombok during three rounds of data collection in October 2015, February 2016 and May 2016. The research sites were selected to represent three production systems (Sesbania NTB, Leucaena NTB, and Leucaena NTT), involving two farmer groups per village that is characterised by a particular FTL system and has begun participation in the project as of Phase II. The following villages were initially selected in consultation with the senior researchers:

- Sesbania NTB: Kab. Lombok Utara, Kecamatan Kayangan, Desa Sesait
- Leucaena NTB: Kab. Sumbawa, Kecamatan Lape Lopok, Desa Langam
- Leucaena NTT: Kab. Kupang, Kecamatan Fatuleu, Desa Camplong 2

It was intended to select two farmer groups with different group dynamics at each siteusing the following four criteria: *Firstly*, farmers who have been trained and initiated cattle fattening groups; secondly, farmers who have received initial training; *thirdly*, farmers who have made preparations for FTL cultivation; *fourthly*, farmers who have the intention and opportunity to fatten cattle once they can start harvesting the FTL. However, during the implementation (see Section 2.4), more and more interesting cases emerged and the number of villages and groups covered by the study expanded to those listed in Table 1.

Table 1: List of farmer groups participating in the study

FTL Type	Location				Farmer Group
	Province	District	Sub-district	Village	
Sesbania	NTB	Lombok Utara	Kayangan	Sesait	• Agung Rinjani • Tetu Tanta Tunaq • Putra Waspada • Bareng Sadar • Patuh Angen • Bina Keluarga
Tarramba (Leucaena)	NTB	Sumbawa	Lape Lopok	Langan	• Amanah Bersaudara • Maju Bersama
			Labangka	Sukadamai	• Unter Kapuk
			Moyo Hulu	Batu Bulan	• Ai Raram
				Boak	• To Balong
Tarramba (Leucaena)	NTT	Kupang	Fatuleu	Camplong 2	• Setetes Madu • Talikomunit • Tunas Muda
			Kupang Barat	Oenaik	• Dalek Esa
			Fatuleu Tengah	Nunsae	• Amtoas

'Non-participating farmers' were selected from the pool of cattle farmers in the same village, partly from the same hamlets as the 'participating farmers', and partly from a different, non-neighbouring hamlet in the same village. The selected respondents had to be representative for the hamlet and spread over the spectrum of wealth categories.

Data collection primarily relied on focus group discussions and individual in-depth interviews (see Section 2.2). To begin the interviews, we relied on informants from each of the type of actors involved in the project. In selecting informants we used *purposive sampling,* in which we intentionally selected individuals and sites to learn and understand the central phenomena. We selected samples from different stakeholders, including primary, secondary and external stakeholders. Primary stakeholders were farmers, facilitators and field researchers, while secondary stakeholders were AIAT researchers. External stakeholders were local government livestock services in Kupang, Sumbawa and North Lombok. In selecting the interviewees we identified stakeholders who had been significantly involved in the project design and implementation. The diverse backgrounds of the interviewees helped us collect more balanced data. Table 2 shows the matrix of interviews and FGDs as planned during a research method workshop held in Mataram, Lombok, on 17-19 August 2015.

Table 2: Matrix of interviews and data sources

Date	Locations	Activities
2-17 October 2015	Lombok Sumbawa Timor	• Introduction of study: o FGD at routine meeting of cattle farmer group
		• In-depth data collection round 1 – FTL establishment: o Interviews with farmer participants (3 sites @ 2 groups @ 7-8 farmers) o Introduction of record keeping format to farmer participants (3 sites @ 2 groups @ 7-8 farmers) o Interviews with non-participating farmers in same hamlet (3 sites @ 2 hamlets @ 3-4 farmers) o Interviews with non-participating farmers in different hamlet in the same village (3 sites @ 1 hamlet @ 4-6 farmers) o Interview with field researcher (on process, experiences)
		• Mapping of project outreach: o Interviews with district gov't official(s) (3 sites) o Interviews with trainers (3 sites) o Interviews with field researchers (on outreach)
9-13; 19-28 February 2016	Lombok Sumbawa Timor	• In-depth data collection round 2 – FTL planting and cultivation: o Follow-up interviews with farmer participants, check records (3 sites @ 2 groups @ 6-8 farmers) o Follow-up interviews with non-participating farmers in same hamlet (3 sites @ 2 hamlets @ 3-4 farmers) o Follow-up interviews with non-participating farmers in different hamlet in the same village (3 sites @ 1 hamlet @ 4-6 farmers) o Interview with Field Researcher (on process, experiences)
11-22 May 2016	Lombok Sumbawa Timor	• In-depth data collection round 3 – FTL utilisation and cattle fattening: o Follow-up interviews with farmer participants, check on records (3 sites @ 2 groups @ 6-8 farmers) o Follow-up interviews with non-participating farmers in same hamlet (3 sites @ 2 hamlets @ 3-4 farmers) o Follow-up interviews with non-participating farmers in different hamlet in the same village (3 sites @ 1 hamlet @ 6-8 farmers)

Date	Locations	Activities
		o Interview with field researcher (on process, experiences) • Interviews with researchers (NTB: Dr Tanda Panjaitan; NTT: Dr Jacob Nulik, Ms Deborah Kana Hau, Dr. Yohanis Ngongo)

An overview of the complete set of activities conducted during the three data collection rounds and lists of informants can be provided upon request.

2.2 Data collection methods

During the fieldwork, we employed different data collection methods, i.e. in-depth interview, observation and focus group discussion (FGD). Using multiple data collection methods builds a better picture of the subjects studied and enhances the validity of the data collected.

In-depth interview

We used semi-structured, in-depth interviews to complement the data collection in this research. The use of interviews is important to capture views, motivations, and subjective experiences of people. In-depth interviews also allowed to explore undefined domains in the formative conceptual framework, identify new domains, and break them down into factors. Furthermore, in-depth interviews assisted in revealing historical and contextual information. A checklist with topics to discuss in the interview was prepared and used flexibly as to allow the respondents to share their experiences as much as possible from their own perspectives. Interviews were conducted in Bahasa Indonesia, recorded and transcribed.

Focus Group Discussion

The Focus Group Discussion (FGD) is significant because groups have their own internal dynamics and ideas, which cannot emerge in person-to-person interviews. The FGD process in this study aimed to gain group perspectives on the project implementation and its outcomes and impacts on them. Groups may have different perspectives on the reasons, motivations, and constraints for participation in the project. We also used FGD to understand different groups' experiences in their involvement with the FTL project.

During the data collection, we initially planned to hold FGDs with farmer groups to introduce the research purpose and arrange a schedule for some individual interviews. We practised an FGD with the Baru Terbit farmer group in Ponain village in Kupang. Due to the farmers' time constraints, it was not easy for us to arrange individual interviews with them. Moreover, during the FGD, farmers generated a lot of information relating to the FTL project. When some farmers did follow up interviews with the research team, we found that the information they provided was similar to the information we had received during the FGD, therefore, there was information repetition. We then decided that we would use FGD farmer groups to get detailed information and do follow up interview with some FGD participants if we need further information.

Direct observation

We used direct observation to understand the reality of the FTL project and related aspects. By attending and observing activities in real social situations, we not only learned what was occurring, but also built relationships with the respondents of the study. Observation includes observing places

where the FTL project activities take place to understand the current situation in relation to FTL seedlings, cultivation and harvesting. We also observed how farmers fatten their cattle using the FTL feeding system. During the research we observed the Leucaena/tarramba[1] fields of the Setetes Madu, Talikomunit, Dalek Esa, Amtoas and Afoon farmer groups. Likewise, we observed the tarramba fields of the Ai Raram and To Balong farmer groups in Sumbawa. Similarly, we visited the sesbania fields of the Agung Rinjani, Tetu Tanta Tunaq, Patuh Angen and Putra Waspada farmer groups in North Lombok. In terms of cattle fattening, we observed the collective *kandang* of Amanah Bersaudara in Langam, Unter Kapuk in Sukadamai, Ai Raram in Batu Bulan and To Balong in Boak. We also visited the collective *kandang* of Agung Rinjani, Tetu Tanta Tunaq, Putra Waspada, Patuh Agen, and Bareng Sadar in Sesait village. In Kupang we visited the *kandang* of the Amtoas, Afoon and Setetes Madu farmer groups where they have fattened cattle.

Validity and reliability

To maintain the validity of research, this research employs the principles of triangulation, which refers to the attempts to get a 'true' fix on a situation by combining different ways of looking at it or at different findings. Of four different triangulation models, namely, the triangulation of data, methods, theories, and investigators, this research used the first two models: i.e. the triangulation of methods and data. As the previous sections show, we employed method triangulation by implementing different types of data collection methods, such as observation, semi-structured in-depth interviews, and focus group discussions. We conducted data triangulation by comparing and combining the data gathered from different sources and data from different times and places. Through this triangulation model, we compared data from a diverse range of interviewees, such as the AIAT researchers, extension officers, provincial officials, field researchers and farmers. Moreover, we also investigated a control group involving farmers who did not participate in the FTL project. In terms of reliability, the research process should be transparent to other researchers or readers. This occurs by providing sufficient explanation of the research strategy and analysis in the research report. We prepared field notes and transcripts during the research process to enhance the reliability of the results.

2.3 Data analysis

The core of the data analysis consisted of three steps. The first step was data coding, i.e. reducing the data into meaningful segments and assigning labels for the segments. The second step was combining codes into categories or themes, and the final step is displaying and comparing the data in data graphs, tables, and charts. This study adopted a thematic analysis, which refers to a method for identifying, analysing and reporting patterns (themes) within data. This method enables the researchers to make sense of the data because it reduces the volume of the original data and turns the data into meaningful themes that are easily digestible.

[1] The FTL project worked with the Leucaena cultivar Tarramba, which was first introduced to Indonesia as a component of another ACIAR Project (AS2/2000/157) in 2001-03. This cultivar is preferred by cattle, less affected by psyllids, leafier, lasts longer into dry season and yields better poles. The report will subsequently refer to "tarramba" when discussing Leucaena cultivation and utilisation practices.

This study adopted inductive thematic analysis in which the themes the researchers identify are strongly linked to the data collected and are not driven by the researchers' analytical pre-conception, which is similar to grounded theory. In conducting thematic analysis, we follow Braun and Clarke's (2006) approach on dividing the analysis process into six phases: 1) familiarising yourself with your data; 2) generating initial codes; 3) searching for themes; 4) reviewing themes; 5) defining and naming themes; and 6) producing the report. Notably, the process of analysis does not linearly move from one phase to the next. Rather, throughout its phases, the analysis is recursive, moving back and forth as needed. Apart from applying this thematic analysis procedure, we included three analysis elements that are necessary in case study analysis. Firstly, the construction of a detailed description of the cases, such as chronology, activities, actors and settings. Secondly, the comparison and contrasting of the cases that leads to cross-case synthesis, and, finally, naturalistic generalisation.

2.4 Implementation details

This longitudinal case study was conducted in three stages of data collection in Kupang, Sumbawa and North Lombok between October 2015 and May 2016. The first data collection was held from 2-17 October 2015, the second from 9-12 and 20-28 February 2016 and the third from 11 to 22 May 2016. We managed to interview numerous informants from different backgrounds, namely, field researchers, senior researchers from AIAT, officials from a livestock service agency (Dinas), facilitators, and participating and non-participating farmers. The number of informants interviewed were 128 people (1st data collection), 126 people (2nd data collection) and 103 people (3rd data collection) in districts of Kupang, Sumbawa and North Lombok.

However, some changes occurred during the research, especially in terms of the number of farmer groups. As explained before (see 3.2.1 above), initially we chose six farmer groups representing sesbania and tarramba planting both in East and West Nusa Tenggara. However, due to some constraints in the field and the need for a deep understanding of dynamics of the FTL uptake among the farmers we added some farmer groups to the list (see table below). Nevertheless, the selection of additional farmer groups was conducted in accordance with the sample criteria we had established.

First of all, in October 2015 we began to hold FGDs with the Baru Terbit farmer group in Ponain village in Kupang. However, during FGD we found that the group had participated in the FTL project from the first phase in 2012. We then decided to replace the group with another group, i.e Dalek Esa of Oenaik village in Kupang Barat. We then held a FGD with the Setetes Madu farmer group of Camplong 2 and conducted a series of interviews with some non-participating farmers in the same hamlet and surrounding ones. In Oenaik village, we interviewed Dalek Esa members and some non-participating farmers from the same hamlet and those who were from different hamlets. To extend our research and to get various dynamics of participation in the FTL project, we planned to visit the Afoon farmer group in Tesbatan 1 to have a FGD with its members. However, due to time and technical constraints, we failed to conduct an interview and just got some information about FTL seedlings and cultivation from the field researcher in charge in Tesbatan 1 (Petrus). In the second research round in February 2016, we finally managed to hold a FGD with the Afoon group in Tesbatan 1 and had a series of interviews with some non-participating farmers in the hamlet and neighbouring hamlets. However, in this third research round we received some information about Afoon from the field researcher (Petrus) who noted that there were no significant changes in the FTL activity. In the second and the third research round, we continued interviewing Setetes Madu and Dalek Esa group members and

held FGDs with newly established groups in Camplong 2, namely, the Talikomunit and Tunas Muda farmer groups which participated the FTL project. We also held a FGD with the Amtoas group of Nunsae, considered to be a successful farmer group in the FTL system, in the third research round. Above all, investigating these diverse farmer groups gave us a more nuanced perspective on the FTL uptake dynamics in Kupang Sub-district, East Nusa Tenggara.

Similarly, in Sumbawa we managed to hold FGDs with the Amanah Bersaudara and Maju Bersama farmer groups during the first research round in October 2015. We also interviewed some non-participating farmers from different hamlets and villages. However, Amanah Bersaudara and Maju Bersama did not participate in the training of facilitators held by Dinas in November 2015. Both Amanah Bersaudara and Maju Bersama have a close family relationship to each other and it seems that they are one group as they manage agricultural and animal husbandry enterprises on the same collective land. We then discussed with the field researcher of Sumbawa (Fauzan) to find other groups, i.e. Unter Kapuk (Cotton Mountain) in Sukadamai village (Labangka 4) of Labangka Sub-district and the Ai Raram group of Batu Bulan village, Moyo Hulu Sub-district. Furthermore, we interviewed some non-participating farmers within the same hamlet and from surrounding hamlets of Batu Bulan and Sukadamai.

In the second and the third research round (February and May 2016), we continued to hold FGDs in Sumbawa with Ai Raram and Unter Kapuk. However, we failed to interview Amanah Bersaudara and Maju Bersama in the second research round. We could not contact and meet them despite visiting their home. We received no explanation from them regarding this absence. As a result, we continued collecting data by focussing on Ai Raram and Unter Kapuk. In Labangka we expanded our investigation to nearby the villages of Sekokat (Labangka 2) and Labangka village (Labangka 1), where there had been a noticeable increase in participating farmers. In May 2016, we also had a FGD with a newly established group, i.e. To Balong of Boak that participated in the FTL project (tarramba cultivation and utilisation, and cattle fattening) in Moyo Hulu. Finding new research participants increased the variety of perspectives from those who participate and not participated in the FTL project. In the last research round (May 2016) we managed to hold an interview with Amanah Bersaudara and Maju Bersama and found out why they refused to be interviewed in the second research round. *Firstly*, they argued that they were busy with paddy cultivation in February 2015. *Secondly*, they were disappointed with BPTP and the FTL project because the project leader (Dr. Tanda Panjaitan) did not give a cattle scale (*timbangan ternak*) as he had promised during his visit in 2015. They argued that this promise was one of the reasons why they had spent additional money to renovate their *kandang* to accommodate the cattle scale. However, the field researcher (Fauzan) confirmed that Amanah Bersaudara had misunderstood the information, as the project has never promised them a cattle scale. Rather, the project would bring them a scale every month to monitor cattle weight increases. Even so, the project (BPTP) has never delivered a scale to Amanah Bersaudara.

In North Lombok, the initial research plan worked well in which we held FGDs with Agung Rinjani, Tetu Tanta Tunaq and some non-participating farmers from the same and different hamlets. Notably, in the first research round (October 2015) only few farmers participated in sesbania cultivation. Due to late training of facilitators held in April 2015, farmers planned to cultivate sesbania in November 2015. However, the sesbania planting was delayed until the end of January 2016 due to the dry season and lack of seedlings.

During the second (February 2016) and third (May 2016) research rounds, we found that many non-participating farmers joined the farmer groups of Putra Waspada, Bareng Sadar and some members of Patuh Angen already participated in the FTL project signified by sesbania planting. This shows that the FTL project reached out beyond the initial target farmers. We also interviewed some members of the Bina Keluarga group who initially participated in the training of facilitators in April 2015. However, due to problems within the group, they did not participate in the FTL project.

Based on these changes, the farmer groups that ended up participating in the evaluation case study until the third research round in May 2016 were those listed in Table 1 above.

3 Implementation of the outreach strategy

3.1 Training of facilitators

The training of facilitators (trainers) signifies the beginning of phase 2 of the FTL project: how to roll out the phase 1 results to more farmers in Kupang, Sumbawa and North Lombok districts. It was expected that the model would be adopted by farmers in order to improve cattle rearing leading to economic betterment. To achieve this objective, the facilitators were expected to have a good understanding of the FTL project, facilitation skills, and the ability to apply such skills in the field. Furthermore, the facilitators were expected to be able to use a communication strategy and media to deliver technology to farmers based on the farmers' real situation; therefore, technology that suits the farmers' needs leading to an improvement of their lives. This two-day training was held by BPTP in three different locations, i.e. Kupang (October 2014), Sumbawa (October 2014), Lombok (April 2015). The training was attended by 40 facilitators and 30 farmers from NTB and 21 facilitators and farmers from NTT. The prospective facilitators were assigned by the Sub-district Technical Execution Unit (UPT) and mostly consisted of Artificial Insemination Officers (*petugas* IB) and extension officers. Meanwhile, the farmers were chosen by a field researcher and a facilitator after they had surveyed target village conditions, farmer's land ownership, and readiness of the farmer group to participate in the FTL project. After all the requirements had been fulfilled by participants, the facilitator and the field researcher gave a recommendation to the farmer to participate in the training. As Amirullah, Labangka facilitator, noted,

> *'...Pak Abdul Manan's group was chosen because it had strong fence, cattle, and was willing to participate…at the beginning it was difficult for the group to participate, but finally they were willing...'* (interview, 10 October 2015).

To achieve the objective, this training provided the participants with knowledge and skills through in-class training and exchange visits. In terms of in-class training, the participants received some information about the FTL system, cattle management, and facilitation skills. The proposed curriculum of the facilitator training consisting of four rounds of 1-2 days each is presented in Appendix 1. Due to organisational issues, training was only conducted in Round 1 for NTB and Round 1 and 2 in NTT, while the other rounds were not materialised in a formalised way. All rounds should should have been conducted separately, consisting of in-class training and followed by an activity in the field by the farmers. For example, having participated in the first session, the farmers were encouraged to practice what they had learned during the training (seedling development).

The participants were also exposed to promotional and educational videos to support the FTL outreach. During the exchange visit the participants visited three different places constituting successful FTL pilot project in three districts, i.e. Oebola Dalam (Kupang), Jatisari (Sumbawa), and Karang Kendal (North Lombok). During these visits, the participants met with successful cattle fatteners and they were asked to compare the cattle fattening model and conditions with what they do in their village (Tutik, field researcher, February 2016). Based on what the participants observed and learned during the exchange visit, they were also asked to prepare activities that would be conducted after they completed the training. In this context, they made a follow-up workplan (interview, farmer, Martiadi, February 2016).

For the participants, this training gave them a new perspective on cattle fattening using the FTL system. A participant from Lape Lopok noted,

'*...for myself, [the training] increased my knowledge [which can be transferred to the] community....about feed not being from one type, not only from king grass, ...in the past it was difficult to search for cattle feed, [the farmers just give paddy hay to the cattle, but the cattle was not fat enough, using tarramba [as feed] we have an alternative for cattle feed …area for planting tarramba can be at a mountain, field, all of these can be planted…'* (interview, 8 October 2015).

The training, especially the exchange visit at Jatisari cattle fattening place in Sumbawa and in Karang Kendal of North Lombok, convinced the participants that the in-class training was true and it increased the participants' motivation to adopt the FTL system. During the exchange visit, the participants watched the real condition of the cattle, *kandang* management and compared these to the cattle fattening system they used themselves. A participant from Sukadamai village of Labangka Sub-district noted,

'...it was very convincing after training [exchange visit]...we examined the condition of cattle that were fattened with tarramba, the cattle got fat easily…and the cattle's weight is difficult to lose, that is the advantage of using tarramba; we also asked the owner some questions about cattle feed…the positive value of this fattening was that the cattle selling price was good…' (interview, 10 October 2015). Likewise, a participant from North Lombok had a positive impression of the FTL system from this exchange visit. He noted, '*…[advantage of exchange visit] it was pretty good for increasing motivation, from this the participants can motivate themselves, over there (at the cattle fattening plot) the participants watched the result [fattened cattle], they also observed the kandang, the most important aspect was cleanliness of the kandang, besides sesbania as food...we also observed a sesbania field next to the kandang...*' (interview, 16 October 2015).

Moreover, this exchange visit also made Aminuddin, a cattle fattener from Moyo Hulu, feel embarrased and motivated to adopt the FTL feeding system. He notes,

'...we were asked to visit Jatisari at the end of December 2014. Then I watched a mother fattening 12 cattle, she used tarramba [as cattle feed], and finally I decided to use tarramba. At that time I had only three cows, no bull… (interview, 9 October 2015).

3.2 Awareness raising activities

The facilitators used at least three methods to raise the farmers' awareness about the importance of the FTL project in Kupang, Sumbawa and Lombok Utara. *First of all,* the facilitators identified problems in the current practice of animal husbandary and facilitated farmers to develop a vision. *Secondly,* the facilitators conducted an economic analysis to compare animal husbandary and agricultural entreprise and their respective contribution to family income. *Thirdly*, the facilitators disseminated information about the FTL system to farmers.

In raising the farmers' awareness, the facilitator for the Setetes Madu group in Camplong 2 village of Kupang, *firstly*, identified a problem that the farmers faced, namely, increasing cattle death incidents due to food shortage. He also told the farmers that although the artificial insemination (IB) was succesfully conducted with their cattle, newly-born cattle would not survive for long as there is not sufficient feed, especially during the dry season. The facilitator also proposed to the farmers that they

have to prepare (cultivate) cattle feed (interview, 10 February 2016). The FTL project, engaging farmers to cultivate taramba/sesbania, matched the problems the farmers had.

Secondly, to further raise the farmers' awareness, the facilitator instilled a vision that providing cattle feed would improve the quality of cattle and, in turn, would increase the farmers' welfare in the future. The facilitator exemplified the case of the farmers in Oebola Dalam, Setetes Madu's neighbouring village, where many farmers succeeded in constructing a house and buying a vehicle due to profit derived from selling tarramba leaves and seeds and from fattening cattle. To maintain the awareness, the facilitator also put the importance of having good intentions in cultivating tarramba, in the sense that the farmers should cultivate tarramba not for getting a cattle grant from the government. Rather, they should cultivate tarramba for cattle feed provision. Therefore, the facilitator emphasised that the principles of self-help, working hard and togetherness among members are important to achieving the objective.

Thirdly, in order to change the farmers' practices from free ranging their cattle to putting their cattle in a pen, the facilitator advanced the dialogue and used an analogy to show that cattle is the farmers' valued money. The Camplong 2 farmers did not realise that free ranging cattle is similar to putting tens of millions of *rupiah* in a forest. The facilitator wanted the farmers to become aware that the cattle they have are valuable and very important for their income generation. If they do not pen them, it means that they are not careful with their own money. They cannot control what condition their cattle is in, what feed the cattle eat and this can endanger the cattle's life, which, in turn, can threaten their income generation. In contrast, the farmers keep their cash of just a few tens of thousands of *Rupiah* under their pillow.

The methods of building a vision and using economic analysis were also used by the facilitator and the field researcher in Sukadamai village in Sumbawa. They showed the financial benefit the farmers would get when they participated in the FTL project. This benefit would overtake their current income from corn cultivation. Although the cash flow from corn cultivation was low, it was considered farmers' main cash income source in Labangka Sub-district. The facilitator also used a promotional video of the FTL project in raising awareness during a group meeting. Having watched the promotional video, the field researcher and the facilitator asked the farmers to compare the economic benefit of corn cultivation and cattle fattening, between the FTL feeding system and the traditional feeding system relying on grass and paddy hay as the main food for cattle. This following excerpt describes the way the facilitator and the field researcher tried to to change the farmers' thoughts and raise their awareness.

> "*…we make a calculation, who becomes a king: farmers or cattle? If we use the traditional system of cattle fattening, the value of cattle is Rp 6 million [2-3 years of fattening]. However, if we use the FTL feeding system, the price of cattle will be Rp 6 million in less than 6 months. If 2 years equals 730 days, and we only get a cattle price of Rp 6 million, then how much will you get every day? We raised farmers' awareness in this way...if we pay you for cutting grass with that price every day, do you want to do it? All attendants answered 'no'…this opened the farmers' way of thinking…they compared their old cattle rearing practice with the new one....'* (interview, Fauzan & Amirullah, 10 October 2015).

The field researcher also compared the financial benefit of corn cultivation with that of cattle fattening using the FTL system as can be seen from this excerpt.

> *"…corn in dry land…in Labangka Sub-district, a corn harvest can yield 10 tonnes at the price of Rp 2000/kg, it is the same as Rp 20 million...after being deducted by the cost of seedlings and cultivation, fertilizer, pesticide, it would be around Rp 12 million/hectare/6 months (corn is only harvested once a year)...[for tarramba] one hectare of land can be planted with around 5000 tarramba trees, and a head of cattle of 2-3 year old needs 350 tarramba trees/cattle/year...farmers do not need to cut tarramba far away (like grass)...if 1 hectare of land can accommodate 5000 tarramba trees, farmers can fatten 15 cattle and they can sell that head of cattle within 4 months…let alone within 6 months… the weight will increase significantly…minimum financial advantage from cattle selling is Rp 0.5 million/month/cattle…if we have 15 cattle, it means 0.5 million X 15 cattle equals Rp7.5 million/month….Rp 7.5 million multipled by duration of fattening, for example, 4 months: [7.5x4]= 30 million…farmers can get a profit of more than Rp 1 million/month…we can only calculate the profit after we have sold the cattle after 4-6 months..."* (Fauzan, FGD Moyo Hulu, 9 October 2015)

To raise the farmers' awareness, the facilitator also asked them to come to and visit the facilitator's home to watch how he fed his cattle with tarramba and observe its effect on the cattle's weight. As Amir noted,

> *'...if we use the individual approach [in awareness raising], we know an individual farmer we approach, and as a facilitator we have to open his way of thinking...."let's come to my home, Sir, and have a cup of coffee'… we do not teach him…before he's coming to my home, I prepare tarramba leaves for cattle, when he comes I do not accompany him drinking a cup of coffee and I ask him permission to feed a cattle ,…'sorry I have to feed my cattle',…I do not ask him to come with me to the kandang, but he follows me and asks ..'why do you give this (tarramba) to your cattle? Well, this is the effect of tarramba on cattle [fat & healthy] cattle)...then he is aware....I really prefer the individual approach to the group one, as an individual farmer will understand faster than a group…'* (interview, Amir, 10 October 2015).

