

**Ecological Intensification of Livestock Production Systems
to Improve Livestock Productivity and
Environmental Services on the Tugi (Gutah) Hills
of the North West Region of Cameroon
(TUGI SILVOPASTORAL PROJECT – TUSIP)**

1st INTERIM PROGRESS REPORT



“Fighting farmer-grazer conflicts, combating environmental degradation”

**Turrialba (Costa Rica) and Tugi (Cameroon)
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EXECUTIVE SUMMARY

The Tugi Silvopastoral Project (TUSIP) is a shared effort between Akwi Memorial Foundation (AMF), a not-for-profit organization based in Bamenda, Cameroon (Africa) and the Tropical Agriculture Research and Higher Education Centre (CATIE), based in Turrialba, Costa Rica. Supported by the World Bank, the pilot project seeks to assess the productivity of traditional livestock systems and their effects on the environment as well as introduce a set of tested silvopastoral practices (innovations) to improve the livestock production systems, stem environmental degradation and empower traditional livestock farmers in the project area, Tugi village in the Gutah Hills of the North West Region of Cameroon. The outcome of the project focuses on enhancing the capability of the target population to manage their farms and natural resources in a sustainable manner through the application of new technical (silvopastoral practices) and social (participatory research and training) technologies or innovations.

Methodology and objectives

Field operations for the project started in January 2010 after a site visit in December 2009 by CATIE. This report covers the period January to June 2010, and presents the methodology used to generate the data collected under the following five objectives of the project and the results obtained so far: (a) Collection and documentation of baseline data; (b) Establishment of silvopastoral innovations; (c) Evaluation of traditional and improved systems; (d) Strengthening farmers' capabilities for decision making and assessing their perceptions on silvopastoral technologies; and (e) Systemization and documentation of lessons learned. The Field staff during the period covered by the report includes a Technical Advisor from CATIE, a Research Assistant, a driver and field technician from AMF. A Toyota Double Cabin 4x4 pick up was acquired at the beginning of the project to facilitate purchase and transportation of equipment and staff. Project management is handled by the administrative staff of CATIE and AMF respectively.

Interim results

The first six months of this pilot have been very successful. Due to the geopolitical nature of the zone of operation, and in an effort to build on ownership, sustainability and scaling up the project, farmers from the three main villages that make up the Gutah Hills (Tugi, Ngwokwong and Chup) were integrated into the project. Key preliminary achievements include i) Collection, collation and analysis of data that enable the project to achieve a characterization of livestock farms in Tugi Village, Mufomo Quarter in Ngwokwong Village and Tuochup Quarter (of Chup Village), ii) Identification and analysis of the perceptions of Tugi families with regard to the external factors that influence their livelihoods as peasant cultivators and livestock producers, iii) Introduction of silvopastoral (technical) innovations such as the construction of 4

model family farms and one community farm with fences, as well as the establishment of forage areas on those farms, iv) Preliminary evaluation of constraints to livestock-crop integrated farming system; v) Impact of traditional agriculture on the environment and sustainability of the ecosystem; and vi) Training of farmers (men and women) using the Farmers Field Schools approach. A complete list of field equipment acquired by the project so far and used for field work as well as the work plan for the next six months are enclosed in this report.

Challenges as we look ahead

As we look ahead to the next and last 12 months of project, we identified a number of challenges, and of course possible solutions: i) availability of agricultural inputs and equipment; ii) management of labor relations in an African village with no prior project experience or exposure; iii) reinforcement of ownership and sustainability of pilot farms; iv) the intensification of gender mainstreaming in the project; v) collaboration and partnership building; vi) enhancement of mutual understanding of cross-cultural experience in project management and implementation.

Conclusions

So far, this has been a good experience in cross-cultural project implementation. The main challenge in project management has been the challenge of cultural sensitivity and the need to adapt CATIE's procurement procedures in a different cultural and political context away from their headquarter. Although considerable progress has been made, there is still need for some minor adjustments which will be overcome with better understanding and admission of cultural relativity in project management.. In terms of budget execution, about 40.9% of the total budget of \$200,000 has been spent in the first third of the project life. So far, 35.6% of the \$115,000 allocated for operations on the field in Tugi and 48.1% of the \$85,000 allocated to cover CATIE's fees and other expenses have been spent. These figures appear reasonable, since a good proportion of the expenditures in Tugi are farm investment costs. In the case of CATIE, travel for two staff to provide technical assistance to TUSIP was planned and effected during the first phase under consideration.

INTRODUCTION

Cultural relevance or context

“Gutah Hills” is a local description of human settlements that lie on the Northwestern plateau of the Meta Clan in Momo Division (North West Region of Cameroon). Three villages (Tugi, Ngwokwong and Chup) make up the geographical area called Gutah as defined by the Meta Cultural and Development Association (MECUDA). Administratively, each village is headed by a village head called a Chief or Fon, and the village is made up of quarters, placed under the local administrative leadership of a quarterhead who is answerable to the Fon. At the lowest rung of the administrative ladder of a village is the family or households headed by heads of household or family heads. The family is the basic social unit in these villages.

In terms of land ownership and control, the Government theoretically “owns” all land in Cameroon, although the Fon or Village Chief is the “owner” of the land inhabited by his people. Actually the Fon is the “custodian” of native or communal land. Land ownership in the Gutah Hills, as in most of Cameroon takes several forms including inheritance, purchase, gift and lease. In the Gutah Hills, all land is customary or communal land with the Fon as landlord.

Livelihood strategies on the Gutah Hills

Inhabitants of the Gutah Hills comprise indigenous (native) people and migrants who are the cattle and urban Fulanis. While the native Meta people earn their livelihoods from the production of crops and animals within a crop-livestock integrated farming system, the cattle Fulanis earn their living exclusively from raising cattle, goats, sheep and horses in a free-ranging farming system, and have small areas dedicated to crops for self-consumption.

Thus, livestock production is one of the most relevant livelihood strategies for the people living in the Gutah Hills. Free-ranging cattle production was introduced into the region occupied by the Meta clan by migrant Fulanis (Mbororos) in the 1950s as nomadic pastoralists. In the late 1970s the Government of Cameroon was beginning to experience the negative impact of traditional cattle raising on the environment and human settlements, therefore began to encourage the Fulanis to adopt a sedentary lifestyle. They gradually yielded to this policy and seized the opportunity offered by the government to settle.

Policy to settle nomadic pastoralists

In the 1970s, there were fewer Fulanis who lived solely on beef cattle and animal by-products such as milk, butter and hides, compared to the indigenous Meta people who lived on food crops, vegetables and small ruminants (goats, sheep), pigs and poultry. In application of Government policy to encourage the Fulanis

to settle, in 1960 the Fon of Tugi allocated some of the hills in his village for the Fulani people to carry on their livestock activities, while the indigenous Tugi people continued to produce food crops, fiber and non-timber forest products such as kolanuts and raphia juice (“wine”) in the valleys and forests of the community. As far back as the 1970s with the settlement of the cattle Fulanis, some Meta people adopted traditional cattle production and incorporated the activity into their farming systems as well. However, at the beginning, many of the natives who adopted cattle raising either stocked their animals in the herds managed by the Fulanis managing those in partnership or they employ Fulanis as herdsmen in their own herds, to enable them to devote their efforts to crop production and small ruminant production, along with other off-farm activities.

Human settlement and farming systems in the Gutah Hills

The settlement pattern in Gutah is compound villages (Nji, 1989; 2006) that comprise large and uneven parcels of farmland around and further away from the residential areas. The farmlands around the homestead are reserved for coffee, plantain and other fruit trees production, while farmlands further from home are used to cultivate roots and tubers (cocoyams, cassava, yams and potatoes) and grain crops (e.g. maize and beans). The farms around the homesteads tend to be small parcels whereas those further away from the homes are large plots on which crops and vegetables are cultivated in large quantities for home consumption and for the market, applying shifting cultivation and fallowing as a soil fertility and productivity enhancement strategy. Families also have land allocated for market-oriented farmland activities in Gyindong Community Farm, and more will be used after TUSIP establishes more intensive silvopastoral options.

The choice, location and utilization of farmland is based on the indigenous knowledge system. The natives are able to do their own soil taxonomy that enables them to distinguish farmland that is suitable for different crops. This explains why farmers on the Gutah Hills operate farms that are located in different parts of the village and on which different crops are grown. Thus, Gutah women own and cultivate several farms depending on the fertility and productivity of the soil. However, due to the pressure on land exerted by increased population, the fallow period is becoming too short to booster soil fertility. This affects the productivity of the soil and threatens the livelihoods of the local population.

The native human settlements go back to the Thirteenth century when the explorers and Clan Heads conquered hitherto unoccupied territory. Gutah villages have several neighbors. Tugi village for example, shares its Southern boundaries with Tudig and Njah-Etu, to the South-West lie the neighboring village of Ngwokwong and Tinechong on the North-West. To the north is Oshie and to the East are the villages of Chup and Guneku (Nji, et al., 2009).

In contrast to the indigenous Meta population which is settled, the Fulani tend to live in isolated circular compounds (Nji, 2006) perched on the hills, which serve as residential and grazing areas for the animals. Nomadic pastoralism or transhumance is still practiced by the Fulani population, with young family members moving part of the herd during the dry season (December to March). In contrast, most of the, practice crop production on farmlands located close and relatively further away from the compounds. Crop production by Fulani families is very limited. Fulani families who grow crops may do so around their homesteads close to their houses, and on land that has been enriched by manure deposited by the animals which the pastoralists move to sleep close to the house, as a preventive measure against cattle rustling. In a sense, we can claim that both the indigenous peoples and cattle Fulanis practice agro-pastoral farming systems, even though in general the relative importance of both components differs between the two ethnic groups.

Pasture management

Previous studies on livestock development in Africa in general and in Cameroon in particular have noted that “the lack of technology in livestock production (e.g., genetic improvement of local breeds, establishment of disease control programs, introduction of improved pastures and better pasture management regimes) impact negatively on the development of the peasant livestock sector in developing countries (Nji, 1995:75). Yet, pastures are the main land use option in the Gutah Hills of Northwestern Cameroon, where most grazing areas are between moderately and severely degraded (Pezo and Azah, 2010a). Pasture degradation in the Gutah Hills is the result of several factors, among others: extensive pasture management, overgrazing –particularly during the dry season– and the use of fire to control weeds and external parasites in cattle, as well as to eliminate the over-matured grasses and residues left after grazing. The latter contributes to soil degradation, as a results of the loss of organic matter and mineral nutrient depletion due to soil erosion in denuded areas. The decline in soil fertility due to these factors is more critical because fertilization is not a common practice, and grazers are not familiar with the value of legumes and trees for soil improvement and more effective nutrient cycling.

Low productivity and poor quality of herbage in degraded pastures result in poor cattle reproductive performance, limited live weight gain which determines that animals frequently take 6-8 years to reach slaughter weight, poor body condition particularly at the end of the dry season, mainly in the case of lactating cows. Moreover, the decline in pasture productivity due to pasture degradation is exacerbated by the increase in livestock density, socio-cultural considerations, climate change etc. This has led to: i) severe land degradation which reduces the carrying capacity of grazing lands, ii) negative impacts on the capacity of the ecosystem to provide environmental services (especially carbon sequestration and biodiversity) and iii) negation of efforts towards food security and livelihoods of the communities.

An additional problem in the case of the North West Region of Cameroon, is the conflicts between grazers and farmers (Harsbarger and Nji, 1991). These conflicts are fueled by a combination of factors particularly population growth, governance bottlenecks, livestock policy development vacuums and pasture degradation. The absence of fences in pastures, the lack of strong fencing in cropping areas, and careless grazing management by herdsmen push animals grazing degraded pastures to invade and damage farmlands. On the other hand, the absence of technologies to improve and sustain crop production and productivity, along with increased demand for food from a rapidly growing urban population exacerbate the need for more farm land and present challenges for improved management of the farming systems in the area.

Securing farmer's food security and livelihoods and the capacity of these systems to provide environmental services hinge on successful intensification of these livestock production systems applying silvopastoral approaches. Such improved technologies can result in increased productivity, relieve pressure on grazing lands and increase the profitability of traditional production systems through more efficient and profitable agriculture. This will also contribute to build healthier and more sustainable eco-systems and create opportunities for peasant cultivators to adapt to climate change and improve their food security (Nji, 2009).

A project developed by CATIE in Costa Rica, Nicaragua and Colombia, supported by the World Bank, has demonstrated that the adoption of appropriate silvopastoral practices in dual purpose cattle farms are associated with improved livestock productivity, carbon sequestration and biodiversity conservation, and the intention of the TUSIP project is to replicate and adapt those principles, approaches and experiences to the prevalent conditions of the Gutah Hills, in order to assess if those innovations will contribute to the long term sustainability of cattle production systems in the western highlands of Cameroon.

The present report describes the initial efforts made to: (a) analyze the current farming systems, and (b) train and encourage livestock farmers and workers to apply strategies for the rehabilitation of degraded pastures using silvopastoral options. These are aimed to ensure adequate year-round availability of high quality forages to improve animal productivity, and at the same time contribute to prevent environmental degradation due to overgrazing, and even to restore ecosystems services that have been affected by the change in land use from forest to degraded pastures.

OBJECTIVES OF THE TUSIP PROJECT

The main goal of the TUSIP Project is to assess the productivity and environmental benefits of a set of silvopastoral practices and to empower traditional livestock farmers in Tugi village by enhancing their capability to manage their farms and natural resources in a sustainable manner through the application of participatory research and training approaches.

