THE STATUS OF TRADITIONAL SILVO-PASTORAL SYSTEMS IN MALAM JABBA VALLEY, N.W.F.P., PAKISTAN

Diplomarbeit
zur Erlangung des akademischen Grades
Magistra rer.nat.
an der Formal- und Naturwissenschaftlichen Fakultät
der Universität Wien

durchgeführt am Institut für Waldökologie
der Universität für Bodenkultur

eingereicht von

Birgit Habermann

Wien, November 1999

TO ALL FOREST DWELLERS.....

The forest is a peculiar organism of unlimited kindness and benevolence that makes no demand for its sustenance and extends generously the products of its life' s activity; it affords protection to all beings, offering shade even to the axeman who destroys it.

Lord Buddha

ABSTRACT

The status of silvo-pastoral systems in Malam Jabba Valley, N.W.F.P., Pakistan was studied with the objective of demonstrating the complex interactions between the development of the human population of a former remote and inaccessible mountain area and the status of traditional agroforestrial landuse systems.

Overpopulation and the consequent encroachment of settlements into the forested areas of Malam Jabba Valley have led to massive deforestation. Lack of fuelwood and timber cause excessive overuse of the remaining forested areas. The environmental damages have led to increased soil erosion and climatical changes.

The assessment was carried through in a three-months field visit in two villages in the valley (Malam and Mangarkot). A forest survey was conducted to analyse the status of the remaining forested areas. Important stand parameter (dbh, total tree height, stand density) were measured and intensity of forest usage was classified.

A survey on the socio-economic conditions was performed with RRA and PRA methods. The farmers were interviewed and encouraged to participate in a group discussion. Important issues discussed during this process were among others, availability of natural resources and constraints in agricultural and forest usage.

The original forest type has altered towards a uniform stand of *Pinus wallichiana* (Secondary Blue Pine Forest). Stand density varies strongly within the forested area. Total tree height and mean dbh is almost the same in both surveyed forested areas. Volumes are generally high compared to the intensity of forest usage. Natural regeneration is only existent to a higher extent in protected forested areas.

The understorey is characterised by low species diversity and occurrence of shrubs such as *Indigofera heterantha*, *Plectranthus rugosus*, *Berberis lycium*, *Sarcococca saligna* and *Buxus papillosa. Quercus incana* and *Quercus dilata*ta occur only as degraded shrubs due to lopping and grazing. Therophytes and hemikryptophytes appear in high abundance but low diversity.

Under the current conditions of intense forest usage to gain timber and fuelwood, and for grazing and cutting of grass on steeper slopes, the remaining forested areas of Malam and Mangarkot will rapidly decrease and become extinct in the near future.

Due to the increase of population there is greater demand for land and increasing demand for forest produce. This high demand cannot be met with the present silvo-pastoral systems. Agrisilviculture with *Ailanthus altissima* and *Robinia pseudoacacia* is practised by some farmers in Malam Jabba Valley to replace the traditional system. These trees are the main substitutes for the indigenous trees to provide fuelwood, fodder and timber to a certain extent. In agrihorticulture pear, apple, peach, persimmon and apricot are cultivated together with conventional crops. These systems provide additional income and will replace subsistence farming that is no longer sufficient to sustain the farmers of Malam Jabba Valley.

ACKNOWLEDGEMENTS

Dank und Anerkennung....

steht am Beginn einer Arbeit wie dieser mit voller Berechtigung, da nun mal eine Diplomarbeit keineswegs im Alleingang durchgeführt wird. So soll an dieser Stelle erwähnt werden, dass viele helfende Hände zum Abschluss und Gelingen dieser Arbeit beigetragen haben.
Dank D.I. Friedrich Falch und seinem Studentenprojekt an der Technischen Universität Wien, an dem ich teilnahm, entstand die Idee zu dieser Diplomarbeit. Durch seine Unterstützung konnte die Feldarbeit so kurzfristig und unbürokratisch organisiert werden. An dieser Stelle muss auch die vorbildliche Betreuung durch die Österreichische Botschaft in Islamabad erwähnt werden, besonders durch Konsul Gernot Wiedner.
Dankbar bin ich auch sehr für die bereitwillige Übernahme der Betreuung meiner Arbeit durch Univ. Prof. Dr. Gerhard Glatzel vom Institut für Waldökologie der Universität für Bodenkultur Wien. Dabei möchte ich mich auch herzlich bei den Mitarbeitern des Institutes bedanken, die mich als „Instituts- und Unifremde“ vorbehaltlos akzeptierten und mir bei Problemen immer weiterhalfen.
Das führt mich zu Ass. Prof. Dr. Franz Andrae, der mir nicht nur „forstliche“ Anleitungen zu den Felderhebungen gab, sondern auch bei der Auswertung stets meine vielen Fragen beantwortete und mir aus so mancher rechnerischen Sackgasse heraushalf !

Special thanks....

to the people that helped me to accomplish the field work in Pakistan. There were so many helpful hands, but first of all I have to mention two people:
Amir Zada, who accompanied us to the villages and helped us with the group interviews, who gave us advice in so many respects and who shared his tremendous knowledge in forestry and communal forest management with us. Thank you also for drinking so many cups of green tea with us!
Sher Shah Syed, who is the most friendly and hospitable man I have ever met – without him the field work and the interviews in Malam would never have been possible. I also want to express my thankfulness to his wife and family, for allowing us to stay in the Hujra so many times.
We want to thank the people in Mangarkot for being so friendly and patient with us and for their hospitality. Thanks also to Fazal Wahid who accompanied us during the interviews, and Amir Zada of Mangarkot who accompanied us during the field work.
The co-operation with institutions and other foreign projects was also delightful and contributed to the success of this study: First of all I want to thank Munazza Khan from the PHP who accompanied me during the interviews with women in Malam and Mangarkot, and Keith Morris for the information on horticulture in Swat and Malam Jabba Valley. I also owe many thanks to the Social Forestry Project that provided information and lots of publications, and the Forest Management Centre in Peshawar, where the staff was unbelievably friendly and helpful, and I deeply appreciate the support and advice I received from the teachers and students of the Botany Department of the University in Peshawar and Prof. Taimur Khan of the Geography Department.
All my thankfulness I want to express for the support of the Agricultural Extension Department Mingora, in particular from Mr. Fazal Maula, and the helpful information from the veterinarians of the Civil Veterinary Hospital Saidu Sharif (Mr. Javaid Iqbal and Mr. Ghulam Jabbar) and the Forest Department.
Thinking of Saidu Sharif will always remind me of the Projecthouse and the staff, in particular Amir Sawab and his sons. Thanks also to our advisors in political and administrational issues, Syed Alamgir and Ali Akbar.

In letzter Minute gerettet hat mich John Mee, der sich dankenswerterweise bereit erklärte, die mühsame Aufgabe des Korrekturlesens auf sich zu nehmen. Gerettet haben mich auch meine Freunde und mein Bruder Werner, die allesamt geduldige Zuhörer waren, wenn ich ein williges Ohr für meine Sorgen brauchte!

Meine grösste Stütze und Hilfe war jedoch Karim, dank deiner Hilfsbereitschaft, deinem Verständnis für meine Arbeit und deinem unentgeltlichen und freiwilligen Einsatz als “field assistant” in Pakistan, als mein Beschützer und Helfer, konnte ich mir den Wunsch erfüllen, diese Diplomarbeit in einem islamischen Land durchzuführen!

For a hungry man or a hungry woman, Truth has little meaning. He wants food. For a hungry man, God has no meaning...We have to find for them food, clothing, housing, education, health and so on – all absolute necessities of life that every man should possess. When we have done all that we can philosophise and think of God.

Jawaharlal Nehru, first Prime Minister of India in 1947

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ABBREVIATIONS

AD	Anno Domini – "in the year of the lord"
AEA	Agroecosystem Analysis
ARSM	Agricultural Research Station Mingora
BC	Before Christ
CPR's	Common Property Resources
DFO	Divisional Forest Officer
ERP	Environmental Rehabilitation project
FMC	Forest Management Centre
FSR	Farming Systems Research
HKH	Hindu-Kush-Himalayan Region
JFM	Joint Forest Management
KIDP	Kalam Integrated Development Project
MAP	Malam Jabba Afforestation Project
MFVD	Malakand Fruit and Vegetable Development Project
MMT	Main Mantle Trust
MPTS	Multipurpose trees
NGO	Non-governmental Organisation
N.W.F.P.	North Western Frontier Province
PA	Participatory Appraisal
PATA	Provincially Administered Tribal Area
PHP	Project for Horticultural Promotion
PRA	Participatory Rural Appraisal
Rps	Pakistani Rupees
RRA	Rapid Rural Appraisal
SDI	Stand Density Index
SF	Social Forestry
VDCs	Village Development Committees
VLUP	Village Land Use Plan
WID	Women in Development

CONVERSION TABLE

LINEAR MEASURE

1 mile	1,609 km

SQUARE MEASURES

1 acre	4047 m²
1000 m²	0,247 acres
1 ha	10 000 m²
10 000 m²	2,47 ha
1 kanal	505,88 m²
1000 m²	1,977 kanals
1 acre	8 kanals
1 ha	20 kanals

LOCAL AGRICULTURAL MEASURES

MOUNTS:

1 mount	~ 50 kg of grain (maize)
1 acre	~ 600 kg/ 12 mounts
1 ha	~ 30 mounts

CHEREB:

1 chereb	~ 250-300 kg maize grain
1 acre	~ 5-600kg/ 2 chereb
1 ha	~ 5 chereb

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1 INTRODUCTION

1.1 Objectives

This assessment aimed at demonstrating the complex interactions between the development of the human population of a former remote and inaccessible mountainous area and the status of traditional agroforestrial landuse systems, in particular the silvo-pastoral systems. The destruction of the forested areas has many disastrous consequences (see 1.3) and threatens the villagers' existence directly. Therefore the silvo-pastoral systems were chosen as the main topic of this assessment.

In order to cover a broader aspect of these interactions both a social survey and a survey on the remaining forested areas were carried through, concentrating on the following issues:

1. **Population, livestock and agricultural land:**
   The survey included statistical data on the local population, the distribution and amount of livestock present in the villages and the amount of available arable land. It provided the basis for understanding the social structure, the situation of the women and the hierarchy in the villages.
2. **Natural resources and landuse:**
   The importance of forest usage and other agroforestrial landuse practices for the local people were investigated, as well as possible non-timber resources and the meaning and use of different tree species. Important aspects were the changes in landuse during time, the consequences of misuse of natural resources and the actual availability of such resources. The seasonal calendars and the respective importance of products from agriculture and forestry were also included in the survey.
3. **Forest survey:**
   The forest survey provided data on stand density, stand structure, remaining resources of timber, non-timber products and non-wooded products from the forest. Species diversity, intensity and consequences of forest usage were also compared. Based on these data a statement on the status of the forest structure and resilience can be made.
4. **Official policies and project work in the region:**
   The high number of foreign sponsored projects in the region made it necessary to include also this aspect in the survey. Interviews and secondary literature were provided by several of these institutions, as well as of governmental organisations such as the Agricultural Extension Department.

The results show the status of the silvo-pastoral systems in Malam Jabba Valley and the future perspectives of the remaining forested areas. The social situation of the local people, as well as their initiatives and possibilities for sustainable development are the framework for the future of the region and its inhabitants.

1.2 The study area

1.2.1 Natural prerequisites of the study area

1.2.1.1 Geography

The study area is situated in the Northwest of Pakistan (34° 90'N / 72°50'E) between the Himalayan and the Hindu Kush foothills. The political province is the North Western Frontier Province (N.W.F.P.). Malam Jabba Valley belongs to Swat District, a part of Malakand Division. The capital city of Swat District is Saidu Sharif - together with its twin town Mingora it has 220 000 inhabitants. Malam Jabba Valley is situated about 8 km to the Northeast of Saidu Sharif and diverges off Swat Valley at the village Manglaur. (INTEGRATED REGIONAL DEVELOPMENT, 1998)

Along Swat River fertile land stretches widely. The hills along the valley used to be densely forested. The valley is still picturesque in spite of severe changes in landscape due to increased settlement and deforestation during the last decades.

In Malam Jabba Valley altitude varies from 990 m to 2880 m from the valley entrance to the highest peak of Shagar Sar (INTEGRATED REGIONAL DEVELOPMENT, 1998). Starting from Ser the valley comprises of an area of about 8540 ha (21 351 acres). The survey focuses on two villages, Malam and Mangarkot. (see fig.1.1)

The last census (1981) resulted in a population of 15 140 people. The outcome of an extrapolation of these data with an assumed yearly population growth rate of 3% was already 24 000 people in 1998. (MALAM JABBA AFFORESTATION PROJECT. PC-I, 1998)

There is one main asphalt road (35 km long) leading from Manglaur to Kuza Jabba. The Austrian Development Co-operation assisted when it was constructed in the 70ies and 80ies. At the same time a skiing lift and a hotel were built in Kuza Jabba (opened to the public in 1998). Most of the villages that are situated off the asphalt road are connected to that road with jeep roads.

1.2.1.2 Geology, rock and soil

The area is characterised by a very complicated geological structure and a large number of different types of rock:

Typical for Malam Jabba Valley are the phyllitic schists. Most of these rocks are between schists and phyllites. They are predominantly composed of quartz and mica, with minor iron ore, graphite, etc. and sometimes containing garnet. The rocks are usually dark grey with a micaceous sheen on the surface. (FMC PLANNING REPORT,1998)

The valley is situated at the Main Mantle Thrust (MMT). The MMT divides the Indian Plate from the Kohistan Island Arc. Earthquakes occur at regular intervals in the region, usually with a strength of 2-4 (Richter-scale), the maximum is at about 6 (Richter-scale). (INTEGRATED REGIONAL DEVELOPMENT, 1998)

The silty clay loam and the moderately deep silt loam is the main soil material (Shangla-rockland complex), always closely related to the parent rock. There are a wide variety of soil types in the area due to the multitude of different parent rocks. (FMC PLANNING REPORT, 1998)

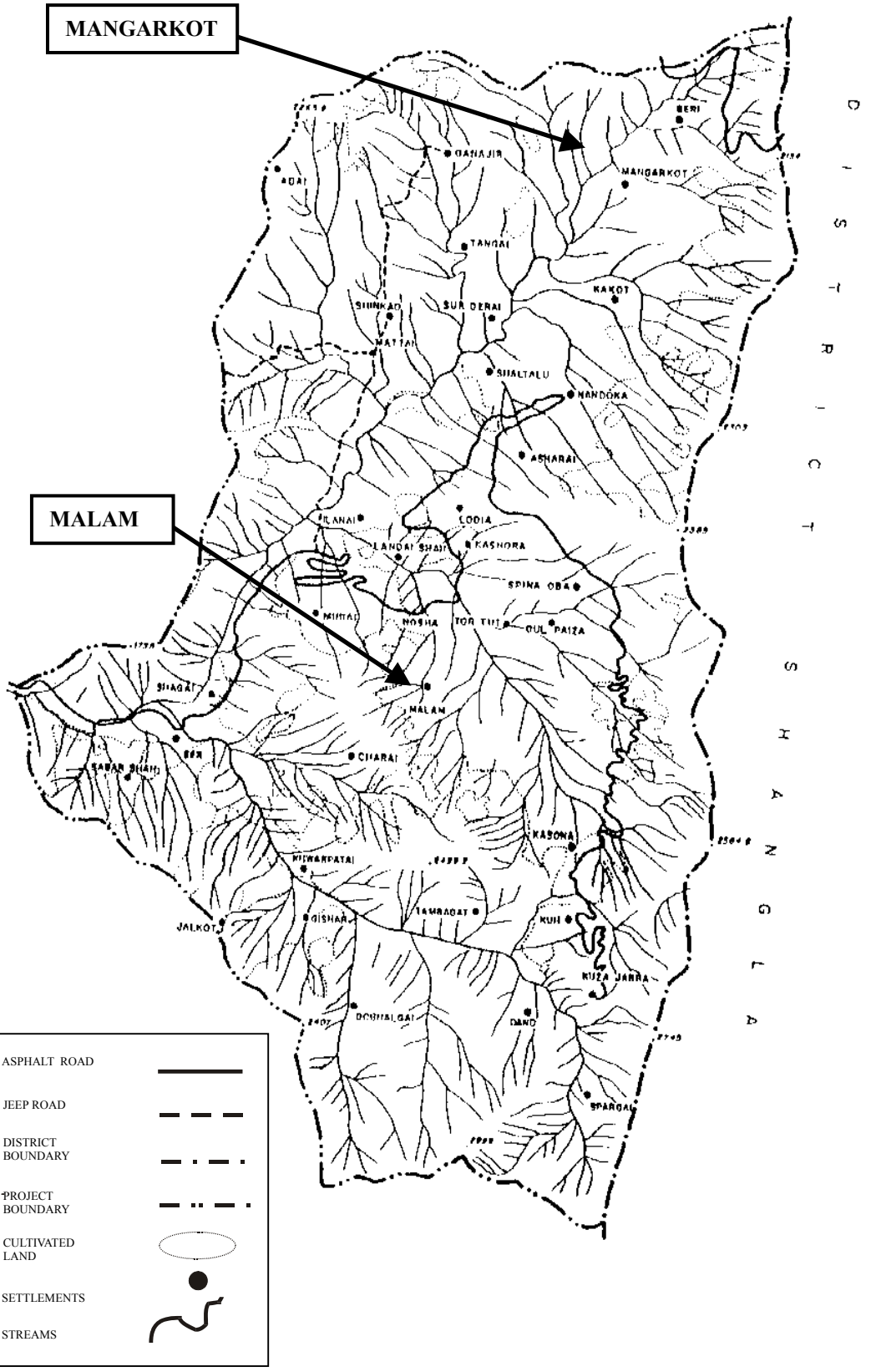
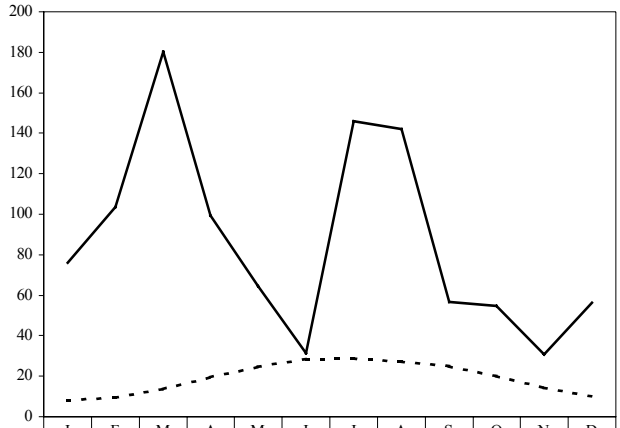


Fig. 1.1: Map showing the project area of MAP in Malam Jabba Valley (from MALAM JABBA AFFORESTATION PROJECT. PC-I, 1998).

1.2.1.3 Climate

The climatic conditions in the area vary from sub-tropical (Barikot[1]), boreal (Miandam[2]) to moist-temperate (Charbagh[3]). Fig. 1.2 shows climatic data of Saidu Sharif, where the only Meteorological Centre in the area is located. (FMC PLANNING REPORT, 1998)

The sub-tropical, semi-arid climate of Saidu Sharif is comparable to that in the lower Malam Jabba. In the upper Malam Jabba Valley the climate is temperate from 1500 to 2500 m and above 2500 m it is alpine. Precipitation increases with altitude while evaporation decreases (compare WEIERS, S., 1995): The margin of the monsoon shows an increase in precipitation to an altitude of 2500 m. Then it decreases and at about 3500 m it starts to rise again. The upper regions of Malam Jabba valley are therefore classified as humid. There are usually two rainy seasons per year: One lasts from January to April (*Rabi*-winter rainfall). The other rainy season occurs in July/August (*Kharif*-summer rainfall) as a consequence of the monsoon influence from the southern subtropical regions (Arabian Sea). From May to June there is a dry and sunny period, while December and January are usually the most cloudy months. Reportedly this pattern varies often and there are both very dry summers and summers with an extremely high precipitation. The climatic snow line is approximately 4600-4700 m (northern slope) and 4800-5000 m (southern slope) respectively. The lower snow line in winter in Malam Jabba Valley is 1800 to 2000 m. (INTEGRATED REGIONAL DEVELOPMENT PROJECT , 1998)



	J	F	M	A	M	J	J	A	S	O	N	D
M.A.T.(°C)	8,2	9,5	13,6	19,5	24,6	28,6	28,7	27,1	24,8	20,2	14,4	9,9
PRECIPITATION (mm)	76,1	103,4	180,4	99,4	64,3	31,5	146	142,2	56,7	54,8	30,9	56,4

Fig. 1. 2 : Precipitation (mm) and mean annual temperature (M.A.T. in °C) of Saidu Sharif, Swat, for the years 1974 –1990 (Source: FMC PLANNING REPORT, 1998; original source of data: Meteorological Centre Saidu Sharif).

[1] The name refers to the whole planning unit according to the FMC PLANNING REPORT (1998), not only to the village.

[2] see 1.

[3] see 1.

1.2.1.4 Vegetation

According to WALTER, H. (1976) Pakistan's flora and vegetation is influenced by the Irano-Turanian, the Sudano-Zambesian and the Indian floral region. In the plain areas of Pakistan Saharo-Sindian and Southmediterranean influences dominate. RAFIQ, R. A. (1996) claims in a study of Palas Valley, Kohistan (NE of Swat Valley), that influences on vegetation and flora originate partly from the Sino-Japanese, the Irano-Turanian and the Mediterranean floral region.

NW-Pakistan is included in ecotone VII and IV according to the classification of WALTER, H. et BRECKLE, S.-W. (1991). Especially the mountainous areas of the Himalayan region are characterised through strongly differing zones as a consequence of the chamber-like structures in this mountain ecosystem. HASERODT, K (1989) explains that the vegetational changes in composition and altitudinal zones in Chitral Valley, Northern Pakistan, are mainly depending on exposition. HUSSAIN, F., et al. (1997 b) proved in a study conducted in the Dabargai hills, Swat, that south facing slopes had higher air and soil temperature than the north-east facing slopes. With increasing altitude the differences in soil and air temperature as well as water holding capacity of soil decreased again. Consequently the plant species and their communities similarly differed on south- and north-east facing slopes.

HUSSAIN, F. published several phytosociological studies of Swat Valley in the 80ies and 90ies. In these he documents consequences of intense human pressure during the last decades: Deforestation and overgrazing have resulted in increased erosion and have changed the original vegetation (HUSSAIN, F. et al., 1997a). HUSSAIN, F. et al. (1997a) cite several studies conducted in the N.W.F.P. stating that vegetation in the area has altered mainly towards unpalatable species as a consequence of grazing of domestic animals. Deforestation and overgrazing are the main ecological problems in the region (HUSSAIN, F. and ALEEM, S., 1989) and have almost extinguished the primary subtropical vegetation of Swat. Degradation due to deforestation and over-grazing has increased therophytes and soil erosion has hindered the regeneration of plants in the area (HUSSAIN, F. et al., 1997 b).

The original subtropical vegetation (see fig. 1.3) at lower elevations in Swat were *Dry Subtropical Broad-leaved Forests* (as defined by CHAMPION, H.G., et al., 1965) with *Olea cuspidata* and *Acacia modesta* joined by *Pinus roxburghii* at about 900 m (3000 ft), and *Subtropical Pine Forests, Upper or Himalayan Chir Pine Forest (P. roxburghii)* at elevations from about 900 m to 1500 m (3000 ft to 5000 ft). *P. roxburghii* is usually joined by *Quercus incana* and *Olea cuspidata* in this forest type.