In the Sub-district of Moyo Hulu, the facilitator used dialogues with individual farmers when explaining the use of local tarramba for fattening cattle. He held dialogues with farmers he considered eager to participate in the FTL project when he was on duty (UPT Dinas Peternakan) in a certain village. He usually asks the farmers to make economic comparison between cattle rearing and agriculture as a contribution to their income. The facilitator often asks farmers some provocative questions, such as: "which income source do you use to construct a house?; "perform pilgrimage to Mecca?; or "send your children to school?". Many farmers recognised that cattle rearing is the highest income source for the family. However, only few farmers wanted to try cattle fattening. For those who were interested in cattle fattening, the facilitator asked them to tie their cattle up and feed them tarramba and observe the result of the use of local tarramba within weeks. In this context, *the facilitator uses methods of trial in feeding cattle with FTL feeding system to raisse the farmers' awareness*. The facilitator used this method for some farmers in Semangu, Leseng, Sebasang, Maman and Boak including Batu Bulan village where farmer group Ai Raram exists.

In Lape Lopok Sub-district, the facilitator is an artificial insemination officer (*petugas IB*) and he introduced the FTL project to a farmer during his visit to the farmer's house to treat cattle. During the

IB consultation session with the farmer, he showed a promotional FTL video. However, he sometimes had to tell a lie to the farmer on a certain aspect of cattle fattening. He notes,

> *'...if I approached a farmer I would find out what a farmer likes: rearing cattle, chicken, cultivating paddy...then I came to his house during the day or at night, and talked to him about other things...then I showed him the promotional video…Although the cattle's age was around three years old, I said that it was 1,5 years old because the farmer in the video used tarramba for cattle fattening and put the cattle in the kandang for a certain period...So, in Lopok I observed the situation of farmers, their land, cattle ….while conducting my IB duty, I promoted tarramba for cattle feed…even though I had to tell the farmers a lie....'* (interview, 8 October 2015).

The facilitator also recognised that his ability to facilitate farmers is weak and that his knowledge about the FTL system is also limited. Therefore, when a farmer who is interested in the FTL system needs a lot of information about it, he asks the field researcher (Fauzan) to explain it to the farmer. This was shown by the case of the Amanah Bersaudara and Maju Bersama farmer groups. The facilitator also asked interested farmers to visit the Amanah Bersaudara's *kandang* to learn about cattle fattening from the group.

In the Dalek Esa farmer group, the facilitator used the method of information dissemination to raise the farmers' awareness. Furthermore, the facilitator relied on the power of group leader who is also the village head. She argues that if the influential leader conveys FTL information, the farmers will respond positively. However, the awareness raising conducted by the facilitator in the Dalek Esa farmer group did not use problem identification to find out what problems the farmers faced nor did she use economic analysis comparing cattle rearing and agriculture. She notes that cattle fattening is not the most important income source for the villagers in Oenaik as they still rely on agriculture (corn, nuts) and mariculture (seaweed cultivation) which are profitable. Therefore, in facilitating the farmers, she always suggests that cattle fattening, agricultural and seaweed cultivation are equally important income sources for them. The facilitator did not attempt to change the farmers' minds by suggesting that cattle fattening can be more profitable than agriculture and seaweed cultivation.

As in Oenaik village, the field researcher and facilitator in North Lombok relied on FTL information dissemination. However, to raise the farmers' awareness, they related the FTL system to the farmers' past practice in using sesbania to feed cow for increasing the volume of milk after giving birth. The field researcher (Kurniawan) also corrected wrong assumptions about sesbania cultivation, i.e. that sesbania disadvantages farmers as it can attract paddy-eating birds to perch on a sesbania limb before eating paddy. The field researcher argues that the experience of other farmers' shows that they cultivated sesbania and chased away birds before they ate paddy. He also explained to the farmers that sesbania does not block sunlight needed by paddy.

Secondly, efforts to raise the farmers' awareness about the FTL system in North Lombok was directed at how to increase cattle productivity and overcome cattle feed shortage during the dry season. Although HMT is still available in these villages during the dry season, the farmers have to work harder to get HMT than in the wet season. Unlike in Sumbawa, where economic analysis between agriculture and livestock was used, in KLU such analysis was not used for awareness raising. This is because agriculture is still a main source of income for farmers and farmers' land ownership is limited, i.e. around 0.25-0.50 hectares on average. Moreover, many farmers are landless and they shared the yield

of the land they work with the owner. Therefore, livestock is still considered as additional income source and a way of saving that can be used when there is an immediate need. A facilitator noted,

> *'...I tried to calculate [benefits from livestock and crops] but from the calculation I find that the contribution of the livestock to the family income is minimal; therefore, I have not provided this analysis to the farmers yet...In KLU, if a farmer only has 2 heads of cattle, it will not increase their income significantly…most farmers only have 2 to 3 cattle...at the beginning, farmers are expected to accept Sesbania as an alternative cattle feed because farmers face resource constraint...In Sumbawa, many farmers convert their land from corn to tarramba cultivation because the economic analysis is advantageous and the natural resources [land] are very supportive…'* (interview, Syaikhun, 16 October 2015).

The effort in raising farmers' awareness that relied on information dissemination was also conducted by the field researcher at Amtoas farmer group of Kupang, NTT. Apart from getting information from the head of group who participated in the training, Amtoas members received information about the FTL system from the field researcher (Charles) who visited them regularly. The information conveyed to the farmers is that the FTL system is better than their current system of cattle rearing. The members also received information about some superior qualities of tarramba compared to local one as cattle feed. This group has experience in cattle fattening using local tarramba, sesbania and king grass. This situation reminded us of the farmers in Central Lombok where they were used to utilising Sesbania as cattle feed before the FTL system was introduced.

3.3 Supporting access to inputs and services

To support farmers' participation in the FTL project, Dinas and BPTP provided farmers with seeds, *polybags*, fencing fund and financial access for cattle purchasing. In Kupang, Dinas and BPTP actively played a role in the provision of seeds and polybags. Evey year Dinas distributes 100 kgs of tarramba seeds to the farmers in 36 sub-districts. This program is in accorandce with the NTT governor' program, namely, *Forcing Cultivation, Forced Cultivation.* Furthermore, BPTP has bought tarramba seeds from tarramba fields located in Kuanheum and Oebola Dalam, two successful modelsmof tarramba fields during the first phase of the FTL project. The field researcher record shows that BPTP NTT distributed at least 197 kgs of seeds to farmers inside and outside Kupang in 2015. However, this seed provision was not followed up by cultivation control to find out whether ot not farmers have cultivated seeds (field researcher, Dani, May 2016).

In the second phase of FTL project, Setetes Madu, Dalek Esa, Afoon, Talikomunit, Tunas Muda, and Amtoas received seeds and *polybags* assistance from BPTP and Dinas. Setetes Madu, for example, got 7kgs of tarramba seeds and 5 kgs of *polybags* in the 2015 cultivation season (interview, facilitator, October 2015). In 2016, Setetes Madu did not need any seed assistance as Setetes Madu had its own seeds from one of its members who harvested tarramba seeds in 2015 and sold some of the seeds to Talikomunit for cultivation in early 2016. Dalek Esa in Oenaik village also received seed assistance (1 kg) and *polybags* for the 2015 cultivation season. However, Dalek Esa only got 0.25 kg of seeds from the field researcher for 2016 cultivation. The amount of seeds was also for replacing dead tarramba trees planted in 2015, but that were lost die to a cattle invasion.

Nevertheless, farmers residing surrounding FTL targeted hamlet like hamlet 2, Camplong 2 village and hamlet 1 and 2 of Oenaik village may not have access to seeds. Moreover, the seed price offered by

the Setetes Mabu group is around Rp 50,000/kg, which is considered expensive by many farmers (interview, Nahaman Sabu, February 2016). In hamlet 2 of Camplong 2, was available just for eight farmers who received it from a member of District Parliament who followed the symbolic cultivation by the Bupati (head of the district) in Camplong 2 in January 2016. However, this amount was only 250 grams, which was very limited (interview, Cornelis, February 2016).

In Sumbawa, Dinas provided farmers with about 100 kg of tarramba seeds in 2014 and 2015. In 2014, Dinas also gave polybag assistance to farmers, but it stopped this assistance in 2015 due to practical reasons; therefore, most farmers have moved from *polybags* to *stump* in tarramba cultivation (interview, Dinas Peternakan, October 2015). In 2016, the Sumbawa Livestock Service Agency ran a *tarramba-isation* (tarramba cultivation) program to overcome cattle feed shortage and increase cattle beef production in Sumbawa supported by the local government with Rp 740 million in funds. This budget is for seed provision (100 kgs) and financial assistance for 13 facilitators and 13 heads of Technical Execution Unit, UPT (livestock service) in 24 sub-districts of Sumbawa.

In Labangka Sub-district, the farmers got seeds either in the form of seeds or seedlings developed in polybags and *stump* from the facilitator and the field researcher. The facilitator also tightly controlled the seeds distributed to the farmers and checked whether they had cultivated the seed. If the facilitator found out that the farmers had not planted the seeds yet without an unacceptable reasons, he asked the farmers to return the seeds to him and he distributed them to others who were ready to plant. Since the end of 2015, farmers in Labangka Sub-district have had access to seeds from other farmers such as Hanamuddin and Fatma Hariadi who harvested the tarramba they cultivated in 2015. Even Dinas bought seeds from Hanamuddin whose tarramba grows well. Since 2015, the facilitator has distributed at least 250 kgs of tarramba seeds to farmers in Labangka Sub-district. This does not include seedlings in the form of *stump* brought by the field researcher from KSB (Kabupaten Sumbawa Barat) when the seedling stock in Dinas was not sufficient. Likewise, the field researcher provided seeds for Amanah Bersaudara and Maju Bersama in Lape Lopok and Ai Raram in Moyu Hulu. As a facilitator in Moyo Hulu, Heru also distributed tarramba seeds from Dinas to a few individual farmers cultivating tarramba in Leseng, Sebasang, Maman, and Boak village.

Nevertheless, to be able to get seedlings, farmers in Labngka Sub-district are required by the facilitator and the field researcher to construct a strong fence around a planting area. Erecting a strong fence was also required by the facilitators in Setetes Madu, Talikomunit, Tunas Muda, and Amtoas. In Dalek Esa, this requirement was not demanded strictly by the facilitator and this led to cattle invading a tarramba field. Both Dinas and BPTP in NTT and NTB basically did not give the farmers fence assistance and demanded they establish it with self-reliance as can be seen in the case of Setetes Madu. In this group each member contributed around Rp 210,000 to build 40 hectares squares of a barbed wired fence in 2014. Similarly, Amanah Bersaudara and Maju Bersama constructed a fence on their land of 12 hectares. In the case of Talikomunit, barbed wire assistance was provided by the village fund (ADD) for constructing a fence for the group's planting area. The village government will also give ADD to a newly established group in hamlet 1 (RT 8) of Camplong 2 who did not participate in the FTL project in 2015.

In KLU, the farmers found it difficult to gain access to sesbania seedlings and relied on seed assistance from BPTP NTB distributed by the field researcher. In October 2015, the field researcher handed 15 kgs of seeds to the secretary of the Tetu Tanta Tunaq farmer group and asked him to re-distribute it to the members of other groups in Sesait village. Moreover, the field researcher distributed 17.000

sesbania seedlings in the form of *stump* in January 2016 for the Agung Rinjani and Tetu Tanta Tunaq farmer group. He also distributed other 4500 seedlings to Agung Rinjani and Patuh Angen in February 2016. Some farmers like members of Puta Waspada of Lokok Are hamlet had the initiative to transplant local sesbania in the form of *stump* and cultivated it. Unlike in Kupang and Sumbawa, farmers in KLU did not need fences to protect their sesbania as it was plantedon a rice bund that could not be reached by cattle. Limited sesbania seed availability worsened by the fact that local Dinas did not provide the farmers with such assistance.

3.4 Activities to support farmer learning and implementation

To increase the farmers' skills and their knowledge about the FTL project, facilitators were required by Dinas to facilitate thr farmers in terms of seedling development, cultivation, harvesting and cattle fattening. The facilitation process in NTT and NTB shows their own dynamic and intensity. In facilitating Setetes Madu, the facilitator had his own strategy to accelerate learning about the FTL system among farmers. *Firstly,* the facilitator and Setetes Madu members live in the same village of Camplong 2. The approximate residence enabled the facilitator to visit the group every day and monitor the group dynamic closely. The facilitator always spends one to two hours to discuss with farmers about issues such as tarramba, cattle and others after he returned from the office. For example, in order to better utilise a grant from Dinas, he suggested that the group should not spend it by distributing it to other members, but that the group should save it for building a meeting place and establishing a *kandang* for cattle fattening.

Secondly, because the facilitator became a member of Setetes Madu and has a hectare of land in the collective field (20 hectares), he actively participates in the group activities. This position enabled him to give farmers lessons related to tarramba cultivation and cattle management, such as cultivation and nurturing of tarramba. In teaching the farmers, the facilitator usually uses evidence before asking farmers to change a certain ineffective practice. For example, in changing the seedling development technique from *tugal* to *polybag,* he did not ask the farmers to stop the practice directly. Instead, he let the farmers plant tarramba by *tugal* until the farmers knew that most of the seeds planted did not grow well. At that moment, he explained them that the *tugal* technique was not effective in tarramba cultivation. He then introduced the farmers to seedling development with *polybags*.

Thirdly, to facilitate farmers' learning, Charles, as the field researcher, also assisted the members by disseminating information about the FTL system. Charles explained the superior qualities of tarramba to them, such as its ability to survive every year (evergreen leaves) despite the dry season, and its advantage in increasing cattle weight between 0.5 and 0.8 kg/day, which will increase the selling price of cattle. Moreover, Charles showed them photos of tarramba and of Oebola Dalam farmers' success in gaining economic advantage from tarramba cultivation. Charles suggested that the farmers should use *tumpangsari* cultivation system, because the farmers were worried that the tarramba would disturb their corn (interview, Charles, 5 October 2015). To ensure that the seedling development was in accordance with the FTL system, the researcher came to the group and taught them how to develop seedlings in *polybags*. The field researcher even forced the farmers to cultivate tarramba during the 2015 cultivation as they waited for the Bupati, who planned to do a symbolic planting in Setetes Madu. He noted, '*...I came, I was angry with them, because seedlings in polybags were high enough and I asked them to plant the tarramba in the field and not to wait for the Bupati...if they waited for the*

Bupati, they would plant next year… eventually I met with the group and they planted...' (FGD Setetes Madu, 2 October 2015).

A farmers' learning process facilitated by a facilitator and a field researcher was also conducted at Dalek Esa of Oenaik village during seedling development in December 2014. Similar to Setetes Madu, the facilitator taught the farmers that seedlings should be developed in *polybags*. However, only some members attended this event. In January 2015, the members transplanted seedlings into their fields, but some of the seedling roots penetrated the plastic because the facilitator had been late in giving cultivation instructions to them. In the first and second cultivation in 2015 and 2016 respectively, the facilitator did not require the farmers to construct a strong fence, i.e. a barber wire fence, wherasas Oenaik village is a 'free cattle zone' in which cattle are allowed to enter the agricultural area. As a result, growing tarramba trees planted in 2015 were destroyed by cattle. Although she was aware that the cost of establishing a wire fence ws expensive for the farmers, she put no effort finding ways to overcome this obstacle. The facilitator also let the farmers to cultivate tarramba in 2016 by using the *tugal* technique (*not polybags*) without giving instructions on how to use the technique properly nor did she analyse the effect of this technique.

In Sumbawa, the facilitator had some strategies to assist the farmers' learning and implementation process. In Labangka Sub-district, the facilitator relied more on an individual approach than a group approach as this enabled him to understand the individual farmer's character easily. *First of all,* the facilitator approached one or two farmers who he considered had potential to become pioneers and accompanied them from seedling development, to cultivation, to cattle fattening. The facilitator also came to the planting area and assisted them in carrying out these activities. Shortly after the training in November 2014, Amir facilitated two farmers in Sukadamai who participated in the training. They cultivated tarramba in December 2014 and harvested a year later in November 2015 (interview, February 2016). He then became a successful example for other farmers. Notably, the FTL learning based on the individual approach in Sukadamai was inseparable from the role played by the field researcher who, during 2014, phase 1 of the FTL project, provided an example of tarramba cultivation and cattle fattening with local tarramba. The field researcher asked a Sukadamai farmer (Suardike) to cultivate tarramba and to use local tarramba for cattle fattening. Within six months this effort increased the weight of his cattle significantly, which surprised the other Sukadamai farmers and finally learned from Suardike about the FTL feeding system.

To encourage the learning process, the facilitator in Labangka Sub-district noted that before cultivation, the first and the most important thing is that farmers have to prove that tarramba use for cattle fattening increases the weight of their cattle significantly. Therefore, he asked the farmers to look for local tarramba in Labangka, even in locations which are 20 km outside of Labangka. In terms of cattle feeding, the farmers use three different portions, namely, 100 percent tarramba (without grass mix), 50 percent tarramba (50 percent other food) and 30 percent tarramba (70 percent other food). The facilitator also taught feeding cattle with tarramba from 7 days a week to a minimum of 5 days a week. Moreover, the facilitator did not require farmers to have own a permanent *kandang* for cattle fattening. He always exemplifies his way of cattle fattening to others in which he tied cattle under a tree. If farmers want to advance their own fattening enterprise, the facilitator would show them how to make a permanent *kandang*. As will be explained in FTL cultivation section, the facilitator and the field researcher accompanied and assisted farmers in cultivation process in order ensure that the cultivation is in accordance with the FTL guideline.

The facilitator in Moyo Hulu also used an individual approach in the learning process and prioritised the creation of a few pioneers (early tarramba adopters) in each village in the Sub-district of Moyo Hulu. The facilitator applied this strategy, i.e. to allow early participants to becoma and example for others, because in Sumbawa it is difficult for the facilitator to change a certain habit through information provision only. The facilitator has to provide the farmers with a successful example. In contrast, people transmigrating to Sumbawa, such as those from Lombok are more receptive to new ideas. This is because the Sumbawanese are spoilt by nature in terms of land availability and plenty of cattle ownership.

When facilitating farmers, he asked them to try to feed their cattle with local tarramba and examine the effect of feeding tarramba on the weight and growth of the cattle over a few week. He also gave his time to the farmers he facilitated and asked them to come and see him in the office UPT Livestock Service of Moyo Hulu sub-district to discuss many things related to the FTL system. When the farmers realised the benefit of feeding cattle with tarramba and wanted to cultivate tarramba themselves, he would support them, from providing seedlings and cultivation, as exemplified by the case of Syafrudin of Maman village and Aminudin of Baru Bulan village in 2015. The most important thing for the facilitator is that the farmers utilise tarramba for fattening cattle first and understand the positive impact of tarramba on cattle; therefore, the farmers are aware of the importance of tarramba cultivation. From 2015 until now, the facilitator has also facilitated a farmer from Boak village who was interested in the FTL system and asked him to establish a farmer group, namely, To Balong. Its members have family relationship as this is expected to ensure the continuity of the group. With intensive facilitation, the group constructed a *kandang* for bulls and cultivated grass in a paddy field replacing paddy in one plot. In December 2015, this group developed seedlings and cultivated tarramba along the fence near its *kandang*.

The efforts conducted by Sudarli, a Lopok-based facilitator, in mobilising farmers to cultivate tarramba consisted of two stages. First, he asked farmers whether they wanted to cultivate tarramba. When the farmers agreed to cultivate it, the facilitator assisted them in preparing seedlings, he even planted seeds in the *polybags* himslef. However, Sudarli did not examine whether the farmers' willingness was genuine and had emerged from their awareness of the importance of tarramba for cattle fattening. Sudarli recalled, *'... having participated in the training of facilitators, I approached a farmer, I visited Serangi village, planted 875 seeds in polybags, but it was absurd ...the farmer who had the land did not want to plant, he owned two cattle, I asked him to utilise local tarramba…I tried to visit him continuously…I [Sudarli] planted one row of tarramba along the fence…I [Sudarli] said, it was very difficuct for this person to plant, in fact this was for his own interest…he participated in the training, but had not cultivate tarramba yet…then I called Fauzan to approach him…he planted only ten trees [with polybags] because he had no time...'* (interview, 8 October 2015). *Secondly*, to assist farmers who were interested in tarramba cultivation, like Amanah Bersaudara and Maju Bersama, Sudarli asked the members to try to feed cattle with a mix of tarramba and grass. Then Sudarli asked the field researcher, Fauzan, to provide intensive facilitation in learning how to fatten cattle, choose types of cattle feed that is suitable for cattle, and cultivate tarramba. Sudarli did not understand the FTL system in detail, so he asked for Fauzan to help. Even in 2016, he is still accompanied by an ARISA facilitator when he facilitates farmers' learning.

In the case of facilitation in North Lombok, there were some methods the field researcher used to assist the farmers' learning process. *First of all,* in order to keep them motivated and retain the results

of the training of facilitators, he, together with the famers, developed sesbania seedlings before the training of facilitators took place in April 2015. This because in the RTL (Follow up Plan Action) in KLU, farmers would cultivate sesbania in November 2015, as after the training in April 2015 the farmers faced the dry season. The seedling development was conducted in the area owned by the head of the Tetu Tanta Tunaq and Agung Rinjani farmer group. The field researcher succeeded in seedlings, but these did not grow well when transplanted in the members' land due to the dry season.

Secondly, although the field researcher disseminated FTL information to the farmers, Kurniawan did not facilitate the farmers in the field on how to cultivate sesbania correctly, like applying planting distance. The farmers transplanted the seedlings to the cultivation are in the way they had previously planted sesbania. Some farmers even used planting distance of 0.5 metre and 25 cm, a distanc at which the plants very too close together and the negatively affects sesbania growth. Based on their experience in planting sesbania, without facilitation from thefield researcher, the farmers eventually understood that it is better for them to use seeds and plant them directly in the planting areas, as this method, *tugal*, is more successful than that of transplanting seedlings to a cultivation area.

Thirdly, because the facilitator in charge in the Tetu Tanta Tunaq and Agung Rinjani had never visited the groups, Agus Sulaiman, who is a SMD officer and participated in the training in April, 2015 took over the role of facilitator. He mostly focussed on disseminating FTL information, that is, that sesbania is good for cattle fattening, and encouraging farmers to plant.

3.5 Media production and use

To support the FTL outreach to farmers, BPTP produced two types of video: a promotional videos and educational videos about the FTL system for tarramba and sesbania in NTT and NTB. The promotional videos contain a brief description of the problems faced by farmers, namely, cattle feed shortage (grass) in NTT and NTB, the FTL system's potential as a solution for this shortage, and the FTL cattle fattening system Sesbania and Leaucaena, respectively. The educational videos contained lessons on how to develop seedlings, cultivate the trees and utilise tarramba/sesbania. These educational videos were completely produced (thee issues) for farmers in NTT in the form of VCD and flash disc (200 pieces). For NTB, the educational videos produced for tarramba (FTL type), cover seedling development and transplanting (2 volumes). Due to technical obstacles in the field, the team could not complete the process of video production by the time this evaluation study was conducted. To increase the farmers' motivation, this video was produced considering the local situation (tarramba for NTT and tarramba/sesbania for NTB) and used local farmers as actors. The locations for the video production were in Jatisari in Sumbawa and Nyerot in Central Lombok, where the first phase of the FTL project took place. Images such as cattle, *kandang*, FTL plants and testemonies from farmers were presented and were intended to motivate the farmers to use the FTL system in cattle fattening.

Some of these videos (i.e. the promotional video and the educational video on seedlings development) were used during the in-class training of facilitator and farmers in Kupang, Sumbawa and Lombok. The videos that were played were intended to give certain knowledge (on seedling development) before the farmers apply it in their own field once they had completing the training. The participants were given a VCD and were asked to play it in the group, so that the members who did not participate in the training could understand the FTL system.

In reality, the VCD (promotional) was only used by the facilitator in Labangka Sub-district in a FTL socialisation during a group meeting. This VCD was played in March 2015 after the facilitator helped some individual farmers to cultivate and fatten cattle using local tarramba. Having watched the VCD, the farmers were impressed by the cattle fattened by tarramba and with the image of an old lady rearing cattle in Jatisari village. This motivated the farmers and they asked, *'Why was this old lady able to fatten cattle, and why was I not able to have lots of cattle too?* The farmers were also asked to tell the group about some of the problems they had encountered in cattle fattening.

In Lape Lopok Sub-district (Amanah Bersaudara and Maju Bersama), the promotional and educational video (on VCD) were played in October 2015 when the research team and the field researcher visited the groups. In the same month, the VCD was played for the first time in Ai Raram of Moyo Hulu during a data collection visit as they suggested that they had never watched the video. In the case of Labangka Sub-district, the promotional video was no longer used to introduce the FTL project to the community. Many informants recognise that video is an effective medium in conveying tarramba cultivation and cattle management to the community. However, at the moment, the community members can directly observe living example (i.e. farmers) who are successfully planting and using tarramba. Therefore, the role of video in Sukadamai is currently replaced by exchange visits in which farmers can observe tarramba fields and talk with the owner.

The research team also played the FTL promotional VCD during a visit to Agung Rinjani, Tetu Tanta Tunaq, Putra Waspada and Bareng Sadar in Noth Lombok (KLU) in October 2015. In the first two groups, the training participants did not play the VCD because their VCD player is broken. In February 2016, the researcher team played the video for some members of Putra Waspada and Agung Rinjani who missed the video session during the first visit. In Camplong 2, the field researcher also played the video for the Setetes Madu group during the FTL socialisation. However, the facilitator of the Dalek Esa group did not use the video because she did not have it.

