Pasture improvement and feeding strategies to improve livestock productivity in high land and low land areas of Timor-Leste

A survey report submitted to
The Ministry of Agriculture and Fisheries
Timor-Leste
By

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Nacional Directorate of Livestock and Veterinary Service, Timor-Leste
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I. Introduction

The role of livestock (cattle, buffalo, sheep, goats, poultry and pigs) for the food self reliance in Timor-Leste has been commonly recognized. This role is becoming more important with the global climate change that, to some extent, is responsible for some recent crop failures or crop damages due to the shift in the wet and dry seasons.

Ruminants (cattle, buffalo, sheep and goats) play an important role both to food security and income generation due to their ability to efficiently convert materials that have no use for humans (forages or crop residues) into meat or milk. This is of particular advantage for Timor-Leste which has limited arable land to grow enough staple foods because the feeds for ruminants do not compete with human consumption.

Among the ruminant livestock, cattle have a great potential to increase the country’s export earnings. The high demand for beef in Indonesia, which is currently importing more than 30% of its domestic consumption, is a great opportunity for Timor-Leste to increase its cattle export to Indonesia. The number of cattle imported to Indonesia can be increased significantly by improving its productivity.

Production of ruminant livestock in Timor-Leste relies greatly on the existing native pastures. This is because the majority of farmers keep their livestock in extensive system and only those who produce finishing beef or buffalo feed their animals by cut and carry system. For this reason, native pastures both at low land and high land areas should be improved to increase their carrying capacity (stocking rate), which currently declining due to over grazing and weed invasion. Besides improving the native pasture, it is also important to improve the availability of cut and carry forages to provide sufficient high quality forages especially for fattening areas. For the cut and carry system, improving feeding management is another strategy to increase livestock productivity.

This report provides preliminary results and recommendations of the design mission to develop planning for improving native pastures and feeding systems to improve ruminant productivity in Timor-Leste. This first draft is intended to be used as internal assessment of progress of the activities assigned by MAF to the team of from University of Mataram after conducting the first stage of the design mission in Timor-Leste.
2. Objective of the mission

The objective of this mission is to develop key development programs and activities over the next five years to improve smallholder ruminant feeding and management systems. To achieve this objective, the following activities were carried out:

- To identify suitable forages (grasses and legumes) that can be used to improve productivity and quality of the high land and low land native pastures
- To identify suitable forages (grasses and legumes) to improve productivity and quality of forages for cut and carry system
- To assess the most appropriate applied technologies for improving the utilization of crop residues for feeding during dry season.

3. Methods

The mission was initiated by reviewing previous studies or literature on the livestock development in Timor-Leste and similar studies held in the Indonesian Provinces of West Nusa Tenggara (NTB), East Nusa Tenggara (NTT) and other eastern islands, that can be adapted in Timor-Leste. Discussions were made with relevant stakeholders (MAF staff, private sectors, national and international NGOs) to gain information on their programs and their views on constraints and opportunities for improving ruminant productivity in Timor-Leste. Several field visits (surveys) to locations that represent the high land and low land areas were carried out to make direct observation on the conditions of pastures at the up-land and the low-land areas during the dry season (July –August 2010). During the field visits some farmers were also interviewed to understand their constraints for improving livestock productivity. Based on information collected, some meetings with MAF decision makers were carried out to discuss most-likely strategies to improve livestock production and how to integrate the MAF programs with those carried out by other stakeholders. The final step of this mission is a one day workshop (to be conducted towards the end of the program) involving all relevant stakeholders to develop a plan to improve pastures and feeding system to improve ruminant productivity in Timor-Leste.