The specific objectives of the TUSIP project are to:

- a. Build the indigenous capacity of livestock farmers in the community to identify, understand and examine the dynamics of the environment and livestock production under the current traditional farming system;
- b. Develop farmers skills and competences for them to be able to assess the environmental costs of traditional management and the potential and real benefits of improved livestock production applying silvopastoral options;
- c. Understand farmers' perceptions and expectations of environmental effects and consequences of climate change on their livelihoods;
- d. Train farmers on the application of a set of silvopastoral and agroforestry technologies and encourage them to adopt those within the mixed farming systems they practice;
- e. Encourage integrated management of grazing lands in Tugi village to ensure adequate year-round availability of high quality forages to improve the productivity and quality of animals;
- f. Contribute to find sustained solutions to the chronic problem of farmer-grazer conflicts in the area and environmental decay due to over-grazing;
- g. Scale up the project to other communities in the region and within the country.

METHODOLOGY AND SCOPE

TUSIP is carried out in the Gutah Hills of the North West Region of Cameroon where the ecological conditions are similar to the ones in several areas of the highlands of Central America in which CATIE has been working for several years developing, adapting, testing and promoting different silvopastoral options for the rehabilitation of degraded landscapes dominated by livestock production systems. Based on the above, The World Bank approached CATIE to start a South-South collaborative effort providing technical assistance to the people of Tugi Village and Akwi Memorial Foundation (AMF), a non-government organization devoted to alleviate poverty in the North West Region of Cameroon.

The project is aimed at promoting the intensification of livestock production systems in Tugi village through the rehabilitation of degraded pasturelands and the promotion of improved silvopastoral technologies with proven success under similar conditions in Central America, but using species that are adapted to local conditions. The intensification is expected to promote the integration of livestock, trees and crops production for sustainable management of natural resources, as well as the diversification of production, in order to assure food security and reduce risk of local communities to climate change. The traditional agro-pastoral system currently practiced in Tugi is mostly oriented for subsistence; whereas the project is working on the adaptation of technology innovations and approaches that can contribute to improve productivity in a sustainable manner, as well as to add value to farm products, mostly those

produced by the animal component, but more importantly this project will help to strengthen farmers' capabilities for decision making.

As much as possible, the project is applying participatory methods and approaches in order to identify the needs, expectations and opportunities of smallholder farmers in Tugi Village, but also as a means to promote stakeholders' ownership of all TUSIP project efforts. In that sense, project staff shared their plans and views, and asked for feedbacks with different instances at the village level (the Fon and quarter leaders, family heads, representatives of different active groups in the community such as the Tugi Livestock Farmers Cooperative, and the Women's Christian Fellowship), as well as at the Momo Division level (the Senior Divisional Officer, the Mayor of Mbengwi Council and its Council Members, the Divisional Delegates and staff of the ministries in charge of Environment and Nature Protection, Forestry and Wildlife, Livestock, Fisheries and Animal Industries, and Agriculture and Rural Development, among others.

Also, as a means to promote partnerships, TUSIP staff has established contacts and presented its plans to different relevant institutions with actual or potential presence in the North West Region of Cameroon. Among the national organizations are: the Presbyterian Rural Training Centre (PRTC – Fonta), the Institute of Agricultural Research for Development (IRAD), and the Faculty of Agricultural Sciences (FASA) of Dschang University; whereas among the international institutions are: Heifer International – Cameroon Office, the World Agroforestry Centre (ICRAF), the International Livestock Research Centre (ILRI), as well as the Cameroon Office of The World Bank. The role of the local partner institution, Akwi Memorial Foundation (AMF), as well as the Project Management Committee (PMC), has greatly facilitated those relevant contacts..

In order to respond to project objectives, TUSIP staff is focusing on the following activities:

- a. *Collection and documentation of baseline data.* A review on the state of the art of the production systems in the target area, including the importance of livestock production in the livelihoods of farmers and rural communities, dynamics of cattle population and use of natural resources, technological innovations, productive, economic and social indicators and institutional capacities. To obtain such information several procedures have been applied, including *reconnaissance* and *in situ* visits to production units, interviews with family heads and other family members, consultation to local experts, a household survey covering 10 families involved in livestock activities, and participatory workshops applying the focus group discussion techniques. Those groups involved men and women from three quarters chosen at random but considering those should be representative of the two ethnic groups present in the village. Two of the quarters were of Natives and one exclusively Mbororo. All these procedures were oriented to map the relationship between livestock production and natural resource use, and to identify hot spots for interventions, problems and solutions to improve livestock productivity. Those workshops, as well as the ones carried

out with village authorities and representatives of relevant groups in the community, were used to create awareness of farmers on how agroforestry systems and silvopastoral approaches can contribute to improve productivity, restore ecosystem services (i.e., carbon sequestration, water harvest, and biodiversity conservation), and to mitigate the potential effects of climate change.



Photos 1 & 2. Participants in the Focus Group Discussion sessions with representatives of Mbengap and Touchup Quarters, respectively.

- b. *Establishment of silvopastoral innovations.* Five pilot (four family and one community) farms have been chosen to implement strategies for the rehabilitation of degraded pastures and the introduction of silvopastoral options. Those farms represent the ecological pattern of the entire village, taking into account differences in elevation and farm resources. In those pilot farms, efforts for the intensification of livestock production systems have started, through the rehabilitation of degraded pastures and the implementation of improved pasture management and other silvopastoral technologies based on the proven successes of the experiences developed by CATIE and its partners in Central America. For that purpose in each farm, the project identified pasturelands, representing the prevalent conditions in the grazing areas of the Gutah Hills, in order to implement, monitor and evaluate the proposed innovations for grazing and cut & carry forages. The introduction of trees in fodder banks and live fences, the enrichment of riparian forest and the protection of water catchments, the use of conserved forages as hay, the utilization of crop residues as feed, the planning of semi-zero grazing for some groups of animals and zero-grazing in the case of small ruminants (sheep and goats), as well as some agroforestry options aim to improve soil fertility and enhance crop productivity, such as alley cropping and improved fallows, are some of the technology innovations identified and/or started to be implemented.
- c. *Evaluation of traditional and improved systems.* The impacts of transforming traditional systems to improved silvopastoral options will be assessed in terms of pasture and livestock productivity, socio-economic parameters (e.g., costs of production, income, use of labor, participation of women) and environmental indicators (e.g., soil organic carbon, bio-diversity, and water quality). Also, TUSIP will try to evaluate the contribution of changes in livestock production strategies on farm income diversification, risk reduction

of climate change, and the contribution for improving the livelihoods of women and other gender groups. Based on the results of TUSIP project, recommendations will be developed for designing compensation schemes of farmers for environmental services generated by the ecological intensification applying silvopastoral systems

- d. *Strengthening farmers' capabilities for decision making and assessing their perceptions on silvopastoral technologies.* A training (capacity building) curriculum on silvopastoral and other agro-forestry innovations, applying principles of the Farmers Field Schools approach, has been adapted to the needs of Tugi farmers and other stakeholders in the beneficiary communities has been developed for TUSIP. Although the application of participatory methods starting from the identification of problems and opportunities, design and implementation of innovations is part of the project's methodological approach; it took time for the concepts to be well understood and for the process to be adopted by the beneficiaries, particularly the farm operators, things finally evolved successfully in the fourth month of field operations. This is understandable considering that this is the first time the target population has been exposed to such approaches.

Also, the proximity of the rainy season that defines proper timing for most agricultural activities, as well as the duration of the project (only 18 months), forced the staff to start applying the traditional top-down approach used by many R&D projects, but keeping in mind the need for identifying strategies that will help to assure ownership of the innovations by farm operators. In the last three months there has been good progress in the involvement of farm operators in project activities, accompanying the staff in all field activities in their farms, participating effectively in the participatory learning sessions, and even implementing some innovations by themselves, such as planting vegetative materials for live fencing, and replicating the innovations in other areas of their farms. Participatory learning sessions are not only attended by farm operators, but also by family members and other members of the community interested in the production processes as well. We believe that we might have expected too much too soon from a population that has neither been researched nor benefited from a development project in the past. Our expectations of a scientific attitude and culture (Nji, 2004) would probably be premature and somewhat exaggerated.

TUSIP will also carry out a study to evaluate the perceptions of farmers and other villagers on the proposed technology innovations, in order to determine how they value those technologies for improving their livelihoods, and what may be potential barriers for their adoption or scaling-out.

- e. *Systemization and documentation of lessons learned.* The TUSIP project is devoting efforts to document details of the technology innovations, including their costs and bio-economical results, as well as environmental impacts in order to scale up/out project experiences for greater impact. The

project has started working with local leaders, with the public sector and international organizations in order to develop a proposal for replicating these experiences with a wider coverage in the Gutah Hills.

RESULTS OBTAINED DURING THE FIRST SIX MONTHS OF OPERATION

Some Characteristics of the Livestock Farms in Tugi Village, Mufomo Quarter in Ngwokwong Village and Tuochup Quarter of Chup Village

A total of 10 livestock farmer families were interviewed using a livelihood strategies oriented questionnaire. The survey included the five pilot farms (P) chosen for the implementation of silvopastoral interventions (all owned by Meta families), plus other five livestock farms (three owned by Meta and two by Mbororo families) considered as control farms (C).

One each of the P and C farms are located in Tuochup quarter of Chup Village, three P and four C farms are located in Tugi Village (Tugi-Tugi, Acha-Tugi) and one P farm is located in Mofomo quarter in Ngwokwong Village and covers three farmers from Njaa-Tugi, Acha-Tugi and Mofomo-Ngwokwong, respectively, working together. The sample size could seem small, however the ones selected represent the majority of livestock farms owned by Meta families, and two Fulani farms which are to a certain extent typical in the Gutah Hills. . It was not possible to obtain all the desired data owing to the fact that the peasant farmers do not keep records of their farm operations.. Repeated visits to the farmers allowed us to confirm and validate the information most of which was based on memory recall The focus group discussions held at quarter level were important sources of information on production techniques but also on gender issues and farm management in a rural community such as Tugi. The participants' perceptions and institutional outlook and arrangements were captured.

The livestock farmers and their families. Farms in Tugi, Ngwokwong and Chup villages are owned by an extended family, led by a family head, but the heads of other family households also participate in the decision making process. Together, they mobilize family resources (e.g., animals, equipment) which they invest on the family farm. The average age of the family head is 59.7 ± 12.5 years, with no differences between P and C. Virtually all of them have been managing the family farms for more than 35 years.. Although many of them attended school (8.3 ± 5.4 and 2.8 ± 3.8 years, for P and C, respectively), some family members hold university degrees. There are others -particularly the older operators and several of the women- who are illiterate.. Almost none of the members in the sample have had any formal training in livestock production techniques. Therefore they practice traditional management using indigenous knowledge handed down from their parents in the case of crop production, and for livestock in the case of the Mbororo farms.

Land resources and their use. All livestock farmers interviewed own or have the right to use the land of their farms for 32.3 ± 14.4 years, with non significant

differences between the P and C groups (36.5 and 29.0 years, respectively). The average size of the intervened farm for the P groups is almost half (17.8 ± 20.3 ha) than for C (35.0 ± 17.3 ha), but considering the size of the other farm that 60% of the interviewed families declared to have access, the average area of the total land owned by the two groups are similar (117.8 and 121.7 ha, for P and C, respectively). The second farm is also used for livestock production, and those who do not practice transhumance graze their animals in such pastures during the dry season (December-March). Also, 30% of the livestock families interviewed indicated that rent areas for grazing during the dry season, either from others who have the grazing land but not enough animals with respect to the feed resources they have, or arrange with others to keep animals with their own herd. All renting arrangements are made on a five-months basis, and the amount to be paid is negotiated. None of the farmers interviewed rent land for crop production. Sixty percent of the P and C families own the land, and the rest have grazing permits issued by an appropriate Government department allowing them to use communal land for grazing..



Photo 3. Overview of Tugi landscape in the dry beginning of the rainy season



Photo 4. Group of native cattle at the rainy season

The use of land for grazing livestock is the common form of land use in the Gutah Hills in terms of coverage and intensity. As Tugi is hilly country or “The Switzerland of Cameroon” (Nji et al., 2009) as Tugians fondly refer to their village, the grazing lands cover mostly undulated and steep slopes. The majority is covered by native or seminatural (a combination of sown and native) pastures. Among the species most frequently found in the pastures are grasses such as *Sporobolus indicus*¹, kikuyu grass (*Pennisetum clandestinum*), *Brachiaria ruziziensis*, *Hyparhenia rufa* and star grass (*Cynodon nlemfuensis* or *C. plectostachyus*); some herbaceous legumes such as *Trifolium sp.*, *Desmodium sp.*, but also some unidentified legume shrubs. Weed infestation in pastures is high, with the presence of narrow leaf weeds such as *Imperata cylindrica* and few *Cyperus spp.*; many broad leaf weeds, with bracken fern (*Pteridium spp.*) as the dominant and more aggressive species. In general, pastures are considered moderate to severely degraded, and it could be due mainly to overstocking of pastures particularly during the dry and early rainy season, but other pasture

¹ In Latin America *Sporobolus indicus* is considered a weed given its low nutritive value and capacity for invading sown pastures

management techniques such as integrated control of weeds, proper rotational grazing, the strategic distribution of salt and others, apparently are either not known or non applied by livestock farmers.

