Community Based Leasehold Approach and Agroforestry Technology for Restoring Degraded Hill Forests and Improving Rural Livelihoods in Nepal

Madan K Gautam[1*], Eryl H Roberts[2] and Bijay K Singh[3]

(Paper presented at Rural Livelihoods, Forest and Biodiversity Conference,
19-23 May 2003 Bonn, Germany)

[1*]Corresponding author, School of Resources, Environment and Society, The Australian National University, Canberra, E-mail: Madan.Gautam@anu.edu.au
[2]Environmental Sociologist, Canberra, Australia
[3]FAO Consultant for Hill Leasehold Forestry and Fodder Programme Nepal.

Abstract
Improving livelihood support in lessening rural poverty along with degraded hill environmental restoration on highly populated lower and mid hills are highly prioritised in the current five year plan of Nepal. To achieve the above national goal, the government of Nepal has launched its Hills Leasehold Forestry and Fodder Development Project with assistance from FAO and IFAD. The government has leased degraded forestlands and granted the leasehold land tax-free to eligible families who are below the poverty line, and has provided training and minimum inputs. Qualitative interviewing methods were used to study project level activities and their impact on leasehold communities. The leasehold groups protect the land from grazing, fire, and regenerate it both naturally and with agroforestry plantations of multipurpose tree and crop species. This has resulted in an increase in forest coverage of up to 70%, and an increase in the income levels of leasehold families during the last seven years. This increase in families' income helps to support children's schooling, health and daily family expenses. The current barriers for further development of leasehold agroforestry are: leasing only degraded forestlands and having limited trust of government on leasehold groups in leasing better quality forestlands, blurred legal status, further support on technical know-how especially on biophysical interaction of trees and crops, and market and finance (mortgage) support. Our study shows that there are ample opportunities to lessen rural poverty along with forest restoration of the hills.

Introduction
Tropical forests are increasingly threatened by accelerating rates of forest conversion and degradation (Lanly 1982; Brown and Lugo 1990). Over 9 million hectares of forest each year are being converted into non forestland, and at least double that amount of forest ecosystem is being fragmented and degraded over the world. Converted land is generally agriculturally unproductive, biologically impoverished, and more flammable than the forests it replaces (Uhl and Buschbacher 1987; Uhl 1987). Similarly, hill forest ecosystem degradation and fragmentation in Nepal is a phenomenon with serious social, economic and environmental implications, and it is also strongly affected and accelerated by human actions. Rural livelihoods in the hills of Nepal are directly linked with forest ecosystems for human needs, in supporting animal rearing and crop production, and in providing environmental and spiritual needs. Hence, there is greater human pressure on the hill forest ecosystems resulting in about 200 hectares per day of forest conversion in non-forest land, or degradation and fragmentation into shrub/bush lands causing loss of plant species and high levels of erosion resulting in a further loss of soil nutrients. Lowering agricultural productivity resulting from loss of soil nutrients and severe

erosion, as a consequence of hill forest degradation and fragmentation, has lowed rural communities' income and livelihood support. This has adversely affected poverty levels, resulting in 45% of hill population having to survive below the poverty line in Nepal (Gautam 2000).

The Government of Nepal, with financial and technical assistance from international agencies, has aimed to restore degraded and fragmented hill forest ecosystems along with supporting rural livelihood from the forests so as to lessen rural poverty. Consequently, in 1994, the Hills Leasehold Forestry and Fodder Development Project (HLFFDP) was launched in Nepal. Our main aim of this paper is to study the programme setting approaches, its activities and overall impact on ground in restoring forestland ecosystem, and in improving rural livelihoods.

Methodology

We studied available project documents (Internet and printed), and literature on ecosystem / forestland restoration and theoretical aspects of livelihood supports prior to conducting research. We used participatory integrated research methodology with a multidisciplinary study team consisting of social foresters, ecologists and agroforestry expert to conduct the study. We studied (a) project level activities to gain in depth information on overall project development, and (b) a case studies to gain programme impacts on restoration and livelihoods supports so as to alleviate poverty.

A workshop session was held in the project office, Kathmandu with the Community Development Adviser, Project Coordinator, Monitoring and Evaluation Officer, Gender Development Officer and Technical Officer, and with staff from other related development agencies: pasture and livestock sciences from National Agricultural Council and Agricultural Development Bank. We held district level workshops at each project district with district and field level development agencies: District Forest Officers and/or Assistant District Forest Officers, Forest Rangers, Livestock Development Officers/Veterinary Officers, Junior Technicians/Assistant Junior Technicians, and Agricultural Development Bank Officer/Small Farmer Development Programme Officer.

To understand the programme's impact in the field we studied the earliest and most recently established leasehold groups. The earliest leasehold group was located in Padampokhari village, Makawanpur district, and was established in 1994. This group together, with the two most recently established leasehold groups in Chitwan district, formed the basis of this case study. Informal interviews were conducted using a semi-structured procedure with leasehold group members and district level personnel. Open-ended meetings at the forest sites were held with leasehold members in groups focusing on earlier stage of forestland, restoration methods, criteria on selecting non-tree crops for intercropping, and management approach. We developed a checklist and respondents were free to raise additional points, and their views thus adapted the central check-list format. Whenever necessary, alterations were made to the checklist during the course of the interviews. Where necessary, individual key personnel, such as the president of the community group, female members of the group and line agencies' personnel were interviewed to explore certain issues in-depth.