4. Results

a. Review of previous research and development programs

There are several research and development outcomes from eastern Indonesia which are relevant to the mission of improving pasture and feeding strategies for ruminants (cattle and goats) in Timor-Leste. These include research reports, published papers or proceedings and policy papers emerged from the following projects.
- Developing feeding systems based on locally available resources in Lombok, Indonesia (research project funded by the International Foundation for Science).
- Integrating forage legumes into the maize cropping systems of West Timor (research project funded by the Australian Centre for International Agricultural Research, ACIAR).
- Evaluating strategies to improve calf survival in West Timor (research project funded by ACIAR).
- Strategies to increase growth of the weaned Bali calf (research project in NTT, NTB, Central Sulawesi and east Java, funded by ACIAR).
- Boosting beef production in South Sulawesi using a farming systems approach (research project funded by ACIAR).
- Scaling up herd management strategies in crop-livestock systems in Lombok, Indonesia (research project funded by ACIAR).
- Developing rice straw based diets for cattle in NTB (research and demonstration project funded by the local government).
- Developing planning and policy on Bali cattle breeding in NTB based on research outcomes (Policy development project funded by ANTARA-AusAID).

The important and relevant outcomes from these research and development programs to this mission are knowledge and experience on:

- Strategies to use tree legumes to improve growth rate of growing, pregnant and lactating goats.
- Strategies to optimize the use of existing forages and introduction of suitable improved forages (grass and legumes) suitable for dry areas.
- Strategic use of locally available high protein feeds (especially tree legumes) to improve reproduction efficiency, calf birth weight, weaning weight and growth rate.
- Management system to improve calf survival under extensive rearing system in dry areas.
- Strategies to improve adoptions of better farming practices through scaling out and scaling up process.
- Strategies to synergize activities between relevant stakeholders.
- Strategies to develop local government policy based on research outcomes.

Some of these knowledge and experience may not be exactly suitable for Timor-Leste conditions, but the difference in agro ecological zones is not significant. To ensure that these outcomes can be adapted to Timor-Leste conditions, a step wise process (start from the lowest risk component) and careful social engineering process should be applied so the local farmers have the capacity to adopt the practice changes.
b. Discussion with MAF decision makers and staff

The most important outputs of the meetings/discussions with MAF decision makers and staff are:
- Spatial and commodity mapping of livestock production in Timor-Leste
- Institutional capacity of MAF (especially human resources and facilities) to plan and implement livestock development programs
- Identification of national and international agencies relevance to livestock development (RDP I, II and III, FAO, CCT, Food Security, HIVOS etc)
- Integration of national and international livestock development programs
- Outcomes of previous livestock development programs

c. Discussions with relevant stakeholders

There are some potential constraints faced by MAF in implementing the program established by this mission. These include lack of skilled government staff at district and village levels. The obvious solution is to integrate and synergize this MAF program with those implemented by other stakeholders, especially international agencies, to make efficient use of resources and to ensure effective implementation of the program.

There are eminent opportunities to integrate the mission with relevant agencies that currently implementing community development in Timor-Leste. Based on discussions with the relevant agencies (CCT, FAO, Food Security, RDP and HIVOS), opportunities are widely open to integrate this particular mission with their program. The RDP already integrated its program to support livestock the development of training (and breeding) centre at Dottik (Manufahi district). The CCT is already collaborates with MAF but finding it difficult to source suitable young bulls for fattening. MAF should have the capacity to develop effective breeding program in locations with large areas of native pastures to ensure availability of young bulls for fattening. HIVOS has established 8 farmer groups in Mihara (Lautem) district to improve smallholder cattle farmers' income as a part of food security program. There is an opportunity to integrate this pasture development program with the established HIVOS farmer groups for example in conducting farmer training and share of expertise.

d. Site visits:

The time schedule and sites visited are presented in Attachment 1. The site visits started from Baucau district (Vemasse, Triloka and Loilubu), Lautem district (Los Palos, Fuiloro, Soro, Ilomar and Barikafa), Manufahi and Ainaro districts (only a general overview of the area because the team was trapped by landslide and collapse of all bridges) and Bobonaro (Tunubibi and Aiasa
highland native pastures). The site visited represented low land and high land areas so the team has collected general view of the areas.