The tree component and its use. The presence of trees on the Gutah Hills landscape is very limited. This is probably due to an intensive deforestation process and the fact that as Savanah area the hill tops tend to be covered more by grasses as the trees are to be found more in the valleys and forests. Trees in pastures are not common, however, some farmers practice indigenous agro-forestry by planting fruit trees on their farms and by constructing live fences.. There are some trees in compact blocks, mostly present as part of riparian forests dominated by native species, or in small plantations mostly with eucalyptus and cypress. These plantings were done as farmer's initiatives after seeing the results of plantations made by the Mbengwi Rural Council in Acha-Tugi .

Eighty percent of the P farms have planted trees –mostly Eucalyptus and Cypresses- many years ago as a farmers' own initiatives, and 100 % have some due to natural regeneration, whereas the corresponding values for the C farms are 40 and 0%. The remaining forests are used mainly as a source of timber, firewood, posts for fencing or corral construction, fruits and ethno medicine. The harvest of trees in farms requires a permit extended by the Department of Forestry and Wildlife Office in Mbengwi; however only 60% of the farmers of the P group and none of the C group have applied for it, meaning that illegal logging is still practiced through out the village. In the case of the Gyindong Forest Reserve located in the Tugi Village Community Farm, which is one of the P farms, the collection of products (mainly kola nuts and medicinal plants) is determined by the Fon and his notables, who constitute the Farm Management Committee, however during the time covered by this report there was also some timber extraction activity in the Community Farm.

All farmers use firewood extracted from their own farms, as well as from private or community forest, and 20% of the P farm owners sell firewood, but none of the C farmers. The forest is the source of timber for all farmers interviewed – except for one in the C group-; also is the source of poles for all except two in the C group. The forest provides fruits to only 20% of the farmers, but 70% collect fruits, and 50% sells those, but the main source of those is the farmland. Forty percent of the interviewed farmers practice some type of silvicultural management, such as pruning, thinning and control of parasite plants, but none fertilize trees.

There is still enough forest and water resources for the village population, but both resources are at risk, as practically none is making efforts on reforestation and protection of the relicts of natural forest and the riparian forest in the village. Moreover, as fire is a common management tool for pastures, as well as for land preparation to plant crops, and also practiced by hunters, there is a serious threat to loose important areas of forested land due to wild fires. In fact,

four cases of damages in forested areas of Tugi-Tugi due to uncontrolled fires were observed only in the last two months of the dry season, and lots of soil erosion has occurred with the early rains due to the lack of soil cover.



Photo 5. Firewood commercialization at house-hold level,



Photo 6. Fire is common management tool, but unfriendly with the environment

Water resources. All farms have their own water sources, 83.3% have water in the pasture areas, and in those water is available all year round. Unfortunately on none of the farms involved in the survey the water source is protected from free grazing and marauding animals. Therefore, the animals are led down to the streams to drink water once or twice a day depending on the season and the weather conditions. Although some have access to their own (30%) or community tap water (20%), 100% of the P and C farmer families collect rain water and use springs or streams as a source of drinking water. The tap water available for a very small proportion of the population located in Acha-Tugi is non-treated.

Similarly, water collected from for drinking is not treated. Although villagers believe that Tugi water is the best in Mbengwi subdivision, water quality analysis done in 2008 on a water sample from the popular road-side source called "Tuminib) on the road to Tugi-Tugi revealed that the water was contaminated with animal feces and thus unfit for human consumption (Ajaga Nji, personal communication). It will be helpful to carry out water quality analysis for other sources because there appear to be a potential for disseminating water-borne zoonosis as animals drink water in the upper parts of the watershed, as well as for the spread of gastrointestinal disorders due to the consumption of contaminated water (e.g., typhoid, worms). In fact, 55.6 and 88.9% of the interviewed families reported typhoid and digestive disorders, respectively; but the percentage of families affected by typhoid might be higher, as sometimes people having typhoid diagnose themselves as affected with malaria.

Crop management. Several crops and fruits are grown in the farms, and vegetables mostly around the family compound. Among the crops are cocoyams, yams, plantain, cassava, potatoes (Irish and sweet), beans and maize. Bananas, mangoes, kola nuts and avocados are the main fruits grown in the village. Among the vegetables are cabbage, okra, celery, parsley, leaks, tomatoes and huckleberry among others. Coffee was a relatively important cash crop for

farmers, but when coffee prices dropped too much, farmers almost cleared off coffee plants from their farmlands or did not manage those any more. Crop production is mainly the responsibility of women in the village, primarily oriented for family food security, but excesses are sold mostly in the village market. For non-cattle raisers, crops are the main source of cash income.



Photo 7. A water reservoir for cattle drinking



Photo 8. Cleaning a stream clogged by sediments and trash

The use of manure as fertilizer is more frequent in the C than the P farms (62.5 and 22.9%, respectively), and mostly applied to vegetables (70%) than to annual crops (40%) or cut and carry pastures (10%). In the P farms a diversity of manure sources are used (cattle, sheep, goats, pigs and even chicken), whereas in the C farms only the use of cattle and sheep dung was reported. In the Fulani livestock farms there is a very limited area devoted to crops, and usually those are planted in an area previously used as a night corral for animals (cattle and sheep). The use of herbicides and pesticides is very limited (20 and 0% in P and C farms, respectively, with no differences between vegetables, annual and permanent crops). More than 70% of the farmers use contour planting for crops, but none of the few who have cut and carry forages apply it in the pasture area. Sixty percent uses fire in land preparation, as part of the shifting cultivation system. The livestock farmers interviewed indicated that in 84.3% of their crop plots yields decline with time, in 94.3% of the cropland in the P farms such decline is attributed to soil fertility reduction, whereas according to the farmers in the C group the decline in yield in 62.5% of the cropland is due to lack or excess of rain.

As farmland areas are moved according to the decline in crop yields, there are non permanent fences protecting the farmland, and the ones built are made mostly of raffia and bamboo. Therefore cattle and sheep easily break into the areas under cropping. If some agroforestry options such as improved fallows and alley cropping were applied it is likely that farmers may invest in permanent fencing, as the length of cultivation cycles and crop yields could be increased.



Photo 9. Crops planted in areas with no fencing



Photo 10. Raffia fence to protect a cropping area

Livestock management. All animal species raised in the village are of local breeds, the White Fulani, Mbororo Red and Guhdali cattle, native hair sheep, dwarf African goats, native chicken and pigs; however few farmers raise crossbred pigs. The Fulani do not have pigs in their farms because of religious beliefs, and although the Meta farmers could have pigs, they are raised mainly for the market as most villagers in Tugi do not eat pork. Horses are raised and used predominantly by the Fulanis. Although the native Tugians do not generally keep horses, few of them can ride them. In times of need and emergency such as illness, the villagers used horses as ambulance to the nearest hospital in Acha-Tugi or Oshie Health Centre. Horses are also used for hauling goods .



Photo 11. A small Fulani girl working as a herder



Photo 12. Cows representing two of the native breeds (Gudahli and Red Mbororo)

Cattle and sheep held in livestock farms graze semi-natural and native pastures in a sort of continuous grazing system, with no fences, but there is always a herder (mostly a male Fulani) watching the animals in the pastures. To invest in fences for all grazing land in the Gutah Hills will be almost impossible, at least in the medium term, but principles of rotational grazing and animal feeding could be shared with herders, in order to prevent or minimize the deterioration of resources, and conflicts with farmers. Animals raised by the villagers are also poorly managed. Frequently chicken and pigs are scavengers, and sheep and goats are tied to a rope in an area close to the house or the farmland, where they can pick some native pastures and/or weeds.



Photo 13. A crossbred pig raised in a pen



Photo 14. Native sheep managed under grazing

Livestock production systems are extensive, with minimal use of inputs. All farmers in the area give common salt to cattle, sheep and goats, once a week or every other week, and few (12.5%) give salt to pigs. Thirty percent of the farmers indicated using mineral supplements. However the poor condition of animals at the end of the dry season, suggests that the amount of salt administered to the animals may be inadequate. By this time, some of the animals are unable to walk and end up in the slaughter house; others indicate low fertility rates. All livestock farmers interviewed indicate using parasite control drugs and vaccines, perhaps because vaccination is one of the animal extension services given to livestock farmers by the government livestock extension services. Only two farmers of the C group are feeding chopped Guatemala grass to their animals. None use molasses, and one Fulani farmer of the C group declared offering concentrates to some of his herd. Three farmers of the same group feed concentrate to sheep but no farmer in any of the groups use tree foliages as animal feed.

The systems practiced by livestock farmers are basically pastoral or agropastoral. As mentioned before trees are present in the farms, but interactions with pastures and animals are minimal or non-existing. Only one farm has trees (Eucalyptus, cypress and few Erythrina trees) in the pastures. The farmer intended to have a multi-strata and multipurpose fence, but there was no barbed wire on the fence. In the rest of the farms, some trees stand near and around the water sources. *Tithonia diversifolia* is a shrub commonly used for fencing around the houses, but farmers do not use it to feed the animals. Some farmers complained that the plant is not palatable, and is disliked because of its invasive behavior in the farmland and pasture areas. In summary, none of the different silvopastoral innovations being promoted by TUSIP are currently adopted on the livestock farms in Tugi and surrounding communities.

Livestock farmers raise cattle for meat production, and only the Fulani milk some of the cows to produce milk and butter for family consumption and a very small quantity for the market. Cattle and horses are sold in Acha-Tugi Cattle Market; whereas the sheep, goats and sometimes pigs are sold in the Tad Market which is located at about 30 km from Tugi. Frequently takes more than seven years for bulls to reach slaughter weight, but those are not the only animals taken to the

cattle market; also culled females due to age and reproduction failures, and even calves, young bulls and heifers are sold (Azah and Pezo, 2010).



Photo 15. Traders and farmers negotiating in the Acha Cattle Market



Photo 16. Native cattle bought in Acha Cattle Market on their way to Bamenda

Social resources. The interviews made to family heads and quarter representative evidenced a high level of organization in the community. The majority mentioned were members of either farmers (80%) or community organizations (90%) of different nature, such as farmers groups, livestock cooperative, tappers group, church related groups, and the locally organized savings group called “Samtang”, which works at a Quarter level. However these groups were more frequently mentioned by the natives than the Mbororos.

Communication within the community seems to be very effective, starting from the Fon and Quarter Heads, but also through the village criers and family members. Village and quarter meetings held on “Country Sundays” are also a good opportunity for sharing the news and taking decisions for community work. Electricity is only available in Acha-Tugi, thus limiting the use of most communication technologies. The hilly nature of the country interferes with radio signals and thus limits the use of the radio as source of external news. Only 40% of the families identified the radio as a reliable source of news. Thus, news in the community tends to ‘flow in the grape vine’ so to speak, using indigenous methods of communication such person to person communication, gossip or rumour. Yet, the most efficient medium of communication used in Tugi village seems to be the announcements made in the Churches on Sunday. Usually, people who receive the “news” pass it over to others in an informal communication network that seems to work really well.

The presence of government institutions is very limited. Although Tugi village has two extension post, one for agriculture and another for veterinary and animal husbandry, only the latter has a resident veterinary nurse. It does not appear that the vet extension officer has a reliable formal and structured training program for farmers. Therefore, according to the livestock farmers interviewed they have not had the opportunity to learn anything new in livestock production in the last five or more years coming from the extension workers or veterinarians. Any new knowledge they have acquired has come from some family member who recently attended a workshop organized for farmers outside

the village or from a friend. They very seldom get information on technology innovations, because extension services are very limited. In the case of livestock production most of their extension activities concentrate on vaccination programs. This revelation is consistent with a long term observation by Nji (1995) that the weakest link in Cameroon's livestock system is extension and that the dominance of veterinary nurses in the livestock extension services beacons the need to "bring man back into agronomic and animal science research", (Nji, 1991).

Financial resources. The lack of capital has been identified by all interviewees as one of the limiting factors for improving their systems, but all seem to be reluctant to take loans. Forty four percent said they were afraid to take those, 22 % declared do not know information on how to get those, and other reasons. However, all quarters have a sort of local savings group ("Samtang") that meets once a week to receive the savings, and from where each member can get money for special needs. In the neighboring village (Oshie) there is also a credit union where some farmers from Tugi village make regular savings and take small loans. In summary there are opportunities for micro-financing in the area, but farmers may change their attitude towards taking loans, only if they find ways to start more market-oriented activities.

Perception on external factors that affect livelihoods. When participants in focus group discussions held with three groups, two of them including women, were asked to rank the most relevant constraints for their livelihoods, they identified markets, diseases, security and roads (Table 1). However, the relative importance of those varied according to quarters and gender, pointing to the need to understand the context in which each group analyzed those. Interestingly these findings are consistent with earlier findings on "constraints to livestock production in the North-West Province" (at the time), (Nji, 1995).

Crop diseases were identified as the main limiting factor by the two groups of women, and animal diseases in the case of the Mbororo group². In all three cases we must consider that either crops or livestock are the main income generation activity for those groups. Market problems and road conditions are related, and both were in average the second limiting factor in importance for the groups. Although crop production is mainly for food security, surplus is taken mainly to the local markets in Tugi-Tugi or Acha-Tugi Cattle Market, but frequently not all the produce is sold. So, middlemen and "buyam-sellams" come to buy unsold produce at ridiculously low prices virtually at a loss to farmers.. Sometimes the women carry their produce on head load to the weekly market called "Tad" more than 15 kilometres away. Not many women can carry their crops to the market because of the distance, the load, the age of the female famers and cost of transportation when transport vehicles are available. The road network on the Gutah Hills is often in a terrible state of disrepair and tends to push

² Although we requested the Ardo (Mbororo leader) to invite men and women to the workshop, he decided that as this was the 1st meeting only male should participate of the Focus Group Discussions.

transportation costs unreasonably through the ceiling. In our view, There is a great need to improve the road network in the areas. The construction and maintenance of farm-to-market roads is a dire need in the communities of the Gutah Hills if development efforts in the area are to be sustainable and profitable.

