Silviculture by rural people in the Middle Hills of Nepal

P. R. Tamrakar[1] and D. J. Danbury

The Middle Hills, the most intensively cultivated and settled region of Nepal is estimated to contain 52 percent of the population. Sub-tropical mixed broadleaved forest is the dominant vegetation of the Mid-hills is estimated to comprise 1.8 million ha. For a large part it is characterised by the *Schima-Castanopsis* association. Much of it is severely degraded through intensive exploitation for fodder, fuel and building materials. Indigenous management systems have attempted to reduce pressure on the forest in some areas by restricting access, but have achieved only limited success.

To determine productivity under regulated management a number of research plots were established in 1984 in *Schima-Castanopsis* forest at two sites in the Central and Western Development Regions. Silvicultural systems tested included coppice, coppice with standards and high forest, to ensure a full range of product-mix possibilities. Detailed measurements of both offtakes and residual standing crop were made. First harvesting took place three years after establishment, with annual assessment thereafter.

Potential productivity of this forest type is high and sustainable. Average annual biomass production is up to ten green tonnes ha^{-1}. Depending on treatment, offtake of fodder and branchwood of between four and seven tonnes ha^{-1} yr^{-1} is possible.

Much of the accessible natural forest is being handed over to local community user groups and to encourage them to adopt appropriate silviculture for their forests a series of demonstration plots is being established. The demonstrations incorporate selected systems from the research plots, according to defined local needs, and in each case form part of an agreed user group management plan.

Such accessible demonstrations are a vital tool in pursuing the long-term objective of placing the bulk of mixed broadleaved forests in the Middle Hills under effective local management.

Keywords : siliviculture, mixed broadleaves, community forestry, Nepal.

The Kingdom of Nepal forms a large part of the central Himalayas and its foothillls. It is roughly rectangular in shape, averaging 870 km in length by 130 km in width, on an axis running west - northwest to east - southeast. Latitude ranges from 26 to 300 N. The Middle Hills occupy the central strip along this axis, forming a deeply dissected plateau with steep sided valleys running in both north-south and east-west directions. Altitude varies from 500 to 2500m, but the most intensively settled and cultivated parts are on the valley slopes, especially between about 1000 and 2000m. It is estimated that 52% of the population of Nepal lives within this range (Anon, 1991)

The natural forest is predominantly sub-tropical mixed broadleaves, though in the drier western parts and some south facing slopes pine forests (*Pinus roxburghii*) remains dominant. Large parts of the natural forests in the Middle Hills have been cleared for agriculture. Much of the remainder is now degraded but it remains the major resource to supply the villagers' basic need for fodder, fuel and building materials. Sustainable management systems

[1] Research Officer, Forest Research and Survey Centre, Kathmandu
Paper prepared for the 20th IUFRO World Congress, Finland, 1995

for these forests are being developed as a part of the Community Forestry Programme of His Majesty's Government of Nepal, implementing the Policy laid down in the Master Plan for the Forestry Sector (Anon, 1988).

The broadleaved resource

The dominant mixed broadleaved association in the Middle Hills is *Schima-Castanopsis* forest which replaces pine in all of central and eastern Nepal whenever dry season conditions are not limiting. *Schima wallichii* occurs thoroughout, with *Castanopsis indica* common below 1200m and *C. tribuloides* above this altitude. Whilst a few pockets of *Schima-Castanopsis* forest are in a relatively untouched state, much of it is severely degraded, often having the appearance of low shrubland rather than high forest. Other broadleaved species, usually in pure stands are a hill race of sal (*Shorea robusta*), a species more commonly found on the Terai plains in southern Nepal; and *Alnus nepalensis*, particularly in wetter areas adjacent to water courses.

Just above the 2000m contour, sub-tropical forest gives way to lower temperate forest with a number of *Quercus* species, often in pure stands; and a mixed broadleaved forest comprising a variety of members of the Lauraceae family (Jackson, 1994).

Accurate estimates of the current extent and condition of the Middle Hills broadleaved resource are not available. However at the time of the Master Plan exercise, the total area remaining was estimated at 1.8 million hectares (Anon, 1988). The population for the Nepal hill region, a broadly comparable area, was estimated to be 8.4 million, so that the area of remaining broadleaved forest amounts to roughly one hectare per household. The distribution of forest and population is, of course, not uniform. There are some areas where local demand for forest products exceeds the currently available supply and it is in these regions, in the eastern and central part of the Middle Hills, where the bulk of effort in developing community forestry is being targeted.