Later in writing this article, contemporary project level information (FAO, 2000) and Forest Act (1993) were cited as secondary information and has been acknowledged wherever necessary. While analysing and synthesising field level information that we have collected was integrated with secondary information to draw conclusion on forestland restoration and rural livelihood improvement**.**

FINDINGS

Programme Background

The Programme began in 1993/94 in the adjoining hill districts of Kathmandu i.e. Dhading, Dolkha, Kavreplanchok, Makwanpur, Ramechhap, and Sindhupalchok, and was later extended to Chitwan, Gorkha Sindhuli and Tanahu districts. A loan for the programme was provided by the International Fund for Agricultural Development (IFAD, Rome) and was administrated by the United Nations Office for Project Services (UNOPS, Kuala Lumpur, Malaysia). The Government of the Netherlands, through the Food and Agricultural Organisation (FAO), granted technical support. The programme was teamed with four rural development line agencies, i.e. Department of Forest, Department of Livestock Services, Agricultural Development Bank and Nepal Agricultural Research Council. The Department of Forest co-ordinated the programme and line agencies provided technical and management support. At the field level, local and national non-governmental organisations and the Agricultural Projects Services Centre are involved.

Programme Approach

Defining degraded forestlands

The degraded forestlands for leasehold purpose are situated in the lower to middle hills at the northern outcrop of the Siwalik hills and river valley, ranging from 400m to 1800 m in altitude. Most of the leasehold forestlands were of moderate to very steep slope, and were previously over exploited forest or shrub lands, eroded forestlands with low organic matter and exposed rock and stones with low moisture holding capacity as a result of overgrazing and frequent forest fires. Some of the leasehold lands were earlier plantation failure sites, or abandoned forest encroached sites. The climate of the sites ranged from subtropical to warm temperate.

Setting up institutions of highly needy groups

Blocks of degraded forest lands are identified and leased to groups of families who are below the poverty line prioritising to the families holding no arable land or less than 0.1 ha of arable land or less than 0.5 ha and/or who have an annual per capita income of below 2,500 Nepali rupees, accordingly. Most of the leasehold farmers are either below the poverty line or very poor and own ≤ 0.50 ha. of land (Table 1). Some of leasehold families do own over 1 ha. of land but the land quality is so poor that its production is less than 0.5 ha land. These people are mostly living in the vicinity of the degraded forestlands. The socio-cultural structure of the leaseholders compromises 46% Tibeto-Mongolian ethnic groups, ie. Tamang, Magar; 33% are Indo-Ayrian, ie. Brahman, Chhetri or Newar; 17 % are Kami or Dami (the socially and economically oppressed castes) and 4% are Praja or Chepang. The leaseholders' farming system is at a subsistence level and depends on primary forest products.

Six or more interested customary families living in the vicinity of the degraded forestlands and who are below poverty line form a group and select a president, secretary and treasurer, and

designate a formal name to the group. Certification of leasehold of degraded forestland is provided by the Department of Forest to the group for 40 years at the rate of one hectare per family. Each family in the group is equally responsible to follow the lease agreement. The basic philosophy behind the group leasing of the forestland are: (a) to provide a sustainable institutional setting for the leaseholders and empower them for leasehold land development, and (b) to work together on the parcel of leased land and share the output equally rather than fragment it for each family, and (c) to establish a self-controlled mechanism, for example if a leasehold member breaks the rule the entire leaseholder group suffers. Therefore, the actions of each member in the group are controlled by each other.

Technology approach

Agroforestry is a popular land use activity on leasehold lands (Box 1). After protecting forestland from livestock grazing and fire, bushes and undesirable species are removed in providing further room and favourable environment for natural regeneration either from trees in neighbouring forests, stumps, root suckers/runners/rhizomes, seed-bank (existing potential germination capacity buried seeds in soils) or more rarely, seeds from existing young trees in the leasehold forestland. The leaseholders build trails or footpaths, which also help in fire protection. Horticultural and pasture species have been planted to fill the big gaps. Type and density of species combination depends on leasehold families' preference on species and nature of ecological need of the species to suit in the existing gaps between trees. For example, strong light demanding lemon grass was introduced in open gaps, whereas forage species, such as stylo (*Stylosanthes guinensis*) was planted in smaller gaps in between trees as these forage need less light compared to lemonsgrass. Multipurpose tree species, Barhad (*Artocarpus lokoocha*) was introduced as an enrichment plantation, nitrogen fixing Ipil ipli (*Leucanea sp*.) and mollases *(Melinis minutiflora)* were planted in open deteriorated micro-sites to enrich soil. For the first two years tree seedlings were smaller and were surrounded by pasture species.

Table 1: Average land owned size (hectare) by leasehold families (%).