Table 1. Ranking^a of external factors affecting the livelihoods in three Quarters of Tugi

Main External Factors	Touchup		Mbengap		Mbororos
	Males	Females	Males	Females	Males
Prices of products	0.5	0.0	0.5	0.0	0.0
Market problems	3.0	3.0	1.5	1.7	1.4
Diseases (plants and/or animals)	1.0	4.3	1.5	4.1	3.5
Security	0.8	0.3	2.5	1.2	1.1
Capital for investment	0.0	1.3	1.1	1.0	1.4
Poor roads	3.7	0.0	1.9	1.0	1.5

^a Based on a rating of 5 to the first, 3 to the second and 1 to the third limiting factors. All evaluations were done independently by each participant

Lack of security is another factor identified as a constrain. This factor is more important in the case of livestock producers. One of the farmers interviewed mentioned that he is not a cattle farmer anymore, because all his 17 animals were stolen. This situation may discourage cattle farmers from investing to livestock production. Cattle rustling has been mentioned as a constraint to livestock production in the North-West Region by several researchers (Harsbarger and Nji, 1995; Nji, 1995). It is clear that the solution to this problem goes beyond technical recommendations, and has to do with policies and the strict application of justice on persons caught, but also some efforts need to be done to assure traceability of animals. None of the herds use an iron-brand to identify the owner or animal identification. Moreover, none of the livestock farmers keep records neither for animals and crops, then it was difficult to get quantitative information related to animal performance and income generated by agricultural activities.

Establishment of Silvopastoral Innovations

The areas in the five pilot farms (four family and one community farm) where TUSIP has established the silvopastoral innovations were defined by stakeholders in January 2010, and soil samples were taken for laboratory analysis. However, some minor changes in the location and size were proposed by project staff, particularly for the cut & carry plots, considering the distance between pastures and corrals to be built, access to water, number of animals to be fed, etc. In all cases, these aspects were discussed with farm operators.

Three silvopastoral innovations that have been proposed and started to be implemented for the grazing areas in the pilot farms are:

- Rehabilitation of degraded pastures
- Implementation of rotational grazing strategies
- Multi-strata live fences

All three will work together, and will not be able to measure independently the effects of the first two to livestock improvement because both are closely related. Meanwhile, the project has started promoting the establishment of forage banks for cut and carry.

Rehabilitation of degraded pastures. The analysis of soil cover in the areas chosen for the implementation of silvopastoral innovations that will be managed under grazing in the pilot farms showed that edible species represented between 17.7 and 48.1%. In pastures that have less than 40% edible species is usually recommended to apply renovation strategies (Días-Filho, 2007). However considering several factors such as the topography of the grazing areas, the interest on reducing costs and and minimize soil erosion and degradation through appropriate soil conservation tillage methods, the period of the year when the project started, and the lack of machinery for land preparation, we opted for applying rehabilitation strategies in all farms, even though we recognized that will need to devote more efforts to reduce competition of the existing non-desirable species.

The vegetation analysis based on basal cover carried out in March 2010 apparently did not evidence how serious the problem with the bracken fern (*Pteridium sp.*), known in the local Meta language as “iwheungh” was. This is because the values varied between almost zero in one of the farms (Baghan Farm), and 12.0% in the most infested area in Gyindong Community Farm. In spite of those values, project staff decided to put efforts on controlling such species, among other weeds, because of its invasive capability specially after pastures are burnt and the start of the early rains. . The stubbornness of the bracken fern is accelerated by its very strong and profuse rhizomes, and the open spaces left in areas occupied by species that were burnt. In fact, after the first clearing of weeds, the bracken fern was the most dominant weed. In all areas, before over-sowing the grasses and legumes in the areas to be rehabilitated, the project staff waited for the regrowth of the bracken fern cut in the first weeding,. In some pastures the staff even did a third light weeding to fight this invasive weed..

Another intervention implemented in the pilot farms has been to build perimeter fences on all intervened pastures. The fences were built using dead posts and barbed wire. However, either by recommendations of the project staff or initiatives of some farm operators, people have started planting some tree species –native or introduced- or sisal plants in between the dead posts in the fences so as to eventually establish a live fence.



Photo 17. Native pastures dominated by bracken fern invasions



Photo 18. Hand weeding for controlling mainly the bracken fern

Fencing has been a means to prevent animals going into the pastures where rehabilitation strategies are being applied. Along with weed control, these strategies have had positive impacts on the composition of pastures as can be seen by comparing the changes in cover between March and June 2010, for two of the pilot farms (Table 2). The most relevant changes in those pastures have been the increase in edible grasses and legumes and the decline in the percentage of bare soil; however it should be recognized that the percentage of broad leaves and bracken fern have also increased; therefore we maintain the recommendation to apply a commercial herbicide composed either by Metsulfuron Methyl or Fluroxypyr in the regrowths of the fern after the second or third hand weeding. The use of Glyphosate is not recommended, even though is recognized as an effective herbicide against the bracken fern. By doing this, we opted for a rehabilitation instead of a renovation strategy.

Table 2. Changes in vegetation cover due to weeding and resting in the grazing areas of two of the pilot farms

Date of evaluation	Edible grass	Legumes	Narrow leaf weeds	Broad leaf weeds	Fern	Bare soil
<u>Baghan Farm</u>						
March 2010	16.5	1.2	12.6	7.5	0.0	62.2
June 2010	31.3	7.9	15.9	16.4	2.1	26.4
<u>Tah Farm</u>						
March 2010	26.6	6.9	3.1	17.7	6.9	38.8
June 2010	29.5	17.9	5.6	22.1	13.4	11.5

Different options were recommended for enriching the presence of grasses and legumes in the intervened pastures. In all cases it has been suggested that immediately after planting the seeds of recommended forages, animals should be introduced at a high instantaneous stocking rate for very short period of no more than two days, in order to defoliate those grasses and legumes grown during the exclusion period. Otherwise, the existing grasses will compete for light and other growing factors with the young plants that emerge after planting. The decision to take animals out of the pasture will be defined at sight by the height

of residue We anticipate that animals will be removed from the pastures when the height of the iron grass for example reaches 5-10 cm. When this strategy is respected, the trampling exerted by grazing animals will help to hold the broadcasted seeds down on the farms and thus, promote a better contact between seeds, soils and water, while preventing the seeds from being washed away by the rains if completely exposed and uncovered somehow by soil or other residue.

Local TUSIP staff started planting grasses and legumes in lines as recommended to facilitate weeding. Where difficulties in line planting are encountered, broadcasting was used. The recommended dosage per hectare is 4 kg of legume seeds (using 2 kg of *Stylosanthes guianensis* + 2 kg of *Desmodium uncinatum*), and 10 kg of *Brachiaria ruziziensis*. All these amounts were estimated correcting the dosage commonly used for those species using the data obtained for germination rate. Also, in the case of *Brachiaria ruziziensis* it was recommended to prepare a nursery using seed beds, in which the grass was planted with a high seeding rate of say 80-100 kg/ha considering the low germination rate detected for the grass. This was done on the Baghan farm and will be extended to the community farm in Gyindong and probably the Tah farm as well. We intend to ensure that the seed beds contain manure or sand (about 1/3 manure or sand + 2/3 soil) and enough moisture to facilitate germination and extraction of plants for transplanting. Additionally, once the seedlings of grasses and legumes reach 5-10 cm, we will apply a complete formula (high in P) to fertilize the pastures (approx. 25 kg/ha).



Photo 19. Wooden box used for evaluating the germination rate in forage seeds



Photo 20. Legumes oversown in strips after partial clearing in the degraded pastures

We recommended the use of vegetative materials for planting where available and suitable. This has been the strategy applied in Tangyie, Tah and Banghan farms, and will be applied in the other two farms (Community and Munoh) as well. In all farms, except for Munoh there are areas with good cover of either kikuyu grass (*Pennisetum clandestinum*) or *Brachiaria ruziziensis*. Therefore soil with roots, stems and leaves were used for replanting, and in the spaces left empty after removing these planting materials, seeds of the two herbaceous legumes (*Stylosanthes guianensis* and *Desmodium uncinatum*) were sown

Use of rotational grazing in rehabilitated pastures. One of the innovations promoted by the project is fencing for the implementation of rotational grazing, given the existing culture of extensive pasture management with no fences commonly practiced in the Gutah Hills. Details on how those fences were built, as well as costs and initial impacts of fencing has been described by Pezo and Azah (2010b). Although the main purpose of fencing in TUSIP pilot farms is the implementation of a well planned rotational grazing management which is absent in traditional livestock systems in the Gutah Hills, this investment has other purposes, oriented either to improve animal productivity and pasture management, or to help prevent farmers-grazers conflicts which are very rampant in the area (Harsbarger and Nji, 1991;Harsbarger, 1995). Other purposes for these fences include: (a) Reserving certain areas for the dry season, either as standing hay for direct grazing or for the preparation of conserved forages (e.g., hay, silage); (b) Preventing animals on going into those pastures that have been recently fertilized or treated with pesticides; (c) Keeping animals out of areas reserved temporarily for seed production, either for natural reseeding or harvesting of seeds; and (d) The need to protect either crops and/or cut and carry forage banks from damage by animals



Photo 21. Installing posts for a dead fence



Photo 22. Nailing barbed wire in a dead fence

The size of the grazing area chosen for implementing the silvopastoral interventions determined the number of paddocks to be installed. In the case of Baghan and Tah farms, two paddocks have been established because the area is of only 1.1 and 0.9 ha, respectively; in Tangyie farm with 2.0 ha of grazing area, it has divided into four paddocks; whereas in the case of Munoh Farm with 4.4 ha, up to five paddocks have been built. Examples of the proposed divisions are shown in Figure 1.

Decisions on the number of paddocks in Gyindongg Community Farm have not been taken at the time this report was prepared. because the project has to work with the Fon and the management committee to determine how the total area of 32 hectares will be used. Also to take into consideration is the number of animals that will be grazing in the community farm. Once the information is collected, we intend to carry out the introduction of innovations on the community farm progressively in three separate areas based on the results of pasture evaluation as shown on Table 2.

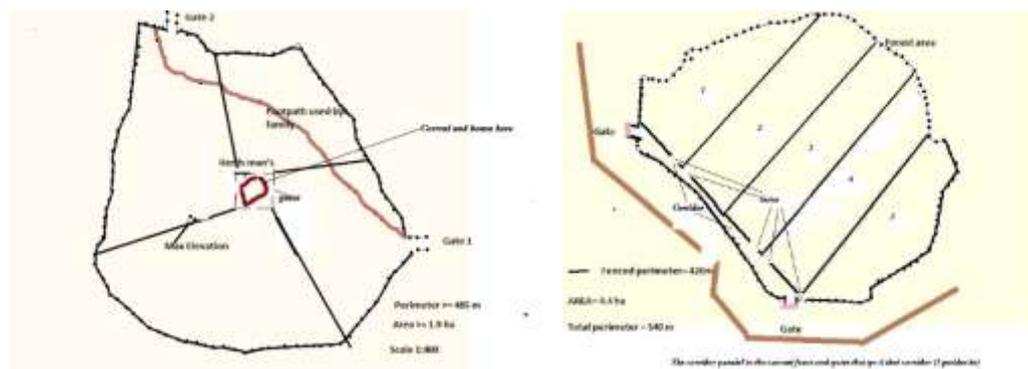


Figure 1. Proposed internal divisions for the grazing area in Tangyie and Munoh farms

Table 2. Level of degradation within the paddock to be intervened with silvopastoral options in Gyindong Community Farm in Tugi, North West Region, Cameroon

Strata	Edible species ^a , %	Weeds, %	Bare soil or rocks, %	Erosion	Level of Degradation
1	28.5	32.1	39.4	Sheet	Moderate
2	69.3	7.4	23.3	None	Slight
3	18.9	42.1	39.0	Sheet	Severe

^a The assumption is that all species classified as legumes are edible

The area identified as Stratum 2 (with slight degradation) will be the first choice for building fences and implementing rotational grazing, as well as introducing some herbaceous legumes. If the number of animals justify to have an additional area for grazing, the one identified as Stratum 1 (with moderate degradation) will be rehabilitated by over-sowing grasses and herbaceous legumes applying a similar strategy as recommended for Tah and Tangyie farms. Up to eight paddocks could be established in this area.

Details of the rotational grazing systems to be implemented in each farm will be defined after monitoring changes in forage availability in the areas rehabilitated and fenced. It is likely that in Munoh, Tangyie and Gyindong Community Farm a self-sufficient rotational grazing system could be implemented, whereas as in Baghan and Tah only two paddocks were rehabilitated, eventually the farm operators would implement either an alternate grazing system (with two paddocks) probably with less than three animals in total, or incorporate those paddocks with others. Fortunately, the Tah is already adopting the innovations being introduced by TUSIP in a very significant way. In a classical adoption-diffusion model (Beal and Bohlen, 1975:5), the Tah farm in this pilot will be considered an early innovator. This is quite exciting and good omen for scaling up the project and for the sustainability of the innovations.