Indigenous forest management systems (IFMS)

As a response to the increasing scarcity of available forest products in recent decades, particularly within easy carrying distance of settlements, a number of Indigenous Forest Management System have evolved (Tamang, 1990). The approach to forest managment, in response to the degraded condition of the forests, was initially entirely protection-oriented, often involving complete restriction of access to the forest over long periods and forcing the exploitation of alternative less accessable resources.

Where local rules have been devised to allow some harvesting, this has mainly been restricted to foliage and dead wood at certain periods only. The success of this approach has been variable, dependent on the social organisation and collective will of each community, but there have been a few good results. Fisher and Gilmour (1992) describe an indigenous forest management system in mixed broadleaved forest in place for 40 years which has turned a virtually bare hill-side back to a vigorous high forest. The local rules applied in such cases have tended to be very conservative and whilst ensuring regeneration and growth, have not optimised the offtake of desired products so necessary in areas of severe shortage. However, in areas where there is well stocked natural forest Indigenous Forest Management Systems are practised to maintain a regular although probably not optimum harvests of desired products.

Research was necessary to determine appropriate silvicultural systems for restoring these forests to full productivity, at the same time determining allowable cutting regimes to generate a sustainable level of offtake of defined products to meet the full range of local demand at the earliest opportunity. In addition, demonstration plots, managed jointly by the Forest User Group (FUG) and field foresters, were necessary to encourage harvesting at higher levels in community forests and to further incorporate the positive elements of Indigenous Forest Management Systems.

Development of silvicultural systems

Recognising the need for reliable data about the dynamics of the Nepal's broadleaved forests under different silvicultural systems in 1984 the Forest Research Division of Forest Research and Survey Centre (then Forest Survey and Research Office) of the Ministry of Forests and Soil Conservation, laid down a series of field trials in the Middle Hills. The objective was to establish a *long-term* trial which would take into account the varied forest product needs of the local communities, with both short and long-rotation systems being included. The research protocol was agreed by all parties and maintenance and assessment operations were carried out by the users, under the supervision of the research staff. Research integrity was at no stage compromised, and there was an ongoing and valuable interaction with the local people.

Trials were laid down in the *Schima-Castanopsis* forest type in two locations, one in the Central

Region (Nagarkot) and one in the Western Region (Khalti). A further, similar trial has been established in the Eastern Region (Ramchey Community Forest) in collaboration with Pakhribas Agricultural Centre (NUKFRP, 1991). The trials at Nagarkot and Khalti have been fully reported elsewhere (Tamrakar, 1993) but are summarised here as the results are of crucial importance for their wider application within the Community Forestry Programme.

Initially four blocks, each of six silvicultural systems (treatments) were established at Nagarkot, and four blocks with five systems at Khalti. Treatments were applied to a plot of 20m X 20m within which an area of 15m X 15m was allocated for measurement. Because of excessive damage by deer and unauthorised cutting, two blocks (one on each site) had to be abandoned, but accurate data for three blocks on each of the two sites are available. Following establishment in 1984, data collection started in 1987, and five years of results, to 1991 are reported.

The treatments were as follows:

Simple coppice: as soon as the canopy closes the crop is completely harvested. Rotation 4-5 years, but thinning of coppice stems may be carried out at 3-4 years.

Phased coppice: as above except that the felling is distributed in two consecutive years, half in each year. This modification ensures that the area is never entirely cleared, reducing erosion danger.

Coppice with standards, regular and irregular: a coppice understorey with a overstorey of even-aged standards. The understorey is managed on the simple coppice system. Standards are selected following coppice singling and allowed to grow on, with appropriate thinning, to maintain a canopy cover of about 35%. In the regular systems the spacing of standards is kept uniform regardless of species; in the irregular system only certain locally-favoured multipurpose species are favoured, even if at an irregular spacing.

High forest: the coppice origin stand is regularly singled to favour one stem per stump and thinned to favour locally preferred timber species. Rotation age will depend on trees reaching the desired size for building purposes. Such sizes have not yet been attained ten years from the start of the trials.

Control: following initial clearance, all coppice and seedling regeneration left entirely untouched. No collection of any material.

Results

A summary of five years of harvesting on the two sites is given in Table 1. Per hectare biomass for foliage, branchwood and stemwood is given. The coppice system produced a large amount of fodder. Coppice with standards has yielded small timber as the main product, with foliage and fuelwood as secondary products. High forest has produced some understorey material and will ultimately yield large timber. It should be noted that as each system has a different rotation, the exact picture will not become clear until the completion of the trials which will depend upon the decisions of the communities on desired product size.

