

# Fodder Development Initiatives and Hill Conservation in Nepal

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## Introduction

Nepal is a country situated between the southern slopes of the Himalayas to the north and the upper parts of the Ganges plain in the south. Altitude ranges from more than 8,000 metres above sea level in the high mountains to about 150 metres in the southern *Terai*. In between these extremes are the Mahabharat and the Siwalik Mountain ranges. Characterised by deep valleys and flat uplands, these hills cover lands between 300 and 3,000 metres in altitude. In the mid- and the lower areas of the zone, extensive terracing, deforestation, and overgrazing has reduced formerly forested lands to wastelands and over cultivated fields. Landslide scars and eroded areas are common. All valleys are cultivated. The expansion of terracing on ridges is accompanied by increased soil erosion.

Soil erosion, a continuous washing away of the hill slopes in Nepal, has become a serious problem. Billions of cubic metres of soil are subject to erosion every year. The Siwalik and mid-hills, occupying about 61,345 sq. km. (41.7% of the country's total area) have been most affected by this problem. Soil erosion is continuously taking place throughout the middle hills, 0.856 million hectares of cultivated lands and 4.465 million hectares of deforested lands (LRMP 1985) as a result of forest clearing

and overgrazing. Consequently, most of these lands have seriously been degraded, able to meet just over 60 per cent of the total annual feed requirements (in terms of Total Digestible Nutrients) for existing livestock populations (approximately 3.4 million cattle, 1.9 million buffalo, 0.41 million sheep, and 3.24 million goats (ASI/AMAO 1995). The degradation of these lands has also resulted in considerable decline in crop productivity due to reduced soil fertility. This has adversely affected many subsistence farm economies in the hills.

The government of Nepal has undertaken a number of conservation initiatives in response to these problems. These initiatives encompass both government and community degraded lands and include sloping terraces for increasing vegetation coverage and fodder supply. The experiments undertaken in the last three to four decades have provided specific lessons which should be considered when formulating future conservation strategies for the hills of Nepal and other hill regions of the Hindu Kush-Himalayas.

## Initiatives

In Nepal, pasture development work started in 1952, after FAO conducted a study towards the implementation of a systematic approach to pasture and fodder produc-

tion to support the Nepalese dairy industry in the hills. Structural orientation and the provision of a Pasture Development Officer occurred in 1965, within the establishment of the Livestock development Section, Department of Agriculture. In 1975, an extensive pasture development programme was launched. White clover was oversown on high altitude pastures as part of the 'Agriculture Year 2032/1975'. However, this initiative was not successful because it did not focus on gathering local support and encouraging people's participation. The technicians in charge of the project were often inexperienced as well.

In the 1980s, however, the Department of Livestock Services (DLS) had remarkable success in planting napier on bunds and risers of private sloping terraces to increase vegetation cover and thereby livestock fodder supply. At this same time, the Swiss were supporting the Tinau Watershed Project in Palpa District. This project successfully sowed degraded forest lands with *Stylosanthes Gaynensis*, cv. Cook, and molasses grass (*Melinis minutiflora*) in fenced areas. These lands were eventually handed over to communities who used them for forage cultivation and to help protect timber and fuelwood plants.

In 1982, the Government of Nepal enforced a Soil Conservation and Watershed Management Act, empowering the Government to declare any area to be a protected watershed in which the harvesting of trees, plants, and other forest products is prohibited without official permission and where afforestation and forest protection are required. This initiative also marked the establishment of the Department of Soil Conservation. This Department is responsible for maintaining land structures through appropriate use of soil

and water resources, as well as proper watershed maintenance. This Department's work has significantly aided the rehabilitation of degraded lands, primarily by sowing stylo, planting fodder and timber/fuel trees, and propagating medicinal plants.

Similarly, the Department of Forests has made significant contributions towards the rehabilitation of degraded lands since the introduction of the Amendments to the Forest Act in 1977. Community forestry and leasehold forestry programmes resulting from this Act have had tremendous positive effects on restoring natural cover on degraded forests in recent years.

Both the Department of Soil Conservation and the Department of Forests work with user groups. The Department of Forests conducts afforestation programmes in government forests through District Forest Offices or through Community Forestry Programmes. The latter empowers and mobilises user groups, helping them to create management plans and establish fuel and fodder tree plantations. Ground forage development programmes have also been established by leasing degraded forest lands to a group of farm families under the Leasehold Forestry and Forage Development Project (HMG-IFAD).