Leasehold families landholding size (ha)	Leasehold families (%)
0 to 0. 26	26
0.27 to 0.5	36
0.51 to 0.75	22
0.76 to 1	9
1 to2.1	7

As seedlings attained height, pasture species did not spread close to tree seedlings growing instead only in-between the tree rows. There is no fixed geometrical configuration for plantation, and hence species have been introduced following the presence of existing natural tree patterns. Trees have been planted in rows, and perennial pasture species have been introduced as understorey ground cover between tree rows in completely bare forestlands.

Box 1 Typologies of Agroforestry technologies practiced in study sites in the leasehold forestlands.

Natural Forest: (1) Sal (*Shorea robusta*) forest with horticultural crops as an understorey crop i.e., turmeric, ginger, pumpkin, soybean, yam and lemon grass. (2) Sal forest with perennial

pasture species on ground cover, i.e., stylo, mollases and napier (rarely). (3) Sal forest with perennial tree fodder species, ie, Barhar, Tanki (*Bauhania* sp) and mulberry, in small blocks. (4) Sal forest with perennial tree fodder species, i.e., Barhar in small blocks with perennial pasture species on ground cover, i.e., stylo and molasses or local pasture species (need to be identified). (5) Sal forest with perennial tree fodder species, i.e., Barhar in alternative lines or scattered. (6) Sal forest with fast growing short rotation fire wood species with less potential for fodder, i.e., Siris (*Albizia lebbeck*), and Ipil-ipil in alternative lines or scattered.

Plantation Forest: (1) Mixed tree species for multipurpose products i.e., Bakaino (*Melia azedarach*), Sisoo (*Delbergis sisso*), and Ipil-ipil with ground cover perennial pasture species, i.e., stylo and molasses. (2) Fast growing nitogen fixing tree, i.e., Utis (*Alnus nepalensis*) with napier grass in gullies. (3) Fast growing multipurpose trees, i.e., Bakaino, ipil-ipil with lentils i.e., Maas (black gram) and pigeon peas.

Management approach for restoration and its impact

The average rate of leasing forestland from 1993/94 to 1998-99 shows an exponential trend (Figure 1).

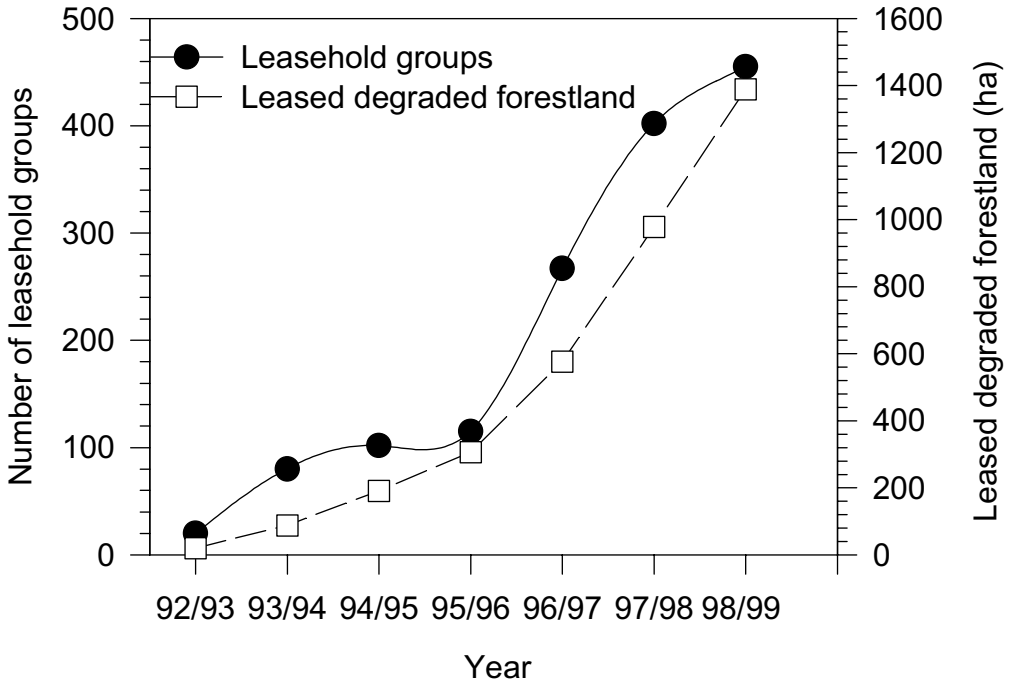

Figure 1: Leasehold groups and the corresponding degraded forestlands handed. (Source: redrawn from FAO 2000).

After leasing the forestlands restoration support activities such as over 5.5 million seedlings of multipurpose forest-tree and fruit-tree seedlings along with planting stocks of grasses were distributed from 558 forest nurseries. In addition, over twelve thousand kilograms of seeds of forage species were distributed to restore over 6 thousand hectares of hill forests (Table 2).

Table 2: Nursery establishment and distribution of planting materials in HLFFDP districts from 1992/93 to 1989/99.