5. Pasture conditions and utilization

Major grasses and legume species in the highland native pastures (based on a random sampling at Leber) are *Chrysopogon sp, Cynodon, Heteropogon contortus, Imperata cylindrica, Desmodium trifolium*, and *alysicarpus vaginalis*. Estimated annual biomass production at the time of observation ranges from 400 to 500 kg dry matter per hectare and the ratio of grasses to legumes is about 75%:25%. In the low land native pastures (samples from Triloka and Loilubu, Baucau and areas around Los Palos), the dominant grasses are *Pennisetum polystachion, Heteropogon contortus, Imperata*, and *Digitaria ciliaris*. The identified legumes include *Desmodium triplum* and *Alysiacarpus vaginalis*. The estimated annual dry matter production at the time of observation is 300-400 kg per hectare. The conditions of pasture at the time of observation indicates that the biomass production from native pastures can be doubled in the peak of wet season.

Native pastures at low land are extensively invaded by *Chromolina odorata, Lantana camara and Jatropha sp*. *Chromolina odorata* and *Lantana camara* are also the major weeds in the highland native pastures. Weed invasion was probably initiated by over grazing that makes the soil easily exposed to weed seeds. Once the seeds are established, these weeds have more opportunity to spread to wider areas because no action was taken to control them. As a result, the grazing area seems to declined in size. This weed invasion is seen as a major threat to the future of native pastures in Timor-Leste and requires serious attention.

Native pastures are commonly utilized by farmers in the surrounding villages (*sucos*). The pasture in Soro is the grazing area for at least 3 *sucos* (Soro, Leure and Ome). Pasture in Ilomar is utilized by farmers from Ilomar and Baricafa *sucos*. Native pasture at Leber (Bobonaro district), is used by farmers from 9 *sucos* (Leber, Aiasa, Oeleu, Lebos, Malilaik, Rifabou, Molok, Bobonaro and Sibuni). Farmers from these villages let their livestock to graze in the native pasture without any organized pattern and no effort to sustain the native pasture. As a result, some of the grazing areas in the high lands already damaged by erosion.
6. Feed availability and quality

Feed shortage, especially during dry season, and low quality of available feeds have been considered as the main factor associated with the low productivity of ruminant livestock in Timor-Leste. This is probably due to the decline in grazing areas (due to weed invasion) and low productivity of the native pasture. Observation on the condition of cattle, buffalo, goat and sheep in the visited sites justifies this general believe. However, in most of the low land areas there are plenty of *Gliricidia* and *Leucaena* but they are not used to feed ruminants. This is probably due to lack of understanding of farmers on the advantages of these tree legumes to improve condition of ruminants, or farmers are not yet accustomed to cut and carry of forages.

In the sites visited, ruminant livestock are mostly grazing during day time and kept in open pens at night. The condition of the pens (especially for cattle) is very wet due to accumulation of feces and urine. None of the cattle pens observed are covered (no roof) so the animals are exposed to strong winds and rains at night. At the time of observation, rainfall was exceptionally high that makes the pen floor worse. This condition is the most likely to be the primary cause of the high calf mortality (ranging from 20 to 50%) as reported by some farmers. This confounds the perceived effects of nutrient deficiency.

7. Recommendations

a) MAF to conduct policy and priority setting meetings before deciding the livestock improvement programs for the next 5 years. The outputs of this meeting will include:
   - Priority development areas and commodity (livestock species) that should be developed in the short term planning according to the potential benefits and impacts (such as food self reliance and export earning) and available human and financial resources.
   - Government regulations to ensure sustainability of production area (e.g. communal grassland) because there have been some cases of land conversions.

b) The visited areas considered suitable for improved pasture are Soro and Ilomar (Lautem district) and Leber (Bobonaro district). These grassland areas can be developed as breeding area to produce calves for fattening.