The Department of Livestock Services works at the district level for forage intervention on community lands. User groups organized by the District Forest Office or those working with the District Soil Conservation Office are involved in these forage intervention efforts. Forage intervention on private land is accomplished through livestock commodity groups or Milk Producers' Co-operative Societies. These Societies supply milk to the Dairy Development Corporation of Nepal.

## Successes and Failures of Hill Conservation Initiatives

Past efforts to rehabilitate degraded lands have succeeded or failed depending on a variety of circumstances. Hence, an attempt has been made to present both positive and negative experiences in order to help shape future development and conservation planning in Nepal.

### *Fodder Enrichment Through Chir Pine Plantation*

The physical success of chir pine plantation both in the mid-hills and the high mountains has been attributed to the fact that pine plant leaves are unpalatable to all livestock. Yet this success has not been appreciated by most users at the village/household level. Local people continue to be resentful of this intervention. They do not like the restriction from grazing during the initial stage of plantation establishment. Restriction of traditional grazing patterns is unpopular because livestock keeping is a common practice of most farm houses in the rural areas. In some areas, it is the sole or major source of cash income after non-farm activities. Restriction of the use of traditional grazing lands means decreased forage supplies for existing livestock, which eventually leads to lower livestock productivity and decreased household cash income.

Fodder cultivation on cultivable land is not a traditional practice for most rural households, unlike the practice of raising livestock by free grazing. Moreover, most rural households keep more head of livestock to reduce the risk of natural disaster or disease, as well as for fertilization of crops, irrespective of livestock productivity levels. But, with the decrease in forage supply, farmers cannot kill or easily sell their un-

productive animals, thereby adversely affecting overall herd productivity. At the same time, decreases in livestock intake or livestock number will adversely affect crop productivity.

The absence of forage growth after canopy closure further contributes to village disdain for chir pine plantations. Canopy closure is so dense in mature chir pine plantations that there is no undergrowth. This is associated mainly with the planting system, as plants are only 5 X 5 feet from each other. The adoption of such a planting distance was arranged to account for probable plant mortality due to livestock grazing, as well as to achieve physical success. As mentioned earlier, however, pine is not palatable to livestock and natural mortality is negligible, as planting is done during monsoon. As a result, plantations become so dense within 12-21 years that virtually no ground cover remains.

The Rapti Development Project had taken two steps to examine the possibility of overcoming these problems. First, the introduction of napier in bunds and risers of *bari* lands and, second, the introduction of Cook stylo, molasses grass, velvet beans, siratro, and centro under five to seven year-old chir pine plantations to provide understory fodder. As expected, both interventions were successful. Community complaints about chir pine plantations are virtually nil. It is expected that the undergrowth of the above introduced species will continue to supply forage until the canopy is totally closed, i.e., at least for another five to seven years. By this time, farmers will have developed enough cultivated forage on their own homesteads that they will no longer be dependent on forests for forage supply.

The above discussion implies that forage development programmes on the private,

sloping terraces and utilization of unused space under new plantations on community lands should be given due attention while organizing community forestry programmes. Such an approach will help improve additional vegetation cover and increase or maintain forage supply, thus maintaining livestock productivity.

#### *Introduction of Stylo and Molasses on Degraded Land*

Stylo sowing has become the most favoured practice for all agencies involved in rehabilitating degraded forests in the Siwaliks and mid-hills of Nepal. Stylo can be grown in very poor to very fertile soil. Stylo does not require land preparation; seeds can just be thrown on the ground. The luxurious green stand of stylo appears within two to three years and stands so thick within three to four years of sowing that it virtually prevents sheet or reel erosion by thickly covering the top soil. As a legume, stylo fed to livestock in combination with straw during the winter or early spring is ideal for maintaining animal nutrition.

Molasses grass is also favoured for improving vegetation of degraded lands and increasing green forage supply during winter when straw is the only source of fodder in most of Nepal's hill regions. However, sowing molasses and stylo together in Palpa has demonstrated that molasses grass completely destroys stylo within five to seven years. It is possible that the favourable nutrient supply of stylo declines, but there is a constant supply of nitrogen to the molasses grass, thereby giving it more opportunity to dominate stylo.

The above experiences indicate that both stylo and molasses grass can be excellent materials to achieve quick ground cover in

degraded lands in the hills of Nepal. Yet they should not be planted together.