To determine the total productivity of the systems it is necessary to estimate standing biomass left after harvesting. Table 2 gives these figures after the 1991 harvest using locally prepared biomass tables, measuring all stems above 4cm dbh (at 1.3m) in managed systems, those above 3cm dbh for the control plots. Combining the data from the two tables, and adding harvested amounts to the standing figures, gives an estimate of total biomass production of the five systems and control. This is shown in Table 3, demonstrating the land capability, at seven years, for the *Schima-Castanopsis* forest type under the different systems.

The conclusion from the results so far is that managed forest always has better productivity than the unmanaged control, enabling a move away from the ultra-conservative regimes of indigenous systems to be made with confidence. Potential productivity under management appears to be high with average annual biomass production up to ten green tonnes per hectare. Depending on the system, fodder production could be up to four green tonnes per hectare per annum and fuelwood up to seven green tonnes per hectare per annum.

Application of silviculture in community forestry

In implementing the Nepal Forestry Sector Master Plan (NFSMP) responsibility for much of the accessible national forest is being handed over to local community user groups, with technical assistance provided by the Forest Department, supported in many cases by international and bilateral donor assistance. The development of community forestry actually began some 16 to 17 years ago, but has recently gained considerable impetus from the new legislation, the Forest Act 1993 (Anon, 1993) and Bye-laws 1995 (Anon, 1995).

The Nepal-UK, Community Forestry Project (NUKCFP), now active in seven districts (Bhojapur, Dhankuta, Shankuwasava and Terathum in the Koshi Hills in the East and Baglung, Myagdi and Parbat in the Dhaulagiri Hills in the West), is supporting the Forest Department in developing and establishing a process of participatory forest management. Four of the districts are in the Koshi Hills region where community forestry has been progressively developed since the 1980s (NUKCFP, 1995) and the rest districts are in the Dhaulagiri Hills, established as a NUKCFP target area only in 1994. The two regions are fair representative of the Middle Hills of Nepal, with considerable physiographic, ethnic and socio-economic diversity. However, all the districts are characterised by shortage of easily accessible forest products to meet local needs, despite the natural climax vegetation of mixed broadleaved forests over much of the area.

Table 4 shows for the four Koshi Hill districts, the area and forest types now under active community forest management. By April 1995, 43 percent of potential community forest had been handed over to forest user groups, working to agreed management plans. The average area of forest managed by each forest user group is 52.3 hectares.

Table 1: Yearly harvest (green tonnes/ha) at Nagarkot and Khalti

Treatments	Management objectives to produce	Harvest years											
		Nagarkot						Khalti					
		1987	1988	1989	1990	1991	Total	1987	1988	1989	1990	1991	Total
Simple coppice													
Foliage	maximum fodder,	5.2	6.8	12.1	6.3	2.3	32.7	6.9	9.1	3.9	3.6	7.7	31.1
Wood	bedding, average	4.2	5.6	16.3	0.1	0.3	26.5	1.8	10.2	1.9	0.9	15.4	30.2
Stem	fuel wood and						-						
Total	some bhatta	9.4	12.4	28.4	6.4	2.6	59.2	8.7	19.3	5.8	4.4	23.1	61.3
Phased coppice													
Foliage	maximum fodder,	1.2	13.5	12.7	3.8	1.1	32.3						
Wood	bedding and fuel	1.1	14.0	20.5	0.5	0.3	36.4						
Stem	wood. Some						-						
Total	bhatta and danda	2.3	27.5	23.2	4.3	1.4	68.7						
Coppice with standard (regular)													
Foliage	Maximum poles,	1.4	3.6	9.9	3.0	4.4	22.3	6.8	8.9	3.9	6.5	2.0	28.1
Wood	danda. Some	1.2	2.8	10.3	1.9	3.1	19.8	1.2	6.9	3.0	4.2	1.1	16.4
Stem	timber, fuel				0.8	1.4	2.2				3.9	0.8	4.7
Total	wood, fodder bedding	2.6	6.4	20.7	5.7	8.9	44.3	8.0	15.8	6.9	14.6	3.9	49.2
Coppice with standard (irregular)													
Foliage	Maximum poles, danda and average	1.7	4.9	10.6	3.5	6.0	26.7	4.4	8.7	2.3	3.4	2.5	21.3
Wood	fodder. Some	1.2	4.8	10.1	3.7	3.5	23.3	1.4	7.9	1.0	1.5	1.5	13.3
Stem	timber, fuelwood					0.7	0.7				1.5	2.0	3.5
Total	and bedding. No Erosion	2.9	9.7	20.7	7.2	10.2	50.7	5.8	16.6	3.3	6.4	6.0	38.1
High forest													
Foliage	Maximum timber.	1.7	5.5	9.7	1.2	2.1	20.2	4.6	2.4	3.8	2.3	0.8	13.9
Wood	Some pole, fuel wood fodder and	1.5	4.5	0.4	0.5	1.8	8.7	1.1	3.0	2.2	1.3	0.4	8.0
Stem	bedding.					2.4	2.4				0.8	0.7	1.5
Total	No erosion	3.2	10.0	10.1	1.7	6.3	31.3	5.7	5.4	6.0	4.4	1.9	23.4