Multi-strata live fences. Building multi-strata live fences as part of a grazing management strategy is practically a new technology introduced by TUSIP; although some live fences can be found in the village around the housing

compounds, corrals and in some cases protecting croplands. Those live fences are made mostly of cypress (*Cupressus* sp.), tree marigold (*Tithonia diversifolia*), sisal (*Agave* spp.), *Erythrina* spp. and other non-identified local shrubs.



Photo 23. A multi-strata live fence



Photo 24. Local fence made of sisal

TUSIP is proposing to have several species of different sizes (multi-strata) and potential uses (multi-purpose) in the live fences, but little has been done so far. Basically, some farm operators have planted some species available locally (e.g., sisal) and project staff have introduced *Acacia angustissima* in the fences of some of the forage banks (not in the grazing areas, because it is an edible species which could be damaged by grazing animals); however, in order to enrich those fences new tree germplasm will be obtained through the contacts already established with ICRAF. Also, it has been suggested to get stakes of *Erythrina* spp. from PRTC-Fonta, as well as few from Tangyie farm to enrich the fences with this valuable fodder tree. Additional nursery work need to be implemented with the seeds of *Acacia angustissima* and *Calliandra calothyrsus* already bought by TUSIP, as well as with timber and fruit species that will be obtained through ICRAF, before planting those in the fences. It is foreseen that such enrichment could be implemented next year, if the size of the trees allows.

Grass/legume forage banks. Forage banks made of Guatemala grass (*Tripsacum laxum*) are found in few farms in Tugi. They are supposed to be used during the dry season, but many of them have not even used for more than one year at the time of this report. As a result of such management, the forage become too old, with a resultant drop in its nutritive value. The innovation proposed by the project involves the introduction of a woody legume with a two fold purpose: enrich the protein content of the cut and carry forage, and improve soil fertility through nitrogen fixation and enhanced nutrient cycling. Also, a more efficient use of the forage bank incorporating it as part of a year-round feeding strategy is part of the innovation, by offering this cut and carry forage not only in fresh during the dry season, but also harvesting it during the rainy season either to complement grazing during that period, or for its conservation as silage for the dry season.

The forage banks established so far are composed of Guatemala grass and an introduced legume (*Acacia angustissima*). However, the grass components could be substituted by napier (*Pennisetum purpureum*) or guinea grass (*Panicum maximum*), which are available in the country, but the genotypes found in the area were not the best for the system, and the uniformity of planting materials can not be assured. Contacts have been made with ILRI to get improved germplasm of the two species, but it will take time to evaluate the performance of those in the Gutah Hills. In the case of the legumes, TUSIP obtained seeds of other woody legumes (e.g., *Calliandra calothyrsus*, *Leucaena leucocephala*, *Sesbania sesban*), and could obtain additional germplasm in the case of *Gliricidia sepium* through ILRI. Some of these, as well as different planting arrangements, could be tested in the forage banks to be established at Gyindong Community Farm.



Photo 25. Cutting Guatemala grass for seeds



Photo 26. Women planting Guatemala grass and Acacia for a forage bank

The proportion of lines of Guatemala grass and Acacia could vary, but the forage banks established in four pilot farms have two lines of the grass and one line of the legume. Although, some farmers could prefer to plant a double line of the legume in between the rows of the grass, we opted for a single line. The distance between rows of both forage species is 1.5 m, but the distance between planting positions is 0.75 m in the case of the grass and 0.5 m in the case of the legume. In each position was one cutting of Guatemala grass with three nodes, whereas in each position of the legume planted 3 – 5 seeds, although later only two plants of Acacia per position may be needed. We used that small number of Acacia seeds per position because their germination rate was 87%. In all cases, Guatemala grass cuttings were prepared the day before planting, and by accident we observed that those could be maintained under the shade for more than two days, considering that the weather is fresh in Tugi. The legume seeds were scarified by soaking in water for 12-24 h, until seeds were swelled.

As all areas chosen for planting the forage bank were in steep slopes and had a very high weed infestation mostly with bracken fern, up to two hand weedings had to be applied before planting, and it was done perpendicular to the slope, planting the grass and the legume in hedgerows, in order to prevent soil erosion. This was done performed directly by the farm operators with the assistance of

project staff in Baghan farm, and by organized women groups in three pilot farms (Munoh, Tah and Tangyie).

Initial evaluations showed that few Guatemala grass cuttings had to be replaced, whereas in the case of Acacia some thinning had to be applied, to leave no more than two plants in each planting position. It is likely that these forage banks will be ready for the first cut during the dry season, but any decision in that respect will be taken based on monitoring the initial growth of the forage bank.

Semi-zero grazing: The intensification of livestock systems under Tugi conditions, specially considering the efficient use of the forage banks and conserved forages, is the implementation of semi-zero grazing systems in which animals will graze during the day and receive cut and carry forages in a corral during evening time. This practice is in principle oriented to improve animal productivity due to the increase in forage intake, reduced physical activity for grazing, and protection from low temperatures during night time which has impacts on the efficiency of energy utilization. However, an important additional benefit of such practice is that animals will be kept during night time close to the herdsman house, which will help to prevent animal thefts, a common problem in the Gutah Hills (Nji, 1995).

The proposed system will require building a corral, and in some cases a house for the herdsman, which according to TUSIP leaders will be an investment made by the farm operators. The initial estimates made suggest that the 0.5 ha forage bank will be enough to feed 8-10 fattening animals, receiving 15 kg of fresh forage per day; however adjustments will be made based on monitoring the yields obtained in the forage banks. Based on the data collected on forage yields, some modeling work to predict animals responses and the economic feasibility of this semi-zero grazing system will be run before the end of the project; however our recommendation is to start this experience with very few animals, preferably fattening animals (about 300 kg BW), because this type of intensification very seldom will be paid by the cow-calf system, and even by younger animals (from weaning up to 300 kg BW).

In order to sustain forage yields, the manure collected in the corrals has to be returned to the pastures. In case a biogas system is installed to use the manure produced in the corral, then the effluent should be used in the pasture as bio-fertilizer. It is not recommended to collect the manure in the corral and transport it to the farmland for fertilizing crops, because it will affect the sustainability of the forage bank. In a following section will be described the options proposed to increase/maintain fertility in the areas devoted for crop production.

Raising sheep and goats in elevated pens receiving cut & carry forages: Small ruminants (goats and sheep) are raised by many families in Tugi, and most of them have only 2 – 5 animals, managed under a sort of rotational grazing/browsing in which animals are tied with a rope in areas close to the house or the farmland (Fig. 27). But the animals frequently cut loose and end up

on the farms with considerable crop damage. Other farmers keep mostly sheep grazing the same pastures used by cattle (Fig. 28). At night, most farmers bring the animals into a corral in the compound, mostly at ground level, so the dung is collected and applied to the crops grown in the backyard.



Fig. 27 Goats tied to a rope grazing by the roadside Fig. 28. Sheep under managed grazing

An alternative to the existing system to be promoted by TUSIP is to keep those animals at least at night time in elevated pens, located in the family compound. Animals will be feed with cut and carry forages, obtained not only from fodder banks, but also the so called “weeds” that are edible, which can be collected and carried from the farmland at the end of the day. As crops are cultivated and managed mostly by women, this activity will become part of the gender-mainstreaming component of the project, yet, it will be highly desirable that all members of the family be encouraged to participate in the activity.

The elevated pens are not new in Tugi village, as some farmers have built some for pig keeping. However the design currently used will require few modifications in the floor and roof in ways that will enable the resource-poor farmers to use local materials as much as possible. Other modifications will include the addition of external feeders and a ramp, as well as to build a fence to limit a small exercise area for the animals. Some models of pens for small ruminant have been shared with current project staff and few farmers, but those as well as proposed feeding strategies will be recommended to the person in charge of the gender-mainstreaming component of the project.

The last two innovations are in the process of being developed, with the small ruminants to be executed as part of the gender mainstreaming component. Although this is a female dominated activity the entire family stands to benefit by getting totally involved and participate effectively in small ruminants component on the family farms.

Evaluation of Traditional and Improved Systems

General characteristics of the areas chosen for implementing silvopastoral innovations. Two of the family farms and the community farm selected by the project are located in Tugi-Tugi, one family farm Tuochup quarter of Chup village, and the fourth family farm in Njaah-Tugi and Muformo-Ngwokwong

(Table 3). These pilot farms have been selected to represent the ecological pattern of the entire village, as well as variations in farm resources. The elevation of these farms vary between 1,540 and 1,985 masl, an altitude range that comprises most of the grazing areas in the Gutah Hills in general and Tugi Village in particular. The areas selected for introducing the new technologies, are fenced to prevent animals from grazing on them. The areas vary from 0.9 ha to 4.4. ha, and 0.4 to 0.5 ha for the grazing and cut & carry areas, respectively. In the case of Gyindong Community Farm a total of 32.0 ha have been fenced, but not all will be used for the establishment of the grazing and cut & carry forages interventions. This will be determined later with the village leaders in charge of the farm. Also, the perimeter fencing will help to protect other technologies that will be implemented such as agro forestry innovations.

Table 3. Location of pastures in the pilot farms selected for the implementation of silvopastoral options in Tugi Village

Location	Farm name	Type of property	Altitude, m.a.s.l.	Grazing Area, ha	Cut & Carry Area, ha
Mufomo (Ngwokwong)	Baghan	Family	1,570	1.1	0.4
Tugi-Tugi	Munoh	Family	1,760	4.4	0.5
Tugi-Tugi	Gyindong	Community	1,540	32.0	To be defined
Touchup (Chup)	Tah	Family	1,985	0.9	0.5
Tugi-Tugi	Tangyie	Family	1,765	2.0	0.5
Total				40.4	1.9^a

^a Not included the area to be installed in the Community Farm

Soil attributes. The results of soil samples taken in all pastures and presented on Table 4 show that in general soils are acid (pH 5.26 to 5.56), but their aluminum content is not a problem (in two farms it was not even detected). Phosphorus (P) is deficient in all farms (< 5 ppm), but the relatively high Cation Exchange Capacity (CEC), in two of the farms >20 meq/l, suggests that probably potassium is high in these soils, as calcium and magnesium may not be high given the acid reaction of the soil.

Table 4. Attributes in soil samples taken in the pilot farms selected for the implementation of silvopastoral options in Tugi Village

Farm	pH H ₂ O	pH HCl	CEC, meq/l	N, %	P, ppm	Al, ppm
Baghan	5.40	4.32	7.60	0.26	0.63	0.15
Munoh	5.44	4.23	10.78	0.56	0.69	0.00
Gyindongg	5.56	4.39	20.67	0.96	2.50	0.96
Tah	5.28	4.24	43.12	1.12	1.17	2.12
Tangyie	5.26	4.30	13.68	0.47	0.69	0.00

The average nitrogen (N) content is high in two of the farms (Gyindongg and Tah), because some of the samples were taken in areas with high organic matter content, due to the good cover of pastures, and probably high accumulation of manure, as animals tend to be maintained there over night. As has been said earlier, the animals are kept close to the house to prevent cattle rustling, but also for early morning milking as practiced by the Mbororos. This effect is particularly evident in the Community Farm where samples were taken in three different sites, one close to the house of the Mbororo family living in it where animals are maintained at night, and two in open areas with variable cover of pasture and weeds. In that case the CEC, N, and P ranged between 13.12 and 29.60 meq/l, 0.58 and 1.59%, and 0.85 and 5.35 ppm, respectively.

The results of the soil analysis, along with results obtained in the pasture degradation evaluation presented in the following paragraphs, have been the basis for the definition of the silvopastoral interventions to be implemented, the selection of the areas where those will be established, as well as in planning the distribution of paddocks. For example, the deficiency of phosphorus in soils usually triggers P deficiency in forages, and it may explain the reproductive failures detected in cattle in the Tugi area; where mineral supplementation is very seldom practiced, and many livestock farmers only use common salt as a supplement. That is the reason why participatory training on the preparation and use of mineral and multi-nutrient blocks have been considered for the second semester of this year, as those will be particularly helpful during the dry season. Also, in the absence of mechanisms to collect enough manure to be incorporated as part of the rehabilitation strategies, and to enrich the areas planted with cut & carry forages, it has been recommended to apply low doses of a phosphorus rich fertilizer, particularly to help the legumes to compete during the establishment phase.

Pasture degradation status. The evaluation of botanical composition (Pezo and Azah, 2010a) conducted in the areas selected for the implementation of silvopastoral options (Table 5) showed that edible grasses varied between 16.5 (Baghan farm) and 47.6% (Tangyie farm), whereas the average cover of legumes is only 2.9%, varying between 0.5% in the farm that presented the highest presence of edible grasses (Tangyie farm) and 6.9% in the one at the highest elevation (Tah farm).

Some of the species found in the different pastures under evaluation are: kikuyu grass (*Pennisetum clandestinum*), star grass (could be either *Cynodon nlemfuensis* or *C. plectostachyus*), *Brachiaria ruziziensis*, and *Hypparhenia rufa* among the grasses. Among the legumes were a native *Trifolium spp.*, *Desmodium uncinatum* var. *Silver leaf*, other non-identified *Desmodium spp.*, but also some non-identified woody legumes. In one farm (Tah Farm) few plants of *Stylosanthes sp.* which were introduced by the farm operator were also found.