#### *Napier Plantation on Sloping Terraces and Community Land*

Napier plantation on bunds and risers of sloping terraces will increase on-farm forage supply resulting in reduced pressure on forests. It will also decrease the time women spend collecting forage, thereby creating greater opportunities for other productive work (housekeeping, child-care, income-generating activities, literacy). If napier is planted for fodder, it will become less necessary for children to act as shepherds for the family's herds — an activity that often takes precedence over going to school. Napier plantations also create a barrier against soil erosion, thereby improving soil and nutrient conservation for improved crop productivity. Napier plantations on risers and bunds have been the most successful technology of on-farm forage development and soil and water resource conservation practices in such areas.

As such, napier plantations have become well accepted in most dairy-producing areas of the hills and Terai of Nepal (Ilam, Dang, Palpa, Tanahu, Chitwan, etc.). Napier provides sufficient green forage to livestock except during January-February. This plant does not require extra fertilization; it grows with the nutrients that leach along slopes or the terrace edges due to gradient differences. Napier provides enough forage that women and children no longer have to collect forest forage, thereby decreasing the assault of forest resources to sustain livestock.

Yet napier plantation programmes have not been heartily accepted by farmers in non-milk market access areas. Moreover, napier plantations, as the main crop on *bari* or as

a mono-crop on degraded community lands did not win the confidence of hill farmers. Thus, the initiative/demonstration did not continue in Chitwan, Madan Pokhara, and Palpa. Farmers contested that they needed this land to grow subsistence crops. They also found it difficult to uproot established sward if they wanted some other crops to grow on that patch of land; napier needed to be removed manually. Farmers also cited rat problems in and around the napier plots. Napier planted on large plots as a mono-crop (Narayanpur, Dang) did not last long; the artificial fertilization (napier is a heavy nutrient eater) of the crop was not practical according to members of the community.

#### *Fodder Tree Plantation Programme*

Combined fodder tree and timber/fuelwood plantations have become a common practice of the Soil Conservation Department in community forest afforestation programmes throughout Nepal. Fodder tree plantation is also carried out by the Department of Livestock Services on a massive scale. Overall performance of fodder tree plantation programmes, however, is poor. Most indigenous fodder tree species grow slowly and require fertile land. Propagation procedures are also complicated. The seedlings supplied for plantations are often too small and improper pittings are dug in which to place these seedlings. Concomitantly, in most rural areas, farm animals are free grazed and do not rely on cultivated fodder.

The fodder grass, *amriso* (*Thysanolaena maxima*), however, has been successfully cultivated in the hills of Ilam. *Amriso* provides green fodder almost year round and is easily propagated. Growing *Amriso* is a direct source of cash income because its inflorescences are sold to make brooms.

The non-edible overstalks are used as fuelwood for household cooking or for fencing kitchen gardens. *Amriso* cultivation has not been as successful in the western regions of the country due to drier climatic conditions in these regions.

All the above discussions clearly indicate that farmers' interest and initiatives are guided from their awareness and social understanding of natural resource conservation and their economic realities. Economic activities are the driving force behind the structuring and adoption of such interventions and their sustainability. Likewise, economic activities are driven by market opportunities and structural development. Therefore, past initiatives have succeeded or failed depending upon whether the fodder development programmes were implemented in the milk market access areas or the non-milk market areas and whether the people were aware of the importance of conservation practices. In most non-milk market access areas, fodder programmes have been unsuccessful. When there have been any successes or a few adoptions at initial stages, all have collapsed after subsidies have been withdrawn or other interests of farmers left unfulfilled.

#### **Local Hill Conservation Organizations**

Farmers' organizations are directly concerned with livestock management, as well as land and water conservation. Livestock production organizations are commodity groups such as buffalo, cattle, sheep, and goat groups or Milk Producers' Cooperative Societies. These organizations are primarily involved in improving forage production on private cultivated or non-cultivated lands. Local organizations involved in community land enrichment through forage and tree plantations are larger groups organized as forest managers and soil and

water conservation user groups. The user groups in Dang and Palpa Districts have organized themselves into district level associations known as District Pasture Development Associations.

These local organizations are formed on democratic principles. Each of them have their own by-laws with specific objectives. Members of the executive bodies are elected. Each month, the executives hold a meeting to discuss pertinent issues that concern themselves and/or line agencies. The capacities of these local organizations have not been fully used by local governments or line agencies. These organizations can perform a number of jobs at the local level. In fact, they could be excellent development partners.

The Palpa District Forage Development Association (PFDA) provides a good example of these organizations' functions and potentials. The PFDA represents 11 forest/soil and water conservation user groups of the Palpa district. The major objectives of the association include the collection of forage seed from user groups which they then market at reasonable prices. PFDA uses the money earned to implement socioeconomic activities at the village level, implement drinking water and village toilet projects, construct school buildings, pay the monthly salaries of school teachers, fence community lands, pay the monthly salaries of community plantation guards, etc. This Association also implements programmes on environmental rehabilitation and supports nutrition programmes. They also try to improve forage seed production practices with the introduction of new technologies and to establish inter-group and inter-agency coordination for rural development.