Districts	Nursery Establishment	Distribution of planting materials				
		Tree seedlings (no.)	Fruit tree seedlings (no.)	Napier (*Pennisetum purpureum*) (sets)	Amriso (*Thysanolaena maxima*) (sets)	Fodder /Forage seeds (Kg)
Total	558	5553495	85870	838500	237134	12347

(Source: recalculated from FAO 2000).

The general survival rate of the plantation is over 78% and forage/fodder seeds has resulted in a 25% ground coverage with perennial forage pasture species. At present, there is no research data to show the environmental protection impact as a result of leasehold forestland management. However, significant reduction of leasehold forest land grazing by livestock, good forest fire control, terrace improvement for tree and intercropping planting are positive indicators of hill ecosystem restoration, and will possibly result in a positive impact on land and water conservation of degraded hill ecosystems. In addition, leasehold forestlands have been planted with higher number of species diversity, and this could contribute directly or indirectly to the establishment of micro scale ecosystems. There are four main management approaches that have been used in restoration of degraded leasehold forestlands:

(1) Land management for natural regeneration: Once the degraded forestland is handed over to the groups with an official certificate, the group members feel a sense of security and ownership of the land. This ownership feeling in turn makes them aware of the need for a long-term management of the forestland - promotion of natural forest regeneration by protection against fire and grazing conservation and enhancement of resources. Fire control and livestock grazing are the major problems in protecting natural regeneration in Nepal. However, no-fire accident caused by people has been reported in the last six years in over 600 groups of leased forestlands. Similarly, as the groups develop consensus and feeling of ownership, they stop grazing their cattle as well as managing to control and eventually stop cattle grazing coming from nearby communities. This resulted in about 75% of the groups managing to stop forestland grazing. This overall results in naturally regenerating and getting establishment of regenerated seedlings.

(2) Barrier to encroaching forestland by self-developed buffer strips: It is not uncommon in Nepal for farmers to encroach forestland by extending their farmlands adjoining to forests. Forest strips along the farmlands are encroached in three steps: (a) first one or two years overgrazing to kill natural regenerations and small trees, (b) second or third year controlled forest fires to burn small and big trees (c) third or fourth year farmland extending by encroaching cleared strip of adjoining forest. Once a forest strip is fully encroached and converted into farmland with removal of all the past evidences of forest existence, the above three steps are repeated for further encroachment. Leasing degraded forest strips prior to encroachment acts as a

barrier for private landowners and has resulted in stopping further encroachment of forestland. As leaseholders have ownership feeling on the forestlands, they promote both forest and non-forest annual crops under agroforestry system. Forty-three leasehold groups have restored about 120 hectares of such forestland with forest vegetation been formed in Sindhupalchok, and has created a buffer strip between farm and forestland and has stopped further forest encroachment. We observed in the buffer strips in Chitwan district leasehold groups have introduced multipurpose trees such Sissoo, Badahar, Bakaina, and Lankuri (*Fraxinus floribunda*) and have attempted to promote pole sized Sal and large Siris trees by removing of Banmara, i.e. forest killer (*Eupatorium* sp.), an epidemic understorey shrub, other weeds, and dead branch pruning to create partial shade for agricultural crops such as tumeric and non-forest cash crops, such as broom grass (*Thysonaleana maxica*).

(3) Plantation in abandoned forestlands: This is especially effective in Chitwan district. Praja and Chepang tribal clans live in and around forestlands and cultivate these forestlands, the forest being both their source of food, way of life and home. Earlier, due to their small population size, the pressure on the forest was limited and swidden-farming was practiced in a long rotation over 20 years or so. Growing population size has by now put pressure on the forest. Now the swidden farming rotation is under 4-years and this has had an adverse effect on forest degradation and fragmentation. Currently the degraded forestland has been titled to these clans for forty years as leasehold forest. This has resulted in their restoring the forestland by practicing agroforestry systems in protecting naturally regenerated tree seedlings, slope stabilizing with forage species such as, planting multipurpose tree species such as candy tree (*Choerospondias axillaris*) and butter tree (*Bassia butyracea*), practicing minimum tillage on slopes to cultivate nitrogen fixing lentils, such as mung beans, soybean and black beans. About 120 hectares of forest that was previously degraded due to shifting cultivation is now managed and has been restored under the leasehold forestry programme in Chitwan and Makawanpur districts.

Box 1: Brief description of studied leasehold groups

1.0 Padam Pokhari village, with a population of around 2,800 people is situated in Makawanpur district in the lower hills of central Nepal. The village community is dominated with almost 90% Tamang: a Tibeto-Burmese origin ethnic group. The village can be reached by foot one hour from the nearest road. Forest based subsistence crop and animal production are the main occupations of the Tamang community. The Tamang group as well as other more distant communities are the primary forest users. However, Tamang community are more attached to the forest for their socio-cultural needs and livelihood support compared to the distant communities who in addition, have alternative livelihood sources such as working in the nearby city, Hetauda, farms and factories. The forest was becoming more degraded every year resulting in less support for the Tamang community livelihoods and this resulted in greater poverty within the Tamang community. The Ramanthali Leasehold Group composed of seven Tamang families and three independent females and four male members was formed during the earliest time of this project in mid 1993. Slowly as the positive results of the group became visible - an increase in social capital - another 18 groups were formed by mid-1998/9. They have formed a cooperative of leasehold groups in 1998/9 called Padampokhari Forage and Forage Seed Cooperative. The cooperative records show that leasehold groups sell seeds of forage species mainly stylo and earn more than $7.0X10^6$ Nepalese rupees per year.