Weeds (broad leaf, narrow leaf and ferns) covered in average more than 23.8% of the area, ranging from 14.7 to 27.7% (Table 4). Two of the farms (Baghan and

Munoh) presented a higher proportion of narrow leaf than broad leaf weeds, whereas the opposite occurred in the other three farms (Pezo and Azah, 2010a). Although the basal cover of ferns was not high by the end of the dry season (3.9% in average) probably because many mature plants were affected by fire, consequently most ferns were just emerging. However their cover increased when the rains started, as those species have strong rhizomes which are not affected by fire (Pezo and Azah, 2010c). The dominant species of ferns known locally as “*iwheungh*” has not been identified, but the most frequent seems to be the well known *Pteridium aquilinum*, which is poisonous for animals. There were some contradictions between local people regarding the presence of blood in the urine, which is characteristic of poisoning with such fern, but all interviewed indicated that animals do not eat such species regularly, but may do it by accident when there are no other forages to eat.

Table 5. Botanical composition of the paddocks intervened with silvopastoral options in the five pilot farms in Tugi, North West Region, Cameroon.

Farm name	Edible grasses	Legumes	Broad leaf weeds	Narrow leaf weeds	Ferns	Bare soil
Baghan	16.5	1.2	7.5	12.6	0.0	62.2
Munoh	27.5	3.3	12.7	15.2	2.1	39.3
Gyindongg	37.7	2.4	12.8	7.2	6.3	33.6
Tah	26.6	6.9	17.7	3.1	6.9	38.8
Tangyie	47.6	0.5	7.3	3.3	4.1	37.2
Mean	31.2	2.9	11.6	8.3	3.9	42.2



Fig. 29. Evaluating pasture degradation in a native Grassland



Fig. 30. The bracken fern, the most dominant invading species in the Gutah Hills

Even though some may consider iron grass (*Sporobolus indicus*) an edible pasture because it is palatable during the rainy season, when it is in a vegetative stage, in this study such species was classified as a weed, because its herbage quality declines drastically during the dry season, therefore is rejected by animals (Leon and Burkart, 1998; Padilla and Curbelo, 2004). Iron grass was the most frequent narrow leaf weed found in the paddocks, but in some farms spear grass (*Imperata cylindrica*) was also important. Those species showed to be fire-tolerant, as both had vegetative regrowths in pastures that were burnt at the end of the dry season. Also, both are known as profuse seed producers. All these factors make these species highly invasive. To control these species as well as

other weeds, the project is applying and promoting selective weeding, over-sowing of palatable and more competitive forage species, and improved grazing management strategies.

The presence of bare soil and rocks in the pastures varied between 33.6 and 62.2% (Table 6). It is very high for pastures, and makes soils prone to high erosion, but it is important to emphasize that the evaluation was made at the end of the dry season, when most herbaceous species were senescent, and in some cases pastures were burnt. As expected, the vegetation cover increased once the rains became more stable, but soil losses were also high in the early rainy season, as the intensity of rain tends to be high during that time of the year, and many pastures are located in steep slopes. Even though we have not made measurements of soil erosion, we assume that the loss of nutrients with the early rains are quite significant as a high proportion of the above soil organic matter (litter and standing aerial biomass) was burnt at the end of the dry season. In fact this management practice, along with overgrazing have been identified as the main causes for the high weed infestation observed in most pastures in the Gutah Hills (Pezo and Azah, 2010c).

Based on the vegetation and soil cover data, as well as the evaluation of soil erosion potential (Pezo and Azah, 2010a), and applying the scale proposed by Betancourt *et al* (2007) (Table 6), it was estimated that three of the pastures are moderately degraded, one is slightly degraded and one severely degraded (Table 7). However, when the evaluation was made based on pasture conditions in different sectors of the same paddock, it was clear a gradient of degradation from slight to severe (Table 2), depending on the management imposed to the different sectors, as well as variation in slope.

Table 6. Scale used for the evaluation of the pasture degradation status in paddocks (Betancourt *et al.* 2007)

Level of Degradation	Edible Species, %	Weeds, %	Bare Soil or Rocks, %	Erosion
None	>80	<5	None	None
Slight	50 – 80	5 – 15	Small spaces	None
Moderate	20 – 50	15 – 40	Isolated spots	None
Severe	<20	40 – 60	Isolated spots	Sheet erosion
Very Severe	<20	>60	Uniformly distributed	Gullies

Estimates of forage availability and quality, as well as of the performance of the native cattle in Tugi are not available yet; however, to have an idea of the economic impact of the level of degradation in the evaluated pastures, Betancourt *et al* (2007) found that in pastures slightly degraded, the live weight gain per animal in crossbred *Bos taurus* x *Bos indicus* cattle decreased by 13% compared to non degraded pastures, and such reduction became 24 and 30% for moderately and severely degraded pastures, respectively. Also, the stocking rate reduced from 2.0 AU ha⁻¹ in the case of non-degraded pastures to 1.7, 1.3 and 1.0 AU ha⁻¹ in the case of slightly, moderately and severely degraded pastures,

respectively. After valuing those changes, it has been estimated that farmers' income was reduced by US\$ 169, 343 and 440 ha⁻¹ year⁻¹ when comparing slightly, moderately and severely degraded vs. non degraded pastures.

Table 7. Level of degradation in the paddocks to be intervened with silvopastoral options in the five model farms in Tugji, North West Region, Cameroon

Farm name	Edible species ^a , %	Weeds, %	Bare soil or rocks, %	Erosion	Level of Degradation
Baghan	17.7	20.1	62.2	Sheet	Severe
Munoh	30.8	30.0	39.3	Sheet	Moderate
Gyindongg	40.1	26.3	33.6	Sheet	Moderate
Tah	33.5	27.7	38.8	Sheet	Moderate
Tangyie	48.1	14.7	37.2	Sheet	Slight
Mean	34.0	23.8	42.2	Sheet	Moderate

^a The assumption is that all species classified as legumes are edible

Once TUSIP collects information on changes in forage availability and quality along the year, will apply the LIFESIM model (León-Velarde *et al* 2006) to estimate potential biological and economical responses to pasture improvement in the dominant pastures of the Gutah Hills, and do an *ex ante* evaluation of the impact of TUSIP's technology interventions. Also, given the short life of the project (only 18 months), and the time available for the interventions to show impacts on ecological parameters (e.g., soil organic C, biodiversity, water quality), predictions will be made based on reports available in the literature, and the experience developed by CATIE working with similar land use systems in Central America. Also, data on investment costs, use of labor, and others has been recorded, but those are not complete because there are still activities under implementation. However, all those will be part of other reports to be submitted by the end of the project.

Strengthening Farmers' Capabilities for Decision Making and Assessing their Perceptions on Silvopastoral technologies.

The innovations being introduced by TUSIP are almost non-existent in the Gutah Hills and the farmers are perpetually deprived of new farm ideas. Seldom do individuals from the Gutah Hills have access to modern farm information and training. The few farmer training options available are offered periodically outside the village by faith-based organisations as the Presbyterian Rural Training Centre located in Mfonta, some 50 km from the Gutah Hills. As the majority of villagers participate in farmer and community organizations, and have frequent meetings at the family, quarter, church and village levels, these interactions provide a good and efficient forum for disseminating technology information and new ideas in the communities served by TUSIP. If more resources were to allow, it will be ideal to build a farmers' training program on the Gutah Hills to cater for the needs of these communities. They hold so much potential for crop and livestock development in the region.

A number of outputs have been produced during the first semester of the project in the area of capacity building of the target community, preparation of training materials, development and transfer of technologies such as fencing and paddocks, production of extension bulletins. TUSIP has started a training program, using some elements of the Livestock Farmers Field School (FFS) approach applied by ILRI in some African countries (Minjauw *et al*, 2004) and by CATIE in Central America (Pezo *et al*, 2007), with emphasis on the rehabilitation of degraded pasturelands, the intensification and diversification of livestock systems through the application of silvopastoral approaches.

Although we planned to apply all principles of the participatory research and learning process which are the basis of the FFS methodologies, starting by the identification of topics to be included in the curricula, given time constraints the project staff decided to do so by using the traditional “top-down” approach, but learning sessions are developed applying the “learning by doing” technique, in order to develop skills and change attitudes towards the technologies, and not only to master the theory behind the technologies, as it occurs many times when lectures and demonstrations are applied. In that sense, the intervened areas in the pilot farms are functioning as “school plots”.

As the FFS approach is new for many Cameroonian technicians working in animal production, one of the initial activities has been the “in service training” of the Research Assistant as a FFS facilitator. In the second half of 2010, we plan to get the Gender Field Facilitators just hired trained in the FFS methodologies.. Materials already developed in other projects, such as the Market Oriented Dairy Systems carried out by ILRI in Kenya (Groeneweg *et al*, 2007), and the Multi-stakeholder Participatory Development of Sustainable Land Use Systems in Degraded Pasturelands in Central America led by CATIE (CATIE/NORUEGA, 2009) are being used as the basis for some of the learning sessions, but those have been adjusted to the conditions of the livestock systems practiced in the Gutah Hills of North Western Cameroon. In the case of the agroforestry technologies, training and extension materials generated by ICRAF are being used (Wambugu *et al* 2006).

The silvopastoral technologies included in the curricula for livestock farmers families and workers are:

- Renovation or rehabilitation of degraded pastures
- Implementation of rotational grazing strategies
- Establishment of multi-strata live fences
- Alley cropping with pastures either for grazing or cut & carry
- Management of forage banks
- Raising sheep and goats in elevated pens receiving cut & carry forages
- Preparation and use of multi-nutrient blocks
- Forage conservation as hay
- Deworming and control of external parasites

- Alley farming with crops
- Use of improved fallows.
- Development and management of nurseries

Some of these topics will be covered with the participation and assistance of trainers on the ground such as HPI, PRTC and ICRAF.

A number of training/extension materials have been produced and distributed among participants in the learning sessions. Eventually, resources and time permitting, Fact Sheets will also be produced for wider distribution. The extension materials already produced are: How to build fences for improved pasture management? (Pezo and Azah, 2010b), How to control de bracken fern (“iwheungh”) in the Gutah Hills? (Pezo and Azah, 2010c), and Planting forage banks of Guatemala grass and Acacia (Pezo and Azah, 2010d). Up to now, only the session on fencing was offered to both the Mbororo and Native communities. The one on weed control was offered previous to the first weeding session, therefore only the workers participated in it, and the one on the establishment of forage banks was only offered to the two groups of women involved in such activity. All sessions were enriched by contributions from the local knowledge brought by participants, such as the identification of non-forage species that could be considered as weeds in paddocks, but have value as medicinal plants and spices; the use of local tools for land preparation before planting, and for tensioning the fences, new design for gates, etc.



Photo 29. A FFS learning session on how to build fences



Photo 30. A group of women in a FFS learning session on establishment of forage banks

Systemization and Documentation of Lessons Learned

TUSIP is a pilot project that intend to serve as a basis for a wider effort in the Gutah Hills, therefore its staff is putting special efforts to document and establish baseline data as a basis and reference for assessing the impacts of the project down the road, but also to generate biological and economic data not available in the region, which could be of value for future efforts to scale up project experiences. In that sense, information on labor used, and costs of labor and materials used in the rehabilitation of degraded pastures, planting of cut and carry forages and fencing has been recorded in all farms, but final data is not available yet, because additional labor and probably herbicides will be necessary

to control the bracken fern and other weeds. Also, some reseeded might be necessary. In Table 8 are shown the investment done so far in the five pilot farms, however, we must indicate that the forage banks have not been established yet in Gyindong Community Farm.

Table 8. Investment in fencing and weeding for rehabilitating and planting new forage areas in the pilot farms

Farm	Grazing		Cut and carry		Investment (in US \$)	
	Area, ha	Perimeter, m	Area, ha	Perimeter, m	Fencing	Weeding
Baghan	1.1	280	0.4	250	1,145	80
Munoh	4.4	420	0.5	320	1,598	328
Gyindong	32.0	790	0 ^a	0	1,706	530
Tah	0.9	300	0.5	310	1,318	180
Tangyie	2.0	490	0.5	320	1,750	210
Total	40.4	2,280	1.9	1,200	7,517	1,328

^a Forage banks have not been established yet in the Community Farm

The data in Table 8 presents the total investments in fencing and weeding for each farm. Yet, it could be misleading considering that the area and initial condition of the pastures were not the same. Therefore, it will be also helpful to refer to costs per hectare. This way, we notice that the variation in costs of weeding per hectare ranged between US\$ 53 and US\$ 200. This variation could be explained in terms of the level of weed infestation, and the aggressiveness of the bracken fern after cutting, but also values are influenced by the contribution of family labor which were not included in the cost estimates, and the economy of scale, getting higher costs for the smallest areas planted or rehabilitated. The important point is that all those factors could be sorted out given the type of records kept by TUSIP staff.

The data collected on costs have been included in some of the extension materials prepared by the TUSIP project. For example, the itemized costs of building fences shown in Table 9 are part of the publication on How to build fences? (Pezo and Azah, 2010b). It is expected that once rehabilitated pastures and other silvopastoral interventions are used and production responses are measured, more detailed cost/benefit analysis will be done and reported.