c) These native pastures should be improved to increase the carrying capacity (stocking rate) by introduction of shrub / creeping legumes. Improvement of native pastures should be done carefully to avoid conflict and misuse of the pastures. The suggested steps could be:
   - Social engineering to encourage farmers’ participation in the use of grassland
- Facilitate participatory weed control by communicating the damaging impacts of the weeds such as *Chromolina* and *Lantana* to the sustainability of the grazing area and their income from livestock.
- Facilitate participatory pasture improvement by providing technical guidance, provision of seeds, erosion control (by managing stocking rate) and develop water storage for livestock drinking water.
- Highland native pasture can be improved by introduction of shrub legumes such as *Stylosanthes hamata cv verano*, which is suitable to dry areas and resistant grazing pressure. On the low land native pasture, various creeping shrub legume and some grass species such as *Brachiaria decumbens*, which is of high biomass production and suitable for grazing, can be introduced.

d) The existing goats and sheep production areas such as Vemasse in Baucau district, should be improved by planting more tree legumes as living fences in the hilly areas where they are herded when the rice field is used for crop (rice) production.

e) Improvement of availability of cut and carry forages
- Optimize the use of existing tree legumes, especially *Leucaena leucocephala* and *Glicicidia sepium* to be used as supplements for grasses. This can be done by providing example at demonstration sites until farmers can see the benefits and do not have to worry about the risk to their animals.
- Conserve abundant forages (especially native grasses) at the end of wet season for dry season feeding.
- Introduce improved grasses such as elephant grass (*Panisetum purpureum*), *Panicum maximum* and *Brachiaria mutata*. Shrub / creeping legumes (such as *Stylosanthes*, *Centrosema pubescent* and *Clitoria ternatea*) can be established together with these improved grasses.

f) The MAF field stations in Los Palos and Dottik should be developed as sources of forage seeds and cuttings for surrounding farmers. These stations can be developed as training centers (short term) and sources of selected breeding stocks (long term). The development priority is to improve the variety and productivity of locally protein-rich forages and improved grasses and improving the infrastructure for demonstration of improved livestock selection and management.

g) Improvement in the use of crop residues
- Conserve crop residues such as rice straw and corn stover for dry season feeding. A simple storage system (such as drying the crop residues to contain 15% water or less and store under shed or in open space by pyramid stacking) is recommended. These systems have been proven to be effective in similar system
of eastern Indonesia, compared to more sophisticated methods such as ammoniation.

These byproducts should be supplemented with tree legumes locally and available energy sources (such as putak) at a level of at least 1% dry matter of the animal's body weight (or around 25% of total daily feed allowance in fresh weight).
# Attachment 1.

## Schedule and activities

<table>
<thead>
<tr>
<th>Date</th>
<th>Activities</th>
<th>Location/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 July</td>
<td>MAF team arrived in Mataram</td>
<td></td>
</tr>
<tr>
<td>7 July</td>
<td>Planning meeting (MAF team and Univ. of Mataram team)</td>
<td>Mataram</td>
</tr>
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</table>
| 8 July   | Signing of MoU between MAF Director General and Rector of Mataram University  
           | Signing of contract between NDLVS Director and dean Faculty of Animal Science | Mataram           |
| 12-24 July | Consolidation of Mataram team, Review of relevant studies in eastern Indonesia | Mataram           |
| 25 July  | Mataram team to Denpasar                                                  | Denpasar          |
| 26 July  | Mataram team arrived in Dili, informal meeting with MAF DG and staff      | Dili              |
| 27 July  | Meeting at MAF office, Visit to CCT, Meeting FAO office                   | Dili              |
| 28-30 July | Visit to Baucau and Lautem districts                                      | Fuiuro            |
| 31 July  | Team discussion                                                           | Dili              |
| 2-4 Aug  | Visit to Manufahi and Ainaro districts                                    | Same              |
| 5 Aug    | Discussion at Food Security office, RDP III office and HIVOS officer       | Dili              |
| 6 Aug    | Visit to Bobonaro district (via Liquica)                                  | One day trip      |
| 7 Aug    | Discussion with MAF team, Preliminary report preparation                  | Dili              |
| 8 Aug    | Preliminary report finalisation                                            | Dili              |
| 9 Aug    | Meeting at MAF office, Mataram team return to Mataram                     |                   |
**Attachment 2.**

**Expert team statement:**

The activities reported in this document have been conducted according to program stages as described in the contract.