2.0 Darechok village has a predominant habitant of 1, 900 Magar caste and is situated in Chitwan district. Magar people traditionally live close to forests in this area. The national highway crosses the village administrative boundary. Angare Bhitta Group A and Group B are the nearest leasehold groups situated within a half hour walk from the highway, and in close vicinity to Mugling town which is at the junction of highways and a gateway to the capital city. There is a great demand for firewood and milk in Mugling town. Both leasehold groups were formed mid way of the project in 1997. The leased forestland was degraded resulting in heavy soil erosion, exposed rock, stones and invaded with weed, and was situated on a dry south-west facing slope between 40 to 60%. Once these groups were formed, restoration activates, such as tree plantation for firewood and timber, weed and shrub removal to encourage previously suppressed naturally grown tree seedlings growth, trail and fire control lines and forage seed sowing, gully control by gully-planting with grass and forage and early establishment seedlings. Forage and grass production started from 1998 and onwards, and planted and naturally established trees started covering up the ground. The forage production and tree coverage motivated the surrounding Magar communities and as a result there are now there 17 groups in Darechok village.

3.0 Saktikhor village is predominantly a Praja village. Praja are traditionally known as Chepang, an itinerant forest dwelling tribal clan. Their way of life is still relatively unchanged and natural. The village is situated along the foothill, and their leased sal forestlands stretch along a narrow strip adjoining the hill. Due to lack of ownership, although this is national forestland, the nearby elite used to encroach this forest strip and try to convert it into private farmland, with the encroached area almost reaching up to the hill. Management of the degraded forest strip was important in order to stop further encroachment. The programme effectively started in 1997 in Saktikhor village with the formation of the Dalantar Pakha leasehold group, and soon within a year 11 leasehold groups were formed in the community ranging from 7 to 11 families per group. The degraded forestland is relatively productive and gentle to moderate slope (less than 30%). Currently, there are 50 leasehold groups. The leasehold groups of Saktikhor village have formed leasehold group cooperatives.

4.0 Manakamana leasehold groups are mainly dominated by Gurung caste community. We visited two groups out of 11 leasehold groups formed in 1999. Both leasehold forestlands were situated on steep slopes, and were of a degraded mixed sal forest. Because this was a recently established group not many activities had yet been launched. We observed that leasehold groups had started primary land preparation and had sown black bean (Mas Dal) so as to get beans for their home consumption, forage from the vegetative parts of the bean plants, and to enrich soil nutrients for the coming tree plantation and had removed weeds around naturally occurred tree seedlings.

Impact on improving livelihoods

School drop-out and parental attentiveness

As leasehold lands are being restored with trees, grass, forage and horticultural crops, the Tamang income has increased progressively. This has a two-fold effect on reducing time for fodder collection and income generation from forage seed and lemongrass, and selling increased milk production. The income and time saving for fodder collection have provided extra time to parents to pay attention to their school going children. Hence, parents encourage to children to

carry out their school homework and only make children limited involvement in household activities, without hampering their study. There has been a significant impact of the programme on the dropout rate with a reduction in the last four years, and this was especially remarkable in case of female pupils who used to give up after 3 or 4 years of schooling.

Social capital building up

Before the programme, the members of the Tamang community were suppressed, particularly the women. During the first and second years of the programme elite groups had assaulted leasehold female members and had conducted destructive activities, such as grazing of plantation and not cooperating in forest fire control as they had a hidden interest to convert forestlands illegally into their own private land. However through enormous efforts on the part of the leasehold families, the restoration activities became successful, and its increasing positive impact on the socio-economic condition of the leasehold families and environment of their forestlands have boosted their moral, confidence and self-respect. The formation of a legally recognised institution – the leasehold group, interacting and being exposed with development agencies, government institutions, and success of their leasehold forest restoration have made the Tamang community unite together and has encouraged them to face problems regarding further management of their leasehold forest. This has resulted in empowering of their social status. The impact of forming leasehold group has resulted in bringing people together to a common consensus for personal and community goals and has created a greater neighbourhood bond between the leasehold families and neighbouring communities. The cumulative impact of moral and ethical uplifting has been progressively created by social capital building-up in the communities.

As the number of leasehold groups increased, the group members experienced the need for interactions between groups for information flow on leasehold forestland management, technical know-how such as plantation scheme, species selection, resources input from market such as availability of seed, seedlings, tools, animals (goats and buffalos) and market for physical products such as forage seeds, forage, milk and goat. Hence they established co-operatives. In doing so every single unit of the group is now in their network system. This also helped them on exchange of local experts; for example, in Padam Pokhari leasehold community a livestock experienced leasehold member administered medicine to a sick buffalo in another leasehold group. Because the leasehold communities are linked together, this helps to pass knowledge and know-how from one member to another and resource capacity of the communities increase progressively.