Adopted from Tamrakar (1993)

Bhatta = Small/large sticks for weaving thatched roof. These may be split or used as it is. Danda = Small poles for construction of huts.

Table 2: Standing biomass (green tonnes ha^{1})

	Nagarkot				Khalti			
Treatment	Foliage	Branch	Stem	Total	Foliage	Branch	Stem	Total
Simple coppice	1.1	10.0		11.1	10.5	15.5		26.0
Phased coppice	1.3	13.4		14.7				
Coppice with Standard (Regular)	6.6	5.8	12.8	25.2	14.6	7.9	24.9	47.4
Coppice with Standard (Irregular)	4.8	6.1	9.3	19.2	8.3	6.4	17.2	31.9
High Forest	4.2	8.3	11.7	24.2	9.0	9.1	26.3	44.4
Control	8.5	8.6	34.8	51.9	7.5	10.6	19.7	37.8

Table 3: Land capabilities (green tonnes ha^{1})

Nagarkot			Khalti		
Harvest	Growing stock	Total	Harvest	Growing stock	Total
59.2	11.1	70.3	61.3	26.0	87.3
68.7	14.7	83.4	-	-	-
44.3	25.2	69.5	49.2	47.4	96.6
49.7	19.2	68.9	38.1	31.9	70.0
31.3	24.2	55.5	23.4	44.4	67.8
-	51.9	51.9	-	37.8	37.8

Adapted from Tamrakar, 1993

The dominance of *Schima-Castanopsis* forest type is seen but also the considerable area of sal (*S. robusta*) at lower altitude, Chir pine (*P. roxburghii*) on drier slopes. Utis (*A. nepalensis*) on streamside sites and *Quercus-Rhododendron* spp. above about 2000m. Clearly though Forest Research Division replicated trials will provide a support for the management of *Schima/Castanopsis* the process of developing appropriate silvicultural system for community forestry also has to include the other forest types.

Forest User Group managed demonstration plots

Recent work within NUKCFP districts (Tamrakar, 1994 a and b) has shown that the people of the Middle Hills are not necessarily the conservative managers that was previously thought. They have some skills in matching silvicultural systems to forest type and product need, but this is not usually developed sufficiently to obtain optimum sustained yield. It can be difficult to explain relatively complex forest management concepts to non-foresters. A good way to do this in community forestry is by establishing a demonstration area, managed by forest user groups, with the professional support of field foresters. Though the full rigour of replicated and controlled silvicultural research is not possible, it can be an appropriate compromise in working towards a larger area of well managed community forest necessary to meet the national policy objectives.

Study tours by early forest user groups in the *Schima-Castanopsis* plots at Nagarkot produced considerable interest and requests for demonstration plots to be established within community managed forests. Initially plots were established in collaboration with Pakhribas Agricultural Centre, District Forest Office, Dhankuta, NUKCFP (then Koshi Hill Community Forest Project) and by staff of the Forest Research Division. Latterly more plots have been established in three districts in the Koshi Hills and three in two districts of the

Dhaulagiri Hills. These latter plots have been designed by the users themselves with consultation with field foresters. This process has been encouraged by NUKCFP in order to utilise the indigenous knowledge more completely and on the basis that learning is faster through personal experience, either good or bad. Details of these 12 plots are given in Table 6. Seven of the plots are in *Schima-Castanopsis* forest type and link closely with the previous research, but three plots have been established in *S. robusta* and two in *P. roxburghii*. The choice of silvicultural system and the weight and timing of initial harvesting was determined by the condition of the stand, the research results already available, and the particular product need of the FUGs managing the plots. In turn the system chosen, if successful in meeting the objective of increasing the productivity on a sustainable basis, will verify the silvicultural operation applied in future community forestry implementation.