<table>
<thead>
<tr>
<th>Experts</th>
<th>Specialisation / Role</th>
<th>Signature</th>
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<tbody>
<tr>
<td>Dr. Dahlanuddin</td>
<td>Ruminant Production system / Team leader</td>
<td></td>
</tr>
<tr>
<td>Prof. Dr. Yusuf Akhyar Sutaryono</td>
<td>Tropical forages / Team member</td>
<td></td>
</tr>
<tr>
<td>Ir. Muhammad Muhzi, MS.</td>
<td>Socio-economic / Team member</td>
<td></td>
</tr>
</tbody>
</table>
Attachment 3.

Selected photos from field visits

Sheep grazing on rice field (Vemasse, Baucau)

Good forages not being used in some areas (dry *Pennisetum polystachion* at Triloka, Baucau)
Goat tethered on a low land native pasture (Loilubu, Baucau)

Buffalo feeding conserved rice straw (Baucau)
Cattle grazing on native pasture (Soro, Lautem)

Typical cattle pen – muddy floor due to rain and accumulated feces and urine (Barikafa, Lautem)
Unused *Gliricidia sepium* (Barikafa, Lautem)

Cattle grazing on native pasture (Same, Manufahi)
Unused Leucaena (Maliana, Bobonaro)
Cattle grazing on steep highland native pasture (Leber, Bobonaro)

Chromolaena odorata and Jatropha sp invasion on most of native pastures (Baucau)
Annex 1

MINISTÉRIO DA AGRICULTURA E PESCAS - RDTL
Direção Nacional da Pecuária e Veterinária

 TERMS OF REFERENCE

<table>
<thead>
<tr>
<th>Post Title</th>
<th>Specialist in tropical pasture and animal feeding</th>
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<tbody>
<tr>
<td>Duration of the Assignment</td>
<td>Two months</td>
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<tr>
<td>Duty Station</td>
<td>Timor-Leste (at the National Directorate of Livestock and Veterinary Services)</td>
</tr>
<tr>
<td>Expected starting date</td>
<td>8th of July 2010</td>
</tr>
</tbody>
</table>

I. Background

Livestock is one of the most potential sources of income to the farmers of Timor-Leste. The low productivity of livestock in this country is caused by several factors, among them, the unavailability of grasses to feed the animals in the dry season (June-December). Observations from the field indicated that there are species of grasses' legumes that can grow well at the up-land areas but not at the low-land areas and vice-verse. Therefore, the National Directorate of Livestock and Veterinary Services (NDLVS) is looking for a candidate (individual, collective or institution) specialized in Tropical Pasture and Animal Feeding to assist local specialists at this National Directorate to prepare the key programs and activities for improving pasture conditions, particularly for large ruminants, at the low-land and up-land areas during the wet and dry seasons, as well as to preserve straw to feed the animals in the dry season. The selected candidate for this assignment will carry out the functions as indicated below.

II. Objectives

To collaborate with local specialists of the NDLVS in conducting a brief study in several districts of Timor-Leste on current smallholder cattle feeding practices, constraints and opportunities (including pasture condition and utilisation in low-land and up-land areas, utilisation of crop residues and agricultural by-products) and assist the local specialists to identify possible solutions, prepare the key development programs and activities over the next five years and to provide sufficient forage to the animals along the year.