Table 9. Cost of installing 100 m of a permanent barbed wire fence in North West Cameroon (Pezo and Azah, 2010b)

Item	US\$
1 Roll of large galvanized wire (200m long)	80.00
4 Rolls of small galvanized wire (75m long) @ FCFA 6,500 each	56.00
41 Poles 4' x 4' x 2m @ FCFA 450 each	36.90
Digging and fitting 41 poles @ FCFA 350 each	28.70
Carrying 41 poles @ FCFA 75 each	6.15
Nails (1 kg)	2.00
Labor (2 workers @ FCFA 1,500 for the five lines)	6.00
Total	215.75

MAJOR CHALLENGES

Establishing working procedures

TUSIP is jointly managed by a research and training institution located in Central America (CATIE) and a Cameroonian non-government organization (Akwi Memorial Foundation), which in principle have different cultural practices and administrative procedures. This has been a major challenge and the partners have been able to streamline their procedures to meet the requirements of donors and funding agencies.

Communication

Some people in the village speak English, and they communicate easily with the Technical Advisor, but even those feel more comfortable talking in the local Meta language, therefore needed an interpreter for better understanding. The recruitment of a Research Assistant and other field staff who speak the local language has helped to overcome over time some of those limitations

There is no electricity nor permanent telephone connections in the village. Even in the city of Bamenda some 60 km away from Tugi where the field office is located, the internet facilities are not always reliable. In order to keep contact with CATIE headquarters, the Technical Advisor has to drive to Bamenda almost every weekend to establish internet communications with the Head Office in Costa Rica and other partners. Even on some weekends, the entire national internet and national telephone system may fail and one has to wait for days until it is re-established. Although there are private internet providers in the country, the backbone is provided by the government run Cameroon Telecommunications Ministry (CAMTEL). The purchase of a pick up in good working condition and at an affordable price has helped mobilization to the city and for transporting staff and materials for field work.

The project management advised the Technical Advisor in the purchase of a mobile phone for him to communicate from the hill tops of Tugi where there is signal, but it did not work properly for international calls. For that reason, it has been a wise decision to install a telephone with an antenna in the village, but it is still being diagnosed to determine what accessories it will take to be fully functional for telephony and internet services out of Tugi.

Project Leadership

TUSIP leadership has all of that to the credit of the project in the pilot phase and will be more so if the project is scaled up/out. It can now be said with all certainty that scaling up TUSIP will be an easy task with the initial barriers to communication broken and under control, and the preliminary results obtained in the field. It will be unfair not to recognize the role of Fon of the village and his notables on project achievements. His Royal Highness Wilson Monoh Mbakwa

IV, Fon of Tugi is a very hard working, intelligent and sociable traditional leader who knows no boundaries. He is easy to reach and to talk to, is always open to support project staff in organizing activities with the community, and his leadership style is well appreciated by the community. In a project like TUSIP that promotes participatory approaches, and therefore depends on the community for its success, it is a blessing to have local leadership upon whom we can count for success and sustainability.

The budget and purchasing procedures

The project budget was initially designed only up to the budget line level, but for operational purposes it became necessary to break down the budget into minor lines or even activities. The distribution of budget lines and some adjustment in the budget were made upon approval by the World Bank Officer in charge. Probably the most relevant change was the creation of a line for the purchase and operation of a project vehicle. Initially the budget considered to purchase a motorcycle, but given the nature of the work, conditions of the roads and project staff, equipment and materials that need to be transported to the pilot farms, a pick up truck was bought instead.

Another problem concerns the purchasing procedures recommended by CATIE which require essentially that three pro-forma invoices be obtained before most major purchases are made. We found that in Cameroon, it is not common for merchants to give “proforma invoices”, and this problem was initially faced by the Project Leader when he was required to get three offers for a motorcycle. He couldn’t after several days of trying with motorcycle dealers in Bamenda. As the Technical Advisor came to learn later from his experience on the ground, such a procedure is not possible to accomplish in Cameroon. Therefore, for the project to buy the materials and equipment needed, project staff have to personally visit at least three different merchants before purchasing was made, always looking for the best prices and quality. It is a time consuming exercise e, therefore if the same product needs to be bought repeatedly (e.g., barbed wire) the best providers have already been identified.

Availability of inputs and equipment

The closest city to Tugi is Bamenda, but even though is a city with about half a million inhabitants in a Region that is basically agricultural and major exporter (to other Cameroon regions) of livestock (cattle, goats, sheep and pigs) and cereals,, the availability of agricultural inputs is very limited. Prices are very unstable for whatever is available and supply sporadic since everything has to be shipped in from the national commercial hub of Douala, 300 km away from Bamenda. Even when equipment and materials are available, the quality is uncertain as there does not appear to be an effective quality control or Standards Board in Cameroon.

Moreover, TUSIP is a very specialized project and the equipment and materials we need are not common place. For example, the project was looking for more specific inputs, such as two herbicides with recognized action for controlling the bracken fern, the most common and difficult to control weed in the region. With the help of collaborating farmer we were able to find the provider of the herbicide, but the shop is located in Douala (about 6 hours drive from the village). Something similar occurred when we looked for high quality galvanized barbed wire, or phosphorus-rich fertilizers. The former could be found in Bamenda, but as the product is imported from Nigeria, it may take up to three weeks to get those in the market, therefore special arrangements need to be done with providers. Sometimes one is lucky to find needed supplies in Bafoussam, another town 120 km away from Bamenda and 4 hours drive from Tugi.

In the case of forage seeds, the diversity of species available on the Cameroon market is very limited and the ones available are locally produced with no quality control, particularly for grasses. Therefore staff had to start with those available in the market, but established contacts with the Forage Germplasm Program of the International Livestock Research Institute (ILRI) to get improved materials, which will not be planted before the next rainy season. Since the quality of materials is a serious problem, the germination rate of seeds of the only short grass found in the market is low. Consequently, the staff decided to increase the sowing rate, and to establish a sort of a nursery from where plants will be transplanted. With the help of a partner, the Presbyterian Rural Training Centre, we were able to identify and locate a local farmers cooperative that produce seeds. Some have been acquired for planting in the next rainy season. Finally, in the case of those grasses that can be planted using vegetative materials (e.g., stolons), arrangements have been made to incorporate them in the pasture rehabilitation strategies

Labor demands

Labor opportunities are not many in Tugi village, and the main targeted vulnerable groups (unemployed youth and women) are being recruited and are offering their labor to establish the technologies under the direct supervision of the TUSIP technical team in return for a wage. Moreover, some villagers who were working in other cities returned to the village, considering the project will be an opportunity for a job at home, but some of them put wage demands over the mean amount paid in the region. For example the mean salary paid is about US\$ 3/day, whereas the project has been paying in average US\$ 5/day.

It took lots of social engineering to bring their expectations to a reasonable and manageable level. The Research Assistant and the Technical Advisor had to use their imagination and time to convince workers that the project has a high demand of labor during the phase in which silvopastoral alternatives were implemented, but it will decline with time, as most livestock activities –i.e., beef cattle production- require very few laborers, at least on a permanent basis, and

many times it is covered by family labor. Although the salaries paid were above the average as indicated above, were not too high but fair, because the project needs to demonstrate the feasibility of innovations under normal conditions.

At a given time the supply of labor was greater than the demand, and in order to prevent conflicts and resentments, roles were openly established for each day, then all young men who demonstrated responsibility at work had the same chance to earn money. Also, women were hired for those activities that adapt better to their skills and experience, but in that case hiring was done through organized women groups. In all cases project staff insisted that participants should not see the project only as an opportunity for earning money, but more importantly as a learning opportunity to acquire knowledge, develop new skills and change attitudes regarding resource management.

How workers have used their wages is their own decision, but living in a small community like Tugi allowed us to learn in many cases how earnings were used. It is clear that the moneys received by the workers helped all to improve their family's food security, few invested in buying small animals (mainly pigs), some used it to repair their motorcycles which is also a source of income by providing transportation services, but in many cases also increased their consumption of the local wine and other alcoholic drinks. Definitely work needs to be done with some of the workers to find ways for improving the investment of the income left after satisfying basic family needs.

Building Ownership

A good indicator of all successful projects is the capacity of ownership that has been built in the beneficiary community or target population; their capacity to appropriate the successes and failures of the project. Although all participating farmers were aware of the innovations promoted by the project, their role in the initial stages of implementation was not as active as desired. And since agricultural innovations are highly dependant on the weather, the project staff, decided to move on with the work plan with whoever was available particularly the family heads, Even as the other members of the families were unsure of the innovations, the project moved swiftly to establish credible benchmarks that allowed other members of the communities to "buy-in" quickly as early as February ahead of the first rains on March 15. Again, the cooperation of the Village Head, the Fon and his king makers as well as some opinion leaders in the communities yielded fruits. The project saw very significant ownership building up in the last three months of the first semester (i.e. April to June). The Project Management Committee (PMC) Meetings and the dialogue on a one-to-one basis with key stakeholders and participants paid off.

Two indicators of ownership are the commitment of all family heads for sharing investments with the project for all activities (50% of the total investment each), and the replication in larger areas than the ones under direct control of the project, that at least one of the participating families is doing. Also, those

families that own the pilot farms are participating actively in all training sessions organized by the TUSIP project. Moreover, at least one of the farm operators already invested his own resources to expand the implementation of the silvopastoral technologies by building additional 450 m of fences and rehabilitating 2.5 ha replicating the strategies applied by the project. Also, in the short time the project has been operating there are already two early adopters who have applied project technologies each in 1.5 ha. These cases indicate the potential for scaling up successful project experiences.

The special case of Gyindong Community Farm

The community farm is one of the pilot farms where silvopastoral innovations will be implemented, and is the one with the largest area assigned for project work; however part of the pasture area has been utilized for more than 10 years by a Mbororo family probably because the place was not being used. Also, Gyindong is a low lying area and some herders take their cattle there for grazing during the dry season. The project fenced the area, but delayed installing the barbed wire in the perimeter, and did not do any work designing internal divisions until the Fon could get the squatter Mbororo family to vacate the area. As indicated before, the Mbororos are immigrants to Tugi and began settling in the area in the 1950s. The land upon which they settle and graze their animals is given free of charge by the Fon with the endorsement of the competent government officials.

As Tugi has vast territory with a limited indigenous population that reside in the valleys and not on the hills, it is easy for individuals to voluntarily take possession of the hill tops until the Fon recalls the area for some community use. Gyindong has been for centuries the bread basket of the Tugi people for its fertility and Natural Reserve Forest. But as the native population got older and rural-urban migration took its toll, the villagers reduced farming activities there while still maintaining close watch over the kola nut reserve. In fact, the site which the squatter has been asked to vacate actually belongs to the Fon and is called "The Fon's valley", translated literally from Meta language. Therefore, the Fon has succeeded to get the squatter on his land to vacate and he has willingly agreed to do so. Were it not for the rain, he would have returned to his father's compound which is about two kilometers away from Gyindong. The project is certain that the Fon will get hold of this piece of land to allow project work to resume there in earnest during the current rainy season that ends in October.

From the project's point of view, the Gyindong Community Farm offers the best opportunity for testing different technology options given the size of the area available for experimentation and agricultural research work, as well as its altitude which is about 1500 masl. This is perhaps the farm at the lowest level of all the livestock farms in Tugi. It is ideal for testing new technologies, developing forage germplasm, and providing opportunities for a sustainable integration of crop-livestock agriculture. The Tah farm is located at about 2000 masl, which along with Gyindong gives a good range of altitudes for testing

germplasm in contrasting conditions. The project is hopeful that this environment will be established so that the prospects for scaling up the project can be maximized.

Ethnicity, Diversity and Strength

Communities in the Gutah Hills draw their strength from their ethnic diversity. The native (indigenous) Meta people provided hospitality to the migrant cattle Fulanis about six decades ago and both ethnic groups seem to complement each other in their livelihood arrangements. While the Fulanis specialize in cattle raising, the indigenous Meta Peoples own the land on which food crops are grown for family consumption and the market. Thus by conspiracy of circumstances, crop-livestock farming systems predominate in the area, and are part of family farms in which each family member plays a key role. Agricultural activities are carried out along gender lines. As a result of traditional sex-role typing, in the native Meta community, some men raise cattle, and many times do off-farm work, and the women tend to be responsible for raising small animals (such as goats, sheep, pigs and poultry) as well as for cultivating crops and taking care of the family.

Crops are the basis for food security, and the surplus sold along with small animals are the main sources of income for poor households. In all farms crops and animal production are intrinsically interrelated in the use of land resources, but the intensity of interactions can be enhanced. The project recognized this reality and started proposing some silvopastoral and agro forestry innovations oriented to tackle the components of the crop-animal systems managed by women (e.g., use of cut and carry forages for feeding small ruminants raised in pens, alley cropping, improved fallows), but this was even fortified by the World Bank approval of the Gender Mainstreaming component of the TUSIP project, with specific funding assigned to implement activities and hiring a female facilitator with background in livestock production and building rural organizations. At the time of writing this report, the search for a Gender Specialist has been launched by Akwi Memorial Foundation with the support of the World Bank. This component is sure to start in earnest in the second semester.

Another relevant aspect of diversity is the presence of two ethnic groups in Tugi village, the native Meta and the Mbororos. Even though all family farms belong to Meta people, staff is developing participatory learning sessions for both groups, but in separate sessions considering their differences in experience, interests and even language.

Building partnerships

TUSIP is a complex and very exciting project with promise. It requires the involvement of several stakeholders for its success. Moreover, if it is considered as a pilot project that should evolve to a larger one scaling up its experiences to

serve other communities in the Gutah Hills of Cameroon, then it is important to get on board many other relevant partners.