The operations carried out in these 12 plots have been mainly thinning, singling, pruning, selective felling and coppicing. In almost all cases the primary objective was the production of fuelwood, although fodder, poles and timber were still regarded as important products. Table 6 shows the initiated fuelwood yield, number of stems and basal area per hectare and after treatment, operational cycle and mean annual yield. None of the plots have had a second treatment applied, although in most cases a relatively short operational cycle of around five years has been chosen. The post harvest basal area figures for some plots may appear low, but the vigour of the coppice growth of *Schima-Castanopsis* and *S. robusta* is so high that growing stock should reach an acceptable level before the next harvesting operation. The operational cycles are only to be regarded as general guides. The exact timing of subsequent harvesting will depend upon the growth and condition of the crop.

No plots have been established for more than four years and because of the variable initial condition of the stand, firm yield predictions are not yet possible. The mean annual yield figures shown are dependent on the type of treatment chosen, the initial stocking, and the assumed operational cycle. They are not an estimate of total annual biomass production which would require an estimate also of growing stock increment. This has not been attempted, as it is difficult with small coppice stems, even under research conditions. However, with continuous monitoring of subsequent harvests, in collaboration with each of the FUGs, a more accurate picture will emerge. From the initial figures, there seems no reason why the levels of sustained production achieved in the research plots (after nine years) should not be matched, or even exceeded on the better sites, with the product mix designed to meet the particular objectives of each FUG.

Other benefits that have occurred as a result of these demonstrations are that user groups have begun to carry out more general harvesting of their forests outside of this demonstration plot, and based on their experiences have initiated less conservative protection arrangements. Other neighbouring user groups have also been encouraged to harvest. Through this process both forest users and field foresters have mutually benefitted.

Conclusion

Community forestry is an interactive developmental process. Bringing about improved silviculture will take time. The process requires full participation of the users from identification of priority needs, through application of management to harvesting the desired products in a timely fashion. Technical research to support community forestry is equally as important as socio-economic research (Danbury and Bowen, 1993). This paper has shown how the results of applied silvicultural research can be used to guide both plots established by professional foresters as well as those set up by forest users. These in turn will serve as guidelines for future management over a wider area.

The experience in Nepal has shown that generally rural people show great interest in bringing the degraded forest back into sustainable production under community management. Forest users need encouragement to harvest the protected forests in a more productive way. Demonstration plots are a means to do this. Foresters can draw on the research results available when assisting users in planning and developing their plots, to fulfill their stated forest management needs.

Sub-tropical deciduous

Experience from and observation of these plots provides an opportunity for forest users to learn and increase their ability and confidence in future harvesting operations. Monitoring of demonstration plots will progressively produce more information, and will also provide feedback for additional applied research, to test particular options under controlled conditions.

The initial interest of a few rural people in the Forest Research Division silvicultural research trails in *Schima-Castanopsis* has led to the successful development of forest user group managed demonstration plots in three different forest types.

Table 4: Community forestry development in the Koshi Hills - progress till 1995

Districts	District Forest Area	Potential Community Forest	Number of FUG	Forest area (in hectares) handed over to the Forest User Groups										CF Handed Over (%)
	(ha.)	%	(number)	*S.robusta*	*STD	Riverine	*P. roxb.*	*S-C*	*Alnus*	Other Temperate	*Q.rhodo*	Mixed	Not Identified	Others	
Bhojpur	41202	70	180	3717	338	0	1105	4038	86	140	145.	0	685	45	36
Dhankuta	14582	98	166	2565	921	30	2535	1529	459	73	324	0	36	8	59
Shankuwasava	34852	78	95	2954	74	0	151	1674	38	0	185	0	767	14	29
Terathum	15176	82	147	1326	25	0	787	1536	563	66	695	48	755	332	50
Total	105812	72	588	10562	1358	30	4578	8777	1146	279	1349	48	2243	399	43

Adapted from Nepal-UK Community Forestry Project, 1995. S-C= *Schima-Castanopsis*

Table 5: Forest User Group managed demonstration plots in NUKCFP area.