Table 3: Production of videos to support FTL outreach (up to May 2016)

Video Type	Content	Plant	Location
Promotional	• Cattle potential for farmers • Problem: Limited cattle feed • Opportunity: FTL for cattle feed • Area potential for FTL planting • Advantage of FTL planting • Cattle fattening system: Breed, food, *kandang*, fattening, health • Advantages of FTL for cattle health • Economic advantages of using FTL • Farmers' testimonies on advantages of using FTL for cattle fattening	Sesbania Leucaena	Lombok & Sumbawa (NTB); Kupang (NTT)
Educational (Seedlings)	• Method of seed harvest • Seed selection • Seed storage • Seed treatment: Immersing • Seedlings development (choices of methods, preparation, nurturing, advantages and disadvantages of certain methods): o Direct seed plantation (Leucaena only) o Using seedling embankment o Using polybags/plastic glass	Leucaena Sesbania	Sumbawa (NTB) Lombok (NTB) Kupang (NTT)
Educational (Cultivation, Nurturing & Cutting)	• Methods of seedling transplanting to planting area • Preparation and cultivation process • Tree nurturing until harvest o Observation and weed clearing o Cultivation combination (types/planting distance) o Nurturing & plant protection from insect/weeds/animal • Cutting	Leucaena	Sumbawa (NTB) Kupang (NTT)

4 Extent of outreach

4.1 Farmer participation

4.1.1 Farmer participation in Kupang, East Nusa Tenggara

At the beginning of phase two of the FTL project in 2015, the high rates of farmer participation of the members of Setetes Madu, Talikomunit, Tunas Muda, Amtoas, Afoon and Dalek Esa in Kupang showed their level of enthusiasm. Setetes Madu, for example, had 20 members and provided a planting area of 20 hectares. This group's participation was seen in their active attendance of socialisation, group meetings, seedling development and cultivation, as well as in fence construction in which each member had to contribute a certain amount of money. The success of the Setetes Madu group stimulated another group, Talikomunit in hamlet 5, to participate in the FTL project. This group consisted of 40 members, provided a planting area of 40 hectares and cultivated tarramba in January 2016 in which the Bupati attended and inaugurated a symbolic planting. Like the Talikomunit group, Tunas Muda, which was established in 2016 and has 16 members, participated in the FTL project. Unlike other groups, Tunas Muda's interest in tarramba cultivation began with individuals who learned about the advantage of tarramba for cattle fattening from Setetes Madu. Because there were many individuals cultivating tarramba, they finally agreed to form a farmer group to facilitate cooperation and learning. Other groups, such as Amtoas and Dalek Esa, also showed active participation at the beginning of the FTL introduction, despite the fact that only eight out of 10 Dalek Esa members cultivated tarramba in 2015.

For the Afoon group of Tesbatan 1, participation in the FTL project was considered relatively easy for its members, because they gained knowledge about the FTL from their observation of some farmers in a neighbouring hamlet who participated in phase 1 of FTL project. One of the villagers from Tesbatan 1 even bought tarramba for cattle feed from a neighbouring hamlet for Rp750,000 to Rp1.5 million for a six-month utilisation. Furthermore, the Tesbatan 1 farmers were also motivated to participate in the FTL project after they had some information about it from Petrus, a field researcher. Their participation was supported by the fact that there is an Amarasi government rule that prohibits farmers from letting their cattle roam in agricultural areas, so the owner has to provide his/her cattle with food. At the planting preparation in 2015, 10 members of Afoon provided a planting area and participated in seedling development. However, because the seedling development area flooded in 2015, only two members were able to cultivate tarramba.

There are several reasons why farmers participated in the FTL project. *Firstly,* farmers experience cattle feed shortages during the dry season. This reason encouraged the participation of Setetes Madu, Talikomunit and Tunas Muda of Camplong 2 village and Dalek Esa of Oenaik village. During the dry season, they have to get grass and leaves in the forest which is 4 kilometres away from their home. They even have to climb trees to pick leaves for cattle feed, and the leaves they get are not abundant. As a result, farmers let their cattle roam free to free to find food by themselves. Maxen Utan noted,

> *'...we had no food, Dinas came and visited us, we are also involved in cultivation of this cattle feed, we are happy as we can feed our cattle...'* (FGD Setetes Madu, 2 October 2015).

Secondly, having participated in the FTL training held by BPTP in 2015, where they learned about the superior qualities of tarramba for cattle fattening, the Amtoas group was motivated to participate in the FTL project. Unlike Setetes Madu, Tunas Muda and Talikomunit, Amtoas has its own long-term experience with tieing up cattle and feeding them with local tarramba, sesbania and king grass. As a

result, feeding cattle with tarramba is a practice that has existed for a long time. This is similar to the case of farmers in Central Lombok in relation to sesbania. When the FTL project introduced the Australian tarramba, which is considered better than the local one, the Amtoas group members accepted the FTL project enthusiastically. Participation in the FTL project gave the members a new perspective on cattle feeding models. In the past, they just fed their cattle without consideration of cattle feed protein, nutrition and feeding portions. Afer participating in the FTL they have changed their cattle feeding system and keep cattle in *kandang* according to the FTL guideline.

Thirdly, the participation of some group in the FTL project was also encouraged by the influence of cultural leadership that existing in the group. Setetes Madu, for example, was established based on strong cultural leadership requiring its members to obey the leader. Setetes Madu's cultural leader has a vision for the future which accords with the FTL project, and so Christian Utan was able to mobilise the group's members to participate in the FTL project. He even excluded a family member who did not want to participate. Furthermore, this cultural leadership ensures that any internal conflict among group members will be resolved peacefully; hence, it ensure sustainable participation in the project (FGD Setetes Madu, May 2016). Cultural leadership is also evident in the Talikomunit group, whose members mostly come from Uki's family, and the Amtoas group, which is led by Ibrahim Suan who is also customary landowner who inspired the members to participate. This group also applies fines as a sanction for members who do not attend meetings. Notably, transferring technology *per se* to farmers, despite its usefulness and goodness, will not ensure its acceptance without cultural leadership support.

In later development of the FTL project in 2016, the different farmer groups show different level of participation and intensity. Setetes Madu is considered to be a disciplined group, implementing the principles of seedlings, planting and maintaining tarramba in accordance with the guidelines stipulated by the FTL project. The group succeeded in establishing a tarramba corp before they started fattening cattle. This success, supported by self-help, cooperation, and good motivation within the group, also shows that a tarramba crop can grow massively in a 'free cattle zone' (*daerah lepas ternak*) such as Fatuleu Sub-district. As the facilitator noted, this sub-district is classified as an area where the tradition of free-ranging cattle (not to put them in a pen) is difficult to eradicate. Setetes Madu's participation in the FTL project in 2016 shows an increasing trend as can be seen from its success in the management of its tarramba fields from seedling development to harvesting. This group provided an additional 14 hectares of planting area for the 2016 planting, extending the size of their planting area to 34 hectares. The members have maintained the group's cohesiveness at least until the third research round in May 2016. Currently, this group has fattened five cattle, feed them with tarramba they harvested.

Likewise, both Talikomunit and Tunas Muda have showed their enthusiasm for the FTL project up up until 2016, although their fields have not yet yielded tarramba leaves and seeds. Tunas Muda is a slightly different case, in that it was formed after its members have gained awareness about tarramba cultivation on an individual basis. These individuals' need encouraged them to establish the farmer group. In this context, Tunas Muda has its own awareness about the importance of tarramba for cattle fattening. Tunas Muda's planting area is currently 12.5 hectares and will be extended in the 2017 cultivation season.

The participation of the farmers in Dalek Esa decreased in 2015 after their first cultivation failed due to cattle invading the planting field. The farmers here do not yet rely on livestock as their main income

source. Therefore, tarramba is not important for cattle feed, although cattle feed shortage is a considerable problem during the dry season. This group relies on agriculture such as corn cultivation and will ensure that cattle do not invade the corn fields. Kaila, a member, noted,'*...if it's the rainy season, there is plenty of grass, but if it's the dry season, it is difficult to find grass, [during dry season] we have to sleep in the (corn) field…during the dry season, we water the field, we have to protect it from the cattle [so they do not enter into the field]'* (interview, 5 October 2015). The head of the village noted that the FTL project is a good way to improve the economic activities of the villagers, who still rely on agriculture, animal husbandry and mariculture (seaweed cultivation) for their livelihoods. The cattle enterprise is only an additional source of income for incidental/annual needs. Some limiting factors, such as areas where cattle roam free ('free cattle zone') and limited funds for the construction of fences, have made it difficult for the FTL project to achieve its target in Oenaik village (interview, 11 February 2016).

The decrease in the participation of the members of the Dalek Desa group is also a result of the character of their participation. There is an indication that member participation is motivated by a desire to get material incentives (i.e. cattle assistance). Dani, a field researcher, noted,'

> *... bapak desa pushed, they all cultivated tarramba, and it was a year old, I looked at the field, it was high and in good condition…they thought that in the future they would get cattle assistance…I heard from some of the members, they [cultivated tarramba] not because of their own awareness but because they expected assistance...if their tarramba field is one to two metres high, they asked me again, please, give us cattle assistance...*(interview, 5 October 2015). Even during the training of the facilitators there was a promise to the farmers that if they planted tarramba, they would receive material assistance. As one field researcher noted, '*...during the training, there was a statement…if the farmers plant tarramba well, they may receive assistance, such statement emerged during the training for facilitators and farmers…we, as field researcher were often asked by the farmers: when would the assistance come?* (interview, 5 October 2015). This type of participation is caused by lack of self-reliance among the members as shown by the members' reluctance to construct a barbed-wire fence. Gaspertalo noted,'*...there was a fence, but during that season [dry season] the cattle jumped into the field...the fence was made of living plants [kedondong trees] without using barbed wire ...if we receive assistance (barbed wire) we will construct it...'* (interview, 5 October 2015). Similarly, Beni notes, '*...the possibility is that we ask for barbed wire assistance, hence, the plants will safe...if you have assistance for us, that's good...'* (interview, 5 October 2015).

As in the Dalek Esa group, the participation in Tesbatan 1 decreased in 2016 signified by the reluctance of this group members to cultivate tarramba, even though they had 1800 seedlings left over from the 2015 cultivation and 80 hectares of dry land that can be utilised for tarramba cultivation. There are at least two reasons that explain the decrease in participation in the Afoon group. *Firstly*, they argued that they were busy with building sanitation infrastructure funded by the village. Moreover, they had to build a fence to protect the tarramba from cattle invasion. Unlike other hamlets in Tesbatan 1 village, hamlet 3 has a loose policy in relation to penning cattle. Cattle owners free their cattle at night so they can look for food in other people's fields. Therefore, to avoid cattle invasion, they have to build a fence and that costs a lot of money. *Secondly*, the need for tarramba cultivation is not so urgent for the Afoon group and this is similar for the Dalek Esa group. They had around 4-5 cattle and they still relied on local tarramba and available grass for cattle feed. If they had at least 10m cattle, they

would have to cultivate tarramba, because the available grass and local tarramba are not sufficient for ten cattle. Moreover, most Tesbatan 1 villagers still rely on income sources from agriculture (horticulture) to fulfil their daily needs. Holid, a member of the Afoon group notes that horticulture (with a land size of 25x25 metres) can generate an income of Rp 1 million per week (interview, 12 February 2016). Moreover, horticulture requires less manpower. Even though cattle fattening contributes to farmers' incomes in Tesbatan 1, cattle fattening is considered as annual income, of about Rp10 million per six months, to fulfil incidental needs.

For full data on farmer participation in the FTL project in Kupang, West Timor, see Appendix 2.

4.1.2 Farmer Participation in Sumbawa, West Nusa Tenggara (NTB)

From March 2015 until May 2016, there was a significant increase in farmer participation in Labangka Sub-district, especially in the villages of Sukadamai, Labangka and Sekokat. The farmers from Sukadamai began participating in the FTL project in 2014, signified by two farmers participating in the training of facilitators and farmers in November 2014. They were from the Unter Kapuk farmer group and were designated by the facilitator as pioneers for other farmers. Then, many farmers in Sukadamai started using local tarramba for cattle fattening. Having utilised tarramba and knowning about the effect tarramba has in terms of increasing cattle weight, the farmers began to cultivate tarramba. In contrast, for the farmers associated with the Setetes Madu group, their particiation in the FTL project began with tarramba seedling development, cultivation, and then utilisation. In 2016, it was difficult to find Sukadamai farmers who do not utilise tarramba (especially the local variety) for cattle fattening.

Apart from Sukadamai village, many farmers in Labangka and Sekokat have also cultivated tarramba. In 2015, at least six farmers cultivated tarramba in Labangka village and became pioneers for other farmers. In the beginning they tried using tarramba for cattle fattening and cultivated tarramba in their yards. After the cattle yielded a profit within six months of starting the fattening process, the farmers were more convinced about the benefit of using tarramba and started cultivating tarramba in planting areas with an average size of 0.25-0.5 hectare. In Labangka village, two farmer groups, Semangat Baru and Karya Dewa, facilitated by BPTP NTB (Pak John), have utilised and cultivated tarramba since March 2016. Initially these groups cultivated sesbania for cattle fattening, but because there is plenty of dry land in Labangka village they moved to tarramba cultivation. By May 2016 the 20 members of the Semangat Baru group had planted 200 tarramba trees (interview, Amak Syukur, May 2016).

Similarly, in Sekokat village, next to Sukadamai village, many farmers became late participants in utilising and cultivating tarramba. There is a veteranian in Sekokat who, at the beginning of the FTL project, was opposed to the utilisation of tarramba for cattle fattening. He argued that tarramba could cause cancer in cattle because it contains toxins. However, when he noticed that cattle fattening does not endanger cattle health and that many farmers made huge profits, he followed suit. In 2015 he cultivated 4800 trees on his 1 hectares land and now he even encourages non-participating farmers in Sekokat to utilise and cultivate tarramba. In May 2016, the number of farmers participating in Sekokat has increased to 15 people, mostly migrants from Lombok. Most of these farmers utilise tarramba and only few of them cultivate tarramba (interview, Mahdi, a facilitator, May 2016).

The late start of farmer participation in Sekokat village is due to at least two reasons. *Firstly*, the Sukadamai farmers did not freely provide information about the FTL / the benefits of tarramba for cattle fattening to Sekokat villagers. Worse still, when the Sekokat farmers tried feeding their cattle with tarramba and faced the problem of their cattle rejecting tarramba, the Sukadamai farmers did not explain how to solve the problems. *Secondly,* most Sekokat villagers who come from a Sumbawanese ethnic background have plenty of assets in terms of cattle and land. The way they rear cattle is sufficient to fulfil their needs. Moreover, they still rely on agriculture (corn cultivation) as their main source of income. It is not surprising that only two farmers with a Sumbawanese ethnic background are participating in the FTL project in Sekokat (interview, Mahdi, May 2016).

The farmer participation in Ai Raram, Batu Bulan, Moyo Hulu was initiated by Aminudinn, the head of the Ai Raram farmer group, who used tarramba for cattle fattening in 2014. When his cattle reacted negatively to tarramba Aminuddin did not stop giving his cattle tarramba. Having succeeded in fattening cattle with it, he borrowed Rp 100 million from BRI to purchase 15 head of cattle and began cultivating tarramba on his land in 2015.

The increase in participation of members of the Ai Raram group was difficult to predict in 2015, as for many farmers there regarded tarramba as a weed and the cattle rearing system they used was letting the cattle roam free. To them, fattening cattle in a *kandang* was considered to be a waste of time and a burden. In 2015 only two of the 16 Ai Raram members followed Aminuddin's example when they observed that the weight of Aminudddin's cattle increased significantly within a shorter period than their own free-ranging cattle. In February 2016 there was an increase in tarramba adoption, i.e. utilisation and cultivation, among the members of Ai Raram in Batu Bulan village, Moyo Hulu. As noted by Pak Ami, the head of Ai Raram, at least 12 out of 16 members utilised and cultivated tarramba in 2016. By May 2016, all the Ai Raram members participated in the FTL project by planting tarramba. Those who did not have their own planting area cultivated tarramba on 1.5 hectare of Aminuddin's land that was set aside as collective land.

In Maman village of Moyo Hulu Sub-district, Syafruddin is a pioneer who uses tarramba for fattening his cattle. He was motivated by the fact that his friend, Pak Manca in Semango village, successfully fattened cattle with tarramba. He then tried to fatten his own cattle, found that the cattle weight increased quickly (within three months) and sold it for a high price. He then decided to cultivate tarramba on his land. Farmers in other villages, such as Sebasang and Leseng, followed a similar trajectory in that they successfully fattened cattle with tarramba and then started cultivating it. They were all supported by Heru, a facilitator from UPTD Dinas Peternakan Moyo Hulu. There was also an increase in participating farmers in Boak village in Moyo Hulu Sub-district, where farmers established the To Balong farmer group. With guidance from the facilitator, the head of the To Balong group planted tarramba and began to fatten their cattle. The group is made up of people who have family ties to ensure smooth cooperation in cattle fattening. Currently, they have already planted tarramba and put their cattle in a collective *kandang,* as this enterprise is more profitable and saves time when fattening cattle. Moreover, fattening cattle in this way will prevent cattle rustling incidents that have occurred in the village recently.

In Lopok, the Amanah Bersaudara and Maju Bersama groups also fattened cattle using local tarramba. This group has never participated in training, but the facilitator (Sudarli), assisted by Sahbudin, a member of the group who works as an extension officer outside of Lopok, asked the groups to participate. Amanah Bersaudara began fattening three head of cattle in 2014, using grass i to increase

their selling price. This group's participation in the FTL began in 2015 after facilitation by a field researcher. They also found some information on the Internet that proved that tarramba can be used for cattle fattening. In 2015, Amanah Bersaudara and Maju Bersama cultivated 2300 tarramba trees on 0.5 hectare out of the 12 hectares of planting land they had. In 2016, Amanah Bersaudara and Maju Bersama are still participating in the FTL and the number of tarramba trees they have planted has reached 7000 on 1.5 hectares of land. However, currently the number of cattle that Amanah Bersaudara is fattening has decreaset to just six (owned by two farmers) due to their involvement in a paddy seedling development business that generates similar profits as their cattle fattening enterprise.

In 2015, Sudarli's information dissemination efforts about the FTL attracted some farmers from Lopok village who tried to give tarramba to their cattle. Their interest was stimulated by what they learned when they visited Amanah Bersaudara's *kandang* and they started cultivating tarramba in 2016, facilitated by an ARISA project facilitator. In the same year, Sudarli also attracted four farmers from Lopok Beru village. Although Sudarli gave them tarramba seeds, they have not yet planted these. He noted that these four farmers are now interested in corn cultivation again because the corn price has increased slightly, from Rp 200,000 to Rp 230,000/kwintal (interview, Sudarli, May 2016). For data on farmer participation in the FTL project in Sumbawa, see Appendix 3.

In the case of Sumbawa, at least three factors have motivated farmers to participate in the FTL project, i.e. utilising and cultivating tarramba. *Firstly,* farmers want to overcome food shortages during the dry season. Every year, especially from January to May, the agricultural land in Labangka Sub-district looks green with growing corn. However, from June to November the ground dries and there is no grass left because the grass has to be sprayed with herbicide to allow the corn to grow well. During harvest time, and when there is no grass left in the planting area, the farmers experience cattle feed shortages during the dry season (interview, Sosdilwan, May 2016). Furthermore, as Dr. Jamal of Sekokat noted, Labangka Sub-district experienced a severe cattle feed crisis in 2015. Many types of cattle feed, such as grass and leaves, shrivelled, except for the local tarramba. This situation raised farmers' awareness that having a large stock of cattle feed is very important for cattle survival. The desire to overcome cattle feed shortages also motivated the farmers from Batu Bulan to participate in the FTL project (FDG, February 2016).

Secondly, farmers participating in the FTL project are aware that the profit from cattle fattening is much larger than that of agriculture, such as cultivating corn and nuts. Such motivations become stronger when farmers have made a profit from cattle fattening using tarramba. A farmer in Sukadamai (Fatma Hariadi) noted that in 2015 he earned around Rp 48,000,000 from selling 13 cattle after fattening them within five months. These motivations also encouraged the members of Ai Raram to participate in the FTL project, because the financial benefit from fattening cattle exceeded those of an agricultural enterprise. The head of Ai Raram noted that his experience shows that what he earned from agriculture (paddy cultivation) was less than Rp 40,000 per day for four months, but at the same time he had to pay about Rp 50,000 per day for labour. It meant that his agricultural enterprise was not profitable. In contrast, he made a profit of about Rp 500,000 per month on the cheapest head of cattle he sold. He decided to step back from his agricultural enterprise and carry on in cattle fattening.

Thirdly, cultivating tarramba will decrease the farmers' effort involved in collecting cattle feed in villages 20 kilometres away from their own village and increase the stock of cattle feed. The increasing number of farmers utilising local tarramba has had a considerable impact on the availability of local

tarramba. To prevent cattle feed shortages in the future, farmers have to plant tarramba on their own land. It is not surprising that many farmers in Sukadamai have converted the land that they used to use for growing corn into tarramba fields.

4.1.3 Farmer participation in Lombok Utara, West Nusa Tenggara (NTB)

In North Lombok, members of Agung Rinjani from Batu Jompang, Tetu Tanta Tunaq from Batpawang, and Bareng Sadar from Lokok Are participated in the FTL information dissemination helt in group meetings. The first two groups are target groups of the FTL project who attended the facilitator training conducted in April 2015, while the last group did not attend the training but actively sought information about the FTL project from Agung Rinjani. Until October 2015, information about FTL did not reach farmers outside of the above farmer groups. The farmer group Putra Waspada from Lokok Are hamlet, next to Batu Jompang, had never heard about the FTL project, including utilising sesbania for cattle fattening, as the facilitator had never talked about it. Nevertheless, the farmers have experience in giving cows sesbania to increase their milk production, especially after giving birth. They also asserted that they had a planting area that could be used for sesbania cultivation. However, in early 2016, the FTL information provided by a SMD officer (Agu Sulaiman) spread more evenly, reaching many farmer groups in Sesait.

The participation of members of farmer groups in KLU (evidenced by sesbania planting) increased from January to March 2016, the period in which the field researcher brought seedlings that had been transplanted in Mataram. Most of the farmers started cultivating sesbania in early 2016, although one farmer from Tetu Tanta Tunaq, three farmers from Patuh Angen, and one farmer from Agung Rinjani were already cultivating sesbania in early 2015, just before the training of facilitators took place in April 2015. The farmers' participation in the FTL project was hampered by the limited availability of seedlings and the rate of sesbania survival after planting. In Agung Rinjani, all the farmers cultivated sesbania, though the number of sesbania trees planted and their survival rates varied. Even some farmers who were not members of Agung Rinjani, such as Amak Ruminah, cultivated sesbania in March 2016. Two members of Putra Waspada cultivated local sesbania by way of transplanting small sesbania seedlings to rice bunds due to limited of seedling stock.

The farmers in KLU were quick to welcome the FTL project due to several reasons. *Firstly,* before the introduction of the FTL project, the farmers had gained experience in planting sesbania on their rice bunds by way of transplanting small local sesbania. They used sesbania as food for cows to increase milk production after calving. Also, in 1989 and 2014, the farmers had received sesbania seeds and fertilizer from Dinas for a large sesbania plantation (*penghijauan*). However, Dinas did not give the farmers information about using sesbania for cattle fattening and therefore the farmers neglected this program. The information provided by the FTL project taught the farmers that sesbania contains the high levels of protein required for cattle fattening. Furthermore, the farmers are no longer apprehensive about any negative effects that they thought sesbania cultivation on rice bunds could have, such as: that sesbania limits the amount of sunlight that reaches the paddy; that sesbania would attract paddy-eating birds; and that it would create difficulties for rice field ploughing. These doubts were put to rest when the farmers talked to the field researcher who countered such assumptions based on the experiences of farmers in other places.

Secondly, like in Kupang and Sumbawa, in KLU, farmer participation in the FTL project was also stimulated by difficulties getting cattle feed during the dry season. While the farmers in KLU can still get grass for their cattle in the dry season, they need extra time to cut grass and to find places where they can cut it. Sometimes farmers have to collect grass from their rice bunds three times a day and this can take more than two hours per day. This is not to mention that they have to carry sacks of grass to the *kandang* and have to buy fuel if they collect grass using a motorbike.

Thirdly, the farmers reported that the earnings from rearing livestock can overtake earnings from growing crops. One farmer even mentioned that livelihood improvements can be achieved faster by rearing livestock than by growing crops. As an example, the selling of livestock has increased the number of people who own motorbikes. This has also motivated farmers to participate in the FTL project. It is worth noting that rearing livestock is more profitable when a farmer manages and owns more than five head of cattle. At the moment, cattle ownership in North Lombok is two to three head of cattle per farmer and many farmers rear someone else's cattle in shared benefit schemes (*ngadas*).

4.1.4 Factors hampering farmer participation

Not only some of the participating farmers, but also other farmers, did not participate in the FTL project due to a variety of reasons. These reasons include: lack of information; lack of seedlings and land; lack of financial capital; cattle's negative reaction to tarramba; difficulty in changing from rearing cattle using a free rang tradition; and dependency on income from corn cultivation.

Lack of information

At the beginning of phase 2 of the FTL project in 2015, the FTL information circulated among targeted farmer groups, while other farmers did not have access to it. The reason for not spreading the information beyond the targeted farmer groups was that the facilitators were still focussed on the groups that they had started facilitating first. If they wanted to give information about FTL to other farmer groups, they had to be able to show these farmers a successful example. This because these farmers would find it easy to trust information when it was supported by evidence. In 2015, non-participating farmers in Camplong 2, Oenaik, Lape Lopok, Batu Jompang and Lokok Are reported that they lacked information.

In hamlet 2, Camplong 2 village, the FTL information never reached farmers outside the targeted farmer groups. In 2015, six informants noted that they did not have information about FTL and the extension officer had never disseminated such information in their hamlet. As Garson noted, *'...[the extension officer] has never talked about tarramba. The distance between hamlet 1 and 2 is two kilometres and (we) seldom exchange information with other farmers in other hamlets...we just hear about tarramba now, we have not heard about it before...'* (interview, 4 October 2015). An interview with a farmer revealed that the farmers in hamlet 2 experience in cultivating local tarramba because they grew it in their yards for cattle feed ten years ago. Furthermore, the farmers here were willing to plant tarramba if they had seeds as they faced food shortages during the dry season. Yogi noted,*'...it is difficult to rear cattle here, let alone during the dry season, even cattle die at that time…the cattle in the savanna, there is plenty of grass during the rainy season, during the dry season they look for their own food...[do you want to plant tarramba?]...I will, but I do not know how...'* (interview, 4 October 2015). Some farmers in hamlet 2, Camplong 2 village, have lacked information until May 2016 (interview, Germanikus, May 2016). It is undeniable that the distance between hamlet 1 where Setetes

Madu members reside and hamlet 2 is very long and this makes it difficult for the facilitator to spread FTL information to farmers in hamlet 2 without financial and technical support from Dinas (interview, Charles, 12 February 2016).

Some farmers received information about FTL in 2016. This was especially so for farmers who had individual relationships with informed persons or with tarramba cultivators. Frederika, Cornelis and six other farmers from hamlet 2, Camplong 2, received information about tarramba, and seeds, from a member of the local parliament who distributed tarramba seeds and asked these farmers to cultivate it. Nahaman Sabu received information about tarramba from Christian Utan (a member of Setetes Madu), because he visited Utan's tarramba field. Similarly, Marlin, a mother working at the Fatuleu Sub-district office, often heared about tarramba from extension officers (interview, May 2016). The symbolic planting conducted by the Bupati in January 2016 also provided a means of access to information about FTL for some farmers and motivated them to participate in it.