Health improvement and affordable medical treatment

Health awareness along with economic means, e.g., income generation from selling milk and forage seeds as well as green vegetables, has changed the attitude of leasehold members towards consultation of medical professionals and medication. For example, people used to see the local health professional only if they were severely ill and they did not used to buy the full course of prescribed medicine. It was mainly due to either to their low income or partially due to not having enough time to think for themselves due to their preoccupation in collecting forest products from degraded forestlands. In contrast, we were told that these days people consulted them at the very early stage of their illness and the patients took their full course of medicine.

Box 2 Group viewpoint by Dalantar pakha Ward no. 1 leasehold group of Saktikhor village.

Shifting farming in the forest is our traditional way of life. However due to lack of incentive of ownership, we never thought to manage the forest with a long-term vision. As the forest is becoming less and less productive, food availability for us is becoming less and less. In our daily dietary habit there are less green vegetables. After getting leasehold forestland, we feel secure in our ownership and look after the forest by managing and improving its productivity with natural and planted tree seedlings, incorporating seasonal vegetable between the trees rows or in patches. While removing weeds and watering vegetable plants we do the same to adjoining tree species as well. All of our group members have grown plenty of vegetables that we sell locally in the market and consume ourselves. This has resulted in a significant intake of green vegetable in our diet.

The aggregated impact of the programme is notable with a change in vegetable growing pattern and in increased vegetable intake pattern (Box 2). Vegetable crops, for example, leafy pumpkin shoot, yam-leaves, along with black bean and snake-beans are grown along with planted Sissoo seedlings, naturally established Sal and Siris seedlings. The vegetables are consumed by the family and the surplus vegetables are sold in the local market.

Support in improving farming systems and daily forest products needs.

As a consequence of a greater availability of animal feed through multipurpose tree species and forage plantation, there was an impact on change in farming systems especially on rearing on livestock types of leasehold families. Figure 2A shows that from 1993/94 to 1997, numbers of less productive cows and calves have decreased by 32% and 8% respectively, and numbers of productive buffaloes and goats have increased by 24% and 38%. The change in livestock quality has resulted in an increase in income of leasehold families from 40 % to 70 from goat, and from 13% to 36% from milk sales (Figure 2B). Similarly, the number of families benefiting from selling agroforestry farm products has increased significantly from year 0 to year 4 of handing over the leasehold forest. Income generation from seed production is dominant in all the years, and this is followed by forage/fodder (Figure 2C). From 1995, the leasehold community started reaping their first product for their daily needs. Although grazing was banned, wild grasses for animal feed and thatching roofs and sal leaves from thinning of naturally regenerated seedlings were collected after a year of protection. Silvicultural operation followed collection of twigs and dead branches. In the second year and onwards, introduced improved forage was available to collect and feed leasehold families' livestock. This also supported to the leasehold families in introducing higher milk yielding cows and buffaloes. Income generating crops such as lemongrass, forage seeds of stylo and mollases provided them cash income from the second year of the programme. Later from 1997-98 and onwards, fodder trees such as Badahar, Ilpil-ipli, Tanki, Mulbery yielded to the first harvest. Until recently, most of the forage seed was imported