FUG NAME	Community forests	Condition	Operation	Fuelwood Yield (green t./ha.)	Number of stems per ha. *Pre harvest*	Post harvest	Basal area (m^2/ha.) *Pre harvest*	Post harvest	Operational cycle (years)	Mean annual yield (green t./ha.)
Handikharka (D)	*S. robusta* (Pole-stage)	poor	Thinning singling	12.0	*4176*	*1409*	19.5	6.4	8	1.6
Ramche (D)	*Schima-Castanopsis* (Shrubland)	Average	singling Coppice with Standard	39.0	*14527*	*6663*	24.2	5.2	5	7.8
Kirtipur (D)	*Schima-Castanopsis* (Pole-stage)	Poor	Thinning singling	43.0		*1118*	-	11.6	5	8.6
Thulo ban (T)	Chir Pine (Pole-stage)	Good	Thinning	37.5	*1553*	*1088*	20.1	15.0	10	3.7
Bhadaure pakha (T)	*Schima-Castanopsis* (Mature)	Average	Thinning	24.0	*3483*	*1468*	23.6	14.2	5	4.8
Rani Pokhari Murti (T)	*Schima-Castanopsis* (Shrubland)	Poor	Singling	6.2		*6266*	-	9.6	5	1.2
Ahale (B)	*Schima-Castanopsis* (Pole-stage)	Good	Thinning	6.6	-	*6112*	-	11.0	5	1.3
Thulo ban (B)	*Schima-Castanopsis* (Pole-stage)	Good	Thinning	8.7	*9164*	*3102*	18.7	10.5	5	1.7
Chyane Dashe Danda (S)	*S. robusta* (Mature)	Very good	Selective Felling andThinning	29.7	*5891*	-	19.4	-	10	3.0
Bhadkhore (P)	*S. robusta*(Pole-stage)	Good	Thinning singling	16.5	*6293*	-	23.5	-	5	3.1
Badgaon (P)Chour	*P. roxburghii* + *C. toona* (Pole-stage)	Good	Thinning Pruning	20.7	*2325*	*1550*	20.7	17.3	4	5.2
Pale Ban (BG)	*Schima - Castanopsis* (Pole-stage)	Poor	Thinning singling	Not yet harvested	*3008*	-	10.2	-	4	-

D= Dhankuta, T= Terathum, B= Bhojpur, S= Shankhuwasabha, P= Parbat, BG = Baglung

A continuous process of two way information dissemination and exchange is under way, which should result in a successively greater proportion of the mixed broadleaved and associated forests in the Middle Hills being brought under effective community management.

Acknowledgement

We would like to extend our sincer thanks to Mr. Rajendre B. Joshi, the Executive Director, Forest Research and Survey Centre and the staff members of Natural Forest Management Research Section of FORESC for allowing us to use the data of Natural Forest Management Research. The project coordinator, Mr. Nick H. Roche and area leader, Kieth J. Fisher of Nepal-UK, Community Forest Project, for their valuable suggestion and support they provided in the commencement and completion of the study. Mr J. Vanclay of CIFOR, Indonesia is acknowledged for his comments on the paper.

References

Anon 1988. Master plan for Forestry Sector, Ministry of Forest and Soil Conservation, Kathmandu Nepal.

Anon 1991. National Census, CBS, Kathmandu

Anon 1993. Forest Act 2049. Royal Seal, Nepal

Anon 1995. Forest Bye-laws 2051. Royal Seal, Nepal.

Danbury, D. J. and Bowen, M. R. 1993 Research for Community Forestry *Banko Janakari* 4 (1) : 16.

Fisher, R. J. and Gilmore D. A. 1992. Villagers, Forests and Foresters. The Philosophy, Process and Practices of Community Forestry in Nepal. Sahayogi Press, Kathmandu, Nepal.

Jackson, J. K. 1994. Manual of Afforestation in Nepal. Nepal - UK, Forestry Research Project, Kathmandu, Nepal.

NUKFRP 1991 Nepal-UK, Forestry Research Project, Annual Report, 1991. Forest Research Division. Babarmahal, Kathmandu, Nepal. c/o BAPSO, P. O. Box No. 106, Kathmandu, Nepal.

Tamang, D 1990. Indigenous Forest Management Systems in Nepal, Research Report Series No 12, WINROCK International, Kathmandu, Nepal.

Tamrakar, P. R. 1993. *Management systems for natural Schima-Castanopsis forests in the Middle Hills of Nepal.* Paper presented at 2nd National Community Forestry Workshop, Kathmandu, Nepal.

Tamrakar, P. R. 1994. *Forest User Groups in the Koshi Hills. A note on some silvicultural experiences.* Nepal - UK Community Forestry Project, Kathmandu, Nepal. Project report B/NUKCFP/02