In Oenaik village in Kupang Barat, FTL information circulated among members of the Dalek Esa farmer group only. As in the case of Camplong 2, the focus of the facilitator was on making Dalek Esa into a good example for other farmers. Based on interviews held with farmers in hamlet 1 and 2 in October 2015, all the informants noted that they did not get any FTL information. Joni, who is used to fatten cattle with local tarramba, noted,*'...there was no information dissemination about it [tarramba] in the group, I just hear about it now, about tarramba cultivation trial…'* (interview, 5 October 2015). In Oenaik village, the lack of FTL information lasted until February and May 2016. Jun Sula from hamlet 2, who fattens cattle with local tarramba, said that the facilitator did not involve him in the FTL project because he resided in hamlet 2 and was not a member of Dalek Esa (interview, 11 February 2016). In a similar vein, the secretary of Oenaik village suggested that even in village meetings the village head had never conveyed the FTL project information to the community members. During our visit in May 2016, we confirmed that information on FTL had not been spread beyond the Dalek Esa farmer group (interview, Bernardus & Yustin, May 2016).

Farmers in Lape Lopok also lacked information about FTL, especially at the beginning of 2015. Mastar, who resides in a hamlet neighbouring Langam, noted that he often visited Amanah Bersaudara's *kandang* and silently learned about cattle fattening with tarramba. For him, it was strange to feed cattle with tarramba, although he recognised that tarramba increased the weight of cattle significantly. He noted that Amanah Bersaudara did not give him information about FTL. He even considered cutting off the tarramba growing along a river near his rice bund because he regards tarramba as a weed. Mastar changed his mind when he had a conversation with Fauzan, the field researcher, who explained how to fatten cattle using tarramba. In February 2016, Mastar began feeding cattle with tarramba and he did not cut off the tarramba growing near his rice bund (interview, Sudarli, May 2016).

Lack of Seedlings and Land

Another factor hampering farmers to cultivate tarramba was a lack of seedlings in their village, as noted by Nahaman Sabu from hamlet 2, Camplong 2, and Zainudin from hamlet 3, Tebatan 1. Nahaman noted that he had asked Christian Utan (a member of Setetes Madu) for tarramba seeds, but failed to get seeds because Setetes Madu's tarramba fields had not yet been harvested at the time. Moreover, the price of tarramba seeds in Camplong 2 was considered high, i.e. Rp 50,000 per kilogram (interview, 10 February 2016). Marlin also suggested that in order to get seedlings farmers

had to be a part of a farmer group. However, in some locations in hamlet 1 the farmers did not form a group (interview, 2016). Like Nahaman, Zainudin had found it difficult to get tarramba seeds even though he has a large planting area. Similarly, Yonas and Jun Sula from Oenaik village did not have access to seedlings.

The limited number of seedlings distributed by the field researcher also hampered farmers in Sesait village (KLU) who wanted to participate, i.e. cultivating sesbania. The number of seedlings distributed by the project was insufficient in relation to the size of the land that the farmers owned, i.e. about 0.5 hectare on average. Moreover, the number of existing local sesbania plants on rice bunds was low, which prevented farmers from transplanting seedlings from local sesbania. Before the introduction of the FTL project, sesbania was regarded as a weed, and most farmers had removed the local sesbania and replaced them with other trees. Until the research round in May 2016, both farmers who were members of farmer groups as well as those who were not had not been able to utilise their land for sesbania cultivation to maximum extent due to limited number of available seedlings.

In addition to the lack of information and seedlings, a lack of land hampered some farmers from participating in the FTL project, especially farmers who had migrated from Central and East Lombok to North Lombok. The only land they owned was their back and front yard. Although they had cattle and knew that sesbania is good for cattle fattening, they did not participate in the FTL project. Likewise, some farmers in Camplong 2 and Oenaik village did not have sufficient land to cultivate (interview, Germanikus, May 2016). Garson from Oenaik village, who had experience in cattle fattening using tarramba that he used to buy from a person in a neighbouring village, suggested that fattening cattle was very profitable and could generate a significant amount of income in short period of time. However, he found it difficult to participate in the FTL project due to limited land ownership.

Lack of Financial Capital

The cost of constructing a barbed wire fence to prevent cattle from entering the cultivation area is also a factor that hampered farmer participation in the FTL project, as can be seen in the case of the Dalek Esa farmer group. The price of one roll of barbed wire is around Rp 60,000, which means that farmers have to spend around Rp 5,000,000 to fence a planting area of one hectare. Lack of financial resources as a factor is also suggested by Melkianus Utan RT, from 08 Hamlet 1 in Camplong 2. He noted, *'...but in the dry season like this, cattle destroys food, because here the cattle rearing system is free [cattle can enter the agricultural areas]...our shortage here is that the fence has to be made using barbed wire, but we do not have sufficient budget to buy it...'* (interview, 3 October 2015). However, soon after the Bupati's symbolic cultivation in Camplong 2 in 2016, the village officials promised him and other farmers in RT 08 one thousand of rolls of barbed wire for establishing a fence. Now Utan, together with 28 other members will cultivate tarramba in 2017. Nevertheless, a reason that there was no lack of capital for the construction of a fence in groups with strong self-reliance, like Setetes Madu, Tunas Muda, and the farmers in Labangka Sub-district, was that the facilitator was strict when requiring the farmers to erect a fence before starting cultivation.

In 2015, we found that some farmers did not participate in the FTL project in Lape Lopok Sub-district because they lacked capital, not information. This was suggested by farmers such as Mahendra, Supriyanto and Wahab (interview, October 2015). For them, to be able to fatten cattle like the members of the Amanah Bersaudara farmer group, would require a lot of financial capital, including for the construction a permanent *kandang* at a cost of Rp 25 million. Furthermore, they would also

need capital to fence the planting area. Supriyanto noted that he has willing to fatten cattle like Amanah Bersaudara, but that he would do it gradually until he had sufficient capital. They noted that they often visit Amanah Bersaudara's *kandang* and know how to fatten cattle with the FTL system. They know that fattening cattle using tarramba in a *kandang* will increase cattle weight more quickly than that of cattle reared in a ranch. As of May 2016, these farmers have not yet participated in the FTL project (interview, Sudarli, May 2016).

Cattle's Negative Reaction to Tarramba

In Moyo Hulu Sub-district we interviewed a farmer who had not adopted tarramba yet because he could not bear to observe the negative effect tarramba had on cattle, especially during the first week of fattening. Initially, farmers have to refrain from give their cattle grass. As a result, the cattle will feel very hungry. The cattle have to adjust to eating tarramba instead of eating grass. When cattle eat tarramba, the tarramba will cause a negative reaction, such as foaming at the mouth. As a result, the cattle will refuse to eat tarramba for a couple of days. To dealing with such a situation, many people stop giving tarramba and continue feeding their cattle with grass. This is what Dahlan, a farmer from Maman village and the younger brother of Pak Syaf, experienced. Dahlan even asked Pak Syaf to take local tarramba from his field for Syaf's cattle. Similarly, farmers of Sumbawanese ethnic origin from Sekokat village in Labangka Sub-district did not participate in the FTL projecr due to this negative response.

Difficulty in Changing from Rearing Cattle in a Ranch Tradition

Similarly, many farmers in Sekokat have not adopted tarramba yet. Most of them are Sumbawanese and used to a free range system in cattle breeding (*system lepas*). For them a free range system does not require a lot of time to look after their cattle. If they want to sell their cattle they catch them and offer them to a buyer. As local people, the Sumbawanese are 'spoilt by nature' with numerous cattle and ownership of large areas of land. They do not need to work very hard for economic prosperity by enhancing their cattle management system, although they realise that cattle can make a significant contribution to the household economy. They sell cattle to pay for education, house construction and even paying for pilgrimages. They do not want to improve cattle management in the way proposed by the FTL project. Putting cattle in a pen requires extra energy to provide the cattle with food, clean the *kandang* and wash the cattle. A farmer from Lape Lopok argues that this is particularly the case for those who have hundreds of cattle (interview, Mahendra, October 2015). Likewise, a farmer from Moyo Hulu noted that he knew that putting cattle in a *kandang* to be fed with tarramba, as practiced by Pak Aminuddin, would make them grow quickly and yield high profits. However, he found it difficult to put cattle in a *kandang*. He freed his cattle in a forest for nine months per year. For the other three months he had to tie the cattle up and find food, grass and leaves, for his cattle. This last activity is considered time-consuming and a burden. Many non-participating farmers also argued that they still rely on the free range tradition because they have cows for breeding, not for fattening.

Cattle is not considered a main source of income

Another reason why farmers do not participate is that cattle fattening is not the most advantageous way to generate an income. It is not a kind of agribusiness in which farmers can sell their cattle every six months. For these farmers, other income generating activities such as agriculture and seaweed cultivation are still profitable; therefore, they do not rely on livestock as their main income source. As a result, participation in the FTL project has decreased, especially during the 2016 cultivation in Dalek

Esa and Afoon. The same is true for farmers in Sekokat, especially those who have a Sumbawanese cultural background. They are still interested in growing corn for main income. When a facilitator asked them to plant tarramba, they responded negatively, arguing that the facilitator asked them to develop a forest of tarramba. Where to plant corn then? (interview, Mahdi, May 2016).

4.2 FTL cultivation

Compared to the first phase of implementation of the FTL project in Kupang, especially in the last two years (2014-2015), the project's achievement in the year of 2015-2016 of the second phase showed a decreasing trend. A decrease was seen in terms of number of plants, land area planted, and number of participating farmers. The field researcher's data (see Appendix 2) shows that during the first phase of the FTL project implementation, the number of tarramba trees planted were 442,500 trees on an area of 107 hectares. This involved 132 participating farmers from 12 villages in 10 sub-districts. In the second phase, the number of tarramba trees planted in Kupang dropped to 328,782 trees. However, there was an increase in the number of farmers participating in the project and the size of the area planted. In this second phase of FTL project (2015-2016), around 284 hectares of land were planted with tarramba by 868 participating farmers from 36 farmer groups from 26 villages in 12 sub-districts.

In contrast, the second phase of the FTL project implementation in Kabupaten Sumbawa shows a considerable increase in terms of number of plants, land are planted and number of participating farmers. However, this increase is still below the case of Kupang. The field researcher's report suggests that in the first phase of the FTL project implementation (the last three years, 2012-2015), the number of tarramba trees planted was 16,800 trees. This planting only involved 12 farmers from two villages in Moyo Utara and Rhee sub-districts and the number of cattle fattened was 38 (Fauzan, 2016). In contrast, during the second phase of the FTL project implementation (from 2015-2016), the number of tarramba trees cultivated was 60,250 trees on 64.3 hectares of land. There were 113 participating farmers involved in this second phase, including farmers from 13 sub-district in Sumbawa, who planted and utilised tarramba. The number of cattle fattened was 278 in 2016 (Fauzan & Dinas Peternakan, 2016). This data shows the different dynamics of farmer participation in these two districts.

The following section will explain the FTL cultivation activities conducted by farmers during the second phase of the FTL project in Kupang, Sumbawa and North Lombok from 2015 to 2016. As explained before, the investigation of the FTL cultivation will be focussed on determined samples in three districts.

Planting area and numbers of trees

Before the farmers started cultivation, the facilitators required them to construct strong fences to avoid cattle invasion. In Labangka Sub-district, the facilitator and the field researcher were strict and required the farmers to establish a fence (made from wooden or wire) before they provided the farmers with seedlings. Similarly, the facilitators in Moyo Hulu (Ai Raram and To Balong group), Lape Lopok (Amanah Bersaudara and Maju Bersama), Camplong 2 (Setetes Madu, Talikomunit, and Tunas Muda) required fences be built prior to planting. In the case of Talikomunit, this group received assistance from the village fund (ADD) to build fences on 40 hectares of planting area. However, the facilitator of Dalek Esa did not require the farmers to construct a fence because it was expensive. Dalek

Esa is situated in Oenaik village where cattle are allowed to enter the agricultural areas. Therefore, a wooden fence is not strong enough to prevent cattle invasion.

In October 2014, Setetes Madu developed 26,000 seedlings in *polybags* and then cultivated these seedlings on 20 hectares of land in February 2015. To ensure tarramba growth, all 40 members cultivated during the rainy season. However, because the dry season started in March and April 2015, the members only cultivated around 24,000 seedlings. The remaining 2,000 seedlings were used to replace dead tarramba seedlings. The Setetes Madu farmer group showed rapid progress in terms of FTL participation. This can be seen from the increase in the area planted with tarramba, from 20 hectares in 2015 to 34 hectares in 2016 (an increase of 14 hectares). During the 2016 tarramba cultivation, the members cultivated 15,000 tarramba seedlings from BPTP and Setetes Madu itself. In May 2016, the members were still cultivating because the rainfall had been low since February 2016. In order to maintain tarramba growth, the farmers always cleared weeds that grew surrounding tarramba. Moreover, if the farmers found seedlings that did not grow, they would replace them with the new ones. In 2016, unlike in the first planting of 2015, the farmers did not wait for instructions from Charles (the field researcher) as by then they had acquired skills in tarramba cultivation techniques from last year's cultivation.

Between October and November 2015, a member of Setetes Madu harvested tarramba, namely, Matias Utan. His field of tarramba plants, located on fertile soil and reaching four metres high within a year, yielded 20 kg of leaves per day and 10 kgs of seeds. However, Matias did not utilise the tarramba for cattle fattening because he had no bull that year. Instead, he fed tarramba leaves to his pigs and sold the seeds to the Talikomunit farmer group. It is expected that all the members of Setetes Madu will be harvesting tarramba in July 2016 (FGD, Christian Utan, May 2016).

The Talikomunit group, consisting of 40 members, developed seedlings in *polybags* in November 2015. The members learned seedling development and cultivation techniques, including *tumpang sari*, from Setetes Madu. In January 2016, Talikomunit cultivated 5 kgs of tarramba seeds on 40 hectares of collective land. Part of the seeds were given by BPTP NTT and the rest were bought from Setetes Madu. The Head of Kupang District inaugurated a symbolic tarramba planting in the Talikomunit area on 20 January 2016, which around 70 people attended. Another group wass Tunas Muda, which was established in 2016 and had 16 members. In 2015 and 2016, they planted tarrramba trees on 12.5 hectares of wired-fenced land within which each member has their own area od land ranging from 0.5 to 1 hectare. As the head of Tunas Muda, Merkiur began tarramba cultivation with 7,000 trees on 2.5 hectares of land in 2015. A year later, his tarramba field yielded 100 kg of seeds and he fed tarramba leaves to his pigs as he did not have cattle (FGD Setetes Madu, May 2016).

Unlike the Setetes Madu group, which cultivated in one planting area of 34 hectares, the Dalek Esa members planted tarramba on a total of 3 hectare of land that was made up of small areas on their members' land. In December 2014, the farmers, facilitated by the field researcher and the facilitator, developed 1,000 seedlings from BPTP in *polybags* on the planting area belonging to the head of group. However, not all the members attended this event. In January 2015, eight members cultivated the seedlings on their own planting area. The Dalek Esa group'd secretary (Beni) cultivated 300 seedlings on his own land of 1 hectare. Until the end of the rainy season of 2015, 10 Dalek Esa members managed to cultivate 964 tarramba trees on their own land, while the rest of the seedlings could not be cultivated because the roots had already penetrated the plastic of the *polybags*.

In May 2016, we found that only thee out of 10 members re-planted tarramba by replacing dead tarramba trees with new seeds (0.25 kg for all members) provided by the field researcher (Dani Tetuin). The rest of the farmers used the *tugal* technique (i.e. planting seeds directly into soil) to re-plant tarramba, however, some farmers did not clear the weeds and it was very difficult to identify where tarramba was. Moreover, they did not establish a strong wire fence that is important to protect the tarramba from cattle invasions (FGD Dalek Esa, May 2016). Apart from re-planting tarramba, these three members of Dalek Esa also planted other plants, such as vegetables and corn, in the field (*tumpangsari*).

In 2015, in hamlet 3, Tesbatan 1 village, tarramba cultivation was only conducted by two members out of ten, namely, the head of the group and one farmer. The field researcher (Petrus) facilitated the farmers during seedling development in which they developed 3,500 in *polybags* on a planting area owned by the head of group. The group's total planting area is around 2.5 hectares (10 members have their own land) and the members would cultivate around 300-400 *polybags* on their own land. Because of flooding, of the 3,500 available seedlings, only 750 seedlings were available, while the rest of the seedlings were destroyed. The two farmers planted these 750 seedlings in early January 2015. In mid 2015, the field researcher, together with the head of the group, developed another 1,800 seedlings using his own money. However, the members have not yet cultivated these seedlings because they were busy with corn cultivation and cattle feed (such as grass) was still abundant. The head of the Afoon group harvested tarramba in February 2015 (Petrus, field researcher, interview, 6 October 2015). However, in 2016, Afoon did not cultivate tarramba even though they still had 1,800 seedlings and 80 hectares of land. They argued that they were busy with working together to build sanitation infrastructure funded by the village. Moreover, they have to put up fencing to protect the tarramba from cattle invasion and this requires a lot of funds (FGD Afoon, February 2016).

Table 4: Data FTL in Kupang, East Nusa Tenggara 2015-2016

No	Farmer Group	Village	Planted Area		Tree Planted		Planting Methods		Seedlings
			2015	2016	2015	2016	2015	2016	
1	Setetes Madu	Camplong 2	20 ha	14 ha	24000	15000	Polybag	Polybag	26000
2	Talikomunit	Camplong 2	-	40 ha		3000		Polybag	5 kg seeds
3	Tunas Muda	Camplong 2	2.5 ha	10 ha	7000		Polybag	Polybag	-
4	Dalek Esa	Oenaik	3 ha	1.85 ha	964	-	Polybag	*Tugal*	250 gram in 2016
5	Afoon	Tesbatan 1	2.5 ha	-	750	-	Polybag	-	5300 (3500 destroyed in 2015)
6	Amtoas	Nuatau	50 ha	20 ha	60000	40000	Polybag, *stump*	Polybag *tugal*	-
No	Farmer Group	Members	Members planting		Planting Distance		Cattle Fattened		
			2015	2016					
1	Setetes Madu	20	20	20	2x1 metre		5		
2	Talikomunit	40	40	40	3x1 metre		-		
3	Tunas Muda	16	-	16	2x1 metre		-		
4	Dalek Esa	10	8	3	3x1 metre		-		
5	Afoon	10	2	-	1x1 metre		1		
6	Amtoas	43	43	43	2x1 metre		14		

Source: Research Team, 2016.

In 2015, after having received information about the FTL project, the members of Amtoas cultivated 60,000 tarramba trees on their collective land. During the cultivation, every member was obliged to plant 1,000 trees. The planting was conducted collectively (*gotong royong*). In 2016, the group's members cultivated other 40,000 tarramba trees, bringing the total number of tarramba planted to 100,000 trees. In 2012 the cultural leader, Ibrahin Suan, gave this group 40 hectares of land, which he extended to 50 hectares in 2013, and to 70 hectares in 2015. Next year, the members will plant tarramba again on their remaining land. Apart from the collective planting area, each member has their own land of 1-2 hectares near their house. They also cultivated tarramba and other cattle feed. The group's total amount of planting area is around 200 hectares. In 2016 the tarramba they cultivated in 2015 only reached 2 metres in height on average.

Apart from the farmer groups, some individuals also cultivated tarrambba, such as Dominggus and Imanuel who resided in hamlet 1, Camplong 2 village (interview, 10 February 2016). In 2012, they cultivated fewer than 100 trees after obtaining seed from someone in Oebola Dalam (Pasar Peria), long before the FTL project started in Camplong 2. However, they did not have detailed information about the FTL system. In 2016, they, together with other 28 farmers, joined a newly established group in RT 8 hamlet 1. They intend to clear 30 hectares of collective planting area and cultivate tarramba in 2017. This new group will also construct a barbed wire fence, with support from the village fund (ADD), on that planting area. Likewise, Yoksen, coming from Amarasi and residing in hamlet 1, Camplong 2, also cultivated local tarramba for cattle fattening. Although he knew that the tarramba the project used was better than the local variety, he had no access to seeds (interview, May 2016).

Frederika Manalu and her husband Yunus Mananeh of hamlet 2, Camplong 2, have fattened cattle using local tarramba for six years. Both of them have their own field to grow food for their cattle, consisting of sesbania, local tarramba, *akasia* and other grass. They inherited the practice of cattle fattening from their parents who fed cattle with local tarramba. They fatten six cattle that belong to other and which are sold every six months. They receive Rp 1 million for every head of cattle sold. In 2016, they, together with other seven other farmers, have cultivated tarramba seeds from a member of the local parliament. However, they did not receive further information about the FTL project. Muhsin of hamlet 3 of Tesbatan 1 village, who got seeds from his grandson who is conducting an internship in SNAKMA (Animal Husbandary Vocational Education) in Naibonat, also planted tarramba. He developed seedlings in 50 *polybags* in his backyard for cattle feed provision. For him, fattening cattle with tarramba is not new, as many people in Amarasi have done this for a long time (interview, February 2016).

From 2015 to 2016, tarramba cultivation showed a significant increase in Labangka Sub-district. The farmers in Sukadamai (Labangka 1), Labangka village (Labangka 1) and Sekokat (Labangka 2) enlarged the area that is used for tarramba cultivation. The facilitator and the field researcher in Sukadamai also attracted many new adopters who utilise local tarramba for cattle fattening. These new adopters also provide their land, of 0.75 - 1 hectare, for tarramba cultivation. Initially, in December 2014, the facilitator succeeded in encouraging farmers like Hanamuddin (Amak Isum) and Abdul Manam to cultivate tarramba on their land of 1.5 hectares and 0,35 hectares, respectively. Another farmer, Fatma Hariadi, who is a local teacher in Labangka sub-district, also cultivated tarramba on his land of 0.75 hectare. In 2016, Hariadi extended his planting area to 2.25 hectares replacing *jati* trees. Hariadi noted that he found it a little difficult to cultivate tarramba as he had to immerse the seeds in hot water for a night. However, during this cultivation, the facilitator accompanied him to ensure that the

cultivation was done in accordance with guideline. He cultivated tarramba after he got made a profit from selling cattle after having fattened them for around six months in 2015 (see Appendix 3).

Table 5: FTL Cultivation Data in Labangka Sub-district

No	Village	Farmers Name	Trees Planted	Planting method[1]	# Cattle fattened	FTL Feeding[2]	Feeding Proportion[3]
1	Suka Damai	Suarinka	4000	T	5	R	L
2	Suka Damai	Sahin	4000	T	6	R	L
3	Suka Damai	Zaenudinn	300	T	0	0	0
4	Suka Damai	Hanamuddin	3500	T	8	R	S
5	Suka Damai	ABD. Manan	500	T	3	R	M
6	Labangka	Fatma Hariadi	1500	T	11	T	M
7	Labangka	Subari	500	T	0	0	0
8	Labangka	H. Moh. Nasir	1000	T	3	T	S
9	Labangka	Aq. Ahir	2000	T	5	T	M
10	Labangka	Aq. Rojal	2500	T	5	T	M
11	Labangka	Rustam	1500	T	3	T	M
12	Suka Damai	Fatma Hariadi	1500	T	11	T	M
13	Suka Damai	Agus Saputra	2000	T	8	R	M
14	Suka Damai	Aq. Maman	1000	T	3	R	M
15	Suka Damai	Jemuhur	500	T	2	R	M
16	Suka Damai	Zaenal Abiinn	500	T	4	R	M
17	Suka Damai	Satria	500	T	3	R	M
18	Suka Damai	Aq. Mahdi	1500	T	4	R	M
19	Suka Damai	Resum	500	T	3	R	M
20	Suka Damai	Sabidah	500	T	1	R	L
21	Suka Damai	Eka	2000	T	1	R	L
22	Suka Damai	Toni	200	T	0	0	0
23	Suka Damai	Sabri	700	T	0	0	0
24	Suka Damai	Kidam	300	T	2	T	S
25	Labangka	Moh. Ali	200	T	9	R	S
	Total		**33,200**		**100**		

[1] P: rice bund; T: tumpangsari; M: tarramba all

[2] T: 7/week; R: 5/week

[3] S: 30% tarramba; M: 50% tarramba; L: 100% tarramba

Source: Field Researcher Report, 2016

When the research was conducted in February 2016, most farmers were still planting tarramba as the rainfall was high. Apart from Sukadamai, many farmers in Labangka village and Sekokat cultivated tarramba in February 2016. At least six farmers cultivated tarramba in Labangka village and began were becoming pioneers for others. Similarly, in Sekokat, located just next to Sukadamai village, many farmers became late adopters in utilising and cultivating tarramba. Even in Sekokat, a veteranian who at the beginning of the FTL project opposed the use of tarramba for cattle fattening, cultivated 4,800 tarramba trees on his one hectare of land.

Furthermore, in early 2016, Mahdi, who is also a facilitator in Sekokat, developed 1,000 seedlings in *polybags* with his brother. In May 2016, the seedlings were 10 cm high. Meanwhile, Pak Hasan from Sekokat, who originates from Lombok, cultivated 200 tarramba trees in February 2016. He got seeds from Dr Jamal, who also gave some information about planting techniques using *polybags*. Pak Hasan plans to cultivate tarramba again on his 1 hectare plot of land in 2017 (interview, May 2016). Until 2016, farmers in Labangka Sub-district cultivated at least 33,200 tarramba trees on an area of 24.5 hectares, which was much larger than the 6.2 hectares area that had been cultivated the previous year (see Appendix 3).

The Ai Raram group members cultivated 300 tarramba trees on a planting area of 1.5 hectare in March 2015 after they developed seedlings in January 2015. The motivation of the head of the Ai Raram group to cultivate tarramba was stimulated by the fact that the availability of local tarramba had decreased because many farmers from outside Batu Bulan village were collecting tarramba close to the village and taking it away. In 2016, all the members utilise and cultivate tarramba on their own land of between 0.5 and 3 hectares. For example, Rahman only cultivated 100 trees on his 3 hectares of land due to a seedling shortage. A Manaf, who cultivated 500 tarramba trees on his 2 hectares of land also ran out of seedlings. Meanwhile, Syafrudin cultivated 1,500 tarramba trees in 0.8 hectare of which only 900 trees survived due to low rainfall. Until May 2016 the head of group had cultivated tarramba on 5 hectares of land (FGD Ai Raram, May 2016).

Syafrudin from Maman village cultivated 0.5 kilogram of tarramba seeds in 2015, but only 50 percent survived. He still managed to grow around 300 tarramba trees on his land of 0.9 hectare. However, in April 2016, Syafrudin from Maman did not fatten any cattle as he sold them and concentrated on *paddy* cultivation. He appeared to have abandoned his tarramba field. There are plenty of local tarramba trees that can be used by the farmers, including Syaf, who fatten cattle (interview, Fauzan, 27 August 2016). Farmers in other villages, such as Sebasang and Leseng, have similar experiences in fattening cattle with tarramba. Then they cultivated tarramba facilitated by Heru from UPTD Dinas Peternakan. A farmer in Sebasang, for example, cultivated tarramba in a field of 1.5 hectares and another farmer in Leseng planted in a field of 1 hectare. In Boak village, where Heru resides, some farmers established the farmer group To Balong and cultivated grass and tarramba. In 2016, this group developed 1,200 seedlings in embankment and transplanted 700 seedlings to the planting area, but only 90 percent of the trees they cultivated survived. This group also invented a new way of developing seedlings. They first immerse tarramba seeds in water for a night, then the seeds are wrapped in white cotton and stored in the soil for a day. After the roots have grown, the farmers cultivate the seeds in *polybags* or embankment.