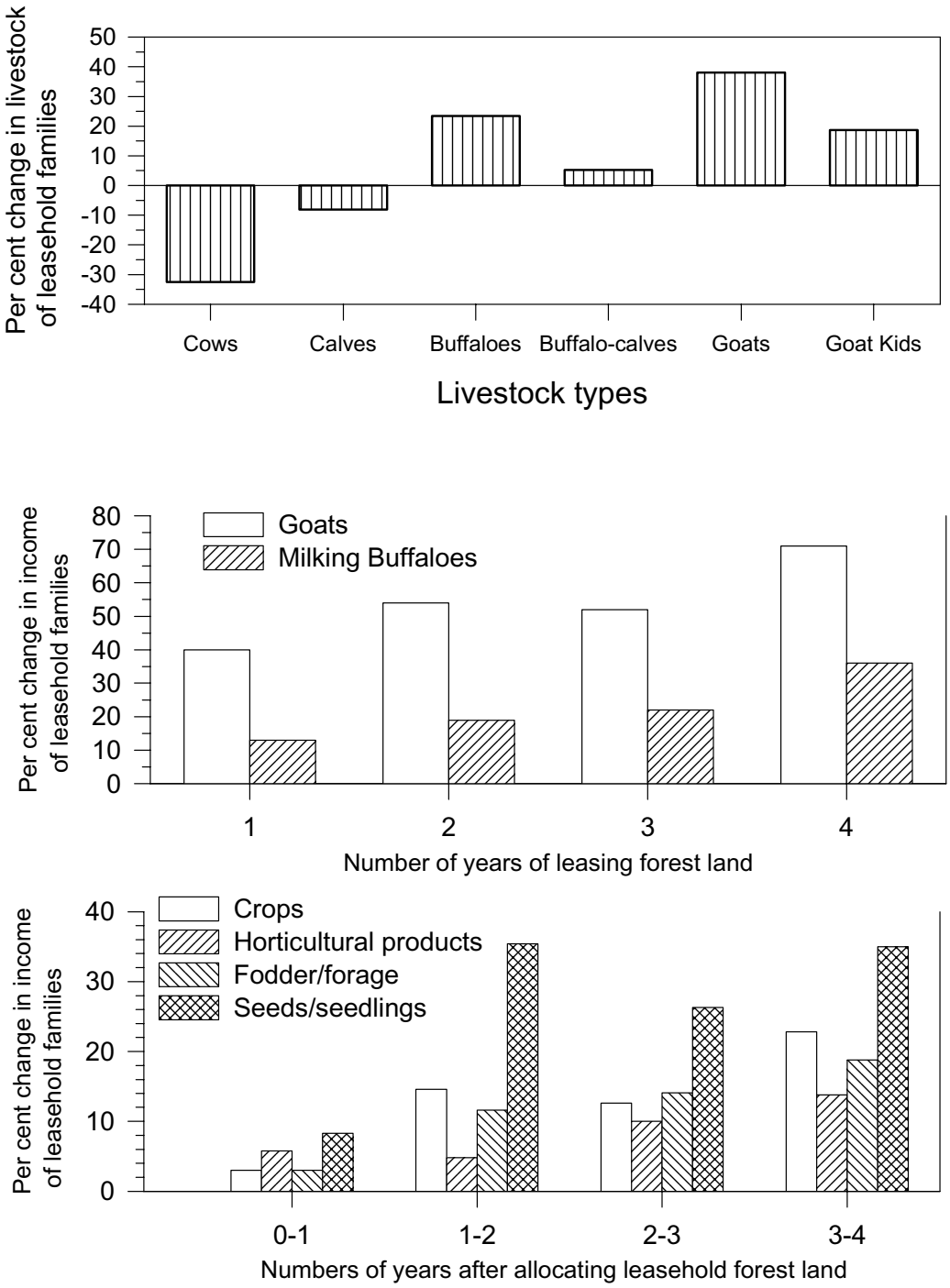

Figure 2: Average change of livestock types from existing breeds to selective improved breeds of per family (A), generated income distribution from livestock resources (B), and types of

generated income from agroforestry practices (C).
(Source: recalculated and redrawn from FAO 2000).

from outside the country. The introduction of forage crops as an understorey of forest trees provided forage as well as seed for the local market.

DISCUSSION

The main objective of this study is to focus on restoration approaches and its impact on forestland and livelihoods of the rural poor in Nepal. Because hill forest ecosystem of Nepal is interlinked with social livelihoods, the classic concept of restoration with a return of an ecosystem close to its condition prior to disturbance (NRC 1992) seems to us very ambiguous in the Nepalese hill forest restoration context. Therefore hill forest ecosystem restoration practices that hold firm to ecological commitment in supporting rural livelihoods are much more likely to prosper and be sustainable (Higgs 1997). The current restoration approach has incorporated small leasehold groups of families of below the poverty line and is people-centred, where ownership and stewardship in management decisions are solely made by the leasehold families. The crucial provision of a long term, i.e. 40 years, ownership of land has resulted in leasehold members' thinking with a long-term vision in the leased forestlands management. A positive indication of a proper and sustainable restoration is that leasehold groups' established-reciprocal relationship between forest ecological and livelihood support needs in managing the forestlands.

A smaller management unit mostly gets a higher level of management. The higher management intensity in restoring degraded forestlands seems to be due to an approach of formation of small groups of an average of seven families and providing them with a reasonable size of forestland. For example, tree establishment along with non-forest crops intercropping as an understorey, shows a high cropping index per unit of land which requires a high level of management in producing both tree and non-forest crops. Furthermore, in principle, forestlands have been leased to work collectively in groups on the parcel of leased land and share the output equally. However, we observed that leasehold families have developed consensus to further subdivide the parcel of leasehold forestland to each leasehold family and have been managed intensively.

The wider picture of the sustainable livelihoods is to put people at the centre of development, focussing their strength to increase human, social, natural, physical and financial capital in improving their social well being, reducing vulnerability, improved food security and more sustainable use of the natural resource base (DFID 1999). We found that the current programme has improved leasehold social well being by making them proactive and in improving their knowledge and skills in forestland restoration and its management, marketing and banking through trained female leasehold members, empowering them through setting up institutions and interlinking as cooperatives are indications of social cohesion, access to and between and within groups. Providing integrated training to leasehold female members "group promoter" has progressively built their capacity to manage their natural resources and have gradually reduced their dependency on government agencies. The availability of food, animal feeds and forest products are indications of the reduction in vulnerability for their daily needs. Information through cooperatives on availability of input needs in managing leasehold forestland and in supporting their farming systems, and information on markets for their natural resources products are further indications for financial capital building up. Parental attentiveness on school

going children and being able to afford primary health care are prime indications of future investment indirectly on managing leasehold forestland. As the leasehold forestlands are renegotiated and groups are established leasehold members get access to bank loans. This overall indication shows there is substantial development in livelihoods support through a restoration and sustainable management of leasehold forestlands.