III. Duties and Responsibilities

Under the supervision of the National Director of Livestock and Veterinary, the incumbent will perform the following functions:

- Review any previous studies or literature about the development of pasture in Timor-Leste (also is recommended to review similar studies held in the Indonesian Provinces of West Nusa Tenggara and East Nusa Tenggara that can be applied in Timor-Leste);
- Conduct field visits to the different locations inside Timor-Leste to observe the conditions of pasture at the up-land and the low-land areas particularly at the dry season, meet and discuss with local farmers and their leaders to make the best use of their land and the community land;
- In conjunction with local specialists of the NDLVS, conduct identification and recommend the key development programs and activities for NDLVS over the next five years for improving smallholder cattle, goat and poultry feeding and management systems;
Identify and recommend forage grasses/legumes and the improvement of their cultivation system at the up-land and low-land areas.

Identify and recommend the most appropriate rural technologies for preparing animal feeding for large and small ruminants, pigs and poultry;

Identify and recommend the most likely options for improving the utilisation of straws, crop residues and agriculture by-products;

Visit some national and international NGOs to understand their programs and activities in regard to the improvement of pasture and animal feeding, and looking for synergies with MAF’s programs;

Coordinate with NDLVS to facilitate workshop(s) about the findings of the field study; prioritizing specific development programs/activities and research activities for improving smallholder cattle feeding and management systems over the next five years, including specific recommendations on forage grasses and legumes that may be appropriate for evaluation on-station and on-farm; and proposing realistic and achievable outcomes if these activities are conducted;

Organise and sponsor two comparative study(ies) by three senior officials of NDLVS to Mataram (NTB) to observe closely the implementation of programs on pasture development and animal feeding; and

Submit a final report of the assignment to the National Director of Livestock and Veterinary Services with copies to the relevant officers at MAF.

IV. Expected Outputs

The incumbent is expected to produce the following outputs:

a. Key development programs and activities over the next five years for improving smallholder cattle feeding and management systems, as well as the improvement of grass/legumes cultivation system at the up-land and low-land areas.

b. Recommendation of forage grasses/legumes resistant to drought, appropriate technologies to grow these grasses at the up-land and low-land areas and the rural technologies for improving the utilization of straws, crop residues and agriculture by-products.

c. A final Report of the assignment prepared and submitted to the National Director of NDLVS and copy to the Secretary of State for Livestock and other relevant officers at MAF.

V. Qualification and Professional Experience

- Advanced university degree in Animal Science or equivalent with deep knowledge of Tropical Pasture and Animal Feeding;

- With minimum of 10 years of professional experience in the area of development of animal feeding in the tropical countries;

- Ability to conduct quick surveys and demonstrated strong experience in developing programs and activities for improving smallholder cattle feeding and management systems at the rural areas;

- Good knowledge of animal feeding and pasture development cross-cutting issues;

- Good communicator and facilitator of the workshops and group discussions, and able to work with people from different culture and education background;

- Able to work under pressure and able to travel at long distances (field visits);

- Excellent writing and communication skills in English, (fluency in Portuguese, Tetum or Bahasa Indonesia would be an advantage).
Contract No: ................

Contract entered into between the Ministry of Agriculture and Fisheries, Democratic Republic of Timor-Leste and the Faculty of Animal Science University of Mataram (Hereinafter referred to as the Contractor).

Address: Kampus UNRAM, Jl. Majapahit no. 62 Mataram, Lombok, NTB, Indonesia.
Telephone: +62 370 633 603 Fax: +62 370 640 592
Email: fapet@mataram.wasantara.net.id

This contract is based on Memorandum of Understanding (MoU) between The Secretariat of State for Livestock, Ministry of Agriculture and Fisheries Timor-Leste and University of Mataram, Indonesia, signed in Mataram on 8 July 2010.

Scope of the Assignment: In conjunction with specialists of the National Directorate of Livestock and Veterinary Services (NDLVS), conduct a brief study in several districts of Timor-Leste on current smallholder cattle feeding and breeding practices, constraints and opportunities (including pasture condition and utilisation of low-land and up-land areas, utilisation of crop residues and agricultural by-products) and assist the local specialists to identify possible solutions and prepare the key development programs and activities for the next five years; organize and facilitate consultation workshop(s); organize study tour(s) to Mataram (the Indonesian Province of NTB) by the senior officers of the NDLVS; and prepare a final report of the assignment to MAF.