Amanah Bersaudara and Maju Bersama cultivated 2,300 tarramba trees on their collective land of 1.5 hectares (only 0.5 hectare of which was cultivated) at the end of 2014. Their whole land is 12 hectares, surrounded by a barbed wire fence which was constructed in 2008. This area functions as a free ranging area accommodating their 80 head of cattle. As noted by Sudarli, a Lopok facilitator, members of Amanah Bersaudara and Maju Bersama cultivated 2,000 tarramba trees in February 2016 using the *stump* technique. They utilised seedlings developed last year as well as seedlings from ARISA. Amanah Bersaudara now has a total of 7,000 tarramba trees and has harvested tarramba that was planted in April 2015. Other farmers, who joined the Saling Sakiki group that was facilitated by Sudarli in 2015 have utilised local taramba, put their cattle in a *kandang* and cultivated 2,500 seedlings from ARISA. While farmers in Lopok Beru got 500 seedlings from ARISA, these have not been cultivated yet due to the lack of a fence and their being interested in corn cultivation (interview, Sudarli & Amanah Bersaudara members, May 2016).

In North Lombok, the field researcher who initiated the sesbania cultivation in 2015 before the training of facilitators, began to anticipate delay in cultivation. Seedlings were developed on the planting area of Mujayawardin (the head of Tetu Tanta Tunaq) and Agus Sulaiman (SMD officer), which was close to a spring. The seedlings have grown and reached 3-4 metres in height. Shortly after the training, Mujayawardin asked the farmers to plant sesbania in their own land using the seedlings he developed. Some members, including members from the Patuh Angen group, transplanted sesbania. However,

due to the dry season, 90 percent of the sesbania seedlings did not grow. In Agung Rinjani, the members have not transplanted 100 sesbania seedlings cultivated by Agus Sulaiman in 2015. This planting area is to become an example for other farmers. At least 15,270 sesbania trees were planted by eight farmer groups in Sesait village. Meanwhile, the number of cattle fattened (mostly with grassa) by the groups is 117, with an ownership system based on result-sharing (*ngadas*). The following table shows the numbers of sesbania planted and growing from 2015 to 2016.

Table 6: FTL Data Sesait KLU 2016

No	Group Name	Planted Trees	Members	Cattle Fattened	Year of Planting
1	Agung Rinjani	4000	20	26	2016
2	Tetu Tanta Tunaq	2500	56	23	2016
3	Bina Bersama	100	37	17	2016
4	Tangi Tunaq Dowe	3600	36	27	2016
5	Putra Waspada	2000	24	17	2016
6	Patuh Angen	2500	26	6	2016
7	Bareng Sadar	200	22	-	2016
8	Agus Sulaiman (Agung Rinjani)	100			2015
9	Mujayawarinn (Tetu Tanta Tunaq)	270			2015
	Total	**15270**		**126**	

Source: Research Reports, 2016

The limited distribution of sesbania seedlings in February 2016 contributed to low number of farmers planting this forage. According to Kurniawan, the project distributed at least 17,000 sesbania seedlings to farmers in 2016. From these seedlings, Mujayawardin as the group leader of Tetu Tata Tunaq took around 9,600 seedlings and distributed them to the group's members. Each member received either 100, 500 or 1,500 seedlings, however, 90 percent of the seedlings did not grow. Effendy, the leader of the Agung Rinjani group, stated "

> ....*yesterday there were 7,000 seedlings, most seedlings did not grow because they were too high....hence we planted sesbania from the seedlings we developed here...those from the project did not survive*..." (interview, 26 February 2016).

Moreover, the height of the seedlings that survived was less that 30 cm and only 10 percent of the seedlings obtained from the project grew well.

Some factors contributed to the failure of seedling transplantation. The first factor was that seedlings are too high, reaching more than 0.5 m, or even 1 m. The second factor was that the time between transplanting and cultivation was too long, i.e. three days caused rotting of the soaked roots. The third factor was that the supporting roots got cut so that the seedlings failed to absorb water when the sesbania was planted. According to Kurniawan, the seedlings were prepared in Mataram in October 2015 for the planting period of December 2015, with the assumption that there would be sufficient rain. However, it was not raining in December 2015 and this hampered the sesbania cultivation using the *stump* technique. Another factor that also contributed to the sesbania growth failure was that during the cultivation there was no oversight by the field researcher. At that time Kurniawan only distributed seeds to the group leader to be further distributed to the rest of the group members without his facilitation to show the farmers how to plant Sesbania well. Kurniawan had to return to

Sumbawa for his new position as facilitator in another project called “Sekolah Peternakan Rakyat” (people livestock school) (interview, Kurniawan, 24 February and May 2016).

To continue the cultivation among the farmers, the group leader of Agung Rinjani nurtured seeds obtained from Kurniawan in his backyard. Around 5,000 seeds grew well and were distributed to group members of Agung Rinjani, Tetu Tanta Tunaq and Putra Waspada. The seedling size was around 25 cm high when they were transplanted and they grew well on the rice bund and on the field. The planting distance is generally 1 x 1 m. However, some farmers planted seedlings using a spacing of 0,5 m, which considered too dense.

In February 2016, Fakhrul Kurniawan’s assistant brought around 4,000 new seedlings with an average height of around 30 cm. These seedlings were quickly distributed to Agung Rinjani’s group members who ordered them before, including the Bareng Sadar group and Agung Rinjani non-member farmers. The Putra Waspada group, when they did not have enough seedlings, took the initiative to plant local sesbania by transplanting small local sesbania plants that grew on the rice bunds. This practice was tried by Uswatu and Nurinn who cultivated 150 and 100 trees respectively (interview, Nurdin, Putra Waspada, May 2016). In March 2016, Kurniawan gave 2,500 seedlings to a Patuh Angen member who finally managed to cultivate the seedlings which grew well in his rice bund (interview, Sugiono, Patuh Angen, May 2016).

Some farmers from the Agung Rinjani, Tetu Tanta Tunaq and Putra Waspada groups have converted their farming land into forage land. They do not plant rice anymore on these lands. Suharsah from the Putra Waspada group noted, “*I planted paddy in the farm, but the yield is uncertain, finally I planted grass...the benefit is greater than planted paddy. The maximum yield from paddy is only three sacks...I also have 0,2 ha for sesbania, elephant grass and cassava, not paddy...if we have many cattle, just buy rice from selling a calve*” (interview, 26 February 2016).

Nevertheless, farmers’ access to land in KLU is limited with an average land ownership of 0.25-0.5 hectare. This makes it difficult for farmers to develop sufficient sesbania trees to feed one head of cattle per year. In Sesait village, many farmers have dry land that is more suitable for tarramba cultivation than for sesbania. However, due to the FTL project’s predetermined plan, stipulating that KLU had to develop sesbania, such an opportunity was difficult to develop. Moreover, transect results also suggested that some areas in Sesait are more suitable for a tarramba plantation (interview, Tutik, May 2016).

Methods of cultivation

In cultivating FTL plants, farmers in NTT and NTB have their own preferences, be it *polybags*, *stump* or *tugal* (i.e. planting seeds directly into the soil). Seedling development using *polybags* was conducted by Setetes Madu, Talikomunit Tunas Muda, Dalek Esa, Untir Kapuk of Sukadamai, and Moyo Hulu. Setetes Madu used *polybags* for seedling development in November 2015 and then planted tarramba seedlings in February 2016. Like Setetes Madu, Talikomunit used *polybag* for seedling development. The group avoided using the planting method of *tugal* as the survival rate is very low compared to that of the *polybag*. The use of the *polybag* is stressed by the facilitator because in 2015 the Talikomunit group used the *tugal* planting technique, but tarramba seeds failed to grow. At least 3,000 tarramba trees were planted by the members of Talikomunit in May 2016. Likewise, in Tunas Muda the method of cultivation used was *polybags.*

In 2015, Dalek Esa used the cultivation method of *polybags*. However, during the cultivation, many tarramba seedlings did not grow because their roots had penetrated the plastic. In early 2016, the farmers re-cultivated tarramba with the *tugal* technique because the rainfall was very low or there was no rain at all. They found it easy to use the *tugal* technique because they could plant the seeds directly into the soil when there was rain and they argued that the *polybag* method of cultivation needs high rainfall. The use of *tugal* technique during cultivation was endorsed by the facilitator of Dalek Esa suggesting that low rainfall in Oenaik forced the members of Dalek Esa to plant tarramba using *tugal* (interview, 11 February 2016). Nevertheless, farmers did not realise that the *tugal* method was not good as the growing tarramba plant has to compete with weeds for survival (observation, May 2016). Meanwhile, Amtoas used both *polybags* and the *tugal* technique as the latter can be applied successfully because Amtoas' planting area is more fertile than that of Camplong 2. This *tugal* planting method was also used to replace dead tarramba seedlings (interview, Derek Nope, May 2016).

In 2014, Labangka Sub-district and Moyo Hulu farmers cultivated tarramba using seedlings developed in *polybags*. However, in 2015 and 2016, the facilitator, the field researcher and other farmers preferred the *stump* technique to *polybags* as the former allowed the tarramba plants to grow faster and stronger. By using the *stump* technique, the farmer can move the tarramba plant to the cultivation area even one year after seedling development. Using the *stump* technique also enables them to transport a large number of seedlings to a cultivation area far from the seedling development lot.

The move from *polybag* to the *stump* technique was also endorsed by Dinas Peternakan as Dinas did no longer support *polybag* assistance for farmers (interview, Sosinlwan Dinas Peternakan, May 2016). The *polybag* method of cultivation requires farmers to plant seedlings into the soil as soon as possible, before the roots penetrate the *polybag.* Moreover, farmers need time to plant seedlings into the soil. Farmers in the Labangka Sub-district avoided the *tugal* cultivation technique as it does not guarantee the growth of the tarramba plant. They also cleared the land many times to ensure that the tarramba did not have to compete with other plants.

In KLU, farmers used the method of *stump* in 2016 cultivation sesaon. Ideally, during transplanting, the height of the sesbania seedling should be 25-30 cm and they should be transplanted in wet conditions. As can be seen in the case of KLU, the use of the *stump* technique failed because when the seedlings were transplanted they had already reached up to 1.5 metres high, their roots had been cut and the transplantation was conducted during the dry season. As a result, 90 percent of seedlings did not grow. Conversely, in the following cultivation, the seedlings from the head of Agung Rinjani, most seedlings grew well as transplantation was conducted when seedling height was 25 cm. Having learned from this cultivation failure, the KLU farmers now prefer planting the seeds directly into the soil to transplanting seedlings. It means that they will use the *tugal* method, as this will strengthen the sesbania's ability to survive and the sesbania does not need to adjust after transplanting (interview, Susianto & Nurdin, May 2016).

Farmers set a certain planting distance according to their needs. If they want to plant the whole area with tarramba for cattle feed only, they will use a distance of 1x2 metre, but if they want to do *tumpang sari,* the farmers will use distances of 1x3, 1x4, 1x7, or 1x10 metres. In *tumpang sari*, farmers can cultivate tarramba together with other plants such as corn, chilli, and grass. This last technique was applied by many farmers in Labangka Sub-district who planted tarramba together with king grass, nuts and chilli. The head of Air Raram also cultivated tarramba in combination with grass intended for

feeding cows, while he uses tarramba for cattle fattening. In such a *tumpang sari,* although a farmer only has one hectare of land, it is as if he has two hectares because he can cultivate tarramba and grass at the same land (FGD Ai Raram, May 2016). In KLU, the planting distance for sesbania is supposed to be at least 1 metre on rice bunds. However, due to lack of facilitation during the cultivation, many farmers used planting distances of less than 1 metre, such as 30, 50 cm or even 20 cm (interview, Kurniawan, May 2016). For information about cultivation methods conducted by individual farmers in Sumbawa, see Appendix 3.

Table 7: FTL Cultivation Methods in Kupang, Sumbawa and KLU

No	Farmer Group	Location	Planting Method	Strong Fence	*Tumpang Sari*
1	Setetes Madu	Camplong 2, Kupang	*Polybag*	Yes	Y/Corn
2	Talikomunit	Camplong 2, Kupang	*Polybag*	Yes	Y/Corn
3	Tunas Muda	Camplong 2, Kupang	*Polybag*	Yes	Y/corn
4	Amtoas	Amtoas, Kupang	*Polybag, Tugal*	Yes	Y/grass, sesbania
5	Dalek Esa	Oenaik, Kupang	*Polybag, Tugal*	No	Y/corn/nuts
6	Afoon	Tesbatan 1, Kupang	*Polybags*	No	Y/horticulture
7	Desa Labangka	Sumbawa	*Polybags*	Yes	Y/corn
8	Sekokat	Sumbawa	*Polybags, Stump*	Yes	Y
9	Sukadamai	Sumbawa	*Polybags, Stump*	Yes	Y
10	Ai Raram	Moyo Hulu, Sumbawa	*Polybags, Stump*	Yes	Y/grass
11	Maman	Moyo Hulu, Sumbawa	*Polybags*	Yes	N
12	To Balong	Moyo Hulu, Sumbawa	*Polybags*	Yes	N
13	Agung Rinjani	Sesait, KLU	*Stump*	No	N
14	Tetu Tanta Tunaq	Sesait, KLU	*Stump*	No	N
15	Putra Waspada	Sesait, KLU	*Stump*	No	N
16	Bareng Sadar	Sesait, KLU	*Stump*	No	N
17	Patuh Angen	Sesait, KLU	*Stump*	No	N

Source: Researcher Team, 2016

4.3 Cattle fattening

Since March 2016, Setetes Madu in Kupang began a cattle fattening enterprise using semi-permanent *kandang* accommodating five cattle owned by four farmers. These young cattle are bred from cows they have, with a combined cattle ownership of 64, therefore, they have saved money to purchase a bull. The Caplong 2 community practices cattle fattening, but the fattening time is very short, ranging from one day to one week. Farmers who want to sell cattle will catch it, feed it with grass for several days and then sell it to a buyer. Cattle fattening with the FTL system, which requires a long period of fattening, is considered complicated due to several reasons. *Firstly,* the availability of cattle feed is limted, especially during the dry season. Because the number of cattle farmers have, with some farmers owning nearly one hundred head of cattle, they free them in nearby forest to let them find their own food. *Secondly,* generally, farmers in Camplong 2 use their livestock for breeding, not as a business. Livestock is considered to be a way of saving, where cattle can be sold that can be sold every time the farmer has an immediate need, such as school fees and parties.

As in Camplong 2, Dalek Esa and Oenaik community still rear their cattle using the free range system, even though they reported that some of them fattened cattle in 2012 because cattle feed, that is, local

tarramba, was still abundant in Oenaik village. After cattle destroyed the local tarramba during one of the dry seasons, the farmers found it difficult to do continue their cattle fattening enterprise. Up until May 2016, Dalek Esa has failed to develop a tarramba field and the members have no cattle to fatten.

In contrast with other groups, Amtoas began their cattle fattening enterprise in response to Dinas's suggestion a long time ago, because Amtoas had plenty of food stock. Since 2013, Amtoas has put cattle in a *kandang* and has received cattle assistance consisting of 65 cows and four bulls in one year. The following year, the group received other assistance from Dinas, namely, 28 bulls. Amtoas has produced its own 16 bulls from cattle breeding. The cattle assistance from Dinas was categorised as a revolving fund in which every member of the group has the right to share in the rearing without having the responsibility to return the assistance. On 27 April 2016, Amtoas sold some cattle derived from Dinas's assistance after fattening them for two years. Currently, they have 14 head of cattle left to fatten using the FTL feeding system.

Since its involvement in the FTL project in 2015, the Amtoas group has fattened 14 of the cattle they have bred themselves, but it has not sold any of them yet. The introduction of the FTL project assisted the group to change to a model of *kandang* in which cattle feed is placed in boxes above the floor. Before joining the FTL project, the members used to put the cattle feed on the floor of the *kandang*, where the cattle tread on their food. Furthermore, before joining the FTL project, Amtoas needed two years to fatten a head of cattle to achieve a weight of 260 kgs/cattle. Currently, Amtoas needs only a year to fatten cattle using the FTL feeding model and has reoriented its cattle fattening using it as a kind of business, not as a form of saving (interview, Derek Nope, May 2016).

Having realised that the financial advantage of cattle fattening is greater than that of corn cultivation, farmers in Labangka Sub-district are stimulated to focus on cattle fattening enterprise. As in Camplong 2, before joining the FTL project, farmers bred cattle for producing young cattle and such an enterprise was considered as long-term saving. The introduction of the FTL in Labangka Sub-district and the emergence of some successful farmers like Amirullah and Suardike have changed farmers' orientation in relation to cattle rearing in Sukadamai from saving to business. For example, Hanamudddin is used to breeding cattle. He fattened eight head of cattle at the end of 2015 and sold some of them in 2016. At the moment, he is proposing a credit scheme to BRI to purchase cattle. To fatten cattle, the facilitator did not require the farmers to have their own permanent *kandang* first. The farmers can tie their cattle under a tree behind their house. The most important thing is that farmers feed the cattle with local tarramba continuously. Moreover, farmers in Sukadamai have a spirit of working together in constructing a *kandang* for a fellow farmer who only provides cement and nails, whereas other farmers provide manpower and wood to construct the *kandang*.

In 2016 more people in Labangka Sub-district had become involved in cattle fattening to increase their income. They had different professional background, including civil servant, part-time teachers, health officers, police offers and livestock officers. Fatma Hariadi, a permanent teacher, has fattened cattle using the FTL system since 2015. He earned Rp. 48 million from selling 13 head of cattle selling after five months of fattening in 2015. To get young cattle, Fatma Hariadi relied on the acquisition of a young bull from cows he ha bred through artificial insemination from the *lemousin, brahman, bali super* and *eksotik* types. Bali cattle can reach a weight of 326-346 kg, even 500 kg after seven months of fattening. Similarly, another farmer, Rosidi, fattened two cattle for six months and got 100 percent profit. In 2016 he bought two head of cattle for Rp. 9 million and sold them for Rp. 18 million. From this profit, he bought another four cattle forRp 16 million and has focussed on cattle fattening as an

income generation activity. What he earned from cattle fattening overtook his monthly salary as a part-time teacher at junior high school, namely, Rp. 500,000. Until 2016, the farmers Labangka Sub-district have fattened at least 195 cattle.

Cattle fattening is also becoming a promising business for the members of the Ai Raram group in Batu Bulan village. In the beginning cattle fattening using the *kandang* system was considered a burden for the farmers as they had to provide grass to feed the cattle every day. The Sumbawanese tradition of rearing cattle is a free range system and they focus on cattle breeding, not on fattening. The head of the group began fattening three cattle with local tarramba as a trial to examine whether it was profitable. Having succeeded in the trial, he got a credit scheme from BRI valued at Rp. 100 million and bought 19 cattle in 2015. In the same year, he also received an APBN grant in the form of 29 head of cattle, which he and his Ai Raram group members (23 people) have fattened. Currently, cattle fattening is a promising income sources for the Ai Raram members. Moreover, they joined the *Sekolah Peternakan Rakyat* (SPR) project sponsored by Dinas in which they have access to free *artificial insemination* (IB) services. The Ai Raram group gets young cattle from cows they have bred through the IB service (FGD Ai Raram, May 2016). To get high quality fattened cattle, the farmers selected young bulls derived from healthy cows that have never suffered from malnutrition. The Ai Raram members did not want to buy young, thin cattle despite them being cheap. Aminuddin draws such lessons from his experience in which he failed to fatten a thin (malnourished) bull he bought cheaply. Although he gave the bull lots of nutritious food, its weight did not increase significantly (FGD Ai Raram, May 2016). The To Balong farmer group also fattend ten head of cattle out of the 53 head of cattle they have and sold some in 2016.

The Amanah Bersaudara and Maju Bersama groups have begun fattened cattle in 2014, before the introduction of the FTL project. Currently, the Amanah group has a permanent *kandang* enabling it to accommodate 12 cattle and they have spent Rp. 25 million to construct a *kandang* in which all the members contributed a certain amount of money. At the beginning of the fattening activity in 2014, Amanah Bersaudara fattened only three cattle because they had limited time to look for grass. With the introduction of FTL to the group, the number of cattle they fattened increased to eight in 2015 because they had plenty of time to look for local tarramba. The Amanah Bersaudara group took young cattle for fattening from their breeding enterprise and bought others from sellers. Since 2014 the group has sold 14 cattle after four to six months of fattening. In terms of selling price, the group has a parameter that profit for every single cattle sold is not less than Rp. 400,000/cattle/month. Currently, Amanah Bersaudara fattens six cattle (owned by two members) and Maju Bersama fattens three cattle (owned by two members). For the groups, cattle fattening is becoming a promising business whose financial advantage are comparable to the paddy seedling development enterprise that the groups have conducted for long time ago (Observation & FGD, Amanah Bersaudara, May 2016).

In KLU, farmers seldom establish a cattle fattening entreprise although putting cattle in a collective *kandang* is commonplace for long periods due to security reasons. However, farmers focus on breeding and prefer cows to bulls. To get cattle, farmers here use profit-sharing (*ngadas*) a mechanism in which a new-born head of cattle will be shared between an owner and a breeder. Some groups like Putra Waspada, Tetu Tanta Tunaq and Patuh Angen received a cattle grant from the local Dinas Agency. Cattle-sharing is rotated among group members in which some members breed cattle for a certain period until the cow gives a birth. Then these members pass the cow on to other farmers so they can use the cow to breed for the same period. For farmers in KLU, cattle-rearing is considered as

a long-term saving method, not as a business. The most recent data from the field researcher shows that the number of cattle fattened by six groups in Sesait is 126.

In the Agung Rinjani group, the SMD (*Sarjana Membangun Desa*, Graduate Develops Village Program) officer assisted the members in achieving cattle ownership and collective *kandang* facilities in 2015. The number of cattle reared by members of Agung Rinjani increased from only 12 in 2015 to 38 later that year after the SMD program added 26 head of cattle. The SMD fund is a kind of revolving fund in which the members of the group and the SMD officer share the profit. The profit-sharing percentage is 60 percent for breeder, 20 percent for group saving and the other 20 percent for the SMD officer. Having sold cattle, the farmers usually buy other cattle to rear using their initial capital and cover their needs from the margin they get. Since the introduction of the FTL project in 2015, Agung Rinjani farmers have begun to focus on a cattle fattening enterprise.

Like Agung Rinjani, the members of Tetu Tanta Tunaq got used to breeding cattle before the introduction of the FTL project. Since March 2016 the members have started fattening cattle. If they have a bull, the farmers will fatten it for a certain period, not sell it like they used to. In 2016, the number of cattle they put in the collective *kandang* was 72, including those from Dinas' assistance. Nevertheless, cattle ownership among KLU farmers is still between two to five cattle. To significantly increase the profit from cattle fattening, farmers have to fatten at least five head of cattle.

Bareng Sadar was a non-participating group in the 2015 training of facilitators and based in Lokok Are hamlet. Although the group still focuses on cattle breeding, it participated in sesbania cultivation in 2016. At the moment, the number of cattle owned by this group reached 30, excluding 21 head cattle from Dinas' assistance, which are mostly cows. Like other groups in KLU, Bareng Sadar uses a revolving system in cattle grant distribution to give its members the opportunity to own cattle.

Meanwhile, the Putra Waspada group has 70 head of cattle, including 32 cattle they got from Dinas in 2015. In distributing the cattle grant from Dinas and to assist its members in achieving cattle ownership, Putra Waspada applies a profit-sharing composition of *40:40:20*. It means that 40 percent is for the farmer, 40 percent for the group and 20 percent for the operational fund. Business-oriented cattle fattening began in this group since the introduction of the FTL project in 2016, with 17 bulls fattened, all of which were derived from its own breeding enterprise. The Putra Waspada members suggested that although cattle breeding and fattening are profitable, cattle fattening is a quicker way to increasing financial gain than breeding. Nurdin noted that with the current cattle feed availability, each member can rear four to five head of cattle, even he had bred 10 cattle including their babies (FGD Putra Waspada, May 2016).

Compared to Sumbawa, it seems that cattle fattening in KLU will not provide a significant economic impact for farmers. There are several reasons for this. *Firstly,* limited land ownership among farmers limits the number of cattle that can be fattened. With farmers owning less than 0.5 hectare of land on average, each farmer will only be able to fatten less than five cattle with sesbania as the main food, whereas to increase the economic advantage a farmer has to fatten at least five head of cattle. Furthermore, land ownership status among farmers in KLU is also becomes a hampering factor for sesbania planting. Many farmers are landless and share land with a land-owner who usually resides in Mataram city. Without the owner's agreement, farmers will not be able to cultivate sesbania on rice bunds. The case of Nyerot (Central Lombok) during the first phase of the FTL project shows that although the farmers have succeeded in adopting the FTL feeding system that had a significant impact

on the cattle price, they could not increase their production capacity of cattle and sesbania because they had limited planting areas. Sufficient farmers' resources has become one of the important supporting factors for farmers to gain maximum financial benefit from the FTL technology.

Secondly, the conversion of paddy field to sesbania one cannot be applied in KLU because the paddy fields are fertile and productive, some farmers even cultivate paddy twice to three times annually. In contrast, Sumbawa farmers can convert areas used for corn planting area to tarramba because they cultivate corn once a year and profit derived from corn is limited. Moreover, the farmers in Sumbawa have a land surplus. In KLU, the conversion of planting areas can be conducted in Kayangan Sub-district, especially in the lowland areas where paddy fields tend to be dry and cannot be planted more than once a year. Although paddy cultivation is not advantageous in terms of financial gain, farmers in KLU cannot change these practices as they cultivate paddy to fulfil their daily need for rice. There is a common statement about paddy plantation among farmers here, "*If you sell your cattle for paddy cultivation capital, you will never get back your cattle. In contrast, if you sell your cattle you can buy tonnes of rice for your food"* (Rapidep, FGD Agung Rinjani, May 2016).

4.4 FTL utilisation

Towards the end of phase 2 of the FTL project in 2016, some farmers in Camplong 2 in Kupang, Labangka Sub-district, Lopok and Moyo Hulu Sub-district of Sumbawa practiced the FTL feeding system. But not a single farmer group in North Lombok adopted this feeding system. Setetes Madu practiced the FTL feeding system at the end of the project cycle, i.e. in March 2016, after the group had developed seedlings, and planted, harvested and utilised tarramba for cattle fattening. It will take more than a year for the group to enjoy the FTL feeding system using its own tarramba for their cattle. To feed the five cattle they have, the Setetes Madu members utilise tarramba harvested from their own field. They usually feed the cattle with a portion of one roll (10-15 kg) daily. They also mix tarramba with grass. However, the farmers do not know how to feed the cattle in accordance with the ideal FTL feeding system. They have not received training on the FTL feeding system and cattle management from BPTP and Dinas.