Sharing information is a strategy for building partnerships, and involving new partners. In that sense, many efforts have been done to present the philosophy, methodological approach and initial results to several stakeholders in different events, i.e., workshops, field visits, as well as handing out flyers describing the project. The Senior Divisional Officer (SDO) for Momo Division, his First Assistant (ADO), the District Officer (DO Central) for Mbengwi Central, the Mayor of the Mbengwi Council, and Heads of relevant ministerial technical departments in Momo Division (Agriculture, Livestock Production and Animal Health, Environment, Forestry and Natural Resource Management) – have pledged their individual and collective support to see the project succeed in rehabilitating grazing vegetation, managing erosion, and the introduction of silvopastoral technologies aimed to curbing rampant and sometimes lethal conflicts between crop and livestock farmers. Also, the leaders and members of neighboring villages (Ngwokwong and Oshie) have requested for information on the project and expressed their interest on benefiting from its lessons learnt. The team has made presentations to members of these communities in the Palaces and they were very well received with high expectations.

At the national level, the Presbyterian Rural Training Center (RTC- Nfonta) has been invited to different project activities and helped on the procurement of forage seeds. On the other hand, although Heifer International – Cameroon has expressed interested to work with TUSIP, signs of their real commitment are still awaited. Students of the Faculty of Agricultural Sciences (FASA) of the University of Dschang are learning about TUSIP and its activities and are expressing interest to develop proposals to carry out their internships with the project, and this could be a bridge for the involvement of other faculty members. With the Project Leader as Full Professor in active service in the Faculty of Agriculture of the University of Dschang, solid and sustainable partnerships can be built with that training institution in the same way that this can be done with CATIE. The project needs to work on the possibility of more involvement of the World Bank Cameroon Country Field Office in Yaoundé, because it would help to provide more visibility and possibly to have access to additional resources.

At the international level, The World Agroforestry Centre (ICRAF) is another partner that has shown interest of greater involvement in TUSIP bringing their experience in agroforestry systems, as well as in training farmers on tree nurseries, grafting of fruit trees and other technology innovations. The International Livestock Research Institute (ILRI) is another potential partner that has been approached basically to identify best-bet forage germplasm for the sites where TUSIP works, as well as the provision of seeds of improved grasses and legumes.

WORKPLAN FOR THE PERIOD AUGUST 2010 – JANUARY 2011 (6 months)

Monitoring biological and socioeconomic performance of SPS Innovations

During the period August 2010 – January 2011, most of the rehabilitated pastures will reach the stage to be used for grazing, therefore changes in availability, stocking rate and grazing management decisions will be recorded. In the case of the grass-legume fodder banks, growth will be evaluated, but we expect that those will be utilized by the end of the dry season.

Other pasture technology innovation that we expect to implement during this period is hay preparation, but it will strongly depend on weather conditions, because to prepare the hay we will need at least 3-5 days of no rain. Project staff will rely on local knowledge for this decision.

The data gathered during this period and up to the start of the next rainy season will serve for the economic evaluation of the economic feasibility of the innovations; however, given that the period under evaluation will be too short, will rely on the use of models to predict long term responses.

Planting trees in multi-strata fences and enrichment of the tree component in farms in other agroforestry arrangements

After the contacts established with ICRAF representatives in Cameroon, they get committed to assist TUSIP on promoting the introduction of fruit and timber trees in the farms. In that sense a 3-day long training course for villagers interested on the topic has been planned, in which participants will learn the basics of tree nursery management, crafting of fruit trees, and multiplication of vegetative materials. TUSIP will build a nursery facility in the village school area, near a permanent water source, which will facilitate watering of plants during the dry season. ICRAF will provide seeds of some fruit trees (e.g., avocado, plums) as well as of a species tree (Njangsang).

Training of Farmers on SPS Innovations and other Technologies

Several factors influence the development and transfer of technologies. In the case of TUSIP, climatic conditions, cultural and social acceptability, issues of the cost of the technology, political and policy considerations are key areas of importance. Fortunately, TUSIP has all these factors on its side and only hope to be assisted to keep moving in its effort to contribute to poverty reduction in the Gutah Hills. In silvopastoral projects, the implementation of innovations invariably depend on the climatic conditions. Such is the case of hay preparation and the formulation and use of multi-nutrient blocks. These two will be two of the topics to be included in the FFS sessions during the second semester of 2010. Also to support those activities, extension materials will be prepared based on

previous experiences in other projects led by CATIE, as well as the ones developed by TUSIP.

Also, during this semester we will review the leaflet on the bracken fern, and it will be extended to become a short extension bulletin, as has been suggested by the TUSIP Project Leader. In the case of the leaflet on the establishment and management of fodder banks, also these will be reviewed based on the experiences regarding the initial growth of the grass/legume mixture. A short extension bulletin will be prepared describing the experiences on the rehabilitation of degraded pastures. In all these cases participatory learning sessions will also be carried out with different groups of villagers.

Additional effort will be given to assist the Gender Specialist on the training of different stakeholders on the design and construction of elevated pens for small ruminants (goats and sheep), as well as on year-round feeding strategies using SSP options for those animals. It is intended to prepare at least one publication to support this activity. Moreover, it is likely that we will need to provide some basic training to the Gender Specialist on the Principles of the Farmers Field Schools Approach, including the planning and management of learning sessions.

Providing Assistance to the Gender Mainstreaming component

Also, as part of Gender Mainstreaming component there is a need to build two fences to protect areas allocated to crop production. Given the experience developed by many young men on building fences for pastures, the TUSIP Research Assistant and the Technical Advisor will assist the Gender Specialist on the design and planning of those fences. Moreover, as we already know who are the best laborers for such task, a list of potential workers will be provided, and we will supervise the quality of the work done by laborers.

Further Research and Outreach or Service to the Community

Farmers perceptions on the SPS prototypes. Although it could be early to have a complete evaluation of farmers perceptions about the technology innovations introduced by the project, we will start defining the methodology to be applied for that purpose, and also we will test the proposed procedures by evaluating farmers perceptions on the establishment of those pastures, and the recovery of degraded pastures during the rainy season. However, as the most adequate moment for farmers to tap farmers' appreciations of the innovations will be later this year towards the dry season, an impact assessment will be conducted at the appropriate time, perhaps with the involvement of students from one of the participating partner institutions. By the 12th month or so of the project, the project would have gathered enough data to allow beginning researchers such as students and others to get involved in special integrated studies that can benefit the project and the communities served.

A proposal for improving the operation of the Acha-Tugi Cattle Market. An initial evaluation of the procedures applied for selling cattle and small animals, as well as animal by-products in the local markets, show that there are tremendous opportunities for improving the commercialization process. The Mayor of Mbengwi Council has approached the project to ask for assistance in developing a more efficient and effective management system for the Acha-Tugi Cattle Market which falls under his jurisdiction. Individuals and groups are asking for forward and backward linkage assistance in their agricultural enterprises. Food and animal quality, profitability and productivity are central to the demands being received in the project office from interested people and organizations. The Senior Divisional Officer told us in his office that he is crossing his fingers for TUSIP because if it succeeds, it will be a good case study and policy torch bearer for solving the chronic problems of farmer-grazer conflicts, cattle rustling and environmental degradation in the North West Province. Farmer-grazer conflicts result in heavy losses of life and property each year in the Region (Harsbarger, 1995, Nji, 1995, Harsbarger and Nji, 1991).

Preparation of a Proposal for Scaling-out Project Experiences

As a pilot project, TUSIP is striving to demonstrate that the concept works perfectly well in a small scale. The goal is to show that it can be replicated and expanded to benefit the wider public. Considerable experience has been shared that sustain our strong belief that TUSIP has generated a product that is worth disseminating. Below are ten reasons why the TUSIP pilot experience should be scaled up/out:

- 1) TUSIP experience confirms the firm belief that south-south cooperation and collaboration is feasible and doable;
- 2) The two implementing organizations have not had any joint venture experience before; but have on their first contact been able to work together on a project that meets the institutional needs of the organizations and the professional goals of the technicians executing the project;
- 3) Many projects start with several site visits and orientation tours. But all that can be counted as orientation visits to the project site and meetings with potential partners boils down to 5 days of a rapid reconnaissance tour by CATIE's Dr. Muhammad Ibrahim in December 2009;
- 4) It is common practice that development projects spend close to 50% of their budgets on personnel costs and overheads. On the contrary, TUSIP is spending less than 15% of its budget on personnel costs;
- 5) The Technical Advisor hit the ground running barely two weeks after the site visit. This is a remarkable sign of commitment not only in the individuals involved but also in the sense of commitment of the partner organization;
- 6) The "experts" of international development projects in developing countries often reside in luxurious accommodation rented at high cost in elite urban neighborhoods. But TUSIP staff live in the village where the

action is and interact with the people on a daily basis, thus getting first hand knowledge of the community being served through a unique experience in participant observation;

- 7) In many African societies, traditional rulers are often excluded from development projects let alone allowed to play an active leadership role in projects. But the case of TUSIP is a uniquely fascinating experience where the traditional ruler is more of a leg man, climbing the hills with the technical team and running errands to ease their work;
- 8) Many projects don't go directly to the people, but TUSIP is deeply grounded in the community with the active participation of beneficiaries;
- 9) Within six months, the project has implemented several technologies successfully in a community with little or no prior development experience and/or exposure, and have trained people to master those technologies. This is good omen for ownership building and sustainability for scaling up the project; and
- 10) Significant numbers of development projects tend to address the real needs of the people only "in the long run". But TUSIP is addressing the immediate needs of the target populations (environmental degradation, farmer-grazer conflicts, improvement of livelihoods, gender equity) within the framework of broader national development goals and agenda (poverty reduction).

There will certainly be many other indicators that will be observed by the end of the second semester. When the project comes to the end of its cycle on June 30, 2011, we are very optimistic that a beneficiary assessment (Salmen, 1990) will qualify TUSIP as a success story. During this period a Concept Note for a new project to scale-up TUSIP experiences will be prepared.

ADMINISTRATIVE ASPECTS

The TUSIP project has received funds from the World Bank for its direct use for operation in Tugi Village, which is transferred to Akwi Memorial Foundation; and some of the funds are received by CATIE to cover its technical assistance work. This is the first experience for CATIE to manage a project in Cameroon, therefore needed to develop procedures for transferring funds and monitoring their use and reporting budget execution. For both AMF and CATIE, this is a rich learning experience as the management is doing all it takes to find acceptable mechanisms to facilitate the flow of funds and ensure project efficiency and effectiveness in delivering.

One of the first steps was to prepare a more detailed budget, almost on the per activity basis, in order to get better knowledge of how funds are used in order to assure the products committed can be achieved. There were minor problems on the transfer of funds, but in general the funds arrived on time to proceed with the planned work. Also, after clarifying the nature of financial reports requested by CATIE, the TUSIP project could prepare the reports and send the supporting documents. However, although it is ideal to have such information by the end of

the month, the cost of package transportation via courier forced the administrators of TUSIP to do it every two months, but it has some implications on keeping updated the reports.

Table 8 shows the financial operation of TUSIP during the first semester of 2010, based on the information available in CATIE. It includes the information of expenses made in Cameroon up to June 10th, 2010 (the period covered by the first two financial reports submitted by AMF), whereas the expenses done in Costa Rica are up to 27th July 2010.

Table 8. Summary of Budget Execution Between 1st November,2009 – 27th July, 2010

Code No.	Item	Budget, US\$	Executed, US\$	Executed, %	Available, US\$
<u>For Operation in TUGI</u>					
TSP-01	Local Consultants	14,500.00	2,151.40	14.84	12,348.60
TSP-02	Vehicle	19,500.00	16,619.02	85.23	2,880.98
TSP-03	Local Travel	5,000.00	3,410.32	68.21	1,589.68
TSP-04	Investment on Farms	63,700.00	15,104.63	23.71	48,595.37
TSP-05	Training, Communication and Dissemination	8,300.00	2,488.94	29.99	5,811.06
TSP-06	Contingencies	1,000.00	153.77	15.38	846.23
TSP-07	Administrative costs - Akwi Memorial	3,000.00	1,000.00	33.33	2,000.00
Sub-total		115,000.00	40,928.08	35.59	74,071.92
<u>For Operation in CATIE</u>					
	International consultant fees	60,000.00	26,235.00	43.73	33,765.00
	Transaction Costs/Processing fees	10,000.00	4,019.33	40.19	5,980.67
	Travel / subsistence for members of target community	15,000.00	10,607.85	70.72	4,392.15
Sub-total		85,000.00	40,862.18	48.07	44,137.82
TOTAL		200,000.00	81,790.26	40.90	118,209.74

As the period covered in this report correspond to 1/3 of the total life of the project, it may appear under-execution for three of the seven budget lines, and over-execution of two of the budget lines for the operation in Cameroon. In the case of TSP-02 is understandable because the main cost correspond to the purchase of the vehicle. In the case of local travel, it appears that the amount budgeted may need revision in the near future, because it covers expenses paid to cover travel costs of the project leader, as well as the rental of a vehicle for initial operations before the project vehicle was bought. The expenditure of 23.7% of the amount budgeted under TSP-04 (Investment on farms) is adequate

considering that field work started in the second half of February and much of the work on the community farm is still to be implemented.

In the case of the operation in CATIE, the level of execution is as expected considering that the *in situ* technical assistance is concentrated in two periods, the longest one (4.5 months) was completed in June 2010. Also the report already includes the purchase of the airplane ticket for the second mission of the Technical Advisor. Considering the execution of the total budget we found that expenditures represent 40.9% of the total budget, which is adequate considering that there was a need for some investments in equipment during the first semester.

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