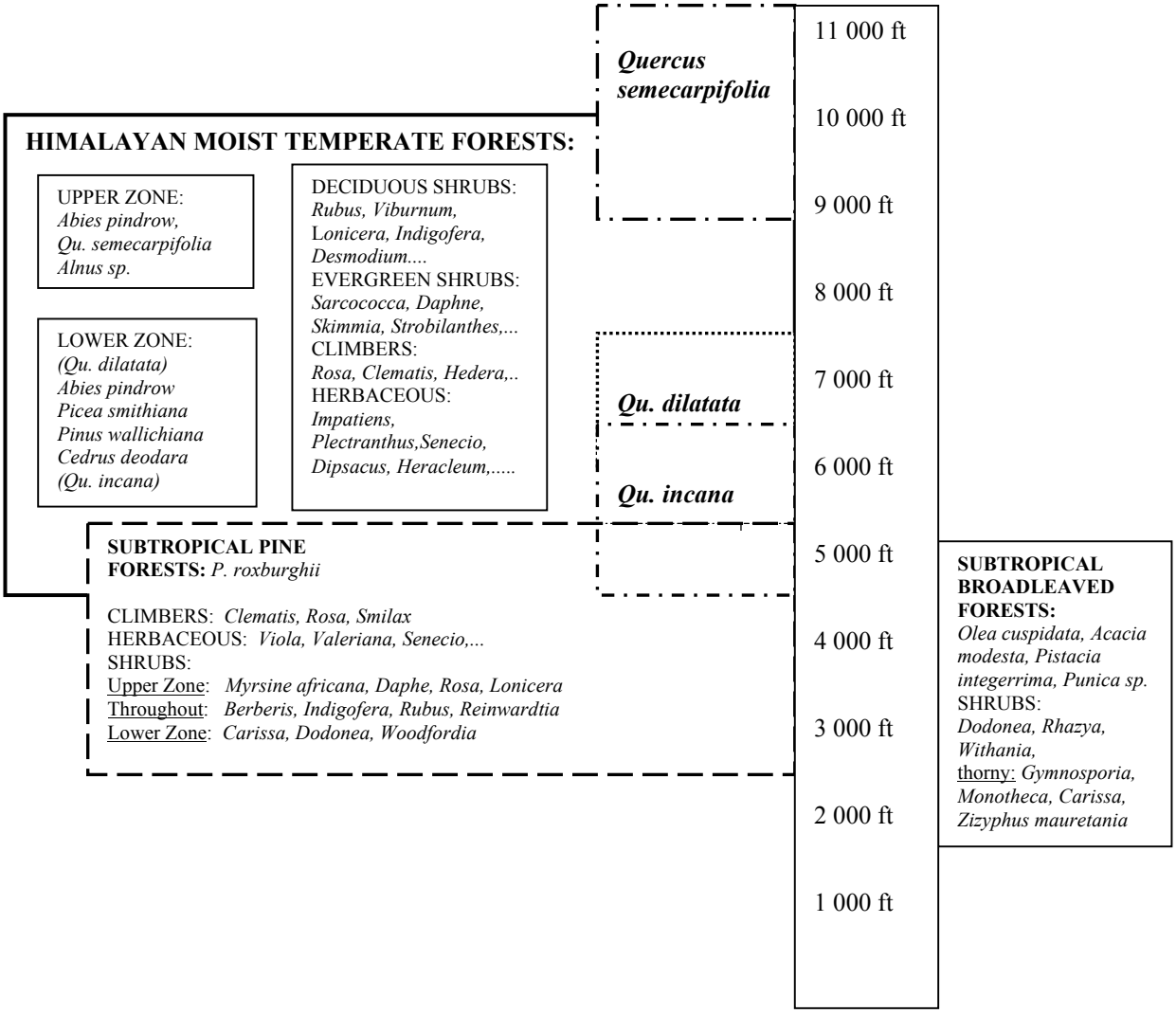
With regard to ecological zones Malam Jabba Valley is situated in a transition zone from the subtropical to the temperate zone (INTEGRATED REGIONAL DEVELOPMENT, 1998). The lower part of the valley is characterised by the subtropical zone which is dominated by *Dodonea viscosa*. This indicates an ultimate stage in degradation through excessive grass cutting and grazing. Occasionally *P. roxburghii* is scattered in and some shrubby forms of *Acacia modesta*, *Olea cuspitata*, *Quercus incana*. More frequent other unpalatable species occur, such as *Monotheca buxifolia*, *Rhazya sp.* and *Withania sp.,* all unpalatable and growing along roadsides and near villages. In higher altitudes *Berberis lycium*, *Indigofera heterantha* and *Plectranthus rugosus* dominate. The transition zone from the subtropical to the temperate zone ranges from 1500 - 2000 m in Malam Jabba Valley. In the temperate zone there are still remains of the coniferous forests that used to cover all the hillsides. The primary forest type in this area and altitude is a *Himalayan Moist Temperate Forest* (according to

CHAMPION et al., 1965). It has been replaced by a degraded forest type classified as *Secondary Blue Pine forest (Pinus wallichiana)* as a consequence of deforestation, overgrazing, terrace cultivation and erosion.

The original forest type is a mixed evergreen forest with *Pinus wallichiana*, *Picea smithiana*, *Abies pindrow*, and the evergreen oaks *Quercus incana* and *Quercus dilatata*. This forest type still grows at higher elevations in Malam Jabba, near Kuza Jabba (>2100m/6600 ft). Oaks are usually severely lopped and often appear as degraded shrubs only.

From 1700 to 2100 m the main forest type is *Secondary Blue Pine Forest (P. wallichiana)*. In the undergrowth occasionally degraded forms of *Qu. incana* and *Qu. dilatata* occur. Shrubs such as *Indigofera heterantha* and *Sarcococca saligna* withstand heavy grazing and intense use for cutting of grass and perennial herbs, as well as lopping for fuelwood, debarking to gain torchwood and timber logging.

Fig. 1.3: Diagram showing the altitudinal distribution of floral zones in Malam Jabba Valley (modified after CHAMPION, H. G. et al., 1965):



1.2.2 Social and cultural history[4]

1.2.2.1 The History of Swat

In the 4th century BC Alexander the Great invaded Swat on his way to India. From the 2nd to the 9th century AD it was the centre of the Buddhist Gandhara-culture. The following centuries were moulded by Hindu influence.
In the 16th century *Yuzufzai Pathan* conquered Swat Valley and subjugated the indigenous people. The Yuzufzai represented only 20 % of the population (WARTHOL,W.,1980), but the right of landownership was entitled only to them. The *Vesh*-system was introduced by the first Pathan intruders in the 16th century and was maintained until 1926: The land was divided, and periodically redistributed (compare 1.2.3.1). Land was not privately owned but was a common property of the Yuzufzai.
The British never directly interfered in Swat until 1895, when the succession to the throne in Chitral was disputed. To prevent further instability in the region the British troops conquered the Malakand pass and entered lower Swat. In the same year the Malakand Agency was created. In 1901 the N.W.F.P. was founded as a province of its own.
In 1926 *Miangul Abdul Wadud*, the grandson of the *Akund of Swat* (Saidu Baba), united the tribes and founded the state of Swat. He became thus the leader, the *Wali* of Swat. He co-operated with the British Government and could maintain the independent state until 1948, when his son *Miangul Jahan Zeb* succeeded him as the next Wali. In 1969 Miangul Jahan Zeb resigned and the Swat merged peacefully into the state of Pakistan.

1.2.2.2 The Pathan Society

The Yuzufzai not only subjugated the original mainly *Dardic* population of Swat, the former pagan (*Kafir*) or *Shiite* population (*Ismaili*) were also converted to Islam (the Yuzufzai are *Sunni* Muslims). The Yuzufzai settled mainly in the fertile valley bottom, consequently the indigenous population partly retreated to the high mountainous areas (= *Kohistani*, meaning mountain people).
As BARTH, F., (1959) writes, the hierarchical system consists of categories called *qoums*, meaning people, religious or ethnic group, caste. Membership in a qoum is determined patrilineal. The first rank in this caste-like system is confined to Saints, second are already the Yuzufzai. Saints were allowed to own land privately. There are four categories of Saints (WARTHOL,W., 1980, according to BELLEW, H.W., 1864):

1) *Sayad* (*Syed, Sayyid*): Descendants of the Prophet.
2) *Pir*: Descendants of a Pathan-Saint.
3) *Mian*: Like Pir, only that the Saint was no Yuzufzai descendant.
4) *Sahibzada*: Descendants of a Saint of minor importance.

The male heads of the families met at regular intervals in the *Jirga*, to discuss current issues and make decisions. In case of a war or a crisis a leader was elected. As there was no ruling dynasty the tribes were constantly involved in quarrels and tribal wars. Members of the Jirga were only the Yuzufzai. A control on social life was

[4] Compare BARTH, F. (1956) , BARTH, F. (1959) and BARTH, F. (1995), BUSCHMANN, H. K. (1996), FAUTZ, B. (1963) and WARTHOL, W. (1980).

guaranteed through the *Pukhtunwali*, a code of honour: The basic principles were hospitality, granting of sanctuary, and obligation to blood feud in case of insult.

1.2.2.3 The role of women in the Pathan society

The women in Swat area usually observe strict *Purdah*. The three principles on which this system is based are the separation of men and women, the seclusion of women to the house and the wearing of a veil or *Purqua* which covers the head completely (INTEGRATED REGIONAL DEVELOPMENT PROJECT, 1998).

The structure of Pathan culture is strictly hierarchic and forms a kind of cast-system (see 1.2.2.2). The upper cast are the rich and religious families; in the lower casts are for example tenants and nomadic Gujars. This structure also reflects the situation of women – depending on these casts, they play different roles in a family. Women of rich and religious families are not allowed to work, while women in poor families are often forced to work outside the house.

According to KHAN, M. (1998) there are three types of social structures common in the villages:

1) **Several families of different origin:**
   This situation can result in a very unproductive atmosphere. Because the families are not related to each other, women are not allowed to move freely. They are not allowed to work in the fields and have to stay within the farm area. There is no co-operation possible within the village and any kind of development work is impossible.
2) **One family of the same origin and of the same "cast":**
   Such "big cast families" have the same forefathers and can form a clan of up to 50-75 families who live together in a village. As long as there is no social inequality, this is the optimum situation for women. They can move freely from house to house, they can work in the fields and co-operation is usually no problem. Women living in such villages can easily participate in small scale projects like house gardening and mushroom cultivation.
3) **One family of the same origin but with different "casts":**
   This is according to KHAN, M. (1998) the most difficult situation. Some families are rich and also have the power in the village. They are too proud to let their women work. The poor families would like to allow their women to work, they are more progressive and also in need of any income they can get. But they cannot allow their women to leave the house because of their rich relatives. Finally there are the middle class families – they are usually the first ones to break the rules. They work outside the village and they also allow women to work, but this is problematic because the rest of the family does not approve with their doing. In such a situation jealousy, envy and many resentments decide over the progress within a village.

1.2.2.4 Population and development

Pakistan is one of the fastest growing countries in the world. Estimations of developmental organisations reached up to a population of 130 Mio people in the mid-90ies. One woman in Pakistan gives birth to 6.2 children on average. Especially in rural areas this trend was still unchanged in 1998: For Swat District a number of 2 362 800 Mio people was calculated on basis of the annual population growth rate between 1981 and 1998 (see table 1.1). The latest census was carried through in February 1998, but results were still unpublished at the time when this report was finalised.

Table 1.1: The population growth in the study area from 1972 - 1998.

	1972	*1981*	*1998*	*Population growth (annually)*
N.W.F.P.[5]	8 388 551	11 061 328	17 688 000	2.8 %
Swat[6]	888 411	1 233 001	2 362 800	3.9 %
Malam Jabba[7]	n. a.	15 140	24 000	3 %

There were several differing estimations available on the number of houses and the number of people living in the villages in Malam Jabba. Table 1.2 shows the numbers that were mentioned for Malam and Mangarkot, the two villages that were included in the survey.

Table 1.2: Estimations of number of houses, average number of people per household and total numbers per village in comparison.

	MALAM			**MANGARKOT**		
	Number of houses	**Average per household**	**Total number**	**Number of houses**	**Average per household**	**Total number**
Population census 1981	-	-	1060	-	-	560
Student Report 1998	200-250	10	1955[8]	160	10	1033[9]/2000
Agricultural department 1998	368	6-7	2392	73	6-7	475
Estimations of villagers	393[10]	10-15 [11]	4912	120-150	10-15	1562
Interviews with farmers	393	10.7	4205	125	14	1750

In INTEGRATED REGIONAL DEVELOPMENT PROJECT (1998) the population census of 1981 was cited and the actual population in 1998 in several villages of Malam Jabba Valley was estimated on basis of the annual growth rate for Swat District. The number of houses and the average number of people per household were also

[5] Data obtained from Agricultural Statistics of North-West Frontier Province for 1994-95 and INTEGRATED REGIONAL DEVELOPMENT PROJECT, 1998.

[6] see 5.

[7] Data obtained from MALAM JABBA AFFORESTATION PROJECT. PC-I, 1998.

[8] Projected to 1998 based on results of 1981 census, assuming an annual growth rate of 3.9 %.

[9] as in 8.

[10] This number was reportedly the result of the last census in 1998.

[11] Reportedly the minimum number of people per household was 8 and the maximum 32 during the last census in 1998.

estimated on basis of field visits and interviews. The numbers given by the Agricultural Department and the estimations of the villagers (see 3.1.8.1 and 3.2.8.1) were projected to the whole village. Calculations of the average of all these various data lead to an estimated population of 2905 in Malam (482 ha arable land/200-250 ha forest) and 1260 in Mangarkot (235 ha arable land/80-100 ha forest).

1.2.3 Landuse and Agriculture

The most precise study on land use in Swat Valley dates back to 1963 and was carried out by FAUTZ, B.. At that time landuse was still mainly characterised by the influence of the *Pathan period* (see 1.2.3.1). The valley bottom was used for cultivation of rice and wheat, the slopes were terraced and used for maize production only. Grains were grown on 95 % of the arable land in the early 60ies. Fruit and vegetable production as well was sugar cane in Lower Swat were only timidly introduced at that time.

Malakand Fruit and Vegetable Development Project (MFVDP) collected much of the widespread knowledge on landuse in Malakand Division. The Project for Horticultural Promotion (PHP) is the successor project of MFVDP and aims to operate in the whole N.W.F.P. . Other landuse-related projects operating in the area are Social Forestry (SF) and Environmental Rehabilitation Project (ERP).

Agricultural statistics documenting the changes from 1982 to 1995 could be obtained from the "Agricultural Statistics of North-West Frontier Province for 1994-95. " produced by the Agricultural Extension Department.

1.2.3.1 Development of land-tenure system in Swat:

Starting as early as the 16th century to 1927 (Pathan Period) only the Yuzufzai Pathan were allowed to own land (compare Vesh-system, 1.2.2.1). The indigenous population of Swat was obliged to pay taxes and forced into tenancy. (FAUTZ, B., 1963)

The Yuzufzai had settled in the most fertile areas (areas of double-harvest) and left the upper areas to the Kohistani and *Gujars*, where only rainfed agriculture or pasturing were possible. While the Kohistani always had firm settlements, the Gujars used to migrate annually. Many of them still migrate from the high mountainous areas (summer settlement) to the plains of Peshawar valley (winter settlement) with their flocks of mainly sheep and goat (*transhumance*). (TIETZE, W.)

The Pathan landlords split the whole Swat valley into *Tapas*. Within a tribe the clans used to rotate *Daftars* at regular intervals (=Vesh-system). The clans exchanged the land among themselves to avoid injustice, because naturally not all the land was of the same quality. The plots were assigned by casting lots. The Daftars comprised of orchards, irrigated areas, rainfed areas as well as land for pasturage. The actual villagers (*Astanadars*) always stayed at the same settlement. In 1926/27,when Swat became an official state with the Wali as a ruler, the system was formally changed. (FAUTZ, B., 1963)

Informally the system was never really given up until this day and the majority of the landowners are still of Pathan origin. In Malam Jabba Valley more than 60 % of the population is either landless or with small landholdings and the farmers earn their living through share-cropping and off-farm labour (MALAM JABBA AFFORESTATION PROJECT. PC-I, 1998.). The social structures started to break up after the abdication of the last Wali (1949 – 1969), but the question of landownership still remains unsolved until today. In fact there is a dispute over the entitlement to the land among several groups:

GOVERNMENT

The government claims to be the real owner of the land in consequence of the abdication of the ruler of Swat, the last Wali, who was the former owner.

WALI FAMILY

The Wali and his family still claim the right of landownership in their former state.

LANDLORDS

Many people sold their land to the Wali, or the government, but then they claimed it back. Some say they bought land from the Wali or received it as a donation for certain services. This is mostly the case among the members of powerful Yuzufzai clans.

LOCAL PEOPLE

The local farmers have been cultivating the land for many years and regard it fully to be their own.

The disputes started as a consequence of a period of confusion following the abdication and merger into the state of Pakistan. The following regularly changing governments and wide spread corruption made the promised landreforms fail (see 1.2.3.6) and so this issue still remains unsolved and hinders further development in the area. According to ZADA, A. (1998) there are different types of tenancy practised in the area. The status of the tenant is very much depending on the landowner:

1) **Sharecropping:**

   The tenant receives a 60 % share. 20 % are for his labour, 40 % is the share of the harvest that goes to the tenant. Usually the tenant decides what to grow and he also finances all the inputs. If the owner provides all the inputs, he takes 70 % and the tenant only 30%.

2) **Leasing:**

   a) ***Bartering:***

      The tenant and the owner agree on the quantity of the share beforehand, e.g. 60 kg of the wheat will go to the owner (fixed quantity instead of percentage). Payment is always in form of grain and not in cash. The tenant has to supply all the input.

   b) ***Cash system:***

      The lease is paid in cash. The amount is fixed beforehand and paid at harvest time.

In case of orchards, tenants receive a share of both the crop and the fruits. But very often the tenants receive only the crop as fodder and just a minor share of the fruit harvest.

The tenants are in many cases also forced to work for the landlords. In a village in Malam Jabba Valley for example, the tenants' wives and daughters often work in the landlords' households. They also take care of the landlords' animals, they milk the cows and produce yoghurt and butter. The men help with the field work, grass cutting and if necessary with timber logging and house construction.

The rapid population growth forces people to move higher up in the mountainous areas. REPP, G. (1990) reports of the much too high population density (150 – 200 inhabitants per km²) in the *Shiwaliks*, on the Southern

Himalayan periphery. In that area almost all of the hills are already deforested and the area faces severe ecological problems such as massive soil erosion. This scenario might repeat itself in areas like Malam Jabba Valley in the near future.

1.2.3.2 Agricultural statistics[12] and landuse in Swat valley:

In Swat District there were a total of 92 993 farms in 1995. The total farm area comprised 302 549 ha, of which 76.6 % were cultivated land. The average size of a farm was 2.49 ha (cultivated land)[13]. 72 316 ha land were under irrigation (23.9% of the total area). Irrigation was usually performed with canals (mainly private), lift pumps, wells or tubewells. Improper handling of irrigation is often the cause for waterlogging and salinity, especially in the plain areas of the valley bottom. Of the total area of 643 970 ha of Swat District only 22 % was cultivated area. Among the uncultivated land there were 2.1% culturable waste land, 33.5 % forested areas and 64.4 % not arable land.

The last decades have brought many changes in landuse in Pakistan: In the N.W.F.P. there was a constant increase of maize, wheat, onion, garlic from 1983/84 - 1994/95. Rice, barley, and potato have been reduced. Yields per ha in kg have increased for most crops. No documentation was found on the increase of vegetable and fruit production (see table 1.3). These gained importance only as late as the 70ies, after the abdication of the last Wali of Swat and the consequent changes in landownership and landuse (see 1.2.3.1). Before that it was not common to grow much else but wheat, maize and rice due to the complex land-tenure-system. In the hilly areas an additional constraint is the lack of irrigation facilities. Here most of the land is only rainfed and allows only a limited range of agricultural products. Fodder production plays an important role for the farmers in the hilly areas, as livestock is essential for their survival. The Kharif-fodder is almost exclusively maize (11 564 ha of a total area of 11 619 ha used for fodder production in summer) in Swat District, while Rab*i*-fodder is *Shaftal* (6462 ha), barley (1 400 ha) , ray (15 ha) and others (4 430 ha) of a total area of 12 307 ha.

The use of fertilisers and pesticides is a privilege of the rich farmers - both are hardly available and very expensive. The Agricultural Research Station Mingora (ARSM) operates a research program on biological control, which might offer an important alternative to conventional pesticides in the future.

In Swat Valley there are traditionally three types of landuse (FAUTZ, B., 1963):

***SCHORGERA* (= riceland, permanently flooded land)**

Double harvest is possible in the Schorgera; the Kharif crop is rice, while the Rabi crops are Shaftal on the land next to the river and wheat in the area further away from the river.

***WAT* (= periodically irrigated land)**

The Wat follows after the rice/wheat area in Swat Valley. In the sidevalleys this is the main type of land in the valley bottom. Kharif crop is mainly maize, in winter (Rabi) wheat and barely are the main crops.

***MAIRA* (= dry land)**

This term refers to the hillsides in lower and middle Swat Valley and the sidevalleys. Most of this land is in the wheat zone (600-1200 m) or the maize-wheat zone (1200-2000 m). Above 2000 m originally only maize was grown. Characteristically summer fallow was used as a pasture, mainly by Gujars.

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[12] The statistical data were taken from "Agricultural Statistics of North-West Frontier Province for 1994-95".

[13] The average value in the N.W.F.P. was 3.95 ha cultivated land per farm.

Nowadays most of the Kharif crop in Swat District is maize, followed by rice and then soybean and potato. The Rabi crops are first of all wheat, then onion, barley, rape and mustard, and several other local crops. The most promising ways of improving agricultural production in Swat District according to experts from the ARSM are:

- Off-season vegetables: Vegetable production facilities in the area fit well in market needs of the South of Pakistan.
- Introduction of improved fruit varieties.
- Crop rotations and intercropping.

Table 1.3: Vegetables and fruits cultivated in Swat District (according to "Agricultural Statistics of North-West Frontier Province for 1994-95. ").

SWAT DISTRICT (94/95)	Area (ha)	Average yield/ha in kg	SWAT DISTRICT (94/95)	Area (ha)	Average yield/ha in kg
Kharif fruits:			***Kharif vegetable:***		
Apricot	552	10167	Water melon	14	13071
Banana	3	2000	Lady Finger	87	8586
Apple	2272	5545	Tinda	37	16135
Pear	403	17643	Brinjal	115	14800
Peaches	105	10133	Pumpkin	40	9225
Plum	460	9696	Bitter gourd	30	9000
Walnut	1026	10079	Tomato	2364	11248
Almond	69	2594	Arum	7	2857
Persimmon	355	9048	Others	52	9538
Grapes	20	3150			
Rabi fruits:			***Rabi vegetable:***		
Citrus	830	7747	Turnip	260	18600
Loquat	36	5167	Carrot	12	15583
Banana	2	5000	Spinach	278	12669
Mulberry	25	3400	Tomato	412	11340
			Cauliflower	160	11394
			Cabbage	32	5250
			Peas	505	7000
			Radish	150	12273

1.2.3.3 Landuse in Malam Jabba Valley:

The landuse map in fig. 1.4 shows that most of the land is terraced. The agro-ecological zones in Malakand Division and Malam Jabba Valley are shown in fig. 1.5. Double cropping in Malam Jabba is possible up to 1800 – 1900 m. In higher altitudes only mono-cropping is practised. In the lower part of the valley (990 – 1300 m, warm temperate to temperate according to fig. 1.5) the barren hillsides dominate. They are partly afforested and partly still used as grazing area. The arable land in this area is mainly confined to the valley bottom, where rice, wheat and vegetables are grown and fruit trees are cultivated. At about 1300 m the valley bottom becomes very narrow and the valley is divided into a Northeast bound valley towards Shangla, and a Southeast bound part in the direction of Kashora. (INTEGRATED DEVELOPMENT PROJECT, 1998)