Amtoas also has applied the FTL feeding system since they was exposed to the FTL project in 2015. Contrary to Setets Madu, Amtoas has a lot of experience in feeding cattle using king grass, local tarramba and the sesbania they planted in 2009. Before the introduction of the FTL feeding system, Amtoas fed their cattle without considering the cattle's nutritional needs based on cattle weight. They just mixed tarramba, sesbania and grass every time they fed the cattle. As a result, farmers needed around two years to fatten the cattle before they sold them. Having been introduced to the FTL project, they gained new knowledge about the FTL feeding system, the nutritional composition of cattle feed (sesbania, grass, tarramba) and a *kandang* model suitable to the FTL project. They have applied this knowledge in cattle fattening enterprise, including the construction of a collective *kandang* near the meeting house in the tarramba field located at the peak of Fatuleu Mountain. Notably, because the tarramba they planted in 2015 is only two metres high, the Amtoas members still use local tarramba and sesbania as feed their cattle (interview, Derek Nope, May 2016).

The FTL feeding system is applied by a large number of farmers in Labangka Sub-district. Unlike in Setetes Madu, where feeding activities commenced at the end of the project cycle, the facilitator in Labangka and Moyo Hulu Sub-district asked the farmers to apply the FTL feeding system by using local

tarramba before they cultivate it. This was intended to create evidence for the farmers that tarramba has a positive impact on cattle weight increase. In applying tarramba feeding portions in Labangka Sub-district, for example, at first the farmers used a mix of tarramba and other food, such as grass and bran, then they used tarramba without any grass or bran at all.

The same method was also used by the farmers in Moyo Hulu, where they fed cattle with local tarramba before starting cultivation. In 2015, it was commonplace for farmers to feed cattle with 100 percent of local tarramba without any grass or bran. As a result, the cattle responded negatively to the tarramba, as evidenced by foaming at the mouth, lack of appetite and looking weak. Nevertheless, the cattle would recover soon with better appearance and growth. Based on the FGD conducted with Ai Raram (May 2016), until 2016 all the members of Ai Raram have fed their cattle using tarramba. However, after learning from past experience and a SPR workshop in Malang in May 2016, the head of the Ai Raram group has changed the FTL feeding system he practiced before, especially regarding the way in which the cattle are introduced to tarramba. It is better for the farmers to begin feeding tarramba gradually, i.e. grass (70 percent) mixed with tarramba (30 percent), increasing the proportion of tarramba gradually until the proportion is 80:20 (tarramba: bran/grass). This to prevent cattle having a negative reaction to tarramba. In 2016, he applied 80:20 (tarramba: bran) portion in feeding cattle with the FTL system (Aminudinn, FGD Ai Raram, May 2016). This model, namely, a mixture of tarramba and bran/grass, has been applied by Amanah Bersaudara and Maju Bersama since 2015 and their cattle have never rejected nor reacted negatively to tarramba. Similarly, To Balong group uses this FTL feeding system that mixes tarramba with king grass. For the time being, the To Balong group still uses local tarramba as the tarramba they have planted has not been harvested yet (interview, Hasan, May 2016).

Data from the field researcher in Sumbawa shows details of the application of the FTL feeding system by farmers in Sumbawa. The model is divided into two categories. *Firstly,* the intensity of feeding is divided into two types: “T” meaning continuous (every day) and “R” meaning that farmers give tarramba 5 days a week. The *second* category is the portion or quantity divided into three, namely, “L” (100 percent of tarramba without grass mixture), “M” (50 percent of tarramba, mixed with grass or bran), and “S” (30 percent of tarramba, the other 70 percent is grass or other food). (See Appendix 3 for data on the FTL feeding system applied by all the sub-districts in Sumbawa.)

The utilisation of sesbania, even the local variety, as cattle feed in North Lombok is still low due to limited availability. Before the FTL introduction, farmers thought that sesbania could hamper the growth of rice and other plants such as cloves. Moreover, sesbania was thought to attract ric-eating birds. Therefore, the famers eradicated sesbania and considered it to be a useless plant. This is examplified by a member of the Tetu Tanta Tunaq group who chopped off 100 sesbania trees just one week before the researcher team and the field researcher introduced the FTL project in October 2015. In 2016, only a few farmers that utilise sesbania such as Mujayawardin, the leader of the Tetu Tata Tunaq group, who cultivated sesbania in April 2015. Some of members also utilised Mujayawardin’s sesbania for cattle fattening. However, the right composition of legume for feeding cattle has not been applied, as there was no follow up training for the farmers until May 2016. As a result, the farmers just fed the cattle with a mix of grass and limited amount of sesbania until the cattle look full (interview, Susianto, May 2016).

5 Effectiveness of outreach processes towards uptake of FTL systems

5.1 Awareness raising processes

As explained before, some farmer groups such as Setetes Madu, Amtoas, Ai Raram, and farmers in Labangka Sub-district showed their enthusiasm through their participation in the FTL project. Their participation is inseparable from the awareness raising strategy applied by the facilitators. *First of all,* the farmers in Kupang faced cattle feed shortages, especially during the dry season. In the case of Setetes Madu in Camplong 2, the facilitator actively identified the problem, i.e. food shortages, and described the negative impact of this problem on a livestock enterprise such as the loss of young cattle. Even if the farmers succeeded in conducting IB, this would be nonsensical if the farmers would not be able to feed the young cattle. The farmers' awareness of the benefits of cultivating tarramba was also stimulated by the facilitator who instilled a hope, i.e. that such an endeavour would have a positive impact on farmers' economic life. To visualise the image of success, the facilitator exemplified the case of farmers in Oebola Dalam which the Setetes Madu members could observe. Similarly, when the facilitator wanted to change their practice from rearing their cattle by free-ranging them in the nearby forest to putting them in a *kandang*, he problematised the former practice and described it as a potentially risk for their financial situation.

It should be noted, however, that the importance of a suggestion or 'pressure' from a cultural leader, as can be seen in the case of Setetes Madu and Amtoas, in stimulating farmers' participation cannot be ignored. In both cases, the combination of awareness raising by the facilitator and the cultural leader's appeal was effective in mobilising the farmers' participation in the FTL project. However, in the case of Melkianus Utan in dusun 1 RT 08, Camplong 2 village, who was motivated to participate in the FTL, he was more influenced by the material incentive the Bupati offered. His motivation to participate in the FTL project became stronger when he knew that the Bupati had conveyed the offer of a material incentive and that it would be implemented in the Setetes Madu group that he knew well.

The effort to raise farmers' awareness through building a hope or dream was boldly implemented by the facilitator and the field researcher in Labangka Sub-district. The farmers of Labangka Sub-district who relied on corn cultivation as an important income source were asked to re-think this, using a simple economic analysis about income sources other than corn cultivation, i.e. cattle fattening. *Arguably, this motive of economic improvement became the most important stimulus for the farmers in Labangka to participate in the FTL project.* Although the farmers of Labangka Sub-district also faced cattle feed shortages during the dry season, the facilitator did not put this problem forward to raise the farmers' awareness. Instead, he advanced an economic calculation in which he instilled a dream that FTL cattle fattening would increase the farmers' profits quickly. As a result, the facilitator in Labangka Sub-district suggested that the farmers utilise the FTL feeding system first, and only start cultivating tarramba in their own field after they had proven the effectiveness of tarramba for cattle fattening. In terms of tarramba cultivation, the motivation of the Labangka farmers to cultivate was also influenced by an economic factor, namely, *planting tarramba would solve food shortages so that the farmers would be able to maintain increased economic gain from cattle fattening* (interview, Fauzan, 27 Aug 2016). In contrast, the facilitator in Setetes Madu in Camplong 2 asked the farmers to plant tarramba first as this would overcome their immediate problem of shortage of cattle feed. This made sense, as in Camplong 2 the availability of local tarramba was limited, while in Labangka Sub-district local tarramba was abundant.

Fatma Hariadi, for example, noted that the economic analysis comparing an agricultural and a cattle fattening enterprise encouraged him to focus on cattle fattening. He also heard the story that the facilitator who sold his tarramba-fed cattle whose size was similar to that of buffalo. Stimulated by the facilitator's words, he finally became interested in utilising local tarramba and cultivating tarramba. He notes,

> *'...[I] want to extend [my planting area from] 0.75 to 1.5 hectares...I have five hectares of field...in the next planting I will also prepare another 2.25 hectares and in this land...there will be a kandang and food field, all together...if we talk about agriculture, it has a risk of 60 percent of failure, 40 percent of benefit, cattle fattening is turnover, because cattle fattening is profitable…if cattle want to eat, their weight will increase….if we cultivate corn without fertilizer, we will lose...but we will not neglect agriculture at all, because it can be utilised for cattle fattening...Praise is due to Allah, economic analysis is ok, I think cattle fattening is far more profitable...' (interview, 10 October 2015).*

Likewise, a Sukadamai teacher who dreamt of performing a pilgrimage was asked by the facilitator to compare his current source of income (as a teacher) to that of derived from cattle fattening. To perform the pilgrimage, he had to save at least Rp. 30 million, which he would not be able to afford by relying on his current income source. Having realised that the income from cattle fattening is much higher than the income derived from his current occupation, he began to buy cattle and use tarramba for food. In 2016, he cultivated 0.5 hectare of tarramba and fattened two cattle. Apart from being a teacher he also cultivated corn. In July 2016, most farmers in Labangka Sub-district experienced an unsuccessful corn harvest resulting in a loss of income due to a low level of rainfall. This also made the farmers think about the fact that cultivating corn has a 50 percent chance of failure, while cattle fattening only has a 10 percent chance of failure. Therefore, currently many farmers are more focussed on cattle fattening than on corn cultivation, including the teacher who will stop cultivating corn and move into cattle fattening (interview, Fauzan, 27 Aug 2016).

In the case of Moyo Hulu, the facilitator also used an economic analysis to compare the agriculture and livestock enterprises to raise the farmers' awareness, and in doing so he used real life experiences that farmers gained in everyday life. However, the level of awareness of the Sumbawanese farmers in terms of FTL participation is still low as seen in Sekokat, Batu Bulan, Boak, Maman and Leseng village. One of factors limiting their participation in the FTL project is that they are *spoilt by nature* in the sense that they have plenty of land and cattle. For them, ownership of such abundant resources means that they can fulfil their daily and immediate needs adequately. As a result, the FTL system, which requires farmers to put cattle in a *kandang* and feed the cattle every day, is considered demanding.

In the case of North Lombok and Amtoas, the information dissemination about the superiority of the FTL system for cattle fattening and its effect on economic betterment encouraged the farmers' participation. In the case of the farmers in KLU, farmers' awareness to participate in the FTL project gained momentum because of the farmers' experience in utilising sesbania for to increase their cows' milk production after calving. Furthermore, the economic situation of most farmers in KLU encouraged them to improve their income through cattle fattening. Although some farmers were aware of the comparative advantage between the agriculture and cattle fattening enterprise; however, the field researcher did not use such comparison as a method in raising the farmers' awareness due to the farmers' limited resources in terms of cattle and land. Realising a dream through cattle fattening will not be possible when the available resources do not support it. In the case of Amtoas, the farmers'

experiences in cattle fattening by utilising sesbania, tarramba and grass in the past, encouraged this group to participate in the FTL project. Their participation was also supported by their understanding that the FTL system was better than the cattle fattening practices they had used in the past. Meanwhile, in Dalek Esa, the facilitator's efforts to raise the awareness of the farmers to participate in the FTL project was not effective. Her awareness raising efforts did not offer a problem identification and economic analysis comparing agriculture, seaweed cultivation and livestock. Instead, she only disseminated FTL information. The situation in Dalek Esa is different from Amtoas and farmer groups in North Lombok where disseminating information is generally sufficient to encourage farmers to participate. As in Dalek Esa, the reliance of the facilitator in Lape Lopok on dissemination FTL information to raise the farmers' awareness was not effective. The facilitator's ineffectiveness was the result of his abandoning the problem identification and needs assessment. It should be noted, however, that his challenge was tremendous as he had to influence Sumbawanese farmers who had been spoilt by nature for a long period.

5.2 Organised learning processes

Group meetings, discussions between farmers and facilitators, observing cattle fattening and trialling of the FTL feeding system have resulted in increasing farmers' knowledge and skills. Unlike in the 2015 cultivation, the members of Setetes Madu did not need facilitation from the field researcher during the cultivation in 2016 as they had already gained experience in seedling development and cultivation. The FTL learning process in Kupang was conducted using a group approach in which the farmers absorbed and discussed information related to seedlings, cultivation, harvesting and utilising tarramba for cattle. In contrast, the field researcher and the facilitator in Sumbawa did not consider a group approach an effective way to facilitate the learning process. This was based on the field researcher's experience in the first phase of the FTL project, when he only managed to mobilise 12 farmers to cultivate tarramba. As a result, during the second phase he relied on an individual approach (Fauzan, Field Researcher Report, 2016).

In some farmers groups an effective learning process was supported by several factors. *Firstly,* the facilitator and the field researcher had successful experience in cattle fattening using local tarramba and this became important capital for them to use while supporting the farmers' learning process. In 2014, the facilitator of Labangka spent Rp. 9 million to buy three head of cattle, which, after fattening them using tarramba for the period of seven months, he sold for Rp. 31 million. Therefore, the facilitator's experience lies in both theory and practice. The combination of theory and practice was also applied by the facilitator in Camplong 2, i.e. Absalom, who always accompanied the Setetes Madu and Talikomunit farmer groups. This lead to tarramba cultivation in accordance with the guidelines of by the FTL project. By practicing what the facilitator taught the farmers, the facilitator implanted knowledge into the minds of the members. Likewise, Agus Sulaiman, who was a graduate who became a village development program officer in North Lombok, and Aminuddin, the head of the Ai Raram group in Moyo, both acted as motivators for the rest of the members and cultivators of sesbania and tarramba respectively. In the case of Heru, even though this facilitator of Moyo Hulu did not practice tarramba cultivation himself, he asked the farmers to prove what he suggested, i.e. to utilise local tarramba for cattle fattening. Heru realised that introducing new ideas through instruction without evidence would result in the rejection of the ideas. The efforts made by the facilitators mentioned above was not made by the facilitator of Dalek Esa in Kupang Barat.

The strategy of focussing on the creation of a few individual farmers who can then become a model for other farmers was considered an effectivive approach in Sumbawa. As can be seen in Sukadamai, individuals who were successful in adopting tarramba became living examples for other farmers who wanted to adopt tarramba. Suardike's successful case in cattle fattening using tarramba accelerated the farmers' learning process in Sukadamai. Suardike began cattle fattening and tarramba cultivation in 2012 and was considered to be a 'crazy farmer' by the villagers because he converted his cornfield into a tarramba field. Some people wondered: "Would he eat tarramba?" Eventually though, Suardike's success in cattle fattening using tarramba attracted local farmers who wanted to learn from him and follow suit. A learning strategy that prioritises the creation of a few pioneers (early tarramba adopters) was also applied in each village in the Sub-district of Moyo Hulu, as it was difficult for the facilitator to change certain practices through just information provision without evidence. Until May 2016, the effectiveness of this strategy has been proven by the case of Ai Raram in Batu Bulan where members learned from the group's head who had succeeded in cattle fattening using the FTL system.

One factor that also contributed to the failure of Dalek Esa members to participate in the FTL project was the facilitator's reluctance to change her approach from a group approach to an individual approach in order to create a successful model for the other farmers. As can be seen above, this effort was applied by the field researcher in Sumbawa after he realised that using a group approach was not effective. The failure of tarramba cultivation in Dalek Esa made it impossible for the facilitator to achieve her dream of having a successful tarramba field to serve as an example for other farmers. This led to difficulties in terms of encouraging the participation of the community members, as villagers will only cultivate tarramba if they have evidence that the FTL system increases the selling price of cattle and can generate an income that is higher than the income generated from nuts, corn and seaweed cultivation which had become reliable sources of income. Providing the villagers with only theoretical and technical knowledge, without a successful example, is ineffective when asking the villagers to participate.

The ineffective learning process within the Dalek Esa group was caused by minimal facilitation activities. During the implementation of the FTL project, *first of all*, the farmer group location was not en route to the facilitator's workplace, and therefore, she needed time, especially after working hours, to visit the group. In contrast, other facilitators whose farmer groups are located on the way to their workplace, can make an intensive visit while on the way home after work. In addition, the lack of transportation incentives from Dinas and the facilitator's inability to ride a motorbike also hampered her in making visits (interview, field researcher, 12 February 2016). *Secondly*, the ineffective learning process in Dalek Esa was also a result of the farmers' low levels of attendance during meetings with the facilitator. She found that almost every time she held a meeting, most of the community members were reluctant to attend because the meeting was in the afternoon when they took a rest from working the field before they had to go back to the field to work more until 7 pm.

A group-based learning process was also conducted in KLU, where farmers gathered in the collective *kandang* every night and shared some information about the FTL project. Regardless, most of the members only knew that sesbania is good for cattle fattening. They did not have any detailed information about the FTL system. This situation occurred because the facilitation process did not work effectively. In the second phase of the FTL project, the facilitators in charge in the Tetu Tanta Tunaq, Agung Rinjani, Putra Waspada, Bareng Sadar, and Bina Keluarga farmer groups did not visit them. As one field researcher noted, some factors hampered the facilitation activites in this second

phase. *Firstly,* some facilitators were women who found it difficult to work, especially at night. However, the farmers preferred group meetings at night rather than in the afternoon because they had spare time at night. This created a difficult situation for the facilitator due to problems of distance, security and domestic work. This also happened to the facilitator in charge in Dalek Esa. *Secondly*, the facilitators have their own work, which took up a lot of their time, and additional work such as the FTL facilitation was not considered important. Also, some facilitators were IB officers who were busy with delivering IB services at farmers' houses in different places. This situation was worsened by the lack of transport incentives from Dinas, which are important for facilitating activities. This situation encouraged the field researchers in Lombok to assist in facilitating farmers, although, according to the rules of the game, the field researchers should aime to decrease their role in facilitating farmers and prepare to phase out in the second phase of the FTL project (interview, Tutik, February & May 2016). *Thirdly*, Kurniawan, as a field researcher, did not supervise the running of the cultivation process. He only distributed seeds to the group leader to be further distributed by him to the rest of the group members without providing any assistance on how to plant sesbania well. Kurniawan had to return to Sumbawa for his new position as a facilitator in another project called "*Sekolah Peternakan Rakyat*" (people livestock school). As a result, the farmers did not plant sesbania properly, for example, they used planting distance that were too small, between 30 cm and 50 cm, for the plants to grow well (interview, Kurniawan, May 2016).

5.3 Farmer-to-farmer communication processes

The spread of FTL information is inseparable from the intensive communication among farmers that occurs informally. The existence of Amanah Bersaudara's *kandang*, situated on the edge of the main road of Sumbawa-Bima, became an effective means for other farmers to learn. Many farmers from Lopok, and even from Bima municipality, dropped in at this *kandang* to examine the *kandang* and learn about cattle fattening using the FTL system from Amanah Bersaudara. Visiting this *kandang* also stimulated some farmers in Lopok and Lopok Beru who participated in the FTL project under Sudarli's (Lopok's facilitator) guidance. Sudarli even encouraged his participating farmers to learn more about aspects of cattle fattening from Amanah Bersaudara.

In Labangka Sub-district, initially the facilitator and the field researcher sought farmers for the socialisation of tarramba as cattle feed. However, their roles gradually decreased to being seedling providers and tarramba cultivation controllers. Early adopter farmers in Sukadamai and Labangka village who cultivated tarramba in late 2014 (in the early part of phase two of the FTL project) harvested and utilised tarramba for cattle feed. In Sukadamai, a farmers called Hanamuddin was used as an example of a successful FTL participant by the facilitator and the field researcher. Hanamuddin's success in tarramba cultivation encouraged other community members to visit his field and have a conversation with him about many things from cultivation techniques to cattle management. The community members also freely asked Hanamuddin for seeds. In this process, Hanamuddin became a role model for the community members and replaced the facilitator's role in conveying FTL knowledge to other farmers. Hanamuddin inspired the community, not only in Sukadamai but also in Sekokat, to adopt tarramba. Hanamuddin's success in cultivating and utilising tarramba for cattle fattening also stimulated Dr. Jamal (the vet residing in Sekokat) to cultivate tarramba and encourage others to follow suit. This can be seen from Dr. Jamal's efforts in providing information about FTL as well as FTL seeds to some farmers in Sekokat (interview, Pak Hasan, May 2016). Likewise, Hakmullah of Labangka village

who proved that tarramba was good for his cattle became a successful example for his neighbours to take up tarramba. Some of his neighbours visited his *kandang* and learned how to develop cattle fattening using the FTL system. Fauzan noted that the FTL project in Labangka Sub-district became a rolling ball as more and more farmers participated in the FTL project due to learning from other successful individuals (interview, Fauzan, 27 Aug 2016).

The Ai Raram farmer group, consisting of 16 members, constituted the village with the highest number of FTL participants in Moyo Hulu Sub-district. The adoption of FTL started with Aminuddin who utilised and cultivated tarramba in 2014. The role of Aminuddin, who was also the head of the farmer group, was very important in disseminating tarramba utilisation and cultivation. He became a motivator and information transmittor for the members. As the members of the group have a family relationship, Aminuddin wanted them to follow suit in achieving better income through cattle fattening. He told the members how to fatten cattle with tarramba, the economic advantage from cattle selling, and taught them how to make an economic analysis comparing cattle fattening and paddy enterprise. This made the FTL project's ideas spread in Batu Bulan village.

Table 8: Farmer-to-Farmer Learning in Labangka 2016

No	Village	Hamlet	Trainer	Trainee Farmers
1	Suka Damai	Karang Banjar	M. Fauzan	Suarinka
2	Suka Damai	Karang Tengah	M. Fauzan	Amirullah
3	Suka Damai	Karang Tengah	M. Fauzan	Hamin
4	Suka Damai	Karang Tengah	M. Fauzan	Sahin
5	Suka Damai	Karang Tengah	M. Fauzan	Zaenudinn
6	Suka Damai	Karang Banjar	M. Fauzan	Muharis
7	Suka Damai	Karang Banjar	Amirullah	Hanamuddin
8	Suka Damai	Karang Banjar	Amirullah	ABD. Manan
9	Labangka	Karang Banjar	Amirullah	Fatma Hariadi
10	Labangka	Karang Banjar	Amirullah	Subari
11	Labangka		Amirullah	H. Moh. Nasir
12	Labangka		Amirullah	Aq. Ahir
13	Labangka		Amirullah	Aq. Rojal
14	Labangka		Amirullah	Rustam
15	Maronge	Tiu Sarungan	Amirullah	Ibrahim
16	Suka Damai	Karang Banjar	Suarinka	Patma Hariadi
17	Suka Damai	Karang Banjar	Suarinka	Agus Saputra
18	Suka Damai	Karang Banjar	Suarinka	Aq. Maman
19	Suka Damai	Karang Banjar	Suarinka	Jemuhur
20	Suka Damai	Karang Banjar	Suarinka	Zaenal Abiinn
21	Suka Damai	Karang Banjar	Suarinka	Satria
22	Suka Damai	Karang Banjar	Suarinka	Aq. Mahdi
23	Suka Damai	Karang Banjar	Suarinka	Resum
24	Suka Damai	Karang Banjar	Suarinka	Sabidah
25	Suka Damai	Karang Banjar	Suarinka	Eka

Source: Field Researcher Report, 2016

In North Lombok, farmer-to-farmer communication also occurred in KLU, especially after some of the farmers participated in the training of facilitators in April 2015. They held discussions and informal meetings with the rest of the farmer group members, especially those from Agung Rinjani and Tetu

Tanta Tunaq. Some members of the Bareng Sadar group located in Lokok Are hamlet, the hamlet neighbouring Batu Jompang, sought information about FTL from Agung Rinjani. Prior to the introduction of FTL project, the members of the Bareng Sadar group often gathered with members of the Agung Rinjani group and visited the group's place to attend *Posyandu Ternak* (integrated health services for cattle). Through this *Posyandu Ternak* forum, farmers exchanged information about the FTL project to others. Amak Ruminah, who is not an Agung Rinjani member and often visits the *Posyandu Ternak*, finally started cultivating tarramba in early 2016 after getting information about FTL.

Nevertheless, until May 2016, complete information about sesbania and cattle fattening had not evenly spread among farmer group members. Generally, farmers received only limited information about *sesbania,* just that it was a means of cattle fattening, and the farmers were asked by trained farmers to plant tarramba. Some farmers acted as transmitters of information about FTL by relaying information from the field researcher to group members as exemplified by the case of Putra Waspada in Lokok Are. When Kurniawan visited Putra Waspada he provided information to the farmers about sesbania, including seedlings, planting techniques and feeding management. He also showed the farmers a success story about sesbania utilisation for cattle feed that increases economic income. However, not all the group's members attended the meeting. As usually happened, one farmer who attended the meeting passed the information to the rest of members. Suharsah, a member of Putra Waspada noted,

> '*…we were given by Kurniawan some knowledge about sesbania planting techniques, sesbania nutrition…that made us enthusiastic…we are able to absorb it…we informed our friends that the knowledge was good…we encouraged those who have a field to plant sesbania…sometimes not all of us gather when Kurniawan comes here…I may accompany him, when I am in the field, he will call me and I meet him…it is me who conveys the information to my friends…'* (interview, 26 February 2016)

The member of the Bina Keluarga group who participated in the 2015 training in KLU failed to spread information among its members. *Firstly*, there was friction between the leader and the members due to a financial issue within the group. As a result, the members no longer trusted the leader and communication among the group members suffered. *Secondly*, the member who participated in the training was not able to convince the other farmers to use *sesbania* as a main cattle feed. He did not have a successful example of a *sesbania* field that was used for cattle fattening to show to the other farmers (Martiadi, interview, 28 February 2016). Currently, Martiadi and his friends, who used to be members of the Bina Keluarga group, have formed a new farmer group and have received an aspiration fund of Rp. 300 million from Gerindra, a political party. This fund will be used to purchase cattle. The formation of this new group is, among other factors, due to the inability of members to solve internal conflict (interview, Martiadi, May 2016). In the meantime, in Setetes Madu, in Camplong 2, the spread of information among farmers is still limited to family members. Dermi argued that family members more easily accepted information from other family members. This is examplified by Talikomunit and Tunas Muda efforts' in learning about the FTL system by visiting Setetes Madu, including during seedling development and cultivation.

5.4 Processes facilitating access to inputs and services

One important factor determining the success of the FTL project implementation is effective provision of inputs needed by farmers for tarramba/sesbania cultivation and cattle fattening. As explained before, for the NTT farmers it was relatively easy to get access to seedlings, *polybags* and assistance for fence construction. The role of BPTP-NTT and Dinas was effective in providing farmers with seedlings and *polybags*. It should be noted, however, that the control over seeds distribution and fence construction did not work well; therefore, it is not clear whether all the farmers who received seeds have planted them.