The commencement of the Forest Act (1993) to lessening poverty and forestlands restoration through small community based leaseholders was a crucial initiation of the Government of Nepal allowing the growing of non-forest crops in forestlands thereby benefiting the restoration of forestlands. Such initiative has played a "stater" role in the successful implementation of the current programme (Roberts and Gautam 2003). Grass, forage, tree-fodder, firewood and resources for human consumption are the main commodities from the forest to support hill farming systems in supporting rural livelihoods. Legally approved agroforestry approach in restoration of degraded forestland has provided these commodities to leasehold families. However, as trees grow shading adversely effects on the intercropped species and has resulted in a reduction in forage and other cash crop production. Possibly this could be minimised by widespread tree planting, i.e. 800 to 1000 tree/ha initial stock in maintaining 200 per hectare as a final crop, as practiced in agroforestry systems in New Zealand (Menzie *et al*. 2001, Gautam *et al*. 2003).

Despite the current ownership of 40 years, the legal status of leasehold groups needs to be further revised especially focusing on legal lease transformation, inheritance, mortgage and insurance against forest fire and natural catastrophe of leasehold forestlands. Following the Kyoto Protocol, tree growers are accountable for their contribution towards environmental protection and are rewarded with "carbon credits" (Lamb 2001). Australia has proposed to provide "salinity credit" to tree growers as soil-salt deposition is a hazard resulting from tree removal (Dornsife 2001). A similar accountability, such as "conservation credit" or "environmental services", could be provided to leasehold groups for their restoration efforts on degraded forestland that have /will benefit to the adjoining national environment.

ACKOWLEDGEMENTS
We are grateful to Padam Pokhari village, Darechok village, Saktikhor village, and Manakamana leasehold groups for their enormous help on this study. The authors are grateful to the staffs of Hills Leasehold Forestry and Fodder Development Project Nepal, Ministry of Forest and Soil Conservation, His Majesty Government of Nepal, and IFAD and UNOPS for providing information that have been cited in this paper solely to for educational purposes.

DISCLAIMER

The materials presented herein are solely the views and interpretation of the authors. They do not necessarily represent the views of the above-mentioned institutions in the acknowledgement section. Information provided by the above institutions may include views on the development and policy but the above institutions take no institutional policy position. These institutions did not give prior review of this paper nor do they necessarily endorse the views expressed therein.

REFERENCES

Brown S. and Logo A., 1990 Effects of forest clearing and succession on the carbon and nitrogen content of soils in Puerto Rico and US Virgin Islands. *Plant and Soil*. 124: 53-64

DFID, 1999 Sustainable livelihoods guidance sheets. http://www.livelihoods.org/info/guidance_sheets_rtfs/Sect2.rtf (accessed on 02.10.02).

Dornsife N.C., 2001 Investment opportunities for sustainable forest industry: an ADB perspective. ADB's strategy – long term strategic framework 2001-2015
Forest Act, 1993 Ministry of Forest and Soil Conservation, Kathmandu, Nepal

Gautam M.K., Mead D., Chang S. and Clinton P., 2002 Spatial variation and understorey competition effect of *Pinus radiata* fine roots in a silvopastoral system in New Zealand. *Agroforestry Systems* 2: 89-98.

Gautam M. K., 2000 *Social impact assessment of South Asia Poverty Alleviation Programme*: Nepal Syanja a pilot study. Impact Assessment Technical Report. SAPAP/UNDP/ UNOPS / RAS – 96-600 United Nations Office for Project Services, PO Box 13673, Kuala Lumpur – 50818, Malaysia, September 2000.

Higgs E.S., 1997 What is good ecological restoration? *Conservation Biology* 11(2): 338-348.

FAO, 2000 Hills Leasehold Forestry and Forage Development Project: Assessment of the impact of HLFFDP on participating households from the household survey data 1994-99, RAPR: GCP/NEP/052/NET, June 2000.

Lamb K., 2001 Carbon Accounting and Plantation Credits in Australia. Proceedings from the workshop -- Carbon Credit Amoritization Mechanisms in the Forest Industry Workshop, February 5-6, 2001, Holiday Inn, George Street, Peterborough, Ontario, Canada

Lanly J., 1982 *Tropical forest resources*. Food and Agriculture Organization of the United Nations (FAO) paper no. 30. Rome: Food and Agriculture Organization of the United Nations

Menzie M. I., Holden D. G., and Klomp B. K., 2001 Recent trends in nursery practice in New Zealand. *New Forests* 22: 3-17.

NRC (National Research Council), 1992. *Restoration of aquatic ecosystems*. National Academy Press, Washington, D.C.

Roberts E.H. and Gautam M.K., 2003 International experiences of community forestry and its potential in forest management for Australia and New Zealand. *Australasia Forestry Conference, Queenstown, New Zealand*, April 2003.

Uhl C., 1987 Factors controlling succession following slash and burn agriculture in *Amazonia. Journal of Ecology*. 75: 377–407.

Uhl C. and Buschbacher R., 1985 A disturbing synergism between cattle ranch burning practices and selective tree harvesting in the eastern Amazon. *Biotropica* 17: 265-268.