The Contractor shall:

1. Perform all tasks as indicated in the TOR (Annex).
2. Organize two study tours to Mataram by the senior officers of NDLVS.
3. Organize and facilitate workshops and group discussions at the districts and at the national level.
4. Submit a final report of the assignment to NDLVS.

The National Directorate of Livestock and Veterinary Services shall:

1. Collaborate and provide support to all technical personnel coming from UNRAM.
2. Pay the Contractor according to the terms of this Contract.

Consideration: Under the terms of this Contract, the National Directorate of Livestock and Veterinary Services shall pay a total fee of USD 30,000 (Thirty Thousand US Dollars) to
the Contractor. NB: All taxes and Bank charges for the electronic transfer of funds to the Contractor's bank account in Indonesia will be deducted from this amount.

2. The payment to the Contractor will be made in two installments as follows:

   (a) 1st INSTALLMENT: 50% of the total fee or equivalent to USD 15,000 (Fifteen Thousand US Dollars) upon completion of the field visits and collection of information.

   (b) 2nd INSTALLMENT: another 50% of the total fee or equivalent to USD 15,000 (Fifteen Thousand US Dollars) upon satisfactory completion and submission of the following outputs:

   - Key development programs and activities over the next five years for improving smallholder cattle/goat feeding and management systems.
   - List of the recommended forage grasses/legumes and the improvement of their cultivation system at the up-land and low-land areas.
   - Recommendation of the most appropriate rural technologies for improving the utilization of straws, crop residues and agriculture by-products.
   - Submission of the final report of the assignment to NDLVS.

3. Payments to the Contractor will be made in US currency.

4. All transportation costs including air tickets from Mataram – Timor Leste - Mataram made by specialists from UNRAM, as well as their accommodation and meals, expenses of the workshops and other logistical costs, will be covered by the Contractor. Local transportation in Timor-Leste will be covered by NDLVS.

5. All costs related to the comparative study by senior officials of NDLVS to Mataram (NTB) as well as their daily subsistence allowances (DSA) will be covered by the Contractor.

6. All outputs produced under this Contract become property of MAF and the Contractor is not allowed to make any publication of these outputs without formal agreement by MAF.

7. This Contract commences on the 1st of July 2010 and expires on 31st of August 2010.

I acknowledge that I have read and accept the terms of this Contract.

On behalf of UNRAM

K. Muhammad Mullizi, MS.
Dean of the Faculty of Animal Science

On behalf of MAF

Eng. Calisto Da Costa Varela
National Director of Livestock and Veterinary Services

Edifício do Ministério da Agricultura e Pescas
Rua Presidente Nicolau Lobato, Comoro, Dili, Telp./Fax + 670 3325121
SURAT PENUGASAN
Nomor: 287/118.3/KP/2010

Dekan Fakultas Peternakan Universitas Mataram dengan ini menugaskan kepada:

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   **Instansi/Alamat**: Fakultas Peternakan Unram
   **Jln. Majapahit No. 60 Mataram

2. **Nama**: Ir. Dahlanuddin, M.Rum.Sc., Ph.D.
   **Jabatan**: Tenaga Edukatif Fakultas Peternakan Unram
   **Instansi/Alamat**: Fakultas Peternakan Unram
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3. **Nama**: Ir. Muhamad Muhdi, MS.
   **Jabatan**: Dekan Fakultas Peternakan Unram
   **Instansi/Alamat**: Fakultas Peternakan Unram
   **Jln. Majapahit No. 60 Mataram


Demikian Surat Penugasan ini dibuat untuk dapat dipergunakan sebagaimana mestinya.

Dekan

[Signature]

Ir. Muhamad Muhdi, MS.
NIP. 130534729

Mataram, 11 Juli 2010