Despite the BPTP NTT's claim about its success in distributing around 200 kg of seeds to farmers in Kupang, the seed was only distributed within target groups. Some hamlets surrounding the target groups, such as in Camplong 2 and Oenaik village, either had very limited or no access to seeds. Similarly, for some farmers in Amarasi, where fattening cattle using local tarramba has been been practiced for a long time, it is still difficult to get seeds. Although a few farmers in Camplong 2 sell tarramba seeds to others at a price of Rp 50,000 per kilogram, this is still considered expensive by most farmers (interview, Alena Sabu, May 2016). Even though Dalek Esa was a target group, it only got 250 gram of seeds during the second planting of 2016. The efforts of the member of the District Parliament who distributed tarramba seeds was not effective as she only distributed 250 grams of seeds to eight farmers in hamlet 2 in Camplong 2 village. Nevertheless, it provided access to seeds for some farmers.

In Sumbawa, farmers' access to seedlings was effective, that is, farmers could easily get seedlings from the facilitator and the field researcher who provide three choices: *stump*, *polybags* and seeds. However, farmers had to construct strong fences around the planting area before they could get seedlings from the facilitator. Unlike in Kupang, where the fences had to be constructed using barbed wire, in Sumbawa farmers could construct fences using living wood, as long as the fence was strong enough to prevent cattle from entering the field. Furthermore, the facilitator strictly controlled the cultivation of seedlings distributed to farmers, and checked whether farmers had planted the seedlings they had received. The facilitator would ask farmers to return the seedlings if he found out they had not yet planted the seedlings without acceptable reasons (interview, Amirullah, May 2016). When the facilitator ran out of seeds, he asked Dinas to send him seedlings. Moreover, some farmers who harvested tarramba, such as Hanamuddin and Fatma Hariadi of Sukadamai, provided farmers with seeds, mostly for free. Hanamuddin also sold seeds to Dinas at the price of Rp 20,000/kg. Even the ARISA project ordered 100 kg of seeds from Hanamuddin in July 2016.

Unlike in Kupang and Sumbawa, the provision of sesbania seedlings to farmers in KLU was very limited. Dinas in KLU did not provide the farmers with seedlings. As a result, farmers could not maximise their land usage for sesbania cultivation. In January 2016, the field researcher provided seedlings that had been developed in Mataram, however, 90 percent of seedlings did not survive. Furthermore, the field researcher gave 15 kg of seeds to secretary of Tetu Tanta Tunaq and asked him to distribute these to farmers in Sesait village. At the end of 2015, there was political conflict during the local general election (to elect the Bupati) in which the head and secretary of the Tetu Tanta Tunaq group forced their members to elect the Bupati candidate they supported. If the members did not elect the candidate they were told to elect, they would be dismissed as the members of the group. When the Bupati candidate the head and the secretary of Tetu Tnata Tunaq had favoured lost in the election, the friction between the head and secretary and the members was unavoidable. Moreover, the

communication within the group did not work well, and therefore the seeds the field researcher had given to the secretary could not be distributed to other members. Currently, none of the members know where the seeds are (interview Kurniawan, May 2016).

In Moyo Hulu, farmers' access to cattle ownership was relatively easy as can be seen from Aminuddin of Ai Raram and Syafrudin of Maman village who were granted a credit scheme (KPPI-BRI) of Rp. 100 million by the BRI bank for purchasing cattle in 2015 (Aminuddin) and 2016 (Syafrudin). The credit applications had been endorsed by UPT Dinas of Moyo Hulu, which provided a recommendation (explaining that it was appropriate for the farmers to receive the credit) to the BRI bank. The head of UPT Dinas in Lape Lopok also endorsed farmers who applied for credit for to purchase cattle as the FTL project supported the fattening. However, he required the farmers to be honest in fulfilling all the bank's requirements, such as photos of the *kandang*, of the cattle feed field and farmers' current economic condition (interview, KaUPT Lape Lopok, May 2016). In Labangka Sub-district, Hanamuddin is currently applying for the same credit scheme of KPPI-BRI, valued at Rp. 100 million, but the BRI bank has not granted it yet (Fauzan, interview, 27 Aug 2016). Since 2015, the BRI bank has blocked credit access for Labangka farmers. In the past, many farmers could not re-pay the credit they had received from BRI; therefore, this supply of credit no longer works. Because many farmers have not been able to repay the credit, the BRI bank has blocked financial access for the farmers in Labangka.

Apart from access to credit for cattle purchasing, some farmers also received aspiration fund from a political party. In 2015, Aminudin of Ai Raram received aspiration fund in the form of 29 head of cattle that are now being fattened by Ai Raram members. Similarly, in mid-2016, Bina Keluarga members in Sesait received aspiration fund of Rp. 300 million from Partai Gerindra (Gerindra Party). The members will form a new farmer group, as the Bina Keluarga group does not function at all, and buy a number of cattle (interview, Martiadi, May 2016).

Although farmers have access to cattle from the local government through the livestock service agency, this does not assist them in cattle fattening as the cattle grant is intended for breeding, including the cow salvation program. Farmer groups in Sesait villages, including Amtoas in Fatuleu, received this cattle grant. This indicates that there is no synchronisation between the local government's program and the FTL project. Access to cattle for fattening was initiated by the Bupati of Kupang who promised Setetes Madu 15 head of cattle, and the SMD program who provided the farmers of the Agung Rinjani group with bulls. Furthermore, individual access to cattle ownership in KLU is also available to farmers by way of profit-sharing (*ngadas*) as the purchasing power of farmers in Sesait village is low. Even though *ngadas* provides an alternative way for farmers to gain access to cattle, this takes longer for farmers to have their own (young) cattle.

In terms of cattle selling, local government in all districts have not provided advantageous services for farmers. In Kupang, the selling price of cattle is lower, i.e only Rp. 32,000/kg of live cattle, than the price of live cattle in Lombok which reaches Rp. 40.000/kg. Farmers have no choice to sell their cattle to a local seller who comes to their place and buys based on the *cawangan* system (estimated price). Such selling conditions are caused by several factors. *Firstly*, the local governments have not yet provided the farmers with cattle scales. As a result, the farmers do not have a bargaining position in determining the price of their cattle. A cattle scale will help the farmers to estimate the weight of their cattle, and therefore, they will have the lowest and highest price estimation when they sell their cattle. In Sumbawa, Dinas is still considering the provison of cattle scales and a *Posyandu Ternak* (integrated health services for cattle) for farmers. *Secondly*, a lack of a livestock market, such as in Sumbawa,

makes it impossible for farmers to negotiate the prices offered by buyers. Moreover, the price of cattle at the farmer level is difficult to increase due to local trader monopoly. As Sosdilwan noted, outside traders such as those from Java and Kalimantan offered high prices for cattle if they have direct transactions with the farmers. However, there is a regulation requiring outside traders who want to buy cattle in Sumbawa to cooperate with the local trader association. As a result, the farmers' profits from selling cattle is reduced (interview, Sosinlwan, May 2016).

6 Effectiveness of media in support of outreach processes

As explained before, many facilitators did not use video in their outreach strategy due to technical issues such as the lack of a projector and/or VCD player in the farmer groups. The video is supposed to be played following thematic training on FTL for farmers to impart some information relating to the FTL. Only a few facilitators/field researchers used the video during the FTL socialisation to farmer group members.

The use of video (especially the promotional one) was effective in the FTL dissemination to give farmers initial knowledge and motivation to participate. The effectiveness of video is shown in the case of Kupang, Sukadamai, Langam (Lopok), and North Lombok. During the training of facilitators in North Lombok, participants watched a promotional video of cattle fattening using sesbania. While they watched the video, the participants digested its message well, they observed healthy cattle in *kandang*, and they understood how to fatten cattle at glance. Although the video was only short, it succeeded in motivating the participants to participate in the FTL project (interview, Agus Effendy, Agung Rinjani, October 2015). Likewise, Dermi Utan of Setetes Madu noted, '*…through video watching, training lessons can be easily understood and [video watching is] enjoyable*…' (Dermi, FGD Setetes Madu, 5 October 2015). The effectiveness of the use of video combined with discussions during the FTL socialisation is evident in the case of the farmers in Sukadamai village. Having watched a promotional video, farmers were curious about the fattened cattle they had seen in the video. They were also challenged and motivated by the fact that the Jatisari old widow in the video who had managed to fatten almost 20 cattle,

> *'Why was this old lady able to fatten [so many cattle], why was not I not able to fatten many cattle, in fact I am a man?*' (interview, Fauzan, October 2015).

Promotional video is also effective in building motivation among farmers to fatten cattle using the FTL system in North Lombok. Due to technical obstacles, the head of the farmer group did not play the video. However, during the first data collection visit in North Lombok and Moyo Hulu the research team played the promotional video to the members of the Agung Rinjani, Tetu Tanta Tunaq and Ai Raram farmer groups and observed the members' responses. Generally, the farmers watched the video attentively and responded to it positively, as noted by a farmer from Putra Waspada,

> '*…it is more convenient for me to watch video because we can watch cattle and sesbania directly…as if I already planted sesbania…I am very pleased to watch it…cattle in video look healthy…'* (interview, 27 February 2016). Similarly, Suharsa noted, '*…watching the examples in the video, seedling techniques, chopping sesbania, feeding methods, are very helpful and with God willing, we can conduct what we watch and hear about cattle rearing…*' (interview, Suharsah, 27 February 2016).

Even Sugiono and Tetu Tanta Tunaq members could recall how to correctly cut sesbania limbs after watching the video during the visit of the researcher team in October 2015 (interview, May 2016).

Criticism of the video, especially of the promotional one, was that the video should be produced by following the FTL activities sequentially, from seedling development, cultivation, harvesting and cattle fattening in a continuous process; therefore, cattle development can be followed consistently. Notably, the facilitator's role in accompanying farmers in the FTL activities is still needed to explain and implement the contents of the video, such as seedling development and cultivation. As Fauzan noted,

'*…the video plays quickly, although it contains all aspects of FTL, but...it is not in detail, through such discussion forum, we make everything clearer…'* (interview, Fauzan/Amirullah, 10 October 2015).

7 Lessons learned

7.1 Relating to outreach processes

The first thing in the outreach strategy to consider is the recruitment of a facilitator as he/she takes up a front gate position in the spread of the FTL project. If it is possible, the recruitment of a facilitator should consider the prospective facilitator's experiences in livestock, that is, he/she should be able to a good understanding technical knowledge about livestock. Cases from some districts show that the facilitators' effectiveness in mobilising their community to participate in the FTL project is, among other factors, influenced by the experience the gained in fattening cattle using tarramba before they participated in the training. Although the facilitator training is important to increase their knowledge and skills, the facilitation process will be more effective in raising farmers' awareness if the facilitators have practical knowledge (experience) before they ask farmers to participate. Effective facilitation can be seen in the case of Labangka Sub-district, Moyo Hulu, Camplong 2 (Setetes Madu), and Batu Jompang (Kelompok Agung Rinjani). Sukadamai village of Labangka constitutes a good example in FTL participation. Both the facilitator and the field researcher are not only advocating tarramba adoption, they also have successfully utilised it for cattle fattening. Their experience lies in both theory and practice. Likewise, the combination of theory and practice was also applied by the facilitator in Camplong 2.

In raising farmers' awareness, facilitators have some choice in methods depending on the local situation in which they work. *First of all,* the facilitator, together with farmers, identified their problems and assessed their needs. The facilitator used living examples that the farmers have experienced in their daily lives, such as cattle feed shortages, death of calves and decreased economic improvement, as can be seen in Camplong 2. Having raised the farmers' awareness, the facilitator proposed a particular solution, namely, cattle feed provision. In the context of the FTL, the facilitator proposed the cultivation of tarramba as the solution a problem.

Secondly, the facilitator raised the farmers' awareness of the FTL project by using the method of hope/dream building. This method was practiced by the facilitator in Labangka and Moyo Hulu. Although the farmers in Labangka Sub-district also experienced cattle feed shortages, as in Camplong 2, the facilitator chose to highlight a positive aspect of the FTL project, i.e. building a hope/dream that cattle fattening would improve the farmers' economic condition quickly. This is conducted by inviting farmers to compare income derived from agricultural activities and cattle fattening income, using a simple economic analysis. Therefore, the farmers understood that using the FTL system will improve their economic situation. This economic analysis plays an important role in changing the farmers' orientation in livestock enterprise from being orientated towards saving to being oriented towards business. This economic analysis also shows its effectiveness in changing the farmers' cattle rearing practices from free-ranging cattle to putting them in a *kandang*, as seen in Batu Bulan village. Notably, the facilitation method of building a hope/dream that was effective in Labangka and Moyo Hulu because it is supported by the fact that in both sub-districts the local tarramba abundant; therefore, farmers have an opportunity to prove the effectiveness of using the FTL feeding system to fatten cattle. Conversely, in Camplong 2, the availability of local tarramba is limited; therefore, the method of problem identification and proposing cattle feed provision as a solution is the best choice.

Thidly, the dissemination of FTL information to farmers in order to raise their awareness is also used by some facilitators, such as in the Dalek Esa group, Amanah Bersaudara and Amtoas groups. However, such method is not effective without problem identification, need assessment and economic analysis.

This shows in the case of Dalek Esa and Amanah Bersaudara. In Dalek Esa, for example, the ineffectiveness of this method is caused by several factors. *Firstly*, the farmers of Oenaik village still rely on agricultural and seaweed cultivation as their main source of income. *Secondly*, Oenaik village is situated in an area where cattle roam free, where cattle can enter agricultural areas easily; therefore, the farmers have to construct a barbed wire fence, which is considered expensive. Information dissemination-based awareness raising was succesfuly conducted in Amtoas and some groups in KLU, however. In these places, this method worked effectively because the farmers have information and past experience in doing what the FTL project suggested. Amtoas had no problem in participating in the FTL project as they used to fatten cattle with sesbania, tarramba and grass. Likewise, most farmers in KLU had experience in using sesbania for cattle feed and understood that such legumes have a high nutritional value as it increases cow's milk production after calving.

It should be acknowledged that an exchange visit during training of facilitator is more useful for the participants in increasing knowledge than an in-class tutorial. Through an exchange visit, the participants had a chance to observe the real condition of the cattle, the *kandang*, the food and discuss with the FTL issues with the farmers. This exchange visit also stimulated the paticipants' motivation to participate in the project, including feeding cattle with forage legumes. As this visit was advantageous in the outreach strategy, it would be better if the farmers who did not participate in the training were also given an opportunity to do the visit.

7.2 Relating to media use

The use of video in the outreach strategy is effective in increasing the farmers' initial knowledge about FTL and their motivation to participate in the FTL project. The effectiveness of video (especially the promotional one) derives from its narration, describing real problems faced by farmers, namely, cattle feed shortages, and presenting a potential solution that can be used by farmers to solve their problem, namely, the provision of forage tree legume. To strengthen this proposed solution, the video narration tells the audience about farmers in other places have proven that using the FTL technology has been effective in overcoming their problem of cattle feed shortage. The video also shows the audience healthy cattle, clean *kandang*, and availability of food. Although the video shows how the FTL system operates in a short presentation, the farmers were impressed with the FTL project as it increased cattle weight significantly leading to economic improvement for the farmers. This impression is also evidenced by some testimonials from farmers who have experience in using forage tree legume for cattle fattening.

Nevertheless, the role of the facilitator in explaining the content of the video to the farmers and guiding them in the field implementation, during seedling development, cultivation and utilising of the FTL, cannot be neglected. It seems that the criticism of the video, especially the promotional one, is that the video should the sequence of steps within one period of FTL implementation. This will ensure the video's cohesiveness in presenting the FTL project cycle. The problem is that during the first phase of the FTL project, the role of the video production for documenting the whole FTL process tended to be sidelined. In fact, such documentation based on day-to-day project implementation is very important in order to draw lessons learned. In addition, because not all the farmers can understand the Indonesian language well, it is recommended that the next video production considers the use of local languages to reach larger audience.

Although it is important for a facilitator to focus on facilitating individual farmers or a group in order to create a successful model for others, the facilitator also needs to reach farmers beyond their target groups. This will avoid a situation in which information only circulates among a limited group of farmers. The use of video for this purpose is mandatory as it shows its effectiveness in motivating farmers to participate. To get around the shortage of VCD players among farmers, the FTL project should transfer the video to a more user-friendly mode, i.e. in the form of flash disc that enable farmers to put them in a mobile phone. The BPTP efforts in transferring the videos to flash discs for farmers in NTT should be appreciated. The same effort should be made for farmers in the other districts.

7.3 Relating to uptake of FTL systems

The uptake of the FTL system is determined by its effectiveness in increasing farmers' economic gain through cattle fattening. For the farmer community in Kupang, Sumbawa and Lombok, a successful example of the application of a new technology is very important before they decide to participate. Most of them are not considered risk-takers who are keen on carrying out experiments and jeopardising their own agricultural or animal husbandry practices. As this research shows, disseminating information about the positive features of the FTL system is not sufficient to convince farmers, they need tangible evidence that this new technology is better than their current practice in cattle rearing.

This research shows that in the second phase of the FTL project there were some efforts conducted in accordance with the above framework. *Firstly,* the project provided an exchange visit for the participants of the facilitator training, comprising extension officers, Dinas staff and farmers. As explained before, an exchange visit is effective in stimulating the participants' awareness, convincing themselves about FTL, and increasing their knowledge about FTL. For the participants, such an exchange visit is more effective than an in-class learning process in terms of acquiring new knowledge. However, non-participants of the training, such as farmer group members, could not participate in the exchange visit due to budget constraints. *Secondly,* in order to accelerate the uptake of the FTL technology at the farmer level, the facilitator focussed on the creation of a few individuals in a village to develop a successful model for others. This is considered effective as can be seen in Sumbawa. In Sukadamai, individuals who were successful participants in the FTL project became living examples for other farmers who wanted to participate. This strategy was also applied by the facilitator in Moyo Hulu. In Sumbawa, most of the facilitators relied on an individual approach in the creation of these model farmers because group facilitation had not proven effective in stimulating participation. While in Kupang participation can be stimulated through a group approach as exemplified by the case of Setetes Madu. This group's success then stimulated other groups, such as Talikomunit and Tunas Muda, in the same village in Camplong 2. Observing the failure of the FTL adoption in the Dalek Esa group in Kupang, the facilitator should change her approach from a group approach to an individual approach to create a successful model.

The FTL system is likely to succeed if the livestock enterprise can become a reliable alternative income source that overtakes existing sources of income within the community, such as agriculture and horticulture. The case of the failure in FTL uptake in Dalek Esa and Afoon is because farmers tend to rely on an agriculture enterprise as their main income source. An agricultural enterprise promises a

better income than livestock. However, in dry areas such as Sumbawa, especially in Labangka Sub-district, farmers' income from livestock can overtake their income from agriculture such as corn cultivation. In this way, livestock (i.e. cattle fattening) becomes a reliable income source for farmers in Labangka. The 'failed' corn harvest in July 2016 has stimulated farmers to more focus on cattle fattening as the risk of failure of this later enterprise is only 10 percent compared to that of corn cultivation which is 50 percent.

The implementation of the FTL project will be more succeful if it is conducted by farmer groups whose level of self-reliance is high. Such self-reliance is even more needed when the FTL project is implemented in area where cattle are allowed to roam free. In such areas, the farmers need extra effort to take care of the tarramba and the cattle (by constructing fences, for instance). This case is shown by groups such as Setetes Madu, Amtoas and the farmers in Sumbawa, where the facilitators only gave seedlings to those who had established a strong fence around the planting area. The farmers had to buy barbed wire or strong wood to construct the fences. In contrast, Dalek Esa in Oenaik village, located in an area where the cattle roam free and can invade other peoples' farms, the facilitator did not strictly require farmers to fence their fields. They argued that wire was expensive and they expected funding from the government. Related to this issue is the fact that the facilitator of the Dalek Esa group seemed to advance a pragmatic reason in proposing Dalek Esa as a target group. As noted by the field researcher (12 February 2016), the issue of the facilitator's closeness to the head of village, who also the head of the group, influenced her to propose Dalek as a project target. In fact, in hamlet 2, located in hamlet 4, there were some farmers who can potentially make the project successful if they were to be involved.

Although the strategy of establishing a dream through cattle fattening, as applied by the facilitators in Labangka and Camplong 2, showed its effectiveness in stimulated farmers' awareness of the FTL project, building a dream has to be supported by the availability of resources such as land, seedlings and access to credit. In the case of KLU, the farmers' resources are limited in terms of land size, land ownership, and number of cattled reared by farmers. Although the farmers are aware of the importance of FTL for cattle fattening which can enable them to improve their economic life, they find it difficult to start using the FTL system. To get more profit through cattle fattening, a farmer needs to have around one hectare to plant sesbania in order to be able to fatten at least five head of cattle. In contrast, Labangka farmers can take up the FTL sytem without having their own planting area. This is because the local tarramba is abundant and can be utilised freely by farmers for cattle feed, especially in 2015. The farmers in Labangka and Kupang also do not have any obstacle in planting tarramba as they have a land surplus.

Arguably, in certain farmers' groups, the participation in the FTL project was also stimulated by the influence exerted by cultural leadership. Setetes Madu, for example, was established on the basis of strong cultural leadership which required members' obedience to the leader. As a cultural leader whose vision is in accordance with the FTL project, the leader was able to mobilise the members to participate in the project and to exclude those who did not participate. This is effective in a community where collecivity has an important role in decision-making, like in Kupang. In this context, the combination of awareness raising and cultural leadership support are effective in mobilising the members' participation in the FTL project. Then, *technology per se, no matter how good it is, will not be accepted easily by farmers without cultural leader support*. This situation does not work in Sumbawa and Lombok in where cultural leadership is less important.

7.4 Relating to institutionalisation of outreach processes

It is undeniable that institutionalisation process needs the active role of a livestock service agency at the district level. The active involvement of Dinas in the training of facilitators is shown by its role in assigning its staff such as extension officers, IB and Dinas staff to participate. Unlike in the districts of Sumbawa and Kupang, in North Lombok the training was held in April 2015, five months late from the initial schedule in November 2014. This postponement of the training had a negative impact on the project as the participants could not implement what they learned during the training, such as seedling development and cultivation, because the dry season started in April 2015. The postponement of the training was caused by a bureaucratic factor, i.e. the delay of funding availability Dinas had. To prevent such delay in the future, Dinas should have contingency funding to prevent training delay. Moreover, the training held by Dinas should be based on thematic training in accordance with the development of the FTL project, not a one-off session like the one conducted in 2015.

Dinas' support in providing farmers with inputs such as seedlings and *polybags,* as can be seen in Sumbawa and Kupang, should be appreciated. Since the inception of phase two of the FTL project in 2014, Dinas of Sumbawa has allocated its funding to provide farmers with 100 kg of tarramba seeds. This provison of seeds was followed by the control over fencing and cultivation. Provision of seeds was also conducted by Dinas in Kupang, where every year it provided 500 kg of seeds for all the sub-districts in Kupang. However, Dinas should tighten its control over seedling development and cultivation. In the past, many farmers who received seeds did not plant them as Dinas did not strictly control the farmers rigidly. In the future, to ensure that the inputs from Dinas are used effectively, it should give seeds in the form of seedlings, and only the farmers who have prepared their land and fence should receive seedlings. This will ensure sustainable cultivation. Nevertheless, in the future, Dinas should consider the selection of the places and groups for FTL target, i.e. areas where cattle are not allowed to roam free, prioritising groups with a high level of self-reliance. For areas where cattle are allowed to roam free, such as Kupang Barat, Dinas and the village government should initiate village regulations restricting cattle to enter other farmers' fields by providing a ranch (*lar*) and enforcing strict penalties for the cattle owners. This is exemplified by the local government in Amarasi, NTT. Meanwhile, limited seedling availability is still a hampering factor for KLU farmers to participate in the FTL project. In the implementation of the second phase of the FTL project, farmers only relied on seedlings provided by BPTP NTB in Mataram. As a result, the farmers did not receive the seedlings at the appropriate time and in the appropriate condition. Institutionalisation of the FTL project will not run well if Dinas does not have the initiative to provide seedlings to the farmers despite farmers' growing awareness.

It is likely that institutionalisation of the FTL project in Sumbawa will run sustainably as Dinas supports this effort by initiating the *tarramba-isation* program in 2016 to overcome cattle feed shortages and provide Sumbawa beef. To support this program, Dinas allocates Rp. 740 million, which will be used for seedling provision (100 kg) and salaries for the facilitators in all the sub-districts in Sumbawa. Although Dinas has initiated the *tarramba-isation*, Dinas also keeps running the paddy hay wafer (*wafer jerami padi*) program to utilise remaining paddy hay post harvest time. However, if Dinas wants to encourage cattle fattening program, Dinas has to emphasise that hay-wafers are not for cattle fattening but for cows that are prepared for breeding. Without this emphasis, Dinas is considered inconsistent in supporting *taramba-isation* and cattle fattening, as hay-wafers are not good for cattle

fattening. Similarly, in Kupang, the FTL project is inconsistent with provincial program of *Paksa Tanam Tanam Paksa* (Forcing Cultivation, Forced Cultivation) stipulated by the NTT Governor. Even the local government support was shown in the symbolic cultivation by the Bupati of Kupang in Camplong 2 village. The Bupati considers that the FTL project is good and he would give some facilities for those who are participating in the project. In the context of KLU, the Provincial government has a program of *NTB Bumi Sejuta Sapi* (NTB earth for million of cattle). The FTL project can actually support this program. However, as can be seen from the FTL implementation, Dinas did not make a good effort to support this project. This will hamper the institutionalisation process.

Due to their position in spreading the FTL project to farmers, the facilitators need support in performing their tasks, apart from the existing ones. In Sumbawa, the facilitators received a monthly transportation funds of Rp. 150,000 from Dinas, but it was small compared to their workload and the locations they have to cover. Dinas of KLU did not support the facilitators with any supporting funds; therefore, the facilitator tended to neglect their task of facilitation in the FTL project and focussed on their existing tasks. Similarly, the facilitators' efforts in facilitating farmers were hampered by the lack of supporting funds from Dinas. They had to spend their own money to visit farmer groups located far away from their workplace. The successful facilitators who facilitated farmers in the FTL project were stimulated by their sincere intention to make the farmers' lives better, as exemplified by the facilitators working with the farmers in Camplong 2 and in Labangka Sub-district.

The FTL institutionalisation should be supported by a local government policy to stabilise the cattle price at farmer level. Currently, the price in Kupang and Sumbawa is considered low (lower than the prices in Lombok) and the role of brokers is dominant in determining the price. Instable cattle price will threaten the sustainability of the FTL project after it has phased out. As Sosdilwan suggested, no farmer will participate in the FTL project if cattle price is not profitable. In contrast, higher prices will encourage farmers' participation as it will improve their economic situation. Although cattle scales can assist farmers in estimating the price of their cattle based on their weight, it will not solve the problem of low cattle prices at the farmer level. Most farmers are in a defensive position in front of brokers. Only if the local government stipulates a policy on minimum cattle price, will the cattle price at farmers' level be profitable for the farmers.

Access to cattle is not a problem for the farmers in Kupang and KLU, where local government through the livestock service agency, distributes cattle grants to farmer groups every year. The farmers in both districts have received cattle consisting of cows (*indukan*) because the focus of Dinas's program is on cattle breeding. Although cows are important for breeding and can assist the cattle fattening program by providing young cattle through artificial insemination, Dinas needs to balance the number of cows and bulls in its cattle grant program. This will endorse the cattle fattening program suggested by the FTL project. As a result, if Dinas wants to institutionalise the FTL system, Dinas should synchronise its cattle grant program with the FTL project.