By implementing the above programmes, this Association has gained the faith of its

member user groups. As a result, this association helps prepare and implement annual member user group programmes.

In 1996, the Dairy Enterprise Support Component of the Agro-enterprise and Technology Systems' Project (DESC/ATSP, HMG-USAID) trained members of PFDA, along with some other seed producers from selected places, in management of stylo seed production on cultivated or community lands in order to test the ability of farmers' organizations to work as development partners. These line agencies then invited PFDA to undertake action research on 'Farmer-to-Farmer Training in Stylo Seed Production and Organization of a Forage Seed Production Association in the Dang District of the Mid-Western Region of Nepal'. This Association was also responsible for sowing stylo on 40ha of degraded community lands in Dang and Palpa districts by mobilising the user groups; PFDA was also required to manage preliminary variety and fertilizer trials introduced by ATSP and conduct preliminary cutting trials on their own.

The farmer-to-farmer training component of this programme involved discussions with farmer groups about the training programme, its objectives and methodology of teaching, and the actual on-site training by following an experiential teaching-learning process. The groups selected farmers interested in training and provided a training site. Trainers were basically leading farmers of Palpa and Dang. In total, 879 farmers of 25 user groups were trained over three months. Women's participation was 67 per cent.

Similarly, the organization of the district level association by PFDA in Dang involved bringing 12 users' groups together into the district level association, preparing by-laws, registering this association with the

District Administrative Office, electing the Executive Committee, and preparing an Annual Plan.

With seeds from DESC/ATSP, 24ha of community lands in Dang and Palpa have been sown with stylo. The communities provided labour for sowing and contributed towards temporary fencing and hiring watchmen in many community plantation areas. Moreover, fourteen farmers in Palpa and eleven farmers in Dang have planted stylo on private lands (covering about 15ha) for commercial seed production.

PFDA, with technical support from the District Livestock Services' Office and DESC/ATSP, also conducted cutting trials in Palpa in 1994 and 1995. It was found that taking forage cuttings once in the month of Shrawan (late July or early August) produced more seeds (66-230kg/ha) compared to two cuttings in the month of Shrawan (July) and Bhadra (August) or Aswin (September) (25-130kg of seed/ha). Taking no forage cuttings but harvesting for seed collection only produced 60-218kg of seed). A similar trend was observed in forage supply (Basnet and BC, 1996). The association was also involved in fertilizer and variety at Palpa and Dang.

The DESC/ATSP concluded that PFDA was cost-effective and had sufficient knowledge/skills in carrying out: farmer-to-farmer training, conducting preliminary field trials, establishing district-level farmers' associations, and extending stylo sowing to community levels through mobilization of user groups.

The above discussion clearly indicates that local organizations like PFDA can be effective partners in many development programmes if they are trained and given opportunities to participate.

## Conclusions and Recommendations

Forage development programmes on private sloping terraces and use of unused space under new plantations on community lands should be given due attention when organizing community forestry programmes. Such an approach will help improve additional vegetation cover and increase or maintain forage supply, thus maintaining livestock productivity. Similarly, both stylo and molasses grass can be excellent materials to achieve quick ground cover in the degraded hills.

Farmers' interests and initiatives are guided by their awareness and social understanding of the conservation of natural resources, as well as economic activities. The above-mentioned successes or failures of fodder development schemes in milk access areas and non-milk access areas, as well as other such economic factors, should not be underestimated when developing conservation and development programmes in Nepal. Community awareness of conservation practices are also fundamental to creating sustainable programmes.

Local organizations should be recognised by local government and line agencies as potential partners in development programmes. Local users' groups are excellent social mobilisers capable of conducting farmer-to-farmer training and action research in specific areas. Yet efforts are required to improve their capacities and capabilities through training so that they may provide paid services at the village level.

Alternative fast growing, nutritious fodder tree and shrub species need to be tested for private plantation on sloping terraces and community lands. Improved napier varieties should be used for private planta-

tion on such terraces, particularly in the dairy pockets.

The Soil Conservation and Forestry Departments should take prime responsibility to encourage community stylo sowing on degraded local lands. The Department of Livestock Services should promote competitive seed production by defining the most potential forage seed production sites by type and by providing the necessary technical support to seed producers. Research institutions should support local farmers.

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