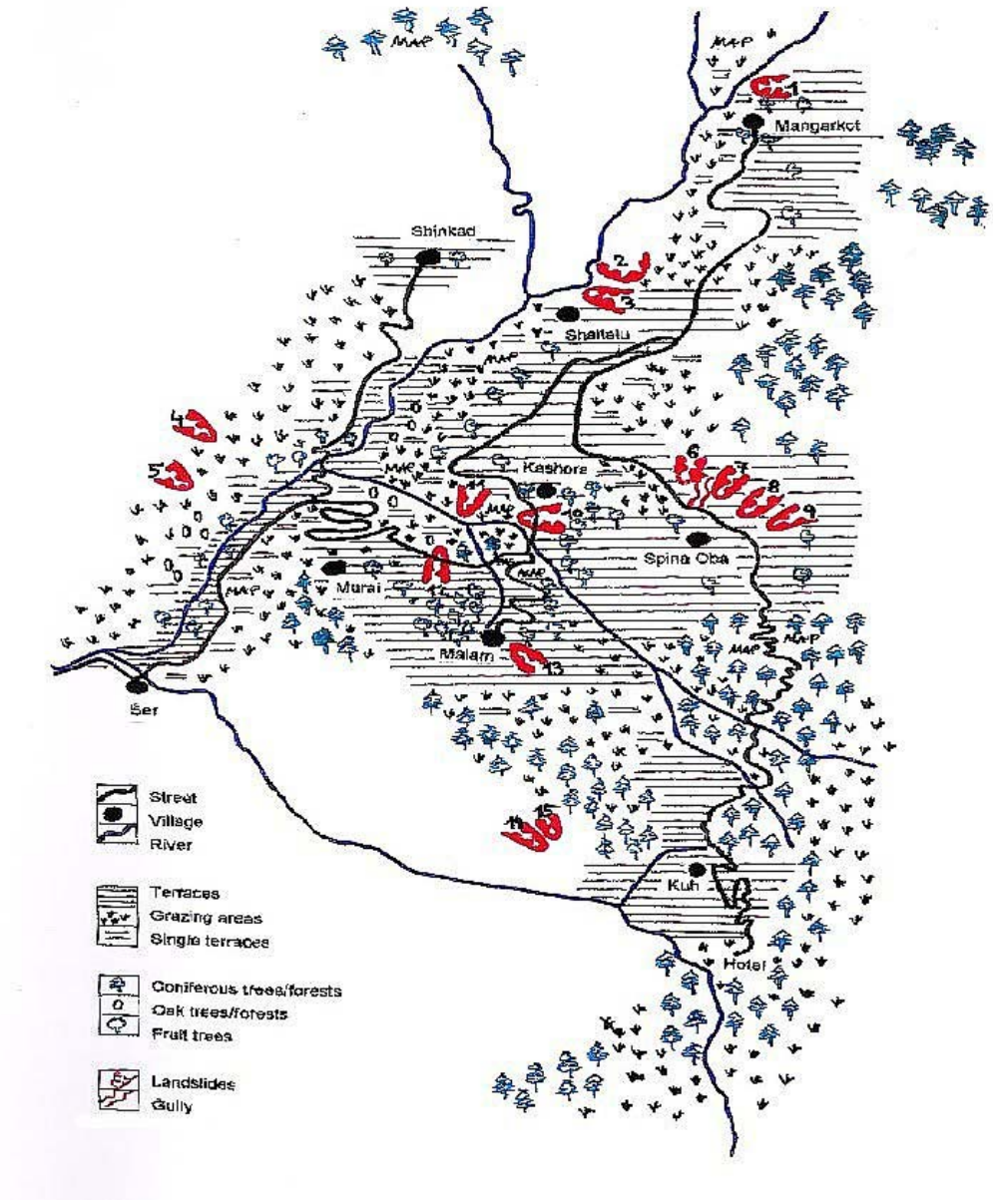
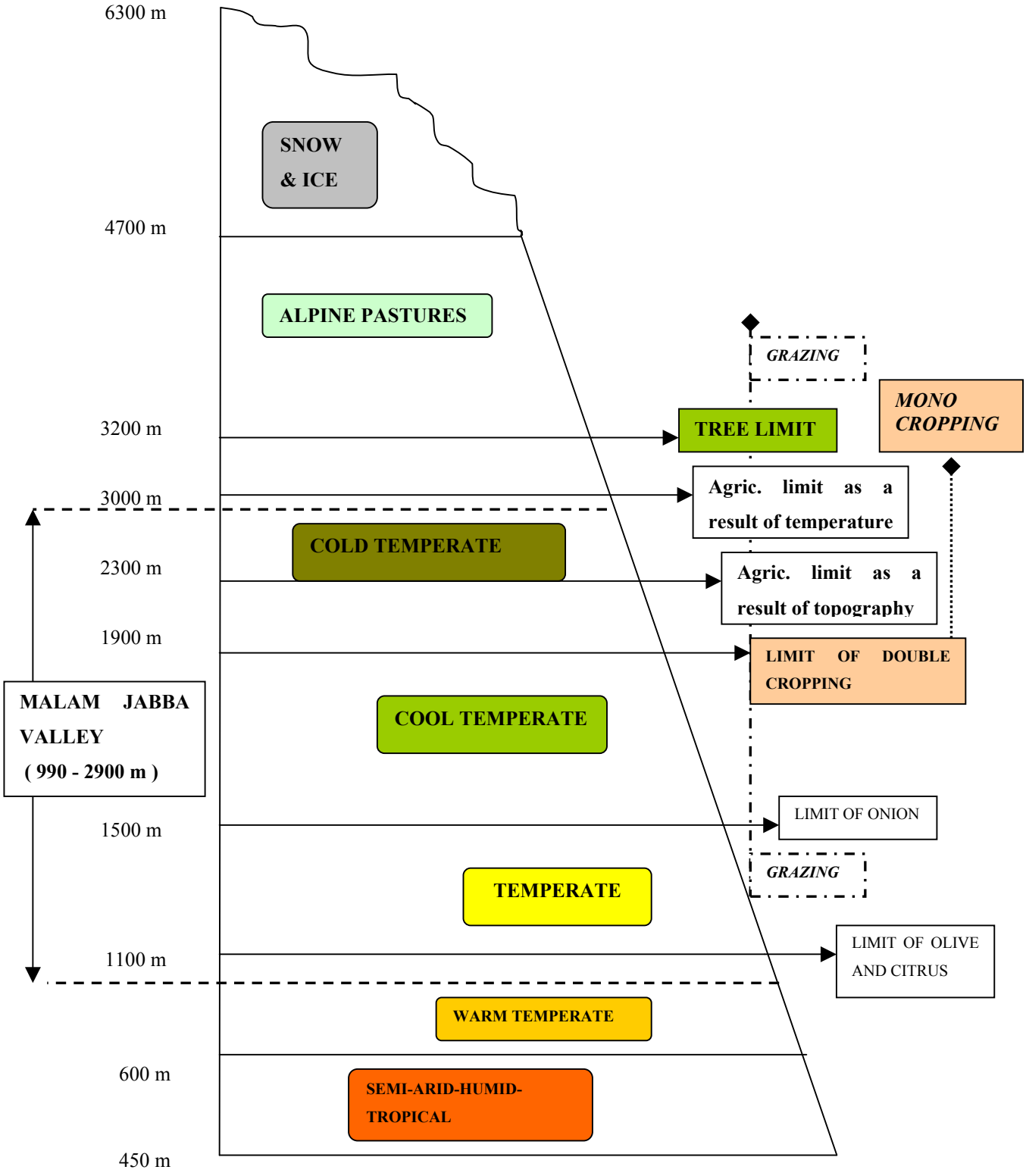


Fig. 1.4: Landuse map of Malam Jabba Valley (only MAP project area) (from INTEGRATED DEVELOPMENT PROJECT, 1998).

Fig. 1.5: The agro-ecological zones in Malakand Division (modified after PATA, 1996).



Towards Shinkad (1500 m) there are only some terraced fields on the northern slopes, but very few on the southern side where mainly barren hillsides remain (communal grazing land). The main crops in this part of the valley are wheat, and maize in the rainfed areas. Vegetable and fruit production is rare.

In the direction of Kashora (1600 m) the slopes rise steeply and there are small terraces scattered all over the hillsides. Fruit trees are scarce, only surrounding the village of Kashora are some orchards to be found. Near Kashora a road branches off to Malam (1800 m) towards the Northwest and further up the hill another road branches off to Mangarkot (1660 m) towards the Southeast. While Kashora and the villages in the direction of Mangarkot are still in the area of double cropping and thus favourable for wheat, vegetables and fruit production, Malam and all other villages further up have less favourable preconditions for such methods of landuse. The lower parts of Malam still allow double cropping but higher than 1900 m only mono cropping is possible.

The village of Spin Obo (1900 m) lies above the lower snow line and usually receives some snow in winter. In Kuh (2300 m) there is often a constant snow cover for two months. 2300 m is the first agricultural limit according to fig.1.5. In the area of Kuh, the hills are very steep and farmers grow potato and maize with very poor harvests. Massive soil erosion endangers many of the steeper denuded hills and landslides occur regularly. The natural forests that covered the hillsides have been reduced to inaccessible, rugged terrain (MALAM JABBA AFFORESTATION PROJECT. PC-I, 1998).

1.2.3.4 Livestock and pasturage

Livestock is usually kept only for domestic consumption. In Swat District there is even a lack of dairy products according to the local veterinarians. Locally produced eggs, yoghurt and milk are valued as very high quality products but are hardly found on the market. Numbers of livestock in Swat District and in particular in Malam Jabba area are listed in table 1.4 and table 1.5.

Table 1.4: The numbers of livestock in Swat District (from LIVESTOCK CENSUS REPORT, 1996).

Livestock population in Swat District	
Buffalo	100 372
Cattle	194 312
Goats	179 641
Sheep	59 713
Camels	78
Horses	2 394
Mules	1 979
Asses	13 828
Poultry	1 074 244

The Livestock Census (1996) named the most important breeds for Swat District, but the majority of the animals could not be assigned to a specific race. Among the cattle breeds most common in Swat District are *Foreign/cross Breed*, *Lohani*, *Kankraj*, *Rojhan* and *Dhanni* among the known breeds. The only breeds of sheep

named in the report were *Kaghani*, *Kooka* and *Thalli*. Also for goats *Kaghani* was mentioned, then *Teddy*, *Barbery, Beetal*, *Kamori* and *Daira dinpanna*. (LIVESTOCK CENSUS, 1996)

The main type of buffalo (*Bubalus bubalis,* Indian water buffalo) in Pakistan is the milk buffalo. It is favoured due to its milk production, but also meat production has some importance. The *Nili-Ravi* buffalo is the main known race in the North of Pakistan. Its colour is usually black, sometimes brown. On average these animals weigh 450 – 600 kg. Milk performance is on average 2000 – 2700 kg. (TER MEULEN, U. et al., 1994)

Reportedly the average milk production of a buffalo is about 4 litres/day in Malam Jabba Valley (up to 10 litres). Cattle milk production amounts to about 3 litres a day and ½ -1 litre for goats. Sheep's milk is not so popular with the locals as most people do not like its taste.

Buffalo reaches matureness later than cattle, while cows can have the first calving at the age of 3½, buffaloes have their first calving at the age of 5 years in the case of a good husbandry. This also depends very much on fodder and nutrients.
The lactation period is usually 250 days. The animals are sold to the butcher from the age of 6 months, but only the male animals. If he can afford, a farmer keeps a buffalo cow until the age of 8 years, then they are still sold to the butcher.

Table 1.5: Numbers of livestock per household and per village in the two selected villages in Malam Jabba Valley.[14]

	Average number of livestock/ household		***Total number of livestock/village*** [15]	
	MALAM	MANGARKOT	MALAM	MANGARKOT
Buffaloes	1	2	575	230
Cows	3	1	1500	115
Ox	1	1	450	95
Goat	3	1	1300	120
Sheep	1	1	430	100
Poultry	6	6	2980	700
Donkey	-	0.1	-	10
Mules	-	-	-	-
Horses	-	-	-	-

[14] The numbers were calculated on basis of the interviews with farmers.

[15] The number of animals per village was derived from the number of households and the average numbers of livestock investigated during the interviews.

Poultry keeping is widespread – in almost every household there are some hens kept for both eggs and meat. Local poultry lay around 120 eggs/year according to veterinary officers. Around the cities especially in Punjab there is also a great deal of poultry farming. In the whole Swat District around 100 000 chicken/month are produced. (according to IQBAL, J., 1998 and JABBAR, GH., 1998)

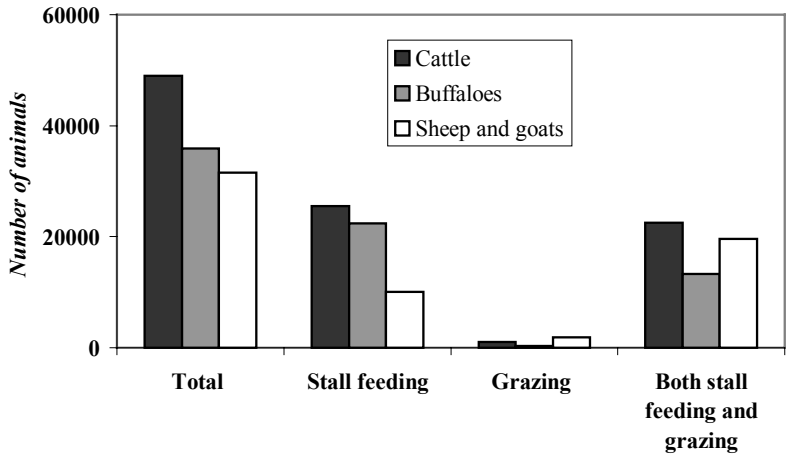


Fig. 1.6: Comparison of numbers of livestock by sources of feed in Swat District . (LIVESTOCK CENSUS,1996)

Usually in Pakistan several flocks of sheep and goats are grazed together by a hired shepherd. He may also own some sheep and goats himself. He takes the animals to graze on the road sides or to the canal banks, on stubbles after crop harvest, on barren hillsides, ...For this he usually receives a 50 % share of the income. There are also families and tribes who migrate with the flocks. (HASNAIN, H.U., 1985)
In May and June the nomads migrate through Swat Valley mainly with goats and sheep up to Upper Swat (Kalam). In October/November they migrate south again to the plains, some of them also stay here for the winter. In Malam Jabba only few nomads stay, but many cross the valley on their way back to the South.

The excessive over-use of rangelands in the area has led to many ecological problems. The barren hillsides are highly prone to massive soil erosion and more and more under protection for afforestations. The remaining forested area is also severely affected by over-grazing, and in many areas grazing is restricted to stop the process of degradation and deforestation. Often grazing areas are transformed into agricultural lands. Animal husbandry becomes more and more difficult for the people in Swat District and Malam Jabba Valley.

1.2.3.5 Veterinary organisations

In Saidu Sharif there is a Civil Veterinary Hospital where farmers can bring livestock in case they need medical treatment. The hospital employs several veterinary officers who usually also have a private office or clinic. In Malam Jabba there is one veterinary field worker stationed, the local contact person for the veterinarians and distributor of veterinary medication for the farmers. As most of the farmers in the rural areas can normally not afford the treatment, animals are sold when they are sick or unproductive. The most important diseases are blackwater disease, foot and mouth disease, worms, liver flue and mental deficiencies.

According to IQBAL, J. (1998) the major constraints in animal husbandry in the area are:

- Lack of farmer education
- Lack of knowledge concerning livestock keeping and practices: No proper vaccination, de-worming, no proper heat detection, no knowledge in artificial insemination etc.
- "Climatic" factors: Poor nutrition, poor management practices, lack of medical treatment,...

Suggestions for improvement aim at increasing efficiency in animal husbandry and at improving and introducing facilities for artificial insemination and reproductive health services.

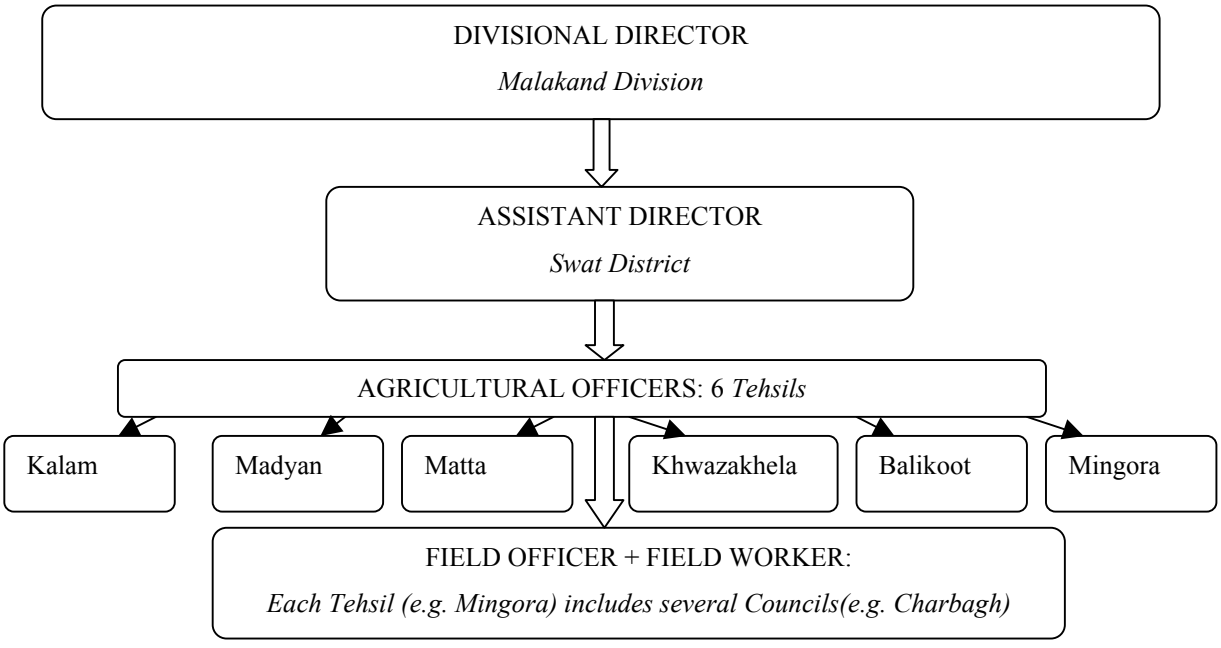
1.2.3.6 Agricultural policies and Extension services

To abolish the feudal tenancy system in Pakistan, several land reforms were carried through. Of these the biggest one was in 1959, when 952 856 ha of land were redistributed. The landreforms in 1972 and 1977 were much smaller. In total an area of 1 408 282 ha was redistributed to 288 000 beneficiaries. There is no limit to the amount of land an individual or group can cultivate under tenancy, but the maximum size for individual landholding is 116 ha in N.W.F.P. . Generally the number of farmers with small landholdings has increased, mainly due to the subdivision of holdings by inheritance and due to population growth. Also middle-size holdings have gained in numbers and area.

Land fragmentation is a serious problem. There are many reasons behind this, often there are simply no alternative opportunities for work and income. Many farmers cannot live on the farm income and off-farm labour has increased. These farmers even rent their lands out to middle and wealthy, upper class farmers. (KHAN, M.H., 1994)

The Agricultural Extension seeks contact with the farmers (see fig. 1. 7). For the field work there are local field assistants and field workers responsible. In Swat District there are 6 *Tehsils*: Mingora, Balikoot, Matta, Khwazakhela, Kalam and Madyan. The next level, the *Union Council* is a kind of self-governmental type of organisation. It includes around 3-3500 farmers each and has one field assistant and one field worker. A field assistant has to attain a two-years certificate course in the Agricultural Training Institute Peshawar.

Fig. 1.7: The administrational structure of the Agricultural Extension in Malakand Division.



The field officers are supposed to go to villages each month and give advise to solve farmers' problems. But the system does not work, there are not enough means of transport and the villages are difficult to reach. There has been a lot of co-operation with foreign sponsored projects, e.g. Kalam Integrated Development Project (KIDP), PATA, SF, ... Contact between research and extension usually functions well, but there is almost no exchange of information between research and the farmers.

The three major constraints in agriculture in the area are (according to MAULA, F.,1998):

- Non-availability of subsidised agricultural inputs
- Non-availability of interest free credit
- Farm to market road

The major problems are agricultural inputs – loans, seed, fertilisers, pesticide,...There are always problems with the availability, the products are never there when there is most need for them. In the year of the survey for example there were no fertilisers available at the time of wheat sowing. Fertilisers were imported at the start of the *Rabi*-season in Punjab, which was of course too late for the N.W.F.P. farmers. Another problem is that farmers are very badly informed; in vegetable production it is popular to grow what was in short supply the year before. For example 1997 everybody grew onion, in 1998 it was wheat, in 1999 it was onion again. In 1997 there was a widespread onion disease (Downey Mildew) that caused big losses - many farmers asked for compensations at that time, but again in 1999 the majority of the farmers planted onion. Another popular crop is tomato which is often attacked by Late Blight. In spite of their rich traditional knowledge the farmers need training concerning the newly introduced crops such as vegetables.

1.3 Environment and development in the Himalayan region

1.3.1 The Himalayan Dilemma

ECKHOLM, E. (1975) describes the "*Tragedy in Shangri-La*" as one example for the world-wide deterioration of mountain environments: From the Himalayas flow the major rivers of the Indian subcontinent (Indus, Ganges, Brahmaputra), thus representing the basis of life in the lowlands adjacent to Himalayan mountainous areas. Population growth in the 20th century has lead to a "*downward spiral of environmental degradation under the condition of a high population density in the Himalayan region*" (BANDYOPADHYAY, J.,1993).

Over-population forces the farmers to move higher to cultivate land. Either former grazing areas are turned into arable land, or forests are cleared. The slopes are ever steeper and in fact *".....unfit for sustained farming even with the astonishingly elaborate terracing practised there*" (ECKHOLM, E., 1975). The increasing fuelwood demand[16], the need for timber for house constructions etc. leads to a further advance in deforestation. After some time the hills surrounding the new settlements in the mountains are denuded and the trees disappear.

The consequent lack of fuelwood forces the villagers to use dung as fuel, which was previously applied as manure in the fields (ECKHOLM, E., 1975). More people also means more livestock, but herd sizes have not grown as rapidly as the cultivated land. Soil fertility cannot be preserved any longer, and the already existing

[16] 0.2 m³ was needed per capita in Pakistan in 1988-89 (ASIT K. BISWAS,1992).

fodder shortage gets worse. Grazing areas are extended into the forest and on former arable land. This hinders natural regeneration and contributes to the advance of soil erosion. Landslides occur frequently thus destroying life and land. The soil that is washed down the hills ends up in big rivers that carry a heavy silt load to the lowlands. The two major environmental and economic problems evolving from this are according to ASIT K. BISWAS (1992):

(1) A reduction in the designed lives of the reservoirs due to higher than expected rates of siltation and

(2) siltation of the river channels and deltas which may make navigation difficult and hazardous.

He further explains that *"...the two most important reservoirs in Pakistan, Mangla and Tarabela, are losing their storage capacities at annual rates of 48.27 and 167.75 million m³ respectively.*" Consequently there is limited possibility of expanding hydroelectric power at a larger scale in Pakistan.

Similar phenomena were documented by IVES, J.D. and MESSERLI, B. (1989): They were among the first to discuss specific mountain characteristics. How complex the interactions in mountains ecosystems are, is described in "The Himalayan Dilemma":

"In any mountain subsistence-agricultural system, the demands on the forest are numerous and fairly self-evident: fuelwood, undoubtedly, and construction timber, house shingles, timber for house and farm utensils, and, of no less importance to the villages, fodder, thatch, and animal bedding. To these must be added medicinal herbs, nuts, fruits, mushrooms, and a host of secondary products such as the use of Daphne spp. (Nepalese: lokta) and Quercus semecarpifolia for the ash and fuel respectively, for paper making in Nepal. These demands on the forest area augmented by the requirements for charcoal, commercial firewood for sale in the cities and towns, and large commercial construction timber."

They criticise, that often cause and effect have been confused within the context of the Himalayan problem. The best intentions are no good if the wrong "cause" is treated. Numerous projects financing solar energy devices, metal and ceramic wood-burning stoves, hydroelectricity projects, and wind generators are excellent evidence, aimed only at providing alternative energy sources to save the remaining forests. According to them it is above all the fuelwood depredation that has caught the attention of the international community – *"...the wrong problem (perceived or real, depending on the definition) has received undue priority*.". (IVES, J.D. and MESSERLI, B., 1989)

Fuelwood shortage is thus an inevitable consequence of the pressing of the subsistent mountain farmers for more agricultural land for production of food for every day life.

1.3.2 Impact of Modernisation on Pakistan's Hindukush-Himalaya

The forest depredations in the Himalayan foothills took place as early as the last century. Another phase of severe deforestation was after partition in 1947 when refugees from India settled in the area. The populations of the Central and Eastern Hindukush were originally small, much differing in language, ethnicity, religion and social organisation until the 1960ies. They were engaged in sedentary agriculture, agropastoralism, transhumance and nomadism (see fig. 1.8). But foreign aid pouring into Afghanistan and Pakistan and political changes within the countries changed the situation rapidly and life changed almost overnight. (ALLAN, N. J. R., 1984a)

As ALLAN, N.J.R. (1984a) wrote, "*Mountain villages moved from the fifteenth to the twentieth centuries in less than a tenth of the time it took Northern European nations to reach a similar level of polity and technology.*"

The influx of refugees from Afghanistan into Pakistan as a consequence of the war (Soviet occupation of Afghanistan in 1979) had a deep impact on the N.W.F.P.: 3.5 Mio people fled to Pakistan within a few years. These people originated from sparsely vegetated arid land, but were settled into forested areas. The consequence was, besides fundamental changes of society, extensive environmental damage, most of it irreversible. (compare ALLAN, N.J.R., 1987b)

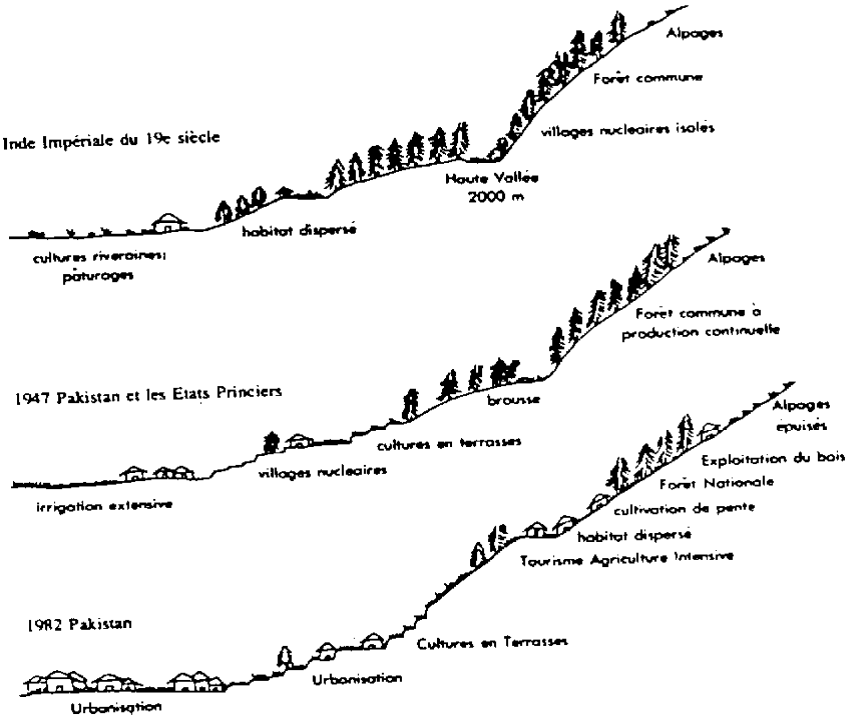


Fig. 1.8: Evolution of agricultural landuse in the mountains of Northern Pakistan (from ALLAN, N.J.R., 1986).

According to ALLAN, N.J.R. (1984b) the surplus of Western donated food such as wheat gave farmers the opportunity to grow higher-value crops and to develop crop rotations at that time. In the areas of Northern Pakistan, influenced by the influx of refugees, growing patterns changed: In the watered areas vegetables were added to the summer-season Kharif crop and potato to the Rabi crops. Intercropping of vegetables, crops and fruit trees were introduced in areas like Swat Valley (see 1.4.3). In high mountainous areas such as Kalam and Kaghan seed potatoes were produced for the lowland areas. ALLAN, N.J.R. (1987a) describes the changing landuse patterns of Kalam, where the agropastoral system existed as a static system for centuries until it was changed through the construction of a road for motorised travel to Kalam in 1965. The next strong impact took place in 1969, when Swat became a part of Pakistan and the former anarchic social system of the Kohistan society was changed and exposed to administration, and agricultural and forestry field extension officers. The main consequences were the depletion of former communal property and deforestation, the step from subsistence farming to cash cropping, changes in pasture strategies, in labour scheduling and mobilisation and finally of the

whole society. Additionally the area has become accessible to tourism marketing which has become characteristic for Upper Swat, but detrimental for the local society. Profiteers are the hotel industries from the lowlands.

"*Esther Boserup suggests that more intensive technologies of agricultural production leading to land intensification are the product of population pressure on limited resources. The absorption of massive supply of labour and capital inputs available from the Afghan refugees indicates that in the foothills of North Pakistan there is an elasticity of response which has permitted a rapid increase in agricultural production."* (ALLAN, N.J.R. , 1984b)

In the meantime it has become questionable whether the Boserup model still applies, or if the carrying capacity of this area is already reached through population pressure and intensification of landuse.

1.4 Agroforestry in mountainous areas

1.4.1 Definition of Agroforestry

Agroforestry is often identified with the term *Taungya*, a Burmese term of hill cultivation[17]. According to SHINYA, T. (in: JORDAN, C.F. et al., 1992) there is much evidence of earlier use of such systems. *Taungya* is in spite of many parallels a system of its own and not identical with typical agroforestry systems.

ALTIERI, M. A. and FARREL, J.G. (in ALTIERI, M. A., 1995) define agroforestry as *"...the generic name used to describe an old and widely practiced land use system in which trees are combined spatially and/ or temporally with agricultural crops and/or animals. It combines elements of agriculture with elements of forestry in sustainable production systems on the same piece of land."* According to them the maybe most widely accepted definition was put up by the International Council for Research in Agroforestry (1982):

"*Agroforestry denotes a sustainable land and crop management system that strives to increase yields on a continuing basis by combining the production of woody forestry crops (including fruit and other tree crops) with arable or field crops and/or animals simultaneously or sequentially on the same unit of land, and applying management practices that are compatible with the cultural practices of the local population."*

NAIR, P.K.R. (in JARRIS, P. G. et al., 1991) explained that according to a global inventory (1982 – 1987) *"...the existence or adoption of an agroforestry system in a given area is determined primarily by the ecological potential of the area, but the socio-economic factors determine the complexity of the system and the degree of intensity of its management."* Important aspects of agroforestry are its suitability to marginal areas and low – input systems (ALTIERI, M. A. and FARREL, J.G. in ALTIERI, M. A., 1995). This makes agroforestry systems particularly attractive for mountainous areas. It is a compromise between extensive landuse, as it would be possible with low population pressure, and intensive landuse, which has become a necessity under the current demographic conditions (DENHOLM, J., 1991) of very high population densities, as is the case in the mountainous areas of Pakistan.

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[17] "*Taung"* means hill, and "*ya"* means cultivation as practised in the hills of Burma (SHINYA T. in: JORDAN, C.F. et al. 1992). According to EVANS, J. (1982) *Taungya* originated in Burma in the mid-1800s.

1.4.2 Agroforestry systems

ALTIERI, M. A. and FARREL, J.G. (in ALTIERI, M. A., 1995) group agroforestry systems as follows:

- Agrisilviculture systems: Concurrent or sequential production of agricultural crops and forest crops.
- Silvo-pastoral systems: Forests are used for the production of wood, food and fodder, as well as for the rearing of domestic animals.
- Agro-silvo-pastoral systems: Landuse for concurrent production of agricultural and forest crops and for rearing of domestic animals.
- Multipurpose forest tree production systems: Forest tree species are regenerated and managed not for wood production only, but also for foliage and fruits for food/fodder.

Apart from these main types of agroforestry systems there are numerous other, more specific types (compare NAIR, P.K.R. in: JARRIS, P. G. et al., 1991).

In the Hindu-Kush-Himalayan (HKH) Region the most common agroforestrial landuse practises are the agro-silvo-pastoral systems. They combine both perennial and annual crops with animals or pasture. (DENHOLM, J., 1991)

The role of the forest in these systems is determined by the following aspects (DENHOLM, J., 1991):

- The most significant strategy for maintaining soil fertility is through the transfer of nutrients from forests and grazing lands via livestock. Biomass in form of grass and leaves is recycled in this way to produce manure for the fields.
- Besides from tree and grass fodder, forests supply timber and fuel. In remote areas there is no substitute available for fuel, and in some areas people even depend on the herbal medicines from the forest to cure illness.
- Particularly farmers with small landholdings rely on the existence of Common Property Resources (CPR's) of forests and grazing lands. There are regulations at communal level to control the use of these CPR's to prevent over-use and exploitations through individuals or the whole community. As mentioned by FOX, J. (1993), *„...common-property-systems are not free-for-alls*." There are usually ownership arrangements in such communities, and resource degradation often originates in the destruction of local-level institutional arrangements (FOX, J. , 1993).
- Through diversification in production existential risks of losses are weakened – the basis food supplies are usually secured. Animals and/or products can still be sold for cash and through the mobility of livestock the farmers are not entirely tied to local conditions.

The current conditions in the HKH have destroyed the balance in these traditional systems. The increasing influence of state authorities and the consequent abolishment of local resource management rules have taken place hand in hand with rapid population growth and uncontrolled settlement in mountainous areas: Increased intensity of landuse is required, but on the other hand destructive for fragile mountain ecosystems.

1.4.3 Strategies in agroforestrial landuse in Swat Valley

In Middle Swat Valley agroforestry is common practice: Particularly in the Wat area there are often fruit trees in intercropping with wheat, rape seed and mustard. The most common fruit trees are apricot, persimmon, apple, pear (*Tongu*), peaches and plum. The main area for this type of agroforestry is from Mingora/Sangota to

Charbagh. On the other side of the river (Matta, Shakardarra) there are also fruit trees, but there is less intercropping and more pasturage.

The trees are usually planted about three to five metres apart. Most of the trees are usually between four and eight metres high. For the major part these orchards were planted 10-15 years ago. In the older orchards the crown density is rather high - still Rabi crops grow rather well. This is due to the fact that the most productive period for the trees is already over at the time when Rabi crops are sown (Oct./Nov). Rabi crops start their growing period after the leaves have fallen and are harvested before the most productive period of the trees starts (May/June). Once the trees are too old, they are gradually replaced with young saplings. The orchards are usually protected from grazing through thorny hedgerows or even barbed wires. Sometimes the land is also used as pasture.

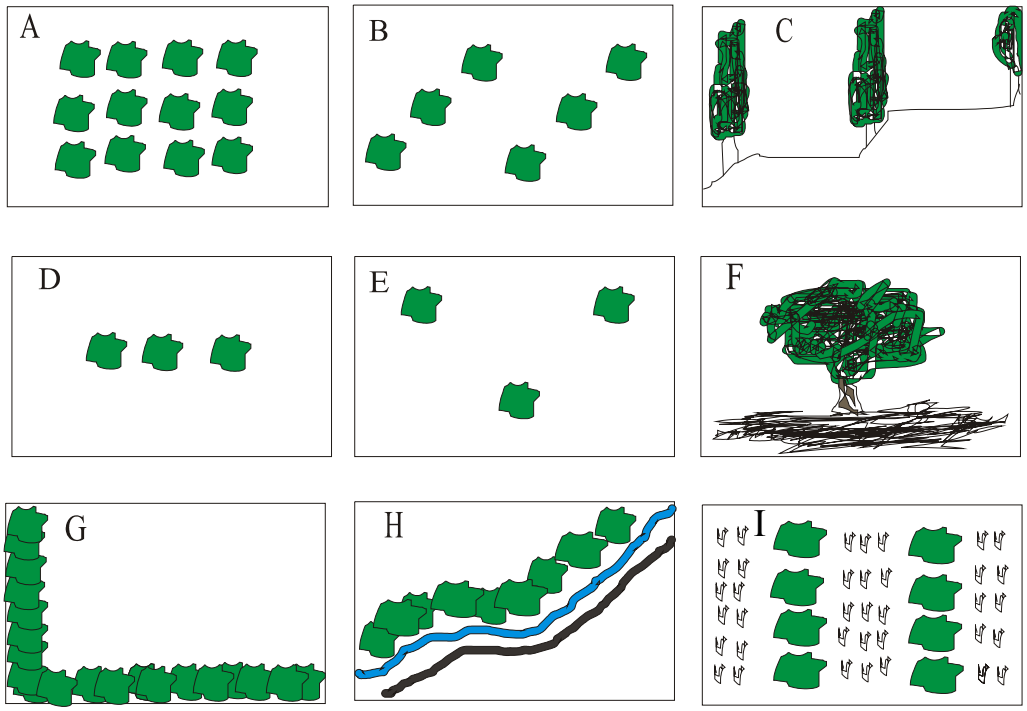


Fig. 1.9. Different agroforestrial systems in Swat Valley (A= intercropping; B, C= plantations on field boundaries; D= Line planting; E= Scattered planting; F = Single tree planted on field; G, H= Hedgerow planting; I= Alley cropping) .

The most common ways of agroforestrial landuse are as follows (see also fig. 1.9):

1. **Intercropping:** Fruit trees are planted in lines/rows with 3-5/3-5 m clearance; crops like wheat form the undergrowth; these fields are mostly irrigated. (see fig. 1.9, A)
2. **Plantations on boundaries:** Fruit trees are also planted on boundaries in rows with 3-5 m clearance; this is mostly the case on terraced ground, as there are usually large banks in-between the terraces. (see fig. 1.9, B,C)

3. **Scattered planting:** Sometimes there are trees scattered around fields, either planted intentionally or naturally growing. In the undergrowth there are crops such as wheat. These fields are often used for grazing after harvest. (see fig. 1.9, E)
4. **Line planting:** There is only one line of trees planted per field, the rest of the field is used for crops only. (see fig. 1.9, D)
5. **Hedgerow planting:** The trees used for hedgerows or alleys are normally not fruit trees but fast-growing trees and so called multipurpose trees (MPTS). The most common species in the area are *Populus sp*, *Ailanthus ailanthissima*, *Robinia pseudoacacia* and *Melia azedarach*; *Alnus sp.* and *Salix sp.* occur mainly along watercourses, together with other mentioned species. *Platanus orientalis* occurs only seldom, and preferably near villages. *Populus sp.* is also planted along the roadside with *A. ailanthissima* and *R. pseudoacacia*.

   Such hedgerows mark the field boundaries, especially with reference to different ownership. Also along footpaths and along irrigation channels there are trees planted in rows or growing naturally. (see fig. 1.9, G,H)
6. **Alley cropping:** Fruit trees are grown in regular rows, but crops are only grown in-between the rows not within them . (see fig. 1.9, I)

1.4.4 Agroforestry in Malam Jabba:

In Malam Jabba Valley various ways of agroforestrial landuse are common:

Silvo-pastoral systems:

The traditionally most important systems are the silvo-pastoral systems. Timber, fuelwood, material for thatches of houses, needles and leaves for animal bedding and fodder, torchwood, resin (from *P. roxburghii* only), etc. are taken from the trees. The animals are brought to graze in the forests and on the steeper slopes grass is cut and stored for the winter. In some areas mushrooms and medicinal plants are collected.

Agrisilviculture systems:

As a consequence of the high need for fuelwood and timber many farmers have started to plant trees themselves on field boundaries and in particular on the banks of terraces. Especially near the houses there are often fast growing trees planted such as *A. ailanthissima*, and *R. pseudoacacia*. Other popular trees are walnut, fig and mulberry. (see photograph 1.1)

Agrihorticulture systems:

Some landowners with bigger landholdings have recently enhanced these ways of landuse. The fruit trees are mainly apple, pear and persimmon. In the undergrowth there are either common crops such as wheat and maize, and occasionally vegetables (tomatoes). (see photograph 1.2)

Photograph 1.1: *Ailanthus altissima* on a field boundary in Malam as an example for agrisilviculture landuse.

Photograph 1.2: Agrihorticulture landuse near Mangarkot: Apple trees in a field after tomato harvest and before wheat sowing (double-cropping).

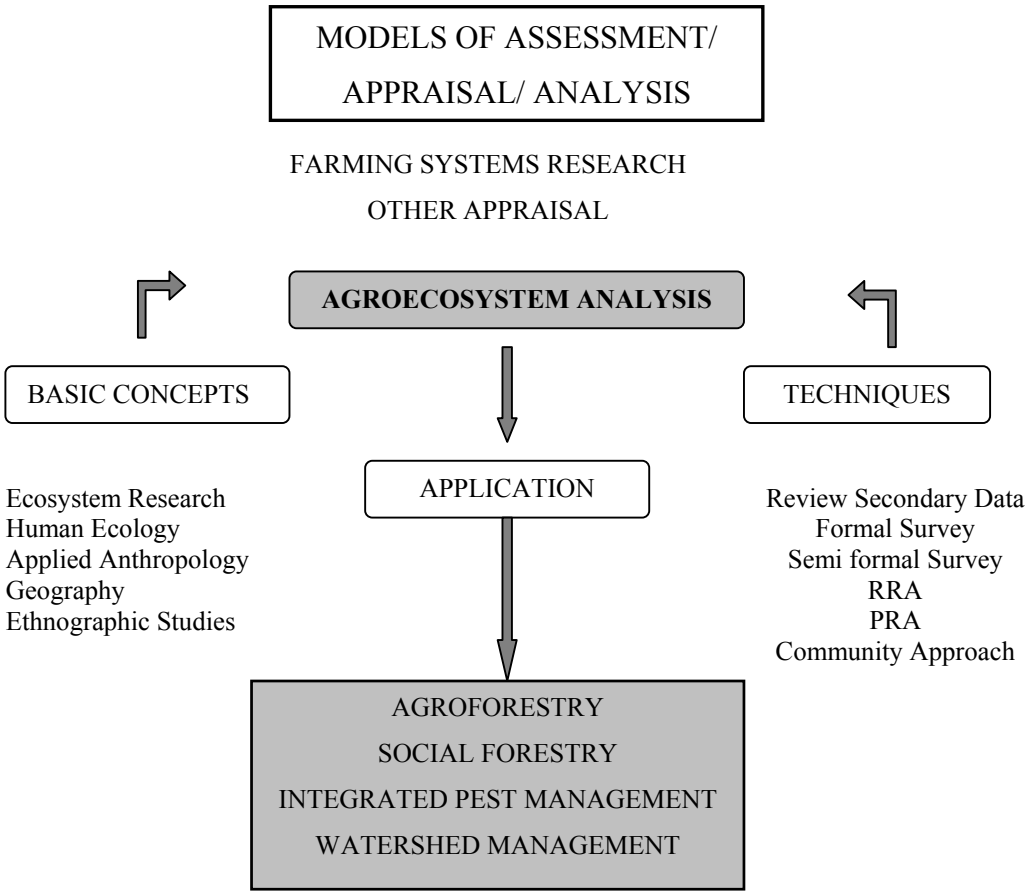
1.5 Agroforestry and participation

1.5.1 Participatory methods and tools for agroforestry applications: Theoretical background of participation in agroforestry

During the last decades the attitude and methods in research and planning have shifted towards a more people-oriented approach. The institutionalisation and centralisation of the typical top-down development strategies have lead to failure and frustration, above all among the concerned local populations. Participation means empowerment of the people – bottom-up replaces top-down, local diversity and rural people's knowledge are key factors in this type of analysis.

DJOGO, A.P.Y., et al. (1994) explain the development of methodology in agroforestry assessments: The introduction of Farming Systems Research (FSR) in the early 1970ies was the starting point of a more participatory and people-oriented approach.

Fig. 1. 10: Combination of Agroecosystem Analysis with other methods and tools (from DJOGO, A.P.Y., et al., 1994).



Agroecosystem analysis (AEA) was developed in Thailand from 1978 onwards by Gordon Conway and his colleagues and at first spread through South Asia. In agroecosystem analysis the following methods are generally applied: (CHAMBERS, R., 1992)

- Transects: Systematic walks and observation.
- Informal mapping: Sketch maps drawn on site.
- Diagramming: Seasonal calendars, flow and causal diagrams, bar charts, Venn or "chapati" diagrams.
- Innovation assessment: Scoring and ranking in different actions.

Multidisciplinary teams incorporating social scientists should help to transfer knowledge and technology from research to farmers.

As CHAMBERS, R. (1992) points out, "*The move here is away from extractive survey questionnaires and towards participatory appraisal and analysis in which more and more the activities previously appropriated by outsiders are instead carried out by local rural or urban people themselves*." CHAMBERS, R. (1992) also explains the development from RRA to PRA: RRA evolved in the 1970s as a consequence of dissatisfaction with the biases of rural development tourism, meaning the brief visits of urban-based experts in rural areas that often failed to detect poverty and deprivation. Another reason was disillusion with the questionnaire surveys, that were usually inaccurate and unreliable, taking a very long time to evaluate and failed to serve the purpose in the end. But RRA is also a more cost-effective alternative to conventional methods. In the 1980s participation started to become a familiar term in rural appraisal. While RRA means learning by outsiders, PRA enables local people to analyse themselves and to plan and even take action. The differences between the two approaches are pointed out in table 1.6, but in reality both RRA and PRA usually work hand in hand.

Table 1.6: RRA and PRA compared (according to CHAMBERS, R., 1994a).

	RRA	***PRA***
Period of major development	Late 1970s, 1980s	Late 1980s, 1990s
Major innovators based in	Universities	NGOs
Main users at first	Aid agencies	NGOs
	Universities	
Key resource earlier undervalued	Local people's knowledge	Local people's analytical capabilities
Main innovations	Methods	Behaviour
	Team management	Experiential training
Predominant role	Elicitive, Extractive	Facilitating, Participatory
Ideal objectives	Learning by outsiders	Empowerment of local people
Longer term outcomes	Plans, projects publications	Sustainable local action and institutions

Participatory surveys should also include the use of secondary sources such as reports and maps of the area. It can also be helpful to include decision-makers and officials in the survey, though local people's experience and knowledge is certainly the most reliable source. The influence of personal behaviour and attitudes should not be under-estimated – certain information can be passed on through ways of dressing, talking and moving, which

may be decisive for the success of the analysis particularly in rural areas. In spite of a whole range of helpful manuals and introductions to PRA and RRA methodology for agroforestry-related assessments (compare e.g. McCRACKEN, J. et al., "An Introduction to Rapid Rural Appraisal for Agricultural Development", and a manual issued from the Royal Government of Buthan, "RRA for Community Forestry Site Selection – Social Forestry Field Manual No 1. 1996.") it is still highly recommendable to rely on ones own judgement in choosing methods. A method is only as good as its user, therefore the user has to feel comfortable with what he/she is doing.

1.5.2 Integrating farmers in development

1.5.2.1 Participatory approach

The principles of PRA are methods, behaviour, attitudes and sharing (CHAMBERS, R., 1992). It is important not to remove information and store it in an archive, without returning anything to the concerned people. Otherwise frustration spreads and only reproaches remain of former enthusiasm and "participation":

"It is good that you have come to hear about our problems. But so many people have come, but nothing has come back to us, nothing has changed...." (local farmer in Malam Jabba Valley).

Often things are not what they seem to be at first glance – cultural and religious differences make it difficult for outsiders to fully understand the situation of the farmers. It is not fair to blame the farmers for a lack of initiative of their own, in particular if there is no support from a community organisation or any functioning extension service. GILMOUR, D.A. et al. (1987) state, "*Where people cannot solve their problems it is often because of external conditions such as economic or political factors ...".*

Participatory analysis enables the farmers to express their ideas and to discuss new ways of farming. They should be the ones to chose the key issues, and to decide on the future development of their land. Agroforestry e.g. is not a new technique for most of the farmers and there are often many reasons for why it is not practised to a higher extent in a particular area. Participation empowers farmers to decide themselves what is best for their land, in most cases they know better than urban-based experts. In spite of all assistance it is finally up to the local people to develop communal organisations to enable the implication of new strategies and facilities, such as nurseries and irrigation systems, that require a fully accepted, socially supportable administrational scheme on a communal level. Afforestations cannot be successful without the full support of the local population, no barbed wire could ever replace an effective "*social fence*" to protect newly planted trees.

1.5.2.2 Social forestry

The background of Social Forestry is "*....the realisation that villagers are the owners and/or users of the land. They are responsible for and take decisions on the management of the land*."(VAN DEN HOEK, A. et al., 1994) Local people should thus be actively involved in management of natural resources and they should sustain the local systems themselves for their own benefit.

In Malakand Division there is a Dutch sponsored Social Forestry Project operating since 1988. After ten years it was supposed to be continued through a Non-governmental Organisation (NGO). The project has been introducing Village Development Committees (VDCs) and was operating mainly with communal land. In each co-operating village a Village Land Use Plan (VLUP) is developed together with all concerned user groups. The

project area comprises Malakand and Dir. Plants were initially distributed free of charge, but in 1998 a fee was introduced to establish a feeling of responsibility. Plants will still be given free to VDCs, but private farmers will be charged. (HERING, H., 1998)

Investigations carried out during the project on the use and importance of trees for farmers showed significant gender differences: Men and women prefer normally the same species, but they mention the trees in different orders according to their different tasks. As collection of fuelwood and fodder is mainly women work, they are more interested in species like Mulberry (*Morus nigra, Morus alba*) and Dodonea (*Dodonea viscosa*), while men are responsible for the provision of timber, thus preferring trees like Chir Pine (*Pinus roxburghii*) and Walnut (*Iuglans regia*). Women prefer tree species that produce fuelwood, fodder and fruit. (JOKY, F. and HERING, H., 1996)

1.5.2.3 Forest policies in the N.W.F.P.

The forested area of Pakistan has decreased from 14 % to 5 % during the last 75 years (LÄNDERPROFIL PAKISTAN, 1998). Deforestation in the N.W.F.P. is advancing at a very high speed: In the last 30 years there was a decrease of 80 % - this tendency will slow down in the coming years, but in areas like Malam Jabba Valley there will be hardly any forest left around 2010-2015 (ARCHER, G. ,1998).

From 1982 to 1994 the forested area in N.W.F.P. has however increased from 869 132 to 1 336 271 ha according to government statistics. 33.5 % of the forested area of the N.W.F.P. in 1994/95 was in Swat District. (Agricultural Statistics of North-West Frontier Province for 1994-95.)

There are some efforts by the government together with foreign sponsored projects to stop this tendency. The more relevant projects for Malam Jabba Valley are listed below:

Forest Management Centre (FMC)

The FMC has its headquarters in Peshawar. It is a co-operation between the N.W.F.P. Forest Department and the Interco-operation Switzerland. A survey on the remaining forested areas is currently carried through, also in parts of Swat District. The aim is to investigate the forested area of the province and to determine the further use of it. The survey covers availability of natural resources, but also social aspects and provides a broad variety of data on the area, that will be very useful for future planning.

Malam Jabba Afforestation Project (MAP)

The MAP is based on an agreement between the Government of N.W.F.P. and the Autonomous Province of Bolzano/Bozen Italy. The project is implemented by the Austrian Consultant Bureau Falch.

The implementation started in 1996/97. Two nurseries are operating in the valley to provide the villages with plants for afforestations in former forested areas, that were often transformed into grazing land. The barren hillsides of the valley will be afforested to stop erosion and to regain the valley's former scenic beauty for touristic purposes. The latter was initiated in the 1960ies to 80ies when a hotel and skiing lift were built in Kuza Jabba, now at the end of the road leading up to the higher areas of Malam Jabba Valley. The initiative for this co-operation between the Austrian and the Pakistani government goes back to an Austrian Ambassador to Pakistan in the 60ies and aimed to found an Asian World Ski-centre in this poor and remote area of Pakistan. The hotel and the lift were opened to the public only in 1998.

Many positive and negative side effects of this project have influenced life and development in Malam Jabba Valley. The MAP is generally seen as a positive attempt and most of the people recognise the benefits of the

project for their communities, although a broader and more integrated approach for the project that is yet to come but already planned is demanded by the local people.

Project for Horticultural Promotion (PHP)

This project was started as Malakand Fruit and Vegetable Development Project (MFVDP) in 1990 and extended to the whole province in 1997/98. The project is a Swiss/Pakistani co-operation. The focus of the project is on improvement of seed quality, provision of appropriate fruit trees in nurseries (rootstock improvement, introduction of new varieties,...), biological control and assistance in product marketing. There are also programs designed particularly for women. A farmer who decides to work for the project receives not only a lease for his fields but also payment for the labour invested in the fields. This marks the change from traditional home subsistence to cash economy. The products all go to the ARSM. Traditionally the farmers exchanged seeds among themselves, some were renowned for their high quality seeds. The establishment of an organised seed production in the area is targeted by the ARSM. For fruit trees the situation is similar. With better varieties the trees will be carrying fruits much earlier and there will be less occurrence of diseases. (MORRIS, K.,1998)

In Malam Jabba Valley there is a Pilot Application Centre which was not in operation in 1998. The MFVDP is widely known in the valley but not seen as a facility to improve farmer's situation. The farmers complain that there is no direct contact and that they do not benefit from the project. An attempted co-operation with MAP, that plans to incorporate a horticultural component, could not be agreed upon due to the differing interests and policies of the two projects.

1.5.2.4 Forest rights in the N.W.F.P.

Nowadays most of the forested area is under the jurisdiction of the Chief Forest Conservator of the N.W.F.P. , but villages in and around forests used to have certain CPR's in the forest, which they still depend upon: They are allowed to obtain forage, twigs and trees for construction of houses (and mosques), marriage timber for a new house after marriage, grave timber, fuelwood, and food products.

The forest is destroyed mainly through felling and burning for creation of agricultural land to be planted with wheat and maize. Excessive lopping for fuelwood and tapping of trees for resin to be sold on the market also reduces the number of trees. Many trees are debarked to chest height to kill them for later use for house construction, as it is forbidden to log a healthy, living tree but nothing objects to logging and using a dead tree. Many unscrupulous Pakistanis have also gained large profits from the sale of illegal timber in the down-country market. (compare ALLAN, N. J. R., 1987b and 3.1.3.7, 3.2.10.7)

In Malam Jabba the situation is similar – people debark trees to weaken them, they sometimes gain torchwood from living trees, and set fire to the trees and stumps to kill them. The situation in the valley is even more critical than elsewhere due to a ban on forest usage within a radius of 8 miles around the hotel in Kuza Jabba. The road, that was originally constructed for the skiing tourists, now serves as an efficient transport route for this illegal timber trade and has therefore enabled deforestation even in the higher areas of the valley. As the locals feel that this forested area is no longer theirs, they do not feel responsible for it and have no interest in sustaining it. The

original structures of self-organisation and self-rule[18] that existed formerly have dissolved and a lawless, mostly unorganised village structure does not guarantee any control on a reasonable use of natural resources.

According to ZADA, A. (1998) there are three types of forest ownership in Pakistan:

(1) Protected forest: The forest is owned by the government, but the community can use the forest and is entitled to a share of the timber sale.
(2) Reserve forest: All the profits go to the government, the communities cannot make claims any longer.
(3) Private forest: .The communities have all the CPR's. This is a very rare case and applies only to about 6% of the forests.

Due to feudalistic system in the Wali period (compare [18]) when the powerful village Malik made all important decisions for the villagers the people are still not accustomed to the democratic idea of their own decision making on village issues. The introduction of self-organisational structures like a VDC is not an easy task, though welcomed by the majority of the villagers.

1.5.2.5 New forest policies for Malam Jabba

According to ZADA, A. (1998) the most important trees in the valley for afforestations are fruit trees i.e. walnut, pear, persimmon, peaches, apricot and multipurpose fast-growing trees like *R. pseudoacacia, A. ailanthissima*, *Populus sp., Alnus sp*.. Indigenous species such as Blue Pine, oak, olive etc. should also be included in afforestations.

According to officials working for the Forest Department most local people are involved in illegal wood cutting, although they admit that most of it is for domestic use i.e. fuelwood or timber. ZADA, A. (1998) describes in one sentence the dilemma and conflict of the farmers in the valley:
"*The local farmers have an excellent indigenous knowledge and experience and the only things they need are initiative and confidence to accept changes."*

The three major constraints in forestry in the area are according to ZADA, A. (1998):

- Landownership disputes
- Very high population growth rate and low literacy rate
- Very weak infrastructure pertaining to basic needs

According to HAIDER KHAN, A. (1998) the conservation of forest itself is a major constraint in Malam Jabba. It is difficult to get people involved in protection and the institutions do not keep the law themselves. He names involvement of people in planning and utilisation of their natural resources as a very important objective, as well as distribution of benefits and the demarcation of the natural forest from forest land/farm land. This demarcation should be mutually agreed upon.

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[18] At the time before its merger into the state (1969) each village in Swat had a *Malik*, and a Jirga, where the villages elders would gather and decide on communal issues (see 1.2.2.2). For the administration and distribution of water, timber and other valuable resources there were responsible elders to concede the rights for use according to the respective schedules and systems.

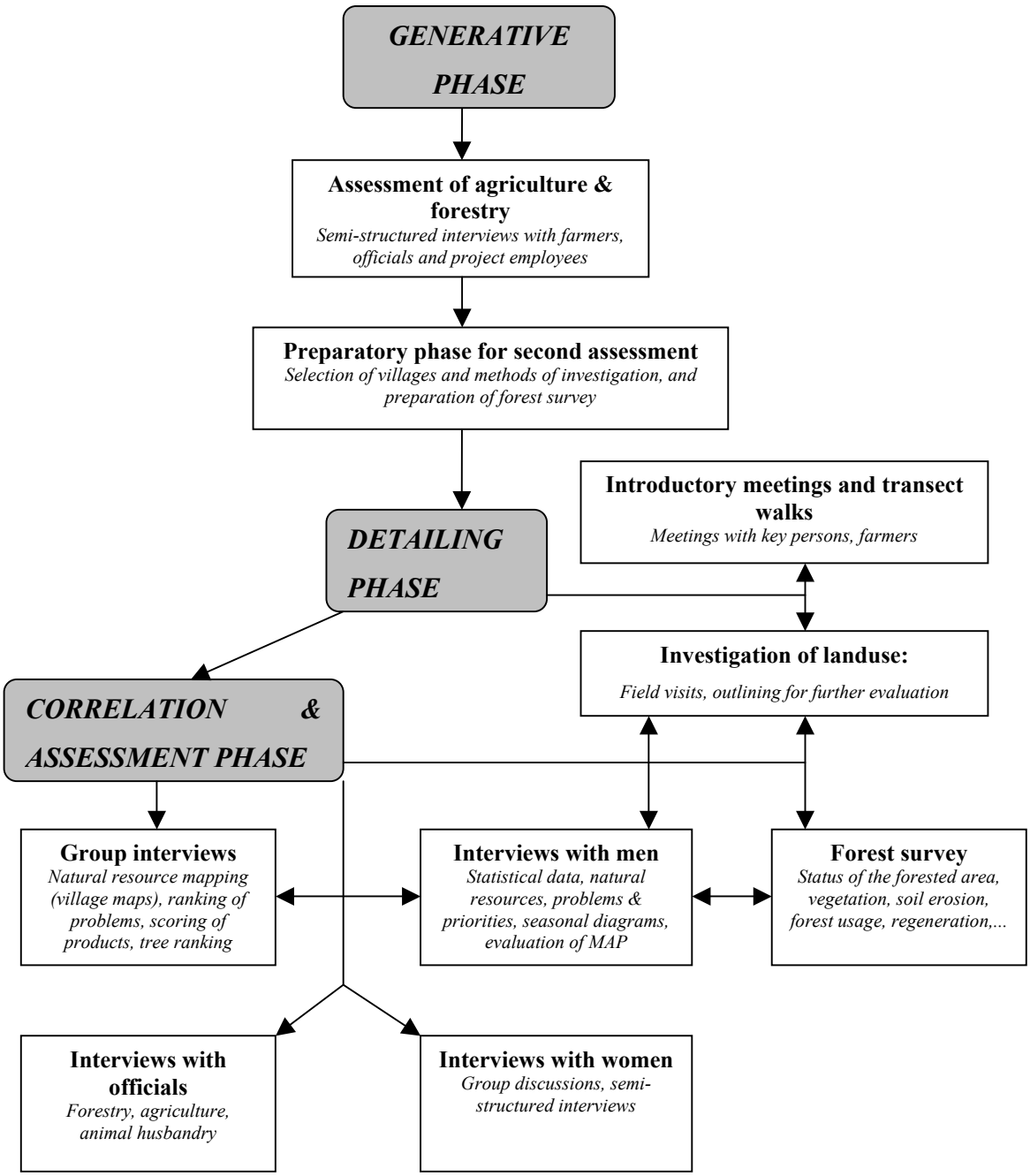
ZADA, A. (1998) claims that the forest has to become communal property instead of state property. He favours traditional management/participatory management or Joint Forest Management (JFM), meaning a co-operation between the governmental Forest Department and the local VDCs.

"Optimal and sustainable use of natural resources should be ensured by imparting extensive training to the local communities. To improve the socio-economic condition of local population the resource rich areas should be given their due share in the national developmental plans. That means better living conditions for rural people... and ....the sustainable management of natural resources /forest." (ZADA, A., 1998)

2 METHODS

The first meetings and interviews took place during the first stay in Malam in February 1998 (INTEGRATED REGIONAL DEVELOPMENT PROJECT, 1998). Based on the information gathered during this five week long survey the two villages Malam and Mangarkot were selected for the current assessment. The field work took place from October to the end of December 1998. This assessment aimed at evaluating the status of the traditional silvo-pastoral systems in the valley. The form of the survey and analysis was chosen according to ABEL, N. and PRINSLEY, R., in JARRIS, P. G. et al.,1991.

Fig. 2. 1: Form of survey and analysis (modified after ABEL, N. and PRINSLEY, R., in JARRIS, P. G. et al.,1991)



2.1 Generative phase

2.1.1 First assessment of agriculture and forestry

During the first stay in Malam Jabba the following aspects were taken into account:

- Culture, traditions and religious life.
- Agricultural policies, landuse and growing patterns.
- Forest policies, the structures of MAP, and the attitude of villagers towards the forest.

Additionally ecological threats like soil erosion and water pollution were included in the study. All these aspects were investigated through interviews with villagers, project employees and officials by an interdisciplinary group of students. The results were analysed and summarised in a report (INTEGRATED REGIONAL DEVELOPMENT PROJECT,1998).

2.1.2 Preparatory phase for second assessment

In order to carry through a more precise assessment of the traditional silvo-pastoral systems in Malam Jabba Valley a further study was necessary. These systems were the basis of the long-term relationship between villagers and the forest. The system got out of balance as a consequence of rapid population growth during the last 50 years and profit-oriented, short-sighted forest policies.

Two villages were chosen for this survey. They are very different from one another, with regard to population, climatic conditions and the degree of forest destruction:

- In Malam the social system is strictly hierarchic and feudalistic. There are some discussions on the establishment of a VDC but still far from realisation. The village still has good reserves in terms of timber availability, it has ample water supplies, and many parts of the village have high quality agricultural land.
- In Mangarkot there are already the beginnings of a somewhat more democratic social system in terms of a VDC, that enables a larger part of the village population to participate in important decisions. The forested area is diminishing and difficult to protect. Agricultural land of good quality and both irrigation and drinking water are scarce in this area.

  The village is situated on the opposite side of the valley to Malam (see fig. 1.1) and has less than half the population of Malam.

2.2 Detailing phase

2.2.1 Introductory meetings and transect walk

This survey was carried out in autumn 1998. In the beginning general information was gathered, in meetings with farmers, and through transect walks. Transect walks in the forested area were performed together with the MAP forester in Malam and Mangarkot. The agricultural areas were visited with local translators.

2.2.2 Investigation of landuse

Landuse maps were set up during walks through the area from below the villages to the tops of the hills. A sketched map of landuse was drawn in each of the two villages. During several field visits the maps were improved and corrected.

The village orchards were visited separately, together with the local translators. Further details on landuse were investigated through informal talks with villagers and from interviews.

2.3 Assessment and correlation phase

2.3.1 Methodology of forest survey

The forested area in Malam Jabba Valley was difficult to survey due to its demanding terrain. The slopes are very steep and there are many gullies running down the hills. Therefore forest inventory was not carried through in a way that would have covered the entire forested area (e.g. grid net system), but with sample strips[1] (as recommended for such forested areas by ZÖHRER F.,1980 and ANDRAE, F. ,1998).

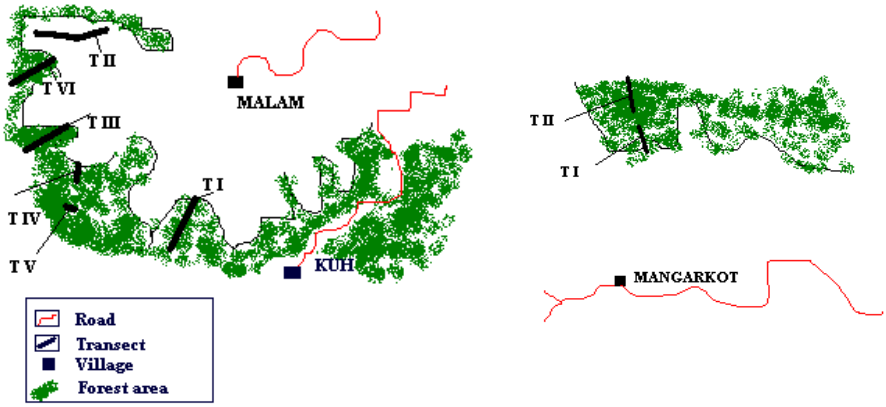


Fig. 2. 2: In Malam (left) six transects were measured, in Mangarkot (right) only two.

The bigger a sample area is, the lower is the coefficient of variation. Sample plots should cover an area of about 100-300 m² and should contain approximately 5-15 trees on average. The obtained results have to be projected into ha and total values. (ZÖHRER, F.,1980)

The average number of trees was expected to be very low, therefore sample plots of 400 m² (20 x 20 m), bordering on each other, were measured along a line from the lower forest line in the direction of the ridge (see fig. 2.2, 2.4).

The line was determined with a compass. Due to the terrain the various transects were of different length (40 - 400 m). In one case (see 3.1.3.12) only one sample plot was measured.

[1] The term "sample strips" is correspondent to "transects".

In order to mark the distance from the line, two thirty metre tape measures were used. The respective sample plot was marked with flagged sticks during the inventory (see fig. 2.4). The twenty metre length was measured as a vertical projection and the additional distances were added according to inclination (see fig.2.3).

Inclination was determined with a dendrometer according to BLUME-LEISS.

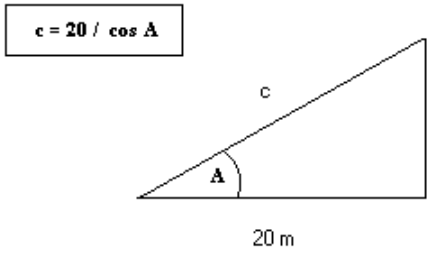


Fig. 2. 3: To determine the size of a sample plot, the area was calculated as a vertical projection.

The locations of sample strips were chosen during transect walks (see 2.2.1) through the forested area. The most important criteria were as follows:

- The area had to be representative with regard to degrees of forest usage, stand density, ground vegetation and terrain.
- Non-accessible areas were not regarded as representative.
- Altitude and exposition had to correspond among transects, in order to gain comparable results.

In Malam, transect I, III and VI started from the lower forest line. Only transect III reached to the ridge, in the other cases the survey was stopped below it. Transect IV comprised of only two plots and transect V had only one plot. Transect II was surveyed to represent an afforestation site.

In Mangarkot, transect I was started from the lower forest line. Transect II began in the middle of the forest and was continued up to the ridge.

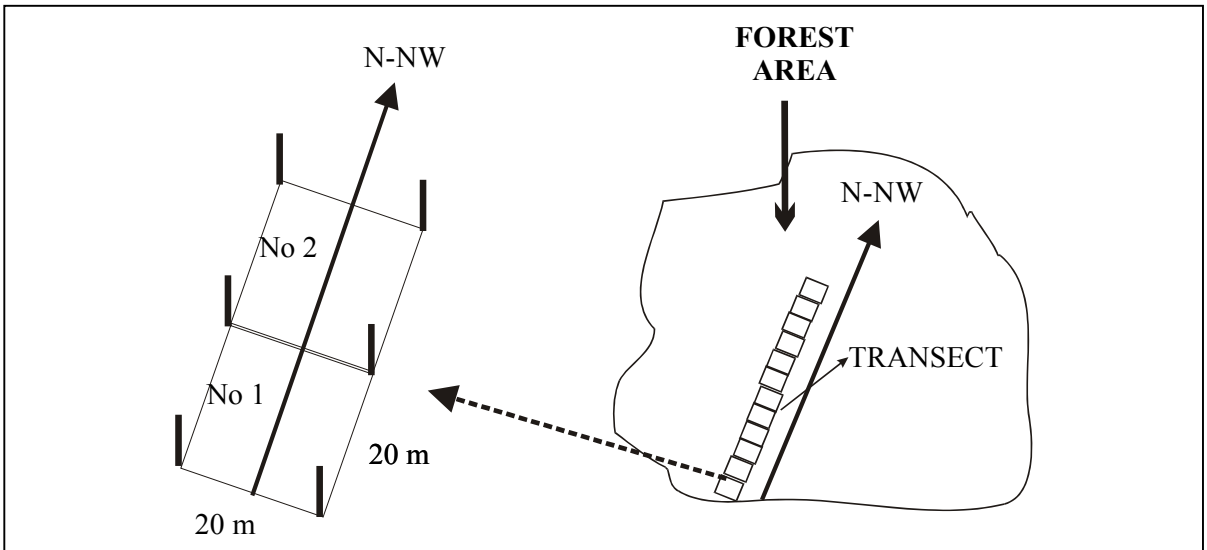


Fig. 2.4: The transects were started at the lower forest line and continued in the direction of the ridge. Each sample plot was 20 x 20 m of size and marked with flagged sticks.

2.3.1.1 Site description

For the forest inventory a prepared booking sheet (see APPENDIX) was filled in for each sample plot and a site description was made for the respective forested area. According to the booking sheet a description of site included sea level, exposition, inclination and terrain. The following types of terrain were taken into account:

1	Hollow	3	Lower slope – slope	5	Slope – Upper slope	7	Upper slope – Ridge
2	Lower slope	4	Slope	6	Upper slope	8	Ridge

The distances to nearby settlements and concerned villages were documented. For each transect a separate sketched map was drawn to document all noticeable influence on the forest patch. Photographs were taken to document the status of the forest and the degree of damage and use.
Soil was evaluated with regard to erosion damage, estimated soil depth and estimated soil coverage (in percentages)[2]. Soil erosion and soil depth were classified as follows:

(1)	No visible soil erosion	(A)	Very shallow soil
(2)	Not much visible soil erosion	(B)	Rather shallow soil
(3)	Visible soil erosion at a moderate extent	(C)	Soil is only sometimes shallow
(4)	Visible soil erosion at a remarkable extent	(D)	Soil is rather deep
(5)	Visible soil erosion at a very high extent	(E)	Very deep soil

2.3.1.2 Stand description

In each plot all stems and stumps were counted. The number of stems referred to all living trees. The stumps were often hardly visible and so it is likely that not all of them, but only the ones resulting from felling during the last five years, could be registered. The less damaged stumps were also counted with regard to the way of tree felling (use of saws or axes) and destruction through fire. Proportions for transects with either more stumps, more stems or equal amounts of both were calculated. The actual number of stems and stumps was projected into numbers per ha.

$$N = \frac{n}{a * x} * 10^4$$

N	number of stems/ha or stumps/ha
n	number of stems/stumps per sample plot
a	area of sample plot (400 m²)
x	number of sample plots

The total height of trees (h) was measured with a dendrometer according to BLUME-LEISS. Total height refers to the height of a tree at its highest growing point. Arithmetic mean height was calculated for all transects.
Calculation of the Mean or Average (according to PHILIP, M. S., 1994) :

[2] In contrast to percentage of coverage abundance of vegetation this term refers to the total soil coverage and not to the share of specific plant groups in an association surveyed on a sample plot.

$$\mu = \sum^{N} \frac{x_i}{N}$$

N	number of sampling units in the population
x_i	the value of the *i*th sampling unit
μ	population mean value

$$\bar{h} = \sum^{n} \frac{(h_{tree})_i}{n}$$

$\bar{h}$	arithmetic mean tree height (m);	h_{tree}	total height per tree (m)
i	Transect number e.g. I or III	n	number of trees per transect i

Diameter at breast height (dbh, at 1.3 m height) of all living trees taller than 3 m was measured with a girth tape. Adjusted to occurrence in the measured plots the following dbh classes were used:

<20 cm 20-30 cm 30-40 cm 40-50 cm 50-60 cm 60-70 cm >70 cm

The number of trees/ha (N) was put in relation with these dbh classes, as well as the corresponding volume (V) and height (h).

$$G_{tree} = dbh^2 * \frac{\pi}{4}$$

$$G = \sum^{x} \frac{(G_{tree})_i}{a * x} * 10^4$$

dbh	diameter at breast height (1.3 m)		
G_{tree}	basal area m²/tree;	G	basal area m²/ha
a	area of sample plot (400 m²)	i	transect number e.g. I or III
x	number of sample plots		

A map was drawn for each plot showing the crown projection and distribution of stems and an average crown width was estimated. Due to the large differences in crown shape and the consequently inaccurate values for crown diameters these data were not further evaluated and excluded from the results, in particular as the objectives of this study did not require further measurements of these parameter.

Volume was calculated for all dbh classes. For each transect the average volume per tree and the remaining volumes (per ha) were determined.

$$V_{tree} = G_{tree} * h_{tree} * f_{conifers}$$

$$V = \sum^{x} \frac{V_{tree} * n}{a * x} * 10^4$$

$f_{conifers}$	0.40 (form factor)		
V_{tree}	volume per tree (m^3);	V	total volume (m^3/ha)
G_{tree}	basal area m^2/tree;	h_{tree}	total height per tree(m)
n	number of trees per sample plot or per transect;	a	area of sample plot (400 m^2)
x	number of sample plots		

2.3.1.3 SDI

REINEKE (1933) showed in the USA, that two fully stocked pure stands without management had, independent of age and site quality, exactly then the same number of stems when the arithmetic mean diameter was equal. He concluded that the number of stems belonging to a certain arithmetic mean diameter was a good measure for the determination of stand density. The curve of the maximum number of stems at a known arithmetic mean diameter shows, if drawn on double logarithmic paper, a straight line with an ascent of –1.6 (independent of tree species).

DANIEL et al. (1979) converted the SDI (REINEKE L.H.,1933) from English units into the metric system. DANIEL, T. W. and STERBA, H., 1980 developed this system further on and adapted it to European conditions. For the metric system an arithmetic mean diameter of 25 cm was chosen. Fig.2.5 shows how to determine this Stand Density Index (SDI). The formula for SDI according to DANIEL, T. W. and STERBA, H. (1980) is[3] as follows:

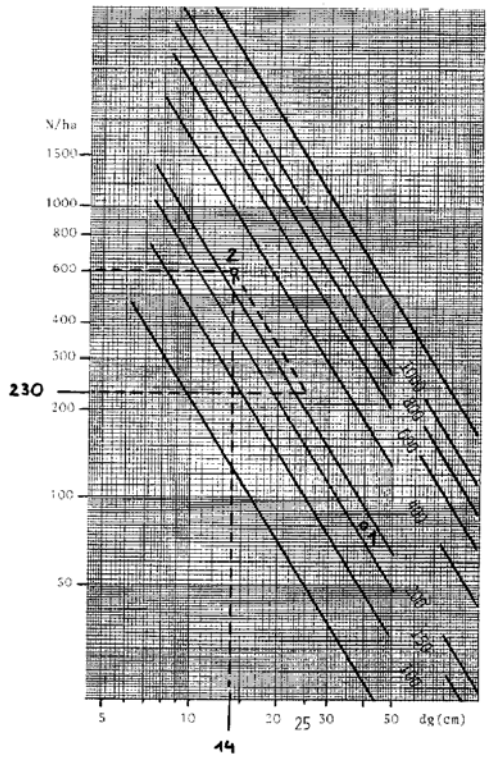


Fig.2. 5: Nomogram for calculation of SDI (from DANIEL, T. W. and STERBA, H., 1980).

[3] The original formula were :

REINEKE (1933) : $SDI = 10^{(\log N + 1.605 \log dg - 1.605)}$

DANIEL (1979): $SDI = 1.0147\ (10)^{\log N + 1.605 \log dg - 2.250}$

$$SDI = N * \left(\frac{25}{dg}\right)^{-1,6}$$

N number of stems/ha
dg arithmetic mean diameter
G basal area (m²/ha)

$$dg = \sqrt{\left[\frac{G}{N} * \frac{4}{\pi}\right]}$$

SDI correlates positively with increasing number of stems and a constant arithmetic mean diameter. It also increases with a constant number of stems and an increase in the arithmetic mean diameter. (DANIEL, T.W. and STERBA, H. ,1980)

Table 2. 1: Guide values for SDI of tree species from yield tables (MARSCHALL, 1975).

SDI (trees per ha)	Spruce	Fir	Douglas Fir	Larch	Pine	Beech	Oak
from	900	800	700	500	600	650	500
to	1100	1000	900	600	750	750	600

As age determination was not possible under the circumstances, calculation of SDI proved as a convenient way to make a judgement on occurring stand densities in the area. Provided that stand density is the same, SDI shows the number of trees that a stand has with an arithmetic mean diameter of 25 cm.

2.3.1.4 Regeneration

All non-planted trees smaller than three metres were counted as natural regeneration. It is likely that many seedlings in the first year could not be detected. The trees were registered in the following height classes:

1	2	3	4
< 20 cm	20 - 80 cm	80 - 150 cm	150 - 300 cm

Proportions of height classes for each transect were calculated. In afforestations the saplings were also counted, e.g. in Mangarkot. In Malam, transect II, the heights of the saplings of the afforestation were also measured. The numbers of dead saplings were counted and expressed in percentages of the total amount.
To record impact of drought and/or grazing categories from 1-5 were used[4]:

1 slight impact
2 impact becomes noticeable
3 moderate impact and damage
4 severe impact and damage
5 very strong impact and irreversible damage

[4] These categories were also used for forest usage, see 2.3.1.5.

2.3.1.5 Forest usage

For the influence of forest usage, the same categories from 1-5 were used as explained above. These referred to grazing, meaning mainly cattle, buffaloes and sometimes goat and sheep. In some areas grass cutting had to be taken into account. The other factors were in connection with the use of trees: Logging, lopping and splintering. Afforestation initiated by MAP was also mentioned as a way of forest usage. Sample plots were given grades according to the categories explained in 2.3.1.4.
For every single measured tree the factors of splintering and lopping were noted with the same categories again, to control objectivity of estimation. In the end, these figures were used for calculations as they turned out to be more precise than estimations per sample plot.
The transects were finally split into groups with regard to the degree of forest usage. The groups were defined according to the following scheme:

GROUP A:	Very intensive use over longer period	(10-15 years)
GROUP B:	Recent, but very intense use	(5-10 years)
GROUP C:	Used, but well preserved	
GROUP D:	Under MAP protection	

2.3.1.6 Vegetational survey

Forest usage effects biodiversity: To document the influence of forest usage on ground vegetation a vegetation survey was carried out. To be able to make a statement on diversity and species composition, species dominance and abundance (= cover-abundance index) were determined according to BRAUN-BLANQUET. Due to difficulties in species determination the survey was more group-oriented than species-oriented. As groups were defined: Trees, shrubs, ferns, herbs, climbers, grasses and mosses.

The plants were classified more precisely with the help of the Botany Department, University of Peshawar, and the Botany Department at the University of Agricultural Sciences, Vienna. As literature were used:

- STEWART,R.R. (1972), eds. NASIR, E. et ALI S.I.: Flora of West Pakistan. Karachi.
- NASIR, Y.J. and RAFIQ, R. A., ed. ROBERTS, T.J. (1995): Wild Flowers of Pakistan. Oxford University Press.
- DHV Consultants BV. SOCIAL FORESTRY PROJECT – MALAKAND/DIR (1992): Fodder species in Malakand. A reference manual. Training Series –3F-.
- DHV Consultants BV. SOCIAL FORESTRY PROJECT – MALAKAND/DIR (1994): Identification of grass species and index on names of grasses, herbs, trees and shrubs. Training Series –3E-.

The system of BRAUN-BLANQUET, as modified by DIERSCHKE, H. (1994) and AMMER, C. (1996) (see table 2.2) was applied and again modified. Classes in-between the existing groups were introduced and the percentages of coverage abundance were adjusted to the system (see table 2.3).

Table 2. 2: The system of BRAUN-BLANQUET, as modified by DIERSCHKE,H. (1994) and AMMER, C. (1996).

Species dominance and abundance	Scale	Percentages of coverage abundance (%)	Average percentages of coverage abundance (%)
r = occasional	1	≈ 0	≈ 0
+ = sparse	2	- 1	0.1
1 = substantial, but with a low degree of coverage	3	1 - 10	5
2 = covering 1/20 to ¼ of the area, or rich in number with a low degree of coverage	4	10 - 25	17.5
3 = covering ¼ to ½ of the area	5	25 - 50	37.5
4 = covering ½ to ¾ of the area	6	50 - 75	65.5
5 = covering more than ¾ of the area	7	75 - 100	87.5

Table 2. 3: This modified BRAUN-BLANQUET-system was applied in the survey to determine species dominance and abundance.

Species dominance and abundance	r	+	1	1-2	2	2-3	3	3-4	4	4-5	5
Numeric scale	1	2	3	3.5	4	4.5	5	5.5	6	6.5	7
Scale in percentages	0.1	0.5	2.5	5	8.75	18.75	37.5	50	62.5	75	87.5

Both the average values for numeric scale and percentages were calculated for each plant group (as defined above) in every transect.

2.3.2 Methodology of social survey

For each village one local translator was instructed how to carry out the interviews (see APPENDIX). To keep track of their influence on the answers of farmers, they were interviewed themselves before hand. Each of them interviewed only men of his own village.

Interviews were performed according to PA, PRA and RRA methods (see 1.5.1). The methods and questionnaires used during the survey were designed particularly for this process. Methods and guidelines for the interviews were taken and modified from:

- CHAMBERS, R.: The Origins and Practice of Participatory Rural Appraisal, 1994.
- CHAMBERS, R.: Participatory Rural Appraisal (PRA): Analysis of Experience, 1994.
- CHAMBERS, R.: Participatory Rural Appraisal (PRA): Challenges, Potentials and Paradigm, 1994.
- INGLIS, A.: Participatory Appraisal Methods. Workshop at the University of Agriculture Vienna, 1998.
- KHAN, M., BOERING, S. (eds.): Activity maps: Facilitating participation in Village Land Use Planning.
- McCRACKEN, J., PRETTY, J.N. et CONWAY, G.R.: An Introduction to Rapid Rural Appraisal for Agricultural Development .

- PRETTY, J.: Participatory Learning for Sustainable Agriculture, 1995.
- RRA for Community Forestry Site Selection, Social Forestry Field Manual No 1, 1996.
- VAN DEN HOEK, A., WERTER, F.: Manual for Village Land Use Planning, 1994.

Due to cultural and traditional circumstances most of the information was gained by talking to men. Women could only be interviewed on one occasion in Malam and again in Mangarkot. Together with a female translator an attempt was made to understand the role of women in local society and to learn more about their constraints and their priorities.

2.3.2.1 Interviews with farmers

At first all interviews were carried out with one farmer at a time or in small groups. The farmers were chosen at random, with some regard to the ethnic/social group they belonged to. The farms were located in all parts of the village area. In Malam fourteen farmers were interviewed and in Mangarkot thirteen.
The questionnaires were only used as a guideline during the interviews and to make notes (form of questionnaire see APPENDIX). The farmers and translators themselves did not have to fill in questionnaires. Sometimes more than one man answered the questions, but attention was always paid to the fact, that all should be part of the same social group and about the same age, otherwise a separate interview was made. The questions covered the following issues:

- **Statistics:** These questions provided information on social groups, age, land, livestock,....and aimed to guarantee the representative aspect of the survey.
- **Natural resources:** Questions were asked to locate the main sources of water, fuelwood, grazing and to find out about the annual crops.
- **Problems and changes:** The objective was also to learn about the main difficulties in livestock keeping, cultivation of fruit trees, vegetables and crops, about people's priorities concerning the forest and about constraints in "daily use", meaning the problems in everyday life. With regard to the role of the official side (Agricultural Extension, Forest Department, foreign sponsored projects,..) local farmers were also asked about their priorities for changes in forestry and agriculture.
- **Seasonal diagrams:** Setting up seasonal diagrams helps to understand what work the farmers have in the different seasons of the year. A year was divided into four seasons (winter rain, summer drought, monsoon period, winter drought). With regard to these seasons farmers were asked to tell about their work and about the products they gain from their fields and from forests at different times of the year.
- **Evaluation of the MAP:** A so-called H-Form (see APPENDIX) was used to ask the farmers about their opinion on the afforestation project and for possible improvements.

2.3.2.2 Group interviews

During the first interviews the farmers were informed, that a group interview would take place after the completion of the interviews with individual farmers. The facilitator of these group discussions was the forester of the MAP. He is not from the valley but he is respected by the farmers and also familiar with the problems of the region. The group interview ran according to the following schedule :

1) Introduction:

It was very important to explain the role of the outsiders and make it clear that they have come to learn from the locals. It was also explained what the gained knowledge would be used for.

2) Village maps:

To make the situation more relaxed, natural resource village mapping was started with. A prepared village map[5] was put on the ground (see photograph 2.3) and symbols (see fig.2.6) were used to show the sources and the critical areas concerning the respective topic. This was also discussed with the basis information about natural resources given by the farmers during interviews .

Fig. 2.6: Symbols and their respective categories used for natural resource village mapping.

3) Problem ranking:

All problems mentioned by farmers during interviews were listed. The ones occurring more often were written on circles in various colours. During the group discussion the men present were asked to rank the named problems according to their priorities, at first in the categories very important, important, and less important. Finally they ranked the circles within the categories (see photograph 2.5).

4) Bean scoring:

Using the results of previous interviews a list of main groups of products from agriculture and forestry was made. For each row 10 beans were distributed, with at least one bean per field. The groups fuelwood, timber, wheat, maize, vegetables, fruits, animals and fodder were given scores with regard to various aspects: “Time consumption” meant whether farmers were spending a lot of time with this product. “Labour” meant if that product required a lot of hard work. “Profits“ covered the economic aspects of the various products, while ”importance” meant whether the farmers considered the products to be very important for their farm and family. Finally the products had to be ranked again by giving scores with the beans. Eight beans was the maximum and one the minimum (see photograph 2.2).

[5] The village maps were roughly drawn on a large sheet of paper.

5) Tree species ranking:
   A list with names and drawings of the 14 most important trees observed in the two villages was made and presented during the group interview. Several farmers, representing various groups from the village, were asked to rank the trees according to their own priorities by giving scores with beans. 14 was the maximum amount and one was the minimum (see photograph 2.6).

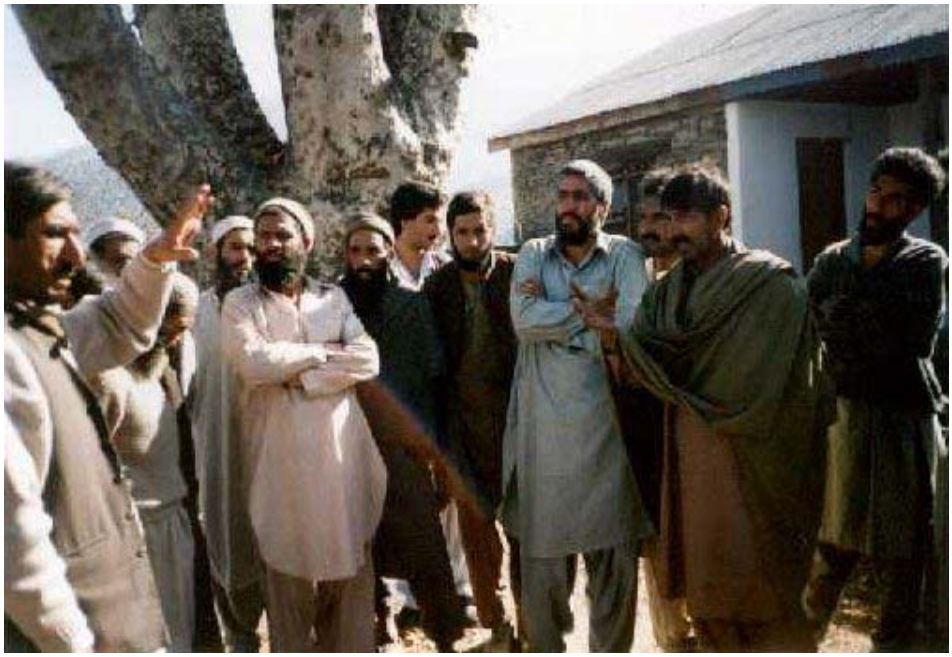
2.3.3 Interviews with officials

Interviews and contact with officials familiar with the valley were also part of the survey. Experts on forestry were asked questions with regard to forest policy in Malam Jabba (see APPENDIX). A former DFO (Divisional Forest Officer) was interviewed and the responsible forest expert from MAP. The questions were relating to forest products, preferred trees for afforestations, the constraints of forestry in the area, possible and desired changes in forestry in the valley. An important part of all interviews was also to find out about the attitude of officials towards the farmers.

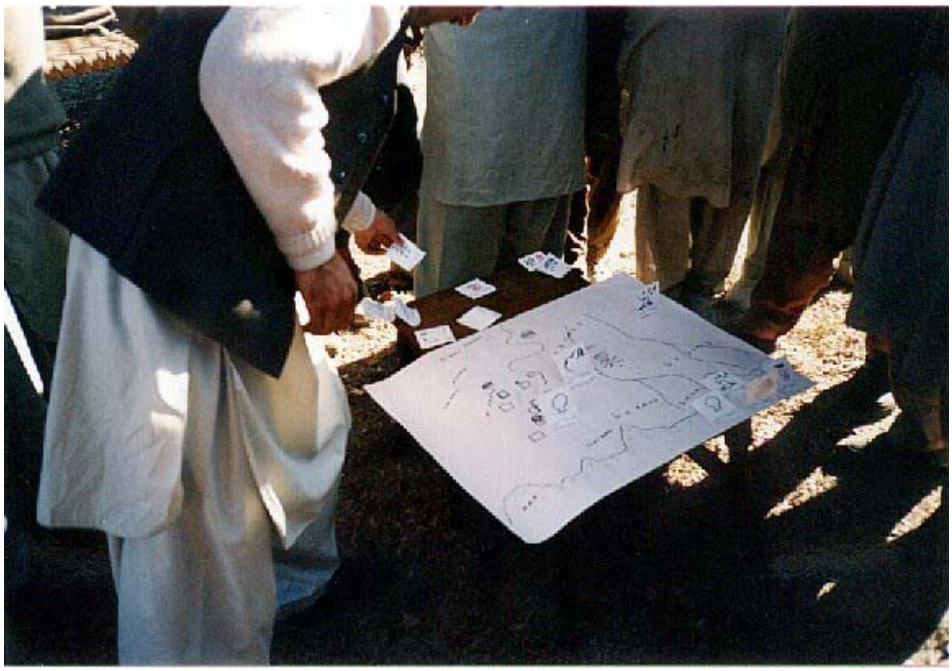
Regarding agriculture, an interview was made with the Agricultural Officer of Mingora, who was also familiar with the situation in Malam Jabba. The questions were about farmers and landownership, as well as major crops, the main market and sustainability. The major constraints and desired changes in agriculture were also discussed.

Concerning livestock veterinarians operating in Malam Jabba were asked about their opinion on constraints in animal husbandry, what should be changed in future, about the number of animals per village, lactation period, first calving and milk production of buffaloes and cattle.

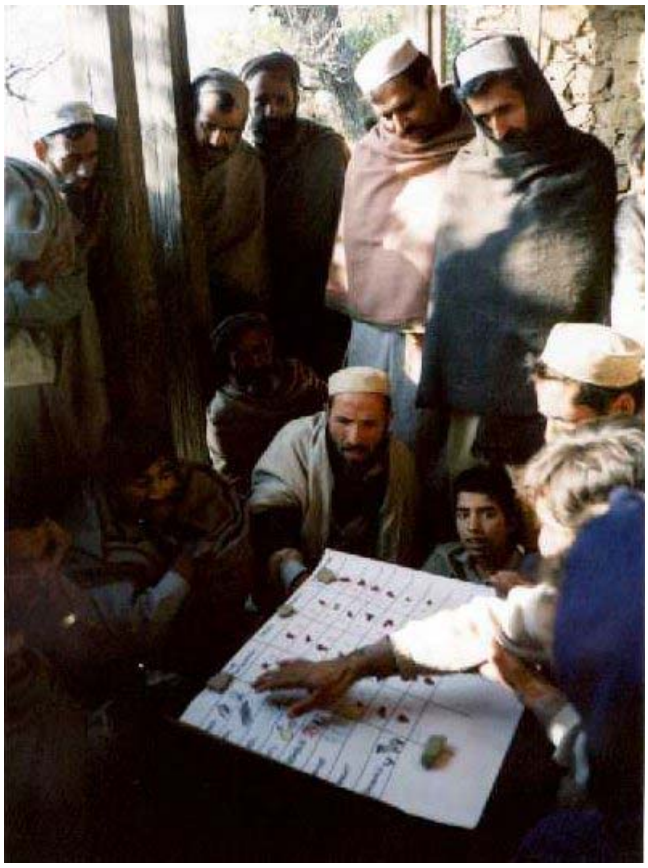
Photograph 2.1: Interviews with farmers: The farmer (right) talks with the translator (middle), while the author(left) takes notes.



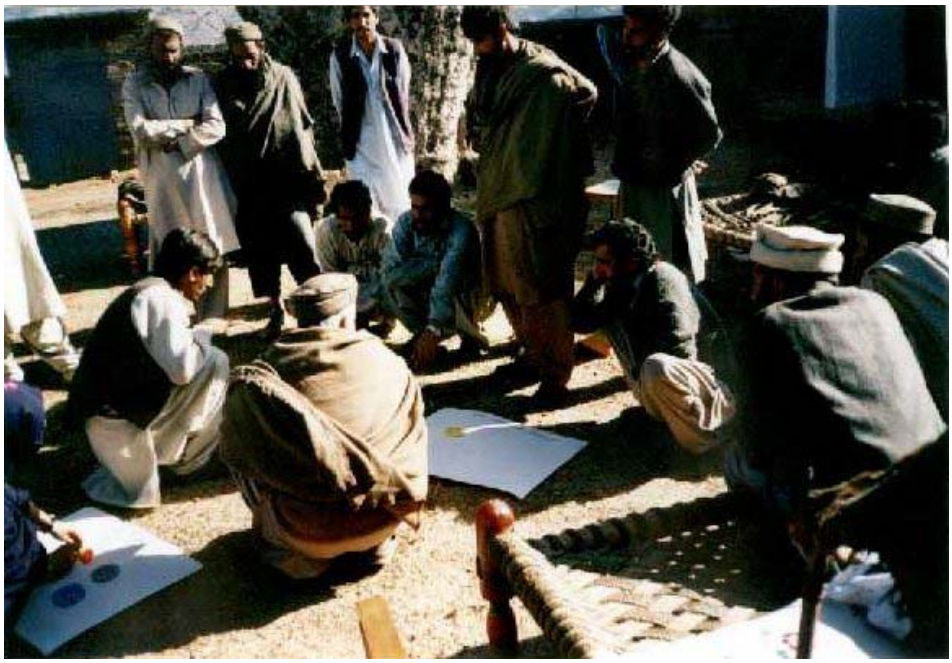
Photograph 2.2: Farmers in discussion with the facilitator (left) during group interviews in Malam.



Photograph 2.3: Village mapping in Malam: The farmers add symbols representing natural resources and crops to a prepared sketch map of the village area.



Photograph 2.4: Bean scoring of products in agriculture and forestry.



Photograph 2.5: Ranking of problems written on coloured circles according to people's priorities.

Photograph 2.6: Farmers in Malam at tree ranking with beans.

3 RESULTS

3.1 Malam

3.1.1 Population, livestock and agricultural land

In Malam the social system is based on a cast-like system (see fig. 3.1 and table 3.1). The most powerful and wealthy family are the *Miagan*. They belong to the Syed clan - members of this clan own most of the land in Malam Jabba Valley and play a very important role in social and political life in the whole area.
The Miagan in Malam own most of the land including the forested area, but their entitlement to the land is not legalised. The family has been holding on to its landownership ever since the last Wali gave the land to them (see 1.2.2.1 and 1.2.3.1).

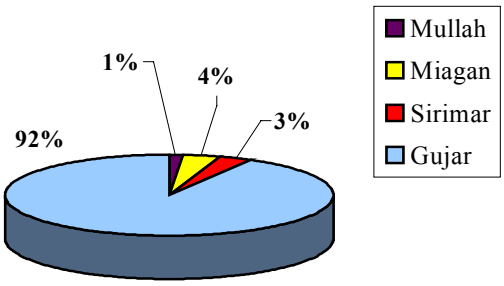


Fig. 3.1: Population of Malam with regard to social groups.

During the last 15-20 years the population in the area has increased dramatically (see 1.2.2.3). Originally only the plateau surrounding the village was cultivated, but now numerous settlements are scattered around the former forested area. The settlers are mainly poor Gujar families. Most of them are tenants of the Miagan. Some of the Gujars are landowners, as well as some Pathan and other settlers. These small landowners are called *Sirimar*. They bought land from the Miagan as social structures started to break up: Some of the traditional landowners started to engage in other business during the last 10 years and consequently sold off some of their land.

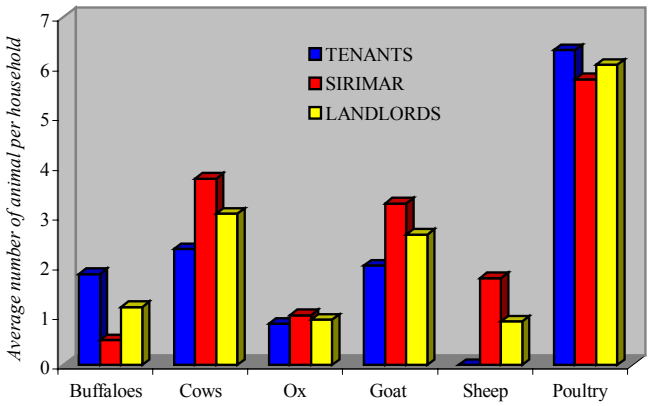


Fig. 3.2: Average numbers of livestock per household in Malam.

Table 3. 1: The main social groups in Malam and their differing interests.

Casts/ Social groups	*LANDLORDS (=MIAGAN)*	*LANDOWNERS (= SIRIMAR)*	*TENANTS*	*RELIGIOUS LEADERS*
Ethnic groups	Miagan (Syed)	Pathan, Gujar, ...	Gujar, Pathan,....	Mullah
User groups / interests	Forest, fruit trees	Livestock	Livestock	Religious issues
Ownership	Own most of the fields and the forest (unofficially).	Own just small landholdings.	No landownership.	Own small landholdings.
MAP evaluation	Are very much in favour of the MAP: Await only profits but no harm.	Are not satisfied with the MAP: Their interests were not taken into account, they lost the grazing areas.	Not satisfied with the MAP: They do not profit from long-term projects; they are dependant on forest produce.	Not so much interest in forest issues, but usually in favour of MAP.
Role concerning the forest	Define themselves as forest protectors, can afford to sustain the forest to secure their existence in a long-term perspective.	Want more rights of forest usage, could afford sustainable use, but not with the present conditions.	Mostly dependant on forest existence - extremely poor living conditions force them to exploit natural resources.	No particular role.
Plantations	Plant fruit trees and fuelwood trees on their land.	Sometimes plant trees on field boundaries.	No plantations.	Sometimes plant trees on field boundaries.

The distribution of livestock in all user groups is shown in fig.3.2:

- Landlords own livestock of all kinds, but mostly the tenants take care of it.
- The Sirimar usually keep less buffaloes, but more cattle, sheep and goats and poultry, as in all other households. The Sirimar have only small landholdings but almost as much livestock as the landlords - they stressed the need for more grazing areas during the interviews.
- The tenants mentioned in most cases the number of buffaloes and cattle that they took care of for the landlords. They do not own so many themselves, they keep mainly poultry and sometimes goats for their own household needs.

It is difficult for people to know how many animals they own, mainly because ownership is not always so clear within the family.

The average number of people in a household in Malam is 10.7:

Social group	*Persons/ household*[1]
Landlords	11.0
Sirimar	12.5
Tenants	8.5

According to the local teacher the maximum number of people in one household during the latest census (unpublished, 1998) was 32, the minimum was 8 persons in a single household. The census reportedly resulted in a number of 393 households for Malam. The total share of various social groups is shown in fig. 3.1.

Fig.3.3 shows the distribution of the land in relation to the number of people per household. The estimated number of people living in Malam is 2900. This is an average value calculated from all estimated numbers (see 1.2.2.3) and the results of the last published census (1981). The numbers given during the interviews would result in about 4200 inhabitants. Most of the people are either tenants or farmers who own property. Many of the small farmers or the tenants are engaged in off-farm labour. Almost in every family there is someone working in the South of Pakistan or abroad (e.g. Saudi Arabia, Kuwait). Other professions practised in Malam are shopkeeper, teacher, miller and hotel employee.

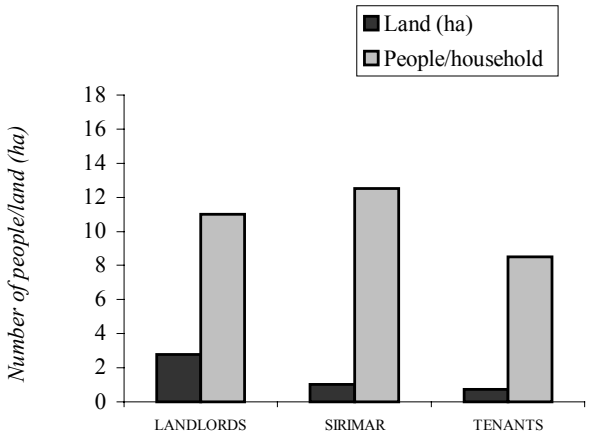


Fig. 3.3: Comparison of the number of people per household and the available land (ha).

[1] These are average values, calculated on basis of the statistical data resulting from the interviews with farmers.

3.1.2 Natural resources

3.1.2.1 Description of the area

Malam is connected to the main road near Kashora with a partly paved and partly unpaved road. This road is in a very bad condition and no public transport is possible.

The village itself is situated on a plateau. Most of the slopes surrounding it are exposed to the N-NW. The area surrounding the village is flat and well suited for agricultural landuse (see landuse map in APPENDIX). There are orchards and fruit trees scattered on the banks of terraces. In this part of the village most of the fields are irrigated and vegetables are grown in the fields. The fields in this area are usually 10-15 m wide and 30-80 m long.

Further away from the village the situation worsens: The slopes rising to the N-NW of the plateau are very steep and the terraced fields are much smaller. Length varies from 15-50 m, and the terraces are usually only 3-10 m wide. There are hardly any trees on the embankments. Many small paths lead up to the houses that are scattered on the hillsides near what remains of the forest. The soil is less suitable for agriculture here, and the fields are very rocky. Most of the tenants live in this area.

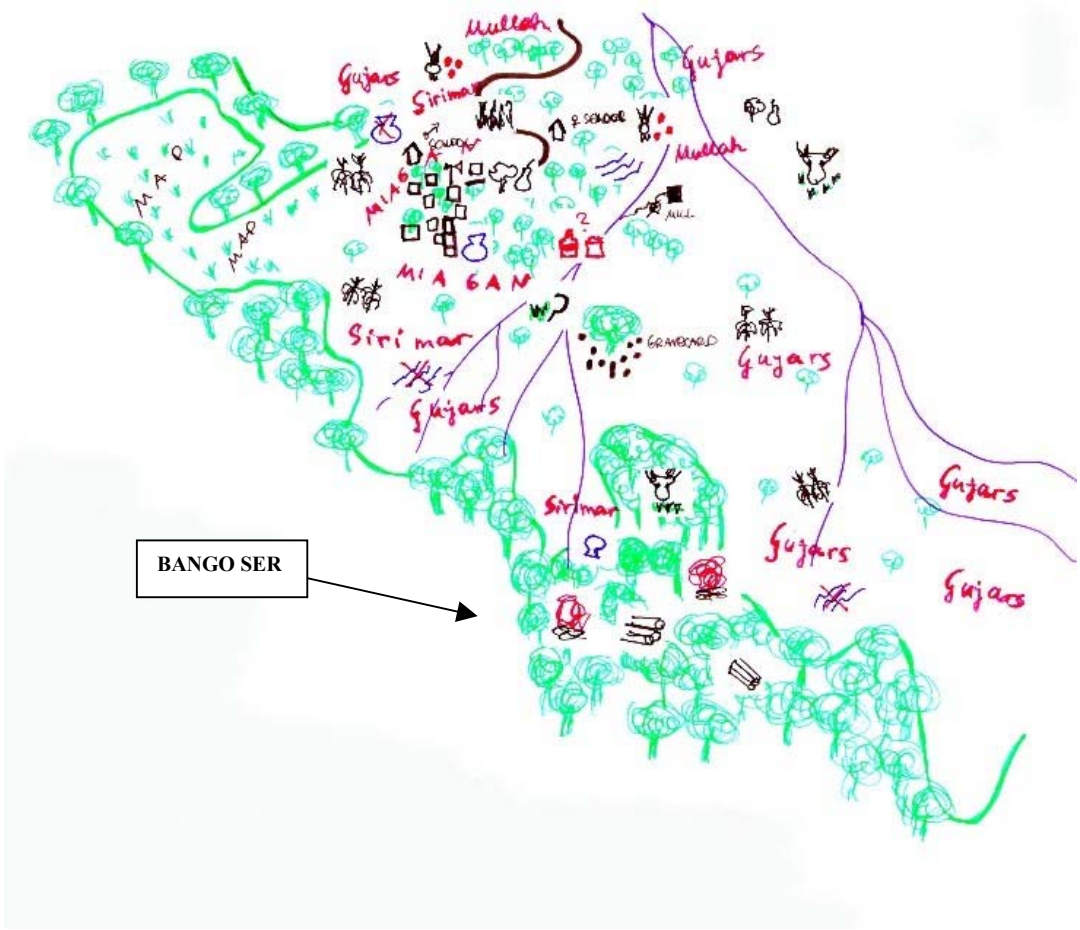


Fig. 3.4: Result of natural resource village mapping in Malam. The map shows locations of the most important natural resources, the settlements of various ethnic/social groups, the location of different crops and important facilities mentioned during group interviews.

Below the village some farmers have access to irrigation and there are many fruit trees on the embankments. Most of these farmers are owners of small landholdings (Sirimar).

The main crops are wheat and maize. The following vegetables are grown in Malam: Onion, tomato, garlic, beans, peas, pumpkin, cucumber, cabbage, cauliflower, spinach, radish, and others, providing the farmers have access to irrigation. The main fruit is pear (local: *tongu*), but also apple, persimmon, apricot, walnut, and plum are grown. The area is said to be suited for fruit growing - there are also many wild fruit trees to be found..

3.1.2.2 Problematic aspects concerning natural resources in the village of Malam

- **Water**

Only around 15-20 houses in the village have access to tap water. All other people have to fetch water from springs and rivers. Usually the walking distance is not so far, but many of the springs do not provide sufficient water. In case of a drought many springs run dry and water becomes scarce. Another problem is the pollution of the unprotected springs: Often the drinking trough for cattle is nearby and animals pollute the water.

- **Fuelwood**

Most people named the area near Bango Ser (see fig.3.4) as the main source of fuelwood. The area is quite remote and there is still ample supply of timber (see Transect IV and V), but it is alarming that almost the entire village claims to obtain fuelwood and timber from there.
Most houses still have some forested area nearby, but these areas are already protected, if not by the MAP then by the landlords who do not allow other villagers to use the forest.

- **Pasturage**

Some farmers leave the animals to graze in the fields near the village, and on the field boundaries. Most of the cattle move to the *Bandras* in summer. This is an area near the skiing hotel. The Gujars look after the cattle here and bring the milk and dairy produce to the farmers.

- **Orchards and fields**

There are several orchards in the village of Malam. Many trees are scattered on banks of terraces and on field boundaries. Only the Miagan can afford to plant trees themselves, and that is the reason why the major part of the fruit area is confined to their settlements in and around the village.

In the fields the majority of farmers/tenants grows only maize, and sometimes wheat. If irrigation is available farmers also cultivate vegetables. In the village area few farmers try inter-cropping of fruit trees with wheat and tomato.

3.1.3 Seasonal diagrams

MEN:

- As shown in fig. 3.5, the agricultural year begins with the preparation of fields. Soon after thaw maize and potato are sown, followed by turnip and cucumber.
- In the dry summer season there is a great deal of work due to harvest of wheat and peas. The follower crop is tomato.
- In September/October harvest starts again with tomato and fruits and then maize. At this time of year grass is also cut and stored for the winter, as well as maize straw. Wheat, peas, onion and garlic are sown. Before the snow arrives, fuelwood is collected and stored for the winter.

Men in Malam claim that the dry winter season is the most work intensive. Second they rank the dry summer season. Least work they have during monsoon rain (July, August).

WOMEN:

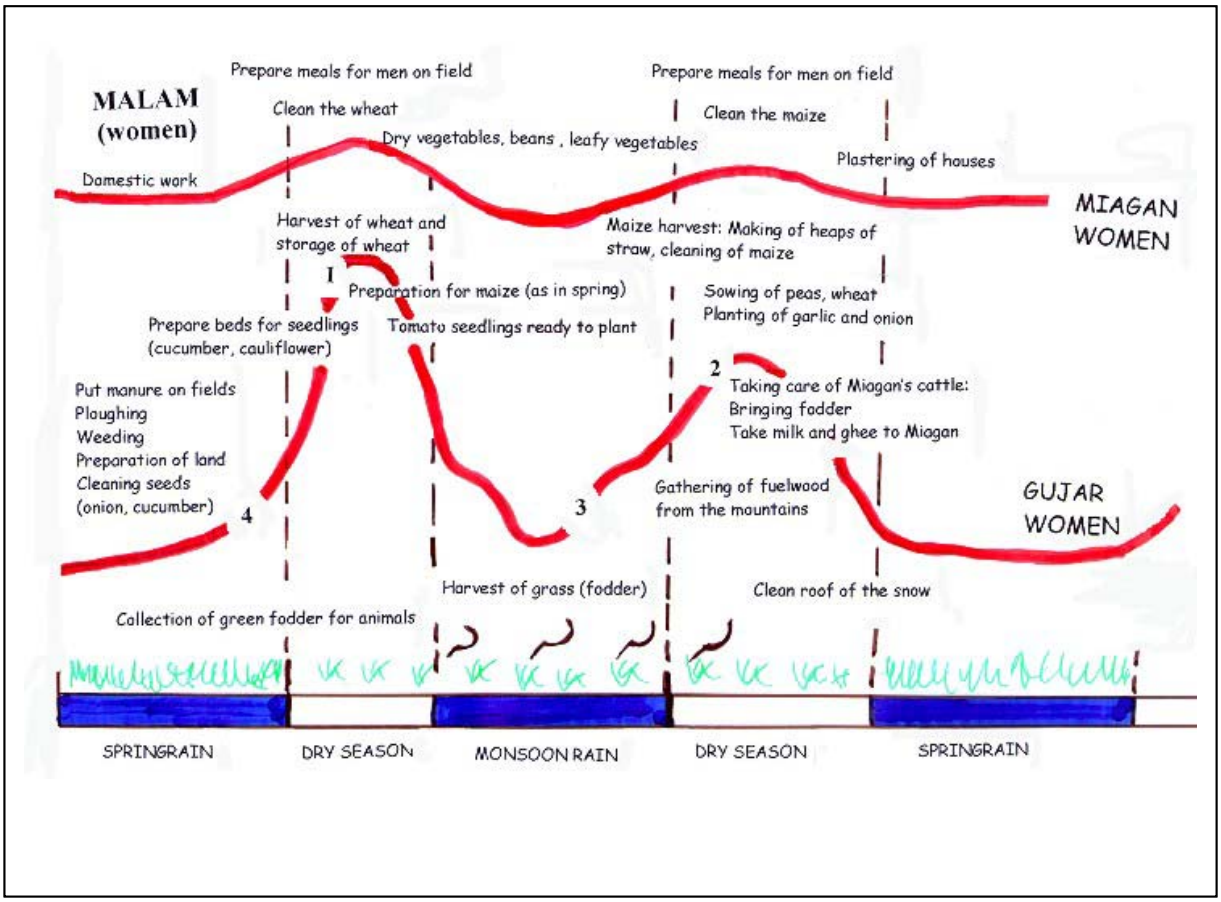
As shown in fig. 3.6, Miagan women have a different seasonal calendar to Gujar women: Most of the Miagan women's work is domestic, preparing meals for men and food processing.

In contrast, the Gujar women also work outside their houses:

- They start the year with the preparation of fields. As soon as possible after the thaw, they again collect green fodder for the animals.
- The most labour intensive period for them is the dry summer season: First the beds are prepared for the planting of vegetables like cucumber, then in May, June wheat is harvested. The follower crops are maize and in some fields tomatoes.
- During the monsoon period there is less work, but still women have to gather fuelwood and fodder every day.
- At the end of the monsoon season harvest of fruits and tomato starts. Maize is harvested in October – the maize has to be cleaned and the straw is stored for the winter. After the harvest wheat and peas are sown. In January onion and garlic are planted.
- Before the snow arrives fuelwood has to be collected from the mountains. In winter the snow makes life very difficult for poor people living on the hillsides and they often have to clear snow from house roofs. In winter the Gujars also must take care of the Miagan's cattle in stables and deliver milk and *ghee* to the Miagan.

All year long leafy vegetables and sometimes mushrooms (in rainy seasons) are collected in the wild.

For women in Malam the dry summer season is the most labour intensive, followed by the dry winter season. But especially the Gujar women claim that there is in fact a lot of work to be done in all seasons.


MALAM
(women)
Prepare meals for men on field
Clean the wheat
Dry vegetables, beans , leafy vegetables
Prepare meals for men on field
Clean the maize
Plastering of houses
Domestic work
MIAGAN
WOMEN
Harvest of wheat and
storage of wheat
Maize harvest: Making of heaps of
straw, cleaning of maize
1
Preparation for maize (as in spring)
Sowing of peas, wheat
Planting of garlic and onion
Prepare beds for seedlings
(cucumber, cauliflower)
Tomato seedlings ready to plant
2
Taking care of Miagan's cattle:
Bringing fodder
Take milk and ghee to Miagan
Put manure on fields
Ploughing
Weeding
Preparation of land
Cleaning seeds
(onion, cucumber)
4
3
Gathering of fuelwood
from the mountains
GUJAR
WOMEN
Harvest of grass (fodder)
Clean roof of the snow
Collection of green fodder for animals
SPRINGRAIN
DRY SEASON
MONSOON RAIN
DRY SEASON
SPRINGRAIN

3.1.4 The importance of various products from agriculture and forestry for farmers in Malam

Scoring natural products with beans (see 2.3.2.2.) showed only vaguely differing results of priority ranking of products and scoring with regard to specific aspects (compare table 3.2 and fig. 3.7):

- Wheat scored highest in the question of importance, followed by fuelwood and timber.
- As most labour intensive fodder and vegetable were seen.
- The collection of fodder was considered to be most time consuming.
- The villagers regarded vegetables as most profitable. Fruits, maize, wheat and animals scored second.

Timber scored low in profitability, although in priority ranking (see fig. 3.7) timber received the second highest scores after fuelwood.

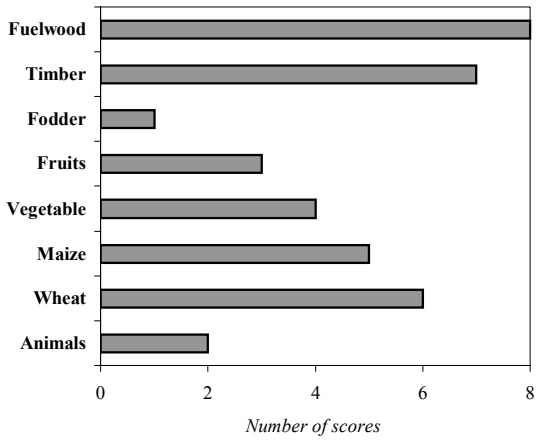


Fig.3. 7: Priority ranking of products in Malam.

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Table 3. 2: Results of scoring of products with regard to various aspects during group interview in Malam.

MALAM	*Time consumption*	*Labour*	*Profits*	*Importance*
Fuelwood	●●	●●	●●	●●●●
Timber	●●	●●	●●	●●●●
Fodder	●●●	●●●	●●	●●
Fruits	●●	●●	●●●	●●
Vegetable	●●	●●●	●●●●	●●
Maize	●●	●●	●●●	●●●
Wheat	●	●	●●●	●●●●●
Animals	●●	●●	●●●	●●●

3.1.5 The main constraints in agriculture and forestry in the village of Malam

Livestock

The landlords have servants who look after the cattle. In summer these servants move to the Bandra with the cattle, because there is not sufficient grass near the village. The milk is brought from the Bandra and sold to people in summer for 15 Rps per kg. Some farmers keep their animals in the village the whole year round.

Especially in early spring there is often a lack of fodder. For the winter the grass is cut and stored in the traditional way. Besides the decrease of grazing areas due to re-afforestation and encroachment, maize

production (fodder crop) has been reduced due to increased vegetable production (cash crop). Especially the tenants and some of the Sirimar complain about the lack of fodder and grazing areas, some of them even had to buy grass for the animals. They often sell animals (goats, etc.) to enable them to buy food for the family. Most of them would like to keep more animals, but they can not afford. Especially the Sirimar are extremely dissatisfied with the afforestation policies because changes of landuse should not be opposed to grazing according to their opinion, as it had occurred as a consequence of MAP afforestations.

Crops

The major crop in Malam was maize at the time of the survey. Most of the maize is grown in rainfed areas because unlike wheat it grows without regular irrigation, except during dry years. Wheat is mainly grown in irrigated areas. Other crops are difficult to cultivate, because the farmers lack experience with new crops and also because most of them are very labour intensive.

The tenants have to cope with the poor quality land they work on – it is only adequate for maize in most cases and the harvest is not very reliable (major constraints: maize disease, drought, hale damage, animals destroy the plants,...). Even if the maize grows well, it is not sufficient for the whole year. The tenants do not have the resources to invest in the farm, they cannot afford to buy fertilisers to improve harvests.

The Sirimar also complain about the poor quality of seeds and about the problems of diseases on wheat and maize. They would prefer to grow other crops, but most of them have only rainfed fields. There are in fact several channels, but some of them are broken or cannot be used. The problem with irrigation is caused by disputed rights among farmers.

Vegetables

There is normally one major vegetable crop each year – in 1997 it was onion, in 1998 tomato. Vegetables seem to grow really well provided that there is enough irrigation. The marketing is done by the farmers themselves, as the market for vegetables is in Mingora.

Vegetable cultivation is mainly the Miagan's business. Tenants usually grow only maize, but some have tomatoes, cucumber, some garlic for themselves. After wheat harvest in May occasionally popcorn is sown. But most of the tenants cannot grow vegetables due to the lack of irrigation in their area.

The Sirimar showed some resentment with regard to vegetables during the interviews: First of all a farmer needs many helping hands for the planting, tending and harvesting of a vegetable crop. It is also difficult to grow a second crop afterwards. There is unfortunately a great deal of ill feeling against vegetable cultivation and consequently also against crop rotations and inter-cropping. Other constraints are pests, diseases and marketing: If a farmer has only a small quantity of vegetables, then it is not lucrative to hire a vehicle for transportation to the market.

Fruit trees

The main fruits are pear and persimmon, apricots are also common. The harvest is usually good, although hale storms, pests and foliar/fruit diseases cause damage in some years. Fruit marketing is not possible because of storage and transportation. The market for fruits is in Punjab and only few farmers sell fruit themselves in Mingora. Normally the fruits are sold to middlemen at flowering stage. The local people do not profit much from this bargain, but they do not have the facilities for self-marketing. Most of the landlords would in fact want to plant more fruit trees.

The tenants on the other hand do not want to plant trees because they do not own any land. If there are trees on the tenant's land, the landlord sells the trees, and the tenant receives only a very small share of the profit. If a tenant wishes to rent the trees himself, he would sometimes have to pay twice as much as a middleman would pay.

The Sirimar would in fact like to grow more fruit trees, but they do not have the financial resources to invest in fruit trees. If the road would be in a better condition, the farmers would also sell fruits themselves at the market.

In spite of all constraints there is a consciousness for the profitability of fruit marketing. Already the lease for fruit is 10000 Rps, while a usual field costs 3000 Rps per year according to the local farmers. The farmers favour pear, peach, and persimmon, while walnut and apple apparently are not so popular with the farmers in Malam. More fruit trees would not only bring more income, they could also be planted on marginal lands, thus bringing additional environmental benefits.

Forests

The landlords complain that there is not much forest left, and that there is no more dry wood available. The lack of timber makes house constructions difficult and expensive. For the landlords pine trees are very important for timber and thus they favour more plantations and more protection of the forested area. The fight against illegal wood cutting, grazing protection and the shortage of fuelwood is their major concern. They are also very much dissatisfied with the forest guards who, according to their opinion, do not protect the forest properly but instead only accept bribes or charge for illegal timber logging.

The tenants and the Sirimar also recognise the need of more forest. The lack of fuelwood and timber causes many problems. They complain about the forest guards, but they also blame the Miagan for not allowing them to use the forest, hence they feel forced into illegal actions. They can not even collect fuelwood openly any longer.

The Sirimar dislike that the Miagan as the owners want the forest to be planted, while the users (Sirimar) would prefer plantations on marginal land. They also complain, that they were not asked for their opinion when the plantation was started. In the interviews the Sirimar also claimed that they would prefer plantation of fast-growing trees instead of pine tree.

3.1.6 Priorities in agricultural policies

All farmers agreed upon the necessity for more agricultural inputs like good quality seed, pesticides, fertilisers, loan facilities, tractors, ploughs,....Improvement of irrigation and the repair of the existing irrigation system was generally mentioned as a very urgent issue.

3.1.7 Priorities in forest policies

Especially the poorer farmers and tenants are aware of the fact that their children will not remain in this area if there is no more forest. They want more plantations and more protection of the forest. On the other hand they also want legalisation of timber logging. One farmer proposed that two to three trees per farmer for the construction of houses should be permitted otherwise people would have to continue cutting trees in the night. People are tired of the present situation. Forest guards fine people and those who cannot pay will go to jail for illegal timber logging. In such cases the people often continue to log trees deliberately.

The evaluation of the running afforestation project (MAP) (see fig. 3.8) resulted again in different opinions in the three user groups:

- Most of the Miagan are satisfied with the MAP. But they prefer more fast growing species like Robinia and Ailanthus to be planted. They generally recognise the importance of afforestations for their future.
- The Sirimar were not so satisfied with the MAP. They have a strong interest in grazing areas and they do not want all of the forested area to be protected. They also claim a right for timber and fuelwood. Many Sirimar farmers particularly dislike the indigenous tree species and would rather have fast-growing species planted.
- Among the tenants the opinions are rather divided. Some are not so happy with the project, others are rather content. Suggestions for improvements were among others to employ forest guards from this area to protect the forest – the farmers believe that such forest guards would have a kind of social responsibility. The tenants also prefer fuelwood trees to indigenous trees. The grazing restrictions are also a problem for many of the tenants.

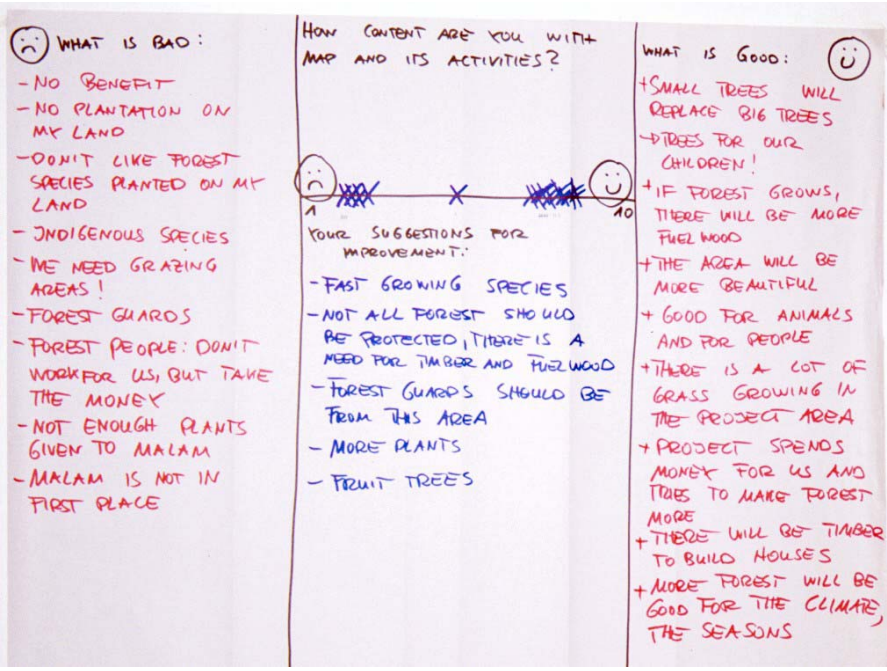

Fig. 3.8: Results of the evaluation of the MAP presented in an H-Form.

In contrast to these statements stands the outcome of the ranking of trees during the group interviews (see fig.3.9): The pine trees were named most often, followed by persimmon (*Amlok*) and the local pear (Tongu). Fast growing trees like Robinia (*Kikar*) and Ailanthus (*Bakyana*) followed later, which was rather astonishing as during the interviews most of the people particularly stressed the importance of such trees. Remarkable were the relatively high scores for oak and the local fig (*Anjeer*).

Splitting up the results of tree ranking among the three user groups and the differing results show what a complicated and sensitive issue trees are in this area (see table 3.3):

- The landlords value fruit trees and conifers because they are the ones who get the profits from them. They claim ownership of the forest, consequently they also claim a legal right of forest usage for timber and fuelwood.

- The tenants rank pine trees and fast growing Robinia first, because they know the value of the pine trees and the fuelwood trees.
  They can not afford to buy fuelwood, like some wealthier families do, so they are dependant on the forest's existence. They also rank the fruit trees high, although they do not profit from them directly. Fig, walnut and mulberry received the comparatively highest scores from this user group.
- The Sirimar group ranked similarly to the Miagan. They prefer conifers and fruit trees.
  Fast growing trees and indigenous trees are given much lower scores.

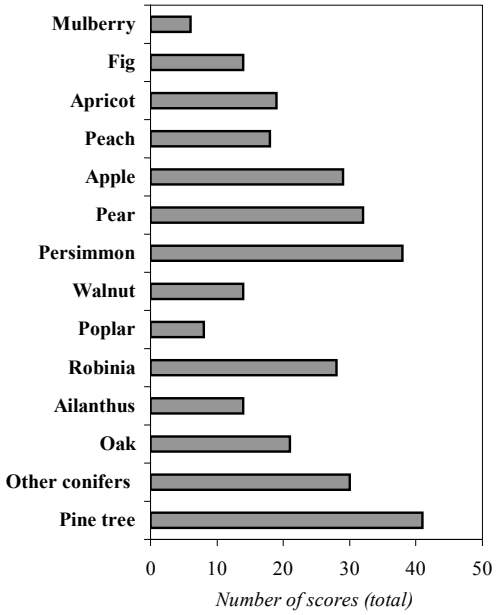

Fig. 3. 9: Tree ranking according to preferences of farmers in Malam.

Table 3. 3: The ranking of trees split up among social groups in Malam (in order of preference).

Miagan man (landlords)	Pathan man (tenant)	Sirimar (small landowner)
Persimmon	Pine tree	Pine tree
Pine tree	Robinia	Other conifers
Other conifers	Persimmon	Persimmon
Local pear	Apple	Local pear
Oak	Local pear	Apple
Ailanthus	Apricot	Oak
Apple	Peach	Robinia
Robinia	Local fig	Peach
Walnut	Walnut	Apricot
Apricot	Other conifers	Local fig
Peach	Mulberry	Poplar
Poplar	Ailanthus	Walnut
Local fig	Oak	Ailanthus
Mulberry	Poplar	Mulberry

3.1.8 The main constraints in everyday life in the village of Malam

3.1.8.1 Interviews with farmers

Important problems for most people in Malam are drinking water supply and irrigation systems. A notable issue is also the condition of the road. The hospital is also too far, there is only insufficient medical support.

The tenants mentioned the water supply, fuelwood, no job, road problem, no money for farming, the lack of fertilisers, seeds, and fuelwood, and the bad condition of houses during the interviews. Most of them do not own the house they live in, because they are too poor to build their own houses.

The Sirimar complained about water supply, lack of fuelwood, electricity, the bad condition of the road, poverty, lack of dispensary, and the lack of functioning irrigation facilities.

3.1.8.2 Group interviews

In the group discussion problems with water supply were named first: In Malam there are only part of the houses connected to tap water and irrigation. Due to disputes on the water issue, there is no further development of irrigation systems and water supply.

The bad condition of the very steep road winding up to the village is another big concern of the villagers – it is a hindering factor in marketing and development.

Fuelwood, timber shortage and forest rights are issues that farmers of all groups considered to be important. Existential for all farmers in Malam are also the following topics: Seed quality, diseases on crops, vegetable marketing and a lack of trees for plantations. (see fig. 3.10)

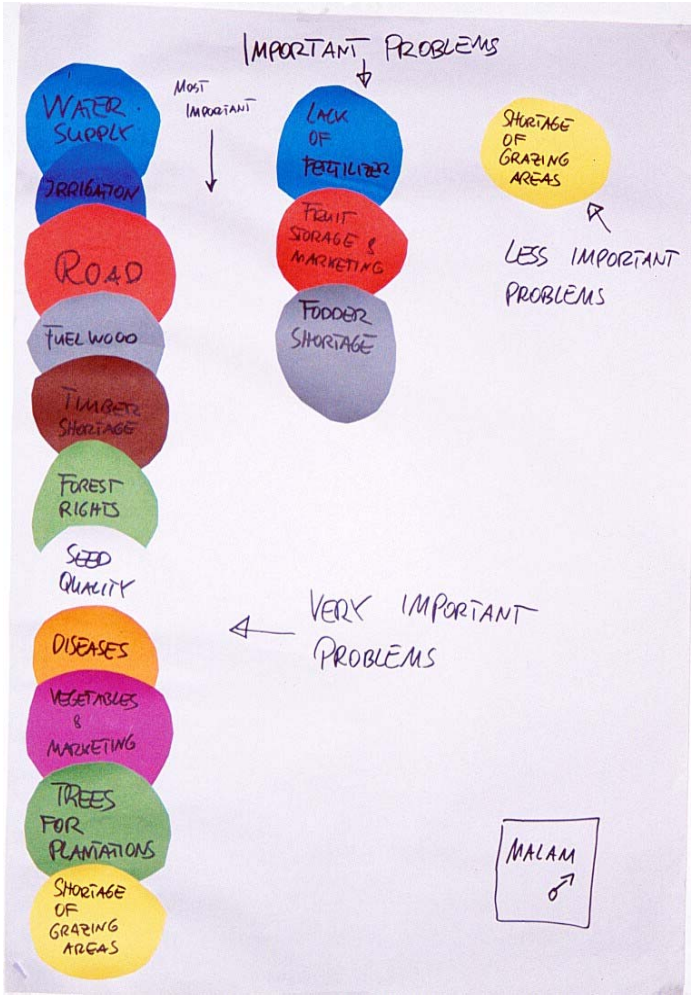

Fig. 3.10: Outcome of problem ranking with farmers in Malam during a group interview.

3.1.9 Situation of women in Malam

3.1.9.1 Social life

In Malam the situation of women depends on the social group they belong to (see 3.1.1): The women of the Miagan family are not allowed to work outside the house - they are not allowed to move out of the house either, unless they have the permission of the male head of the family. They are only allowed to visit their relatives. If they do leave the house, they must observe strict Purdah. Miagan women do housework like cooking, cleaning the floor and they help with the cleaning of corn after harvest. The women from the tenants' usually help with all the housework, belonging to a lower cast, they are allowed to enter the landlords' houses.

The Miagan women get married rather early, often at the age of eleven. Many girls are not even allowed to learn to read and write. Consequently most women know little about their rights, for example about remarriage after becoming a widow. Many of them are denied their right to remarry. A woman is also denied the right of chose her husband, which means even if she would say no to a proposal made by her parents, it would remain without consequence. Another consequence of the confinement of the women's life to the house and family is the high birth rate.

Despite of their isolated life the women are aware of environmental problems threatening their existence. Asked about tree ranking they said they preferred fruit trees and fuelwood trees. In contrast to men the timber issue is not so important to them[2]. They are also very interested in learning about food processing and storage.

The Gujar women are very hard working , they work as much as their men. For the gathering of fuelwood they require three hours a day, although collecting fodder for animals is the major part of their daily work. In addition to their own house and field work they also work for the Miagan: They take care of their cattle, they bring fuelwood, bake bread, help with harvest work, etc. For taking care of the cattle they occasionally receive milk and about 6000 Rps a year. In presence of the Miagan women the Gujars felt intimidated and did not speak freely.

3.1.9.2 Agricultural issues

Maize and wheat are usually cleaned, dried and then stored in big wooden boxes. Important are also beans: The women in Malam named red, black and white beans plus wild soy beans. All of them are dried and stored and used for cooking; only the wild soy beans are used as additional fodder in winter. Tomatoes and onions are also dried for conservation. The leafy vegetables that the Gujars collect are Shaftal and all kinds of digestible green plants growing in the area. They are also dried and used for cooking either fresh or dried. Some Gujars also collect mushrooms in the forests, but they have become very rare.

Gujar women named as their major constraints the fodder shortage in winter, fuelwood collection and cutting grass for fodder, health, the hard work in the fields and with the cattle. It is also recognised that the diminution of the forested area is a big problem. Like some of the men, the Gujar women blame the Miagan for this, because they have sold many trees as timber for furniture themselves. Therefore they are not credible as forest protectors in their eyes.

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[2] Compare also JOKY, F. AND HERING, H., 1996.

3.1.3 Results of the forest survey

In Malam, six transects were measured, comprising of 240 trees in 59 plots. The forested area of Malam amounted to approximately 200-250 ha (5-600 acres) in 1998. The stand density was generally low, but there were still good reserves in terms of high volumes. The forests were exposed to excessive use for grazing, grass cutting, lopping and timber logging. Encroachment threatened many areas of the remaining forest. Two years earlier, MAP had introduced an afforestation site (transect II), situated close to transect VI. Transect VI will be included in the protected zone in the coming years.

3.1.3.1 Description of sites of the forest survey

The lower forest line was at ca. 1950 m at the time of the survey. The traditional lower forest line was between 1850-1900 m. The village itself is situated below the forested area (1800 m) on a comparatively wide stretched plateau. Forest usage has been intensified during the last 10-15 years. The primary forest type in this area and altitude is according to CHAMPION, H.G. et al. (1965) the *Himalayan Moist Temperate Forest*. Among the degraded types of moist temperate forests it can be classified as *Secondary Blue Pine Forest* (*Pinus wallichiana* - forest). The status of the forest as it was at the time of the survey is shown in a map in the APPENDIX.
The forest can only be reached by walking along steep slopes. Many settlements are in the vicinity of the forest. For the farmers living in these areas, the forest is easy to reach. The steeper slopes are not used for grazing but for the cutting of grass only. There is also less intense timber logging and lopping.

Table 3. 4: The status of the Malam forested area.

	Malam I	**Malam II**	**Malam III**	**Malam IV**	**Malam V**	**Malam VI**
Status	A	D	C	B	B	A /D
Intensity of use [1]	1	6	5	2	4	3
Distance to next	10 min/	20 min/	5-10 min/	5-10 min/	15-20 min/	5 min/
settlement/Malam	1 h	30 min	30-45 min	45 min	1 h	20 min
Sea level (m)	1900-2020	1850 – 2050	1950 – 2130	2060 - 2080	2170	1950-2010
Inclination(°) [2]	6-30	7 – 27	26 – 38	18 – 27	40	37-39
	(15)	(18)	(30)	(22.5)	(-)	(32)
Exposition	N-NW	N-NE	NE	N	SW	NE

GROUP A: Very intensive use over longer period (10-15 years)
GROUP B: Recent, but very intense use
GROUP C: Used, but well preserved
GROUP D: Under MAP protection

[1] Number 1 stands for most intense, 6 for least intense.

[2] The average values for inclination are given in brackets.

In table 3.4 all site-related and topographical parameters are listed. All transects except for Malam V are exposed to the N. The hills surrounding the plateau of Malam are exposed to the N, NW or NE. The frequent monsoon and early spring rains lead to a rather moist climate in the forest and as long as there is sufficient crown coverage, it keeps the forest ground protected from strong radiation and high temperatures. Depending on these conditions there is often a remarkable difference in vegetation within the forest (see 3.1.3.3).

3.1.3.2 Soil and erosion

Silty clay loam and moderately deep silt loam are the main soil materials in Malam Jabba Valley. (FMC PLANNING REPORT, 1998). In the forested area soil coverage ranges from 30 – 95 % (see table 3.5). The least soil coverage appears in areas of intense use, e.g. if there is a path leading through the forest or if canopy density is low, with no more rich undergrowth existing. The soil is naturally rather shallow and often parent rock is protruding. Intense forest usage enhances soil erosion additionally.

Table 3. 5: Comparison of soil coverage and soil erosion in all transects of Malam.

	Malam I	**Malam II**	**Malam III**	**Malam IV**	**Malam V**	**Malam VI**
Soil coverage [3]	30 – 95	70 – 95	70 – 95	80 – 90	95	90 – 95
(%)	(65)	(86)	(82)	(85)	-	(94)
Soil erosion	(5)	(2)	(3)	(1)	(2)	(3)
Soil layer	(B)	(C)	(A)	(D)	(B)	(C)

(1)	No visible soil erosion	(A)	Very shallow soil
(2)	Not much visible soil erosion	(B)	Rather shallow soil
(3)	Visible soil erosion at a moderate extent	(C)	Soil is only sometimes shallow
(4)	Visible soil erosion at a remarkable extent	(D)	Soil is rather deep
(5)	Visible soil erosion at a very high extent	(E)	Very deep soil

3.1.3.3 Vegetation

The percentages of coverage abundance range from 3 - 26 % per plant group in all transects (see fig 3.11). This expresses how abundant the plant groups are represented on average in the whole surveyed forested area of Malam. Fig. 3.12 shows how differing the six transects are with regard to dominance and abundance of various plant groups.

TREE LAYER

The dominant tree in the Malam forests is *Pinus wallichiana*. Most of the trees are affected by intense usage through lopping. Due to grazing and grass cutting, natural regeneration is low (see 3.1.3.5).

[3] The average values for soil coverage are given in brackets.

SHRUB LAYER

Oaks (*Quercus incana, Quercus dilatata*) exist only in the understorey as lopped shrubs. They are usually severely affected by overgrazing and outcompeted by a diverse range of either spiny and/or unpalatable shrubby evergreen and broad-leaved species.

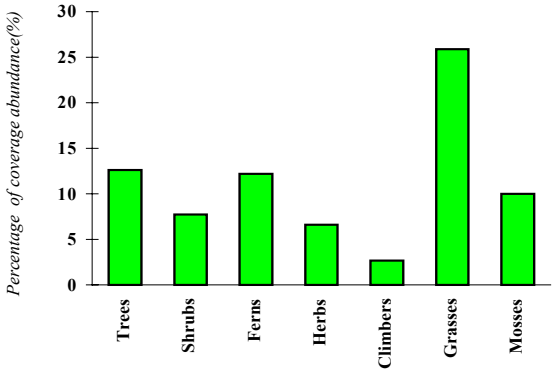


Fig. 3. 11: Comparison of various plant groups with regard to dominance and abundance.

Sarcococca saligna and *Buxus papillosa* are evergreen shrubs from the *Buxaceae* family:

While *S. saligna* prefers the lower and more disturbed zone, *B. papillosa* is more abundant in the undisturbed forested areas with a higher canopy density, together with *Viburnum nervosum* (transect IV,V). *Indigofera heterantha*, *Plectranthus rugosus* and *Berberis lycium* are typical for thinned forests with a strong human impact. They form a very dense and inaccessible thicket along the lower forest line, especially in recent clearings (lower plots of transect VI, III and II). They also grow on open meadows and along foot paths in Malam from ca. 1700 to 2300 m.

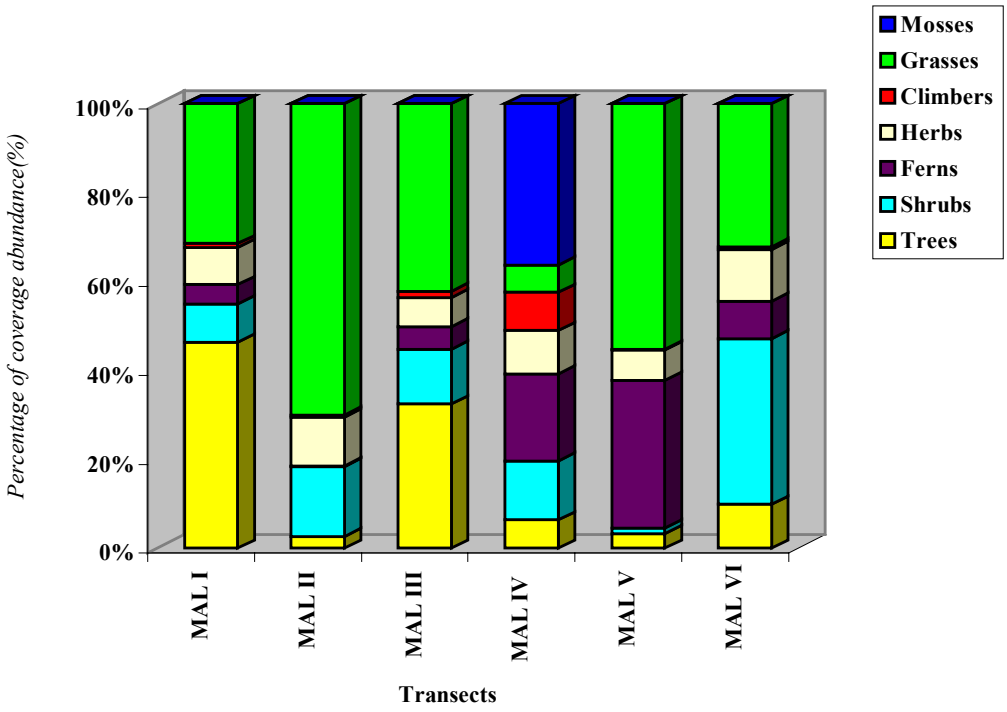


Fig.3. 12: Plant associations of all transects in Malam in comparison.

LAYER OF SOIL

Grasses have the highest degree of coverage in the forested area of Malam: Their dominance is a consequence of regular and frequent cutting of woody, perennial plants as well as pasturing. The nutrient richness due to grazing, and high radiation due to forest thinning have changed the climatic situation in the forest.

Cynodon dactylon is most abundant in dry, open areas. Rosette plants (*Plantago spp*.), plants with creeping shoots (*Trifolium spp.*, *Ranunculus spp*.,...) and ferns (*Onychium contiguum*, *Adiantum capillus veneris*,...) appear regularly, but climbers such as *Hedera nepalensis* are rare.

Mosses occurred only at one place during the survey (transect IV) on a larger scale, because most surveyed forested areas were not humid enough due to canopy thinning and climatic changes in the region.

3.1.3.4 Stand density

Table 3.6 shows the most important stand parameters: Stand density is varying from 68-250 trees/ha. The corresponding SDI ranks from 272-759 trees/ha. The highest number of stumps/ha (350) coincides with the highest number of trees/ha (both in transect V).

Table 3. 6: Stand description with average values for all transects of Malam.

Number of transect	Stand density [stems/ha]	Number of stumps [stumps/ha]	SDI [stems/ha]	Volume [m³/ha]	Average volume [m³/tree]	Basal area [m²/ha]	Arithmetic mean height [m]
Malam I	165	158	377	224	1.4	22.8	24.5
Malam III	200	153	684	643	2.6	45.7	28.1
Malam IV	88	63	340	205	3.3	23.3	27.2
Malam V	250	350	759	1455	2.4	49.0	29.7
Malam VI	68	93	272	247	2.9	19.0	25.8

The remaining volumes (m³/ha) are remarkably high considering the comparatively low stand density - they rank from 205-1455m³/ha (see 4.2.1). The calculated average volume (m³) per tree matches or even exceeds the value of pine in final stands in all transects except for Malam I (1.4 m³).

Basal area corresponds to stand density (see table 3.6). Fig.3.13 shows the variation in stand density (trees/ha) in the surveyed forested area of Malam.

The tallest trees are in the areas where there is less intense use, and stand density and SDI also reach higher values there: Arithmetic mean height of trees is highest in Malam V (29.7), the most pristine forested area among the six measured transects in Malam. In Malam I the arithmetic mean height is only 24.5 m.

The growing stock per dbh class is shown in fig. 3.14. The volumes are generally higher in the larger dbh classes (40-70 cm). In Malam III there are high volumes in almost all dbh classes, in Malam I only in the lower classes up to 60 cm.

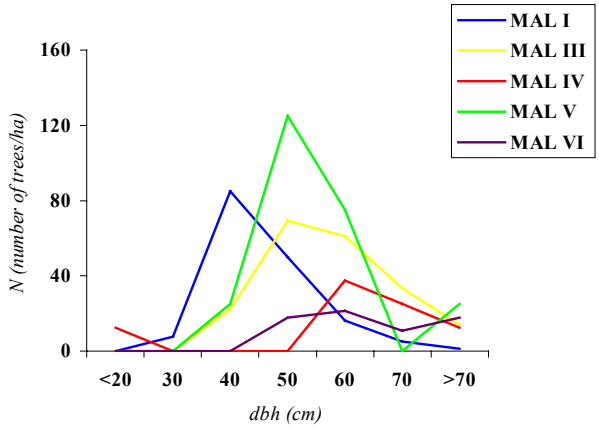
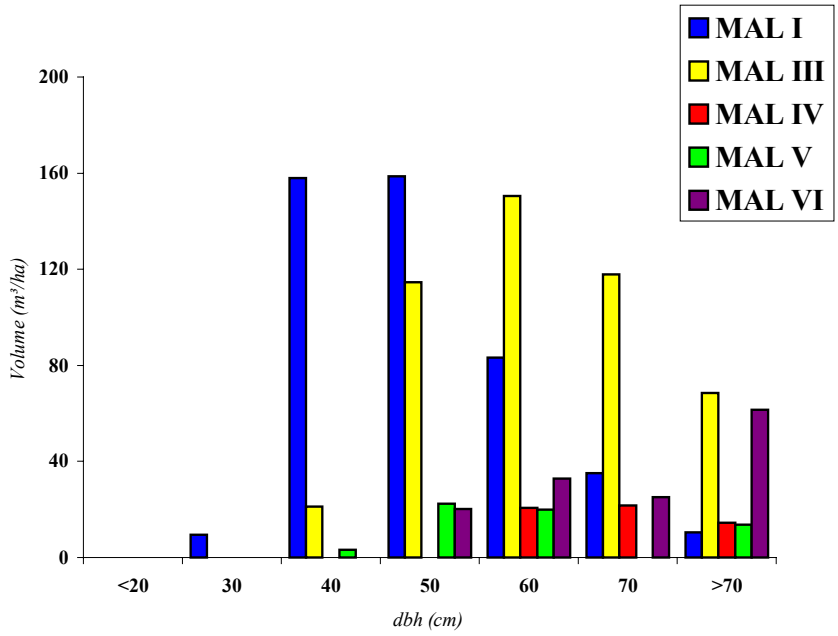


Fig. 3. 13: Comparison of stand structures with regard to stand density (trees/ha) and dbh (cm). The classes are subdivided in groups from <20, 20-30, 30-40,....to 60-70 and >70 cm.



3.1.3.5 Regeneration

All seedlings found were of *Pinus wallichiana*. The amount of natural regeneration was generally low in the surveyed forested areas of Malam, with the exception of transect VI (see fig. 3.15). This was due to grazing restrictions (transect VI is meant to be part of the MAP protection zone).

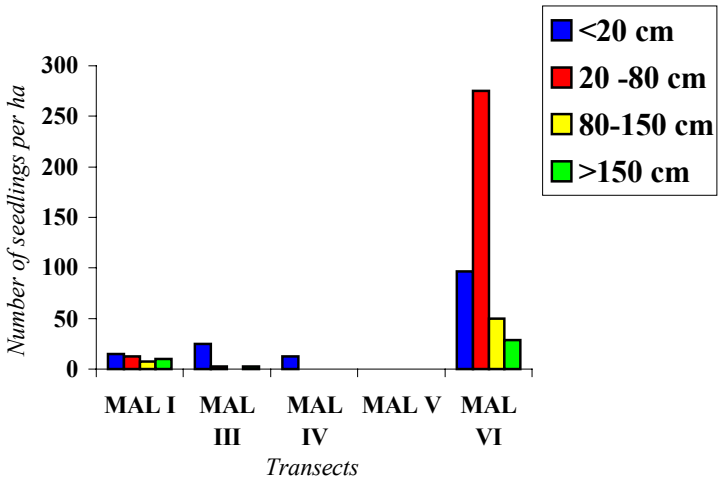


Fig. 3.15: Natural regeneration compared in all transects of Malam.

In transect V there was no natural regeneration visible. Here it was very difficult to detect seedlings due to the steepness of the slope. There was also grazing to some extent (mainly sheep and goats). In all other transects there was only little natural regeneration, but it would certainly increase rapidly if grazing pressure would decrease (compare 3.1.3.11).

3.1.3.6 Stems and stumps

Stumps from recent clearings are easy to find, but if older than about five years, they are hardly visible. Fig. 3.16 shows the distribution between the number of stumps and the number of living trees in the transects of Malam forest. In some parts of the forest the stumps almost outnumber the living trees. In Malam I there are more stumps in 40 % of the measured plots. Often the numbers are equal between the living trees and the stumps.

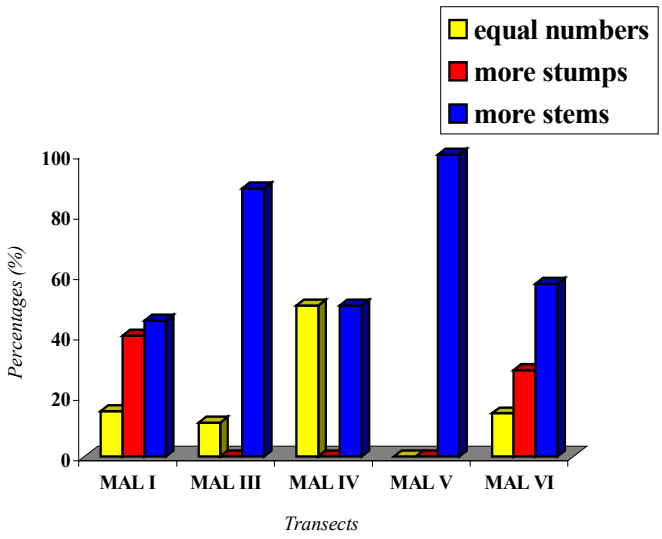


Fig. 3. 16: Comparison of the number of stems and stumps.

Adding the numbers of stumps to actual stand density, this would result in an average of 600 trees/ha in the S-exposed forested area and approximately 350 trees/ha on the N-exposed slopes.

The calculated SDI is 759 trees/ha for transect V (S-exposed) and 684 trees/ha for transect III (most intact N-exposed transect). In many areas forest clearing had taken place to a higher extent at least five years before the survey was done and stumps or missing trees are no longer visible.

3.1.3.7 Forest usage

The results of fig.3.16 are also corresponding to the ranking after intensity of use (see fig.3.17): I, IV and VI are most intensely exploited, III and V to a lesser extent. Lopping of pine trees for fuelwood is the most important way of forest usage in Malam, followed by logging and grazing.

- Lopping is practised to a high extent in all parts of Malam forest, the most intense in Malam.
- Logging is most common in Malam V, and least evident in Malam VI.
- Grazing leaves traces in all parts of the forest, but in Malam I grazing is most intense among all compared forested areas.
- On the steeper slopes (Malam III and VI) grazing is replaced by the cutting of grass with sickles .
- Splintering to gain torchwood is widely practised, but only to a lesser extent.

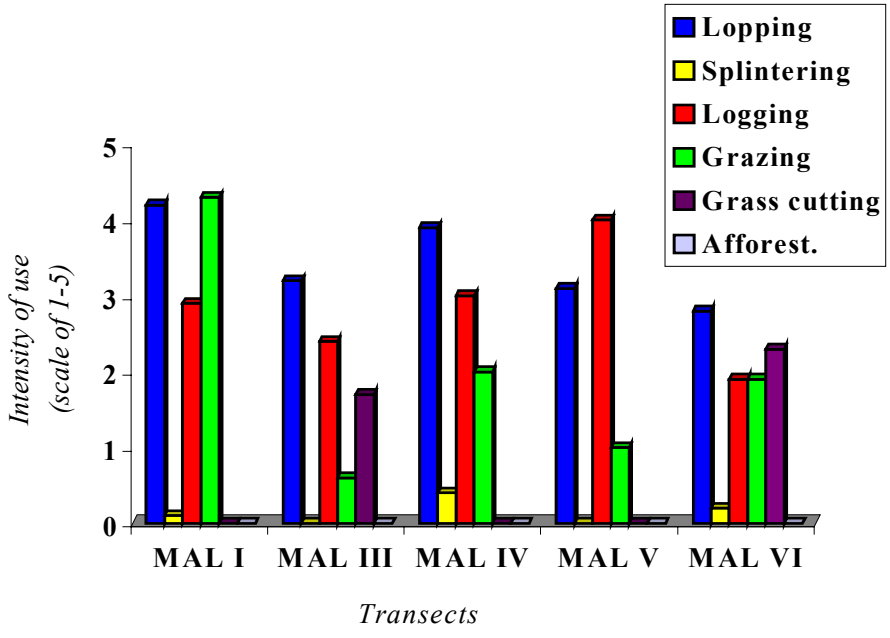