Appendix 1: Proposed Curriculum Training of Trainers – FTL systems

September Year 1 – May Year 2

Round 1: September – October (2 days)

1. Introduction to FTL based cattle fattening
   1.1. Potential for cattle fattening in Eastern Indonesia
   1.2. The problem of poor nutrition of cattle
   1.3. Why use FTL and opportunities in Eastern Indonesia
   1.4. Potential for integrating FTL based cattle fattening with existing enterprises
2. Cattle fattening system management
   2.1. Fattening systems
   2.2. Annual planning and budgeting
   2.3. Financial analysis
3. Field trip to demonstration site (half day)
4. Establishment of FTL plantations in village
   4.1. How much FTL should be planted
   4.2. Seed source and treatment
   4.3. Nursery establishment and management
   4.4. Practical exercise in establishing nursery
5. Cattle farmer group training and facilitation
   5.1. What's the difference: extension versus facilitation?
   5.2. Awareness raising for participation
   5.3. Facilitation of practice based learning
   5.4. Structure and organisation of thematic training
   5.5. Workplan development

Round 2: November (1 day)

6. Management of FTL plantations in village
   6.1. Transplanting into the field
   6.2. Protecting the growing seedlings from weeds and animals
   6.3. Harvesting in a sustainable manner
7. Cattle farmer group training and facilitation
   7.1. Routine guidance of farmer groups
   7.2. Communication skills (presentation, facilitation, written, non-verbal)

Round 3: March (2 days)

8. FTL harvesting and utilisation
   8.1. Stage of first harvest
   8.2. Cutting management (height, number of branches per tree, …)
   8.3. Time and intervals of harvest for sustainable use
   8.4. Storage and preservation
9. Introduction to feed management

9.1. What nutrition do cattle need for best fattening outcome
9.2. Sources of feed in village:
- FTLs: which, how to harvest
- other than FTL (grass, corn stover, other plant material, tofu, rice bran)

9.3. Role of FTLs in cattle nutrition
9.4. Adaptation of cattle to FTLs

10. Field trip to demonstration site (half day)
11. Cattle farmer group training and facilitation
    11.1. Enhancing decision making skills
        - Obtaining access to relevant information
        - Annual farm management planning
        - Experimentation and observation
        - Economic analysis and setting targets

Round 4: May (2 days)

12. Cattle fattening
    12.1. Feed and water requirements
    12.2. What percentage of FTL in diet
    12.3. Managing toxicity when feeding Leucaena
    12.4. Weight assessment
    12.5. Monitoring weight gain
    12.6. Optimum duration of fattening and sale weight
13. Cattle management
    13.1. Building a cattle pen
    13.2. Selecting feeders
    13.3. Health management:
        - Parasite control (internal and external)
        - Disease control
        - Dealing with injury

    13.4. Keeping the cattle pen clean
    13.5. Waste management
14. Cattle enterprise
    14.1. Planning for fattening
    14.2. Financial planning and analysis
        - Buying and selling cattle (including bargaining skills)
        - Accessing banking services (saving account), loans)
        - Accessing market information

15. Cattle farmer group training and facilitation
    15.1. Facilitating group dynamics
    15.2. Facilitating collective action at the village level

Appendix 2: FTL cultivation and utilisation data from Kupang, 2015-2016

2.1 Areas planted with FTL in Kupang, East Nusa Tenggara 2015-2016 (Research Team, 2016)

No	Farmer Group	Village	Planting Area		Tree Planted		Planting Methods		Seedlings
			2015	2016	2015	2016	2015	2016	
1	Setetes Madu	Camplong 2	20 ha	14 ha	24000	15000	polybag	polybag	26000
2	Talikomunit	Camplong 2	-	40 ha		3000		Polybag	5 kg seeds
3	Tunas Muda	Camplong 2	2.5 ha	10 ha	7000		Polybag	Polybag	-
4	Dalek Esa	Oenaik	3 ha	1.85 ha	964	-	Polybag	Tugal	250 gram in 2016
5	Afoon	Tesbatan 1	1 ha	1 ha	750	-	Polybag	-	5300 (3500 destroyed in 2015)
6	Amtoas	Nuatau	50 ha	40 ha	60000	40000	Polybag, *stump*	Polybag tugal	
No	**Farmer Group**	**Members**	**Members planting**		**Planting Distance**		**Cattle Fattened**		
			2015	**2016**					
1	Setetes Madu	20	20	20	2x1 metre		5		
2	Talikomunit	40	40	40	3x1 metre		-		
3	Tunas Muda	16	-	16	2x1 metre		-		
4	Dalek Esa	10	8	3	3x1 metre		-		
5	Afoon	10	2	-	1x1 metre		1		
6	Amtoas	43	43	43	2x1 metre		14		

2.2 Aggregated data of FTL Cultivation in Kupang (Source: Field researcher report, Anin Tetuin, 2016)

No	Jumlah Desa/Kecamatan	Jumlah Anggota	Tahun Kerja	Luas Lahan (ha)	Jumlah Tanaman			Jumlah Tanaman
					polibag	Tugal	*stump*	
1.	9/5	50	2012	21	50.100	13.500		63.600
2.	7/5	41	2013	15 ½	7.385	18.610	750	26.745
3.	6/3	21	2014	17 ½	5.700	8.000	5.200	18.900
4.	4/3	43	2015	37 ½	48.340	14.210	3.200	65.750
5.	2/4 (luar kelompok)	68	2015	52	polibag			357.850
6.	36 expansion groups in phase II (26/12)	868	2015-2016	284	265.110	63.672		328782
Total		1091		428	734.485	117.992	3.200	861.627

2.3 Data of FTL cultivation in Kupang per Village (Source: Field researcher report, Anin Tetuin, 2016)

No	Desa	Kecamatan	Luas lahan	Jumlah tanaman	Periode tanam
1.	Ponain	Amarasi	24,5 Ha	18.250	2012-2015
2.	Tesbatan I	Amarasi	2 Ha	4.000	2012-2015
3.	Tesbatan II	Amarasi	2 Ha	5.700	2012
4.	Oesena	Amarasi	2 Ha	13.000	2012
5.	Nonbes	Amarasi	5 Ha	1.700	2014-2015
6.	Kotabes	Amarasi	2 Ha	5.000	2015
7.	Pakubaun	Amarasi Timur	1 Ha	1.000	2015
8.	Oemofa	Amabi Oefeto timur	1 Ha	3.500	2015-2016
9.	Fatuteta	Amabi Oefeto	5 Ha	20.850	2016
10.	Sumlili	Kupang Barat	2 ha	5.000	2016
11.	Oebola Dalam	Fatuleu	50 Ha	100.000	2012-2016
12.	Camplong II	Fatuleu	34 Ha	50.000	2015-2016
13.	Ekateta	Fatuleu	12 Ha	14.000	2015
14.	Nunsaen	Fatuleu Tengah	70 Ha	100.000	2014-2016
15.	Uel	Kupang Timur	2 Ha	1.400	2014-2016
16.	Kuanheun	Kupang Barat	18 ha	20.213	2012-2015
17.	Oematnunu	Kupang Barat	6 ½ ha	4.982	2012-2015
18.	UPT Sumlili	Kupang Barat	6 ha	30.000	2012-2016
19.	Bipolo	Sulamu	5 ha	5.240	2015
20.	Manulai I	Kupang Barat	1 ha	500	2015-2016
21.	Oenaek	Kupang Barat	3 ha	1.400	2015-2016
22.	lifuleo	Kupang Barat	1 ha	583	2015
23.	Otan	Semau	5 ha	500	2015
24.	Uetnutu	Fatuleu Timur	2 ½ ha	143	2015
25.	UPT LILI	--	40 ha	297.337	2015-2016
26.	Peternakan Propinsi	--	4 ha	15.000	2015
27.	TTS	--	½ ha	2.000	2015
28.	Pemda Kab Kupang	--	4 ha	15.000	2015
TOTAL		**10 Kecamatan**	**311 Ha**	**736.298**	**2012-2016**

Appendix 3: FTL cultivation and utilisation data from Sumbawa, 2015-2016

(Sources: Livestock Service Agency of Sumbawa District, 2016, and Field Research reports)

3.1 Development of FTL in Alas Sub-District (October 2015)

No	Nama Petani	Alamat	Luas Lahan	Waktu Tanam	Cara Tanam	Note
1	Asisuinn	Simpang Tano	1 Ha	03 January 2015	Pollybag, Tugal	150 cm high
2	Ahmad Mahdar	Juranalas	2 Ha	07 March 2015	Tugal	120 cm high
3	A.Wahab	Al Jati	1 Ha	05 March 2015	Tugal	100 cm high
Total			**4 ha**			

3.2 Development of FTL in Empang Sub-District (2015)

No	Nama Peserta	Keterangan
1	Muslimin	Tahap Pertumbuhan (Seandg)
2	Baladewa S.Pt	Tahap Pertumbuhan (seandg)
3	Samsu Bahri	Habis inmakan sapi
4	Ibrahim AR	Habis inmakan sapi

3.3 Development of FTL in Moyo Hilir Sub-District (2015)

No	Nama Petani	Luas Lahan (Ha)	Pola Penanaman			Perkembangan
			Polybag	*Stump*	Tugal	
1	Drs.Hamzah	1,5 ha	500	100	-	Tinggi 60 cm
2	Dedy Yusuf	1 ha	500	200	-	Tinggi 50-60 cm
3	A.Hasim	0.5 ha	300	-	800	Tinggi 50 - 60 cm
4	Burhanudinn	0.5 ha	500	-	500	Tinggi 50 - 60 cm
5	Salimah	0.5 ha	500	-	600	Tinggi 50 - 60 cm
6	Sahrullah	1 ha	400	-	700	Tinggi 1m
7	Najamudinn	0.5 ha	500	-		Tinggi 1 m
8	Edy susanto	0.6 ha	500	-		Tinggi 50 cm
Total		**6.1 ha**	**3700**	**300**	**2600**	

3.4 Development of FTL area in Lape Lopok Sub-District (2016)

No	Nama	Alamat	Luas Area
1	Klp. Amanah Bersaudara	Langam	1 Ha
2	Klp. Maju Bersama	Langam	1 Ha
3	Klp. Saling Sakiki	Lopok	1,5 Ha
4	Abu Amin	Lopok Beru	1 Ha
5	Sanapiah dayo	Lopok	1 Ha
6	Hasanudinn	Lopok	0.5 ha
7	M.Yusuf	Kemang Kuning	1 Ha
8	M.Nur	Lopok	1 Ha
9	Aziz Rahim	Lopok	1 Ha
			9 ha

3.5 Development of FTL in Labangka Sub-District (September 2015 & January 2016)

No	Nama Petani	Alamat/ Desa	Luas Lahan Tanam		Waktu Tanam		Persemaian		Note
			2015	2016	2015	2016	2015	2016	
1	L. Hakmullah	Labangka	0	1 Ha	-	January	-	*Stump*	-
2	Agus	Labangka	0,75 Ha	1 Ha	January	January	Polybags, *stump*	*Stump*	Harvested Sep 2015
3	Mmq. Fit	Labangka	0	0,75 Ha	-	January	-	*Stump*	
4	L.Karni	Sekokat	0	0,75 Ha	-	January	-	*Stump*	
5	Sukamulia	Sekokat	0	0,25 Ha	-	January	-	*Stump*	
6	Muniah	Sekokat	0	1 Ha	-	January	-	*Stump*	
7	Samanuinn	Sekokat	0	1 Ha	-	January	-	*Stump*	
8	Aq. Huriah	Sekokat	0	1 Ha	-	January	-	*Stump*	
9	Aq.Is	Sekokat	0	0,25 Ha	-	January	-	*Stump*	
10	Sukirman Flani	Sekokat	0	1 Ha	-	January	-	*Stump*	
11	M.Ein Jayain	Sekokat	0	0,75 Ha	-	January	-	*Stump*	
12	Maas	Sekokat	0	0,25 Ha	-	January	-	*Stump*	
13	Abd.Manan	Sekokat	0,35 Ha	0,50 Ha	January	January	Polybags, *stump*	*Stump*	
14	Aq.Nurian	Sekokat	0	0,25 Ha	-	January	-	*Stump*	
15	L.Mulatif	Sekokat	0	1 Ha	-	January	-	*Stump*	
16	Sahand	Sekokat	0	0,25 Ha	-	January	-	*Stump*	
17	Aq.Supar	Sekokat	0	0,25 Ha	-	January	-	*Stump*	
18	Arif	Sukadamai	0	1 Ha	-	January	-	*Stump*	
19	Martono	Sukadamai	0	1 Ha	-	January	-	*Stump*	
20	Rosmaiin	Sukadamai	0	1 Ha	-	January	-	*Stump*	
21	Ali	Sukadamai	0	1 Ha	-	January	-	*Stump*	
22	Fatma Hariadi	Sukadamai	0,75 Ha	1 Ha	January	January	Polybag, *stump*	*Stump*	
23	Ramand	Sukadamai	0	1 Ha	-	January	-	*Stump*	
24	Jumainl	Sukadamai	0	0,75 Ha	-	January	-	*Stump*	
25	Aq.Maman	Sukadamai	0	0,75 Ha	-	January	-	*Stump*	
26	Aq.Faridah	Sukadamai	0	0,75 Ha	-	January	-	*Stump*	
27	Ibrahim	Sukadamai	0	0,75 Ha	-	January	-	*Stump*	

28	Alan	Sukadamai	0	0,75 Ha	-	January	-	*Stump*	
29	Aq.Gomong	Jaya Makmur	0	1 Ha	-	January	-	*Stump*	
30	M.Tayib	Jaya Makmur	0	1 Ha	-	January	-	*Stump*	
31	Munakip	Jaya Makmur	0	0,25	-	January	-	*Stump*	
32	Suarinka	Sukadamai	1 Ha	1 ha	January	January	-	*Stump*	Harvested (September)
33	Abdul Manan	Suka Damai	0,35 Ha	0	January	January	Polybags, *stump*	*Stump*	Harvested (September)
34	Hanamuddin	Sukadamai	1,5 Ha	0	January	January	-	*Stump*	Harvested (September)
35	Amq.Saleh	Labangka	1 Ha	0	January	January	Polybag	*Stump*	Harvested(Sep)
36	Amq.Labang	Labangka	1 Ha	0	January	January	Polybag	*Stump*	
37	Rustam	Labangka	1 Ha	0	January	January	Polybag	*Stump*	Harvested (Sep)
38	Jamal	Sekokat	0	1 ha	-	January	-	*Stump*	
			6.2 ha	**24.5 ha**					

3.6 Development of FTL Tree in Moyo Hulu Sub-District (January 2016)

No	**Nama Petani Peternak**	**Alamat**		**Potensi Kepemilikan**		
		Desa	**Kecamatan**	**Lahan (Ha)**	**Ternak**	**Notes**
1	Aminollah	Leseng	Moyo Hulu	0,5	13	
2	Syaifullah	Leseng	Moyo Hulu	0,5	6	
3	Mukhsin / KTT “Mitra Abain”	Leseng	Moyo Hulu	1,5	11	
4	Hilim HB	Pernek	Moyo Hulu	1,5	21	
5	Aminudinn HJ/ KTT “Ai Raram”	Batu Bulan	Moyo Hulu	1,5	19	
6	Syafrudinn	Maman	Moyo Hulu	1	12	Cattle sold & focusing on paddy (April 2016)
7	M.Hatta	Mokong	Moyo Hulu	1	15	
8.	Suinrman	Marga Karya	Moyo Hulu	1,5	15	
9	Gatot Irwansyah	Marga Karya	Moyo Hulu	1	8	
10	Supanin	Marga Karya	Moyo Hulu	1	12	
11	Alimudinn	Sebasang	Moyo Hulu	1,5	16	
12	Hamand Yakub	Semamung	Moyo Hulu	1	10	
13	Hasanudinn/ KTT “To Balong”	Boak	Unter Iwes	1	53	
				14,5	**211**	

3.7 Data Cultivators Labangka 2016

No	Village	Farmers Name	Trees Planted	planting method (P/T/M)	Cattle fattened	FTL Feeding (R/T)	Feeding Proportion (S/M/L)
1	Suka Damai	Suarinka	4000	T	5	R	L
2	Suka Damai	Sahin	4000	T	6	R	L
3	Suka Damai	Zaenudinn	300	T	0	0	0
4	Suka Damai	Hanamuddin	3500	T	8	R	S
5	Suka Damai	ABD. Manan	500	T	3	R	M
6	Labangka	Fatma Hariadi	1500	T	11	T	M
7	Labangka	Subari	500	T	0	0	0
8	Labangka	H. Moh. Nasir	1000	T	3	T	S
9	Labangka	Aq. Ahir	2000	T	5	T	M
10	Labangka	Aq. Rojal	2500	T	5	T	M
11	Labangka	Rustam	1500	T	3	T	M
12	Suka Damai	Patma Hariadi	1500	T	11	T	M
13	Suka Damai	Agus Saputra	2000	T	8	R	M
14	Suka Damai	Aq. Maman	1000	T	3	R	M
15	Suka Damai	Jemuhur	500	T	2	R	M
16	Suka Damai	Zaenal Abiinn	500	T	4	R	M
17	Suka Damai	Satria	500	T	3	R	M
18	Suka Damai	Aq. Mahdi	1500	T	4	R	M
19	Suka Damai	Resum	500	T	3	R	M
20	Suka Damai	Sabidah	500	T	1	R	L
21	Suka Damai	Eka	2000	T	1	R	L
22	Suka Damai	Toni	200	T	0	0	0
23	Suka Damai	Sabri	700	T	0	0	0
24	Suka Damai	Kidam	300	T	2	T	S
25	Labangka	Moh. Ali	200	T	9	R	S
			33200		**100**		
				P: rice bund T: intercrop M: tarramba all		T: 7/week R: 5/week	S: 30% tarramba M: 50% tarramba L: 100% tarramba

3.8 FTL Data (Non Cultivators) in Labangka 2016

No	Village	Farmers Name	Trees Planted	planting method (P/T/M)	Cattle fattened	FTL Feeding (R/T)	Feeding Proportion (S/M/L)
1	Suka Damai	Amirullah	0	0	5	R	L
2	Suka Damai	Hamdi	0	0	5	R	L
3	Suka Damai	Muharis	0	0	4	R	M
4	Suka Damai	Sapar	0	0	2	R	M
5	Suka Damai	Suparman	0	0	2	R	S
6	Suka Damai	Rosidi	0	0	3	R	M
7	Suka Damai	Yusup	0	0	1	R	M
8	Suka Damai	Sarwan	0	0	3	R	S
9	Suka Damai	Beri	0	0	2	R	S
10	Suka Damai	H. Majid	0	0	4	T	M
11	Suka Damai	Jum	0	0	1	R	M
12	Suka Damai	Aq. Kanah	0	0	4	T	S
13	Suka Damai	Jamal	0	0	2	T	S

14	Suka Damai	Hendri	0	0	1	T	M
15	Suka Damai	Aq. Samil	0	0	3	T	S
16	Suka Damai	H. Yahya	0	0	3	T	M
17	Suka Damai	Rohimi	0	0	2	T	S
18	Suka Damai	Berahim	0	0	2	R	S
19	Suka Damai	Su'in	0	0	2	R	S
20	Suka Damai	Samal	0	0	3	R	M
21	Suka Damai	Ahok	0	0	5	T	M
22	Suka Damai	H. Moh. Ali	0	0	2	R	S
23	Suka Damai	Sawal	0	0	2	R	M
24	Suka Damai	Wahab	0	0	2	R	M
25	Suka Damai	Sahdi	0	0	2	R	M
26	Suka Damai	M. Bakar	0	0	1	R	M
27	Suka Damai	Ruslan	0	0	2	R	M
28	Suka Damai	Sopyan	0	0	4	R	M
29	Labangka	Ramdan	0	0	2	R	S
30	Labangka	Hakmullah	0	0	3	R	M
31	Labangka	Junaidi	0	0	3	R	M
32	Labangka	Opik	0	0	3	R	M
33	Suka Mulia	Pihir	0	0	4	R	L
34	Suka Mulia	Basri	0	0	7	R	L
35	Suka Mulia	Antum	0	0	4	R	M
36	Suka Mulia	H. Jaenal	0	0	4	R	M
37	Sekokat	Adi	0	0	2	R	S
38	Sekokat	Jaya	0	0	2	R	M
39	Sekokat	Saman	0	0	1	R	M
					95		
				P: rice bund T: intercrop M: tarramba all		T: 7/week R: 5/week	S: 30% tarramba M: 50% tarramba L: 100% tarramba

3.9 FTL Data (Cultivators) in Moyo Hulu 2016

No	Village	Farmers Name	Trees Planted	planting method (P/T/M)	Cattle fattened	FTL Feeding (R/T)	Feeding Proportion (S/M/L)
1	Poto	Hamsa	300	T	0	0	0
2	Poto	Irwansah	0	0	2	T	M
3	Poto	Herudin	200	P	6	R	M
4	Poto	Ahmad	0	0	2	T	M
5	Poto	Sapruddin	0	0	2	T	M
			500		**12**		

3.10 Data in Moyo Hilir 2016

No	Village	Farmers Name	Trees Planted	planting method (P/T/M)	Cattle fattened	FTL Feeding (R/T)	Feeding Proportion (S/M/L)
1	Sebasang	Alimuddin	1000	T	0	0	0
2	Maman	Sapruddin	500	T	6	R	M
3	Batu Bulan	Aminuddin	500	T	2	R	M
4	Leseng	Aminullah	1500	T	0	0	0
			3500		**8**		

3.11 FTL Data in Lopok (Kelompok Tani Amanah Bersaudara & Maju Bersama) 2016

No	Village	Farmers Name	Trees Planted	planting method (P/T/M)	Cattle fattened	FTL Feeding (R/T)	Feeding Proportion (S/M/L)
1	Langam, Lopok	Sahabudin	2000	T	1	R	L
2	Langam, Lopok	Aripin	0	0	3	R	L
3	Langam, Lopok	A. Nola	0	0	2	R	L
4	Langam, Lopok	Hasrudin	0	0	1	R	L
5	Langam, Lopok	Arrahman	0	0	1	R	L
6	Langam, Lopok	Roni Kurniawan	0	0	2	R	L
7	Langam, Lopok	Nasaruddin	0	0	3	R	L
8	Langam, Lopok	Herwanto	0	0	2	R	L
9	Langam, Lopok	Andi Sopyan	0	0	2	R	L
10	Langam, Lopok	Deni Ardiansah	0	0	1	R	L
11	Langam, Lopok	Samsuddin	0	0	1	R	L
12	Langam, Lopok	Saifullah	0	0	1	R	L
			2000		21		

3.12 FTL Data in Utan & Alas Barat 2016

No	Village	Farmers Name	Trees Planted	planting method (P/T/M)	Cattle fattened	FTL Feeding (R/T)	Feeding Proportion (S/M/L)
1	Rhee Loka	I Nyoman Saji	2000	T	4	R	L
2	Labu Mapin	A. Azis	200	T	3	T	M
			2200		7		

3.13 FTL Data Fase 2 Post-Training in Sumbawa 2015

No	Sub-district	Farmers Name	Trees Planted	Farmer Group	FTL Feeding (R/T)	Feeding Proportion (S/M/L)
1	Tarano	-	2000		Muslim	
2	Tarano	-	2000		Khor'iq	
3	Tarano	Samsul	1000	Pamega		Destroyed by Cattle
4	Tarano	Ibrahim	1000	Dewa koro		Destroyed by Cattle
5	Labangka	Hanamuddin	3500	Untir Kapuk	Amirullah	
6		ABD. Manan	1500	Untir kapuk		
7	Plampang	-	-	-	Rusdin	
8	Lopok	Arifin	2000	Amanah Bersaudara	Sudarli	
9	Lunyuk	No farmer trained	250		Muslimi (fasilitator)	
10	Moyo Hilir	Najamuddin	500	-	Supriyanto	
11	Moyo Hulu	Aminuddin	1000		Khaerullah	
12		Aminullah	2000			
13	Labuan Badas	-			Ferry	
14	Utan	-			M Saleh	
15	Alas	Ahmad Mahdar			Saparuddin	
16		Yudinurrahman				
17		Abd. Azis	200			
18	Ropang & Lantung	No farmer trained			Subhan	
			14950			

3.14 Farmer to Farmer learning in Labangka 2016

No	**Village**	**Hamlet**	**Trainer**	**Trainee Farmers**
1	Suka Damai	Karang Banjar	M. Fauzan	Suardika
2	Suka Damai	Karang Tengah	M. Fauzan	Amirullah
3	Suka Damai	Karang Tengah	M. Fauzan	Hamdi
4	Suka Damai	Karang Tengah	M. Fauzan	Sahdi
5	Suka Damai	Karang Tengah	M. Fauzan	Zaenuddin
6	Suka Damai	Karang Banjar	M. Fauzan	Muharis
7	Suka Damai	Karang Banjar	Amirullah	Hanamuddin
8	Suka Damai	Karang Banjar	Amirullah	ABD. Manan
9	Labangka	Karang Banjar	Amirullah	Fatma hariadi
10	Labangka	Karang Banjar	Amirullah	Subari
11	Labangka		Amirullah	H. Moh. Nasir
12	Labangka		Amirullah	Aq. Ahir
13	Labangka		Amirullah	Aq. Rojal
14	Labangka		Amirullah	Rustam
15	Maronge	Tiu Sarungan	Amirullah	Ibrahim
16	Suka Damai	Karang Banjar	Suardika	Patma Hariadi
17	Suka Damai	Karang Banjar	Suardika	Agus Saputra
18	Suka Damai	Karang Banjar	Suardika	Aq. Maman
19	Suka Damai	Karang Banjar	Suardika	Jemuhur
20	Suka Damai	Karang Banjar	Suardika	Zaenal Abidin

21	Suka Damai	Karang Banjar	Suardika	Satria
22	Suka Damai	Karang Banjar	Suardika	Aq. Mahdi
23	Suka Damai	Karang Banjar	Suardika	Resum
24	Suka Damai	Karang Banjar	Suardika	Sabidah
25	Suka Damai	Karang Banjar	Suardika	Eka

3.15 Farmer to Farmer learning in Rhee Loka, Utan 2016

Village	Trainer Farmer	Trainee Farmers	Tarramba Planted	Planting System (P/T/M)	Cattle Fattened	FTL Feeding (R/T)	Proportion (S/M/L)
Rhee Loka	I Nyoman Saji	I Made Widi	500	T	8	R	L
Rhee Loka	I Nyoman Saji	I Nengah Krade	500	T	3	R	L
Rhee Loka	I Nyoman Saji	I Nyoman Tamin	500	T	4	R	L
			1500		**15**		
				P: rice bund T: intercrop M: tarramba all		T: 7/week R: 5/week	S: 30% tarramba M: 50% tarramba L: 100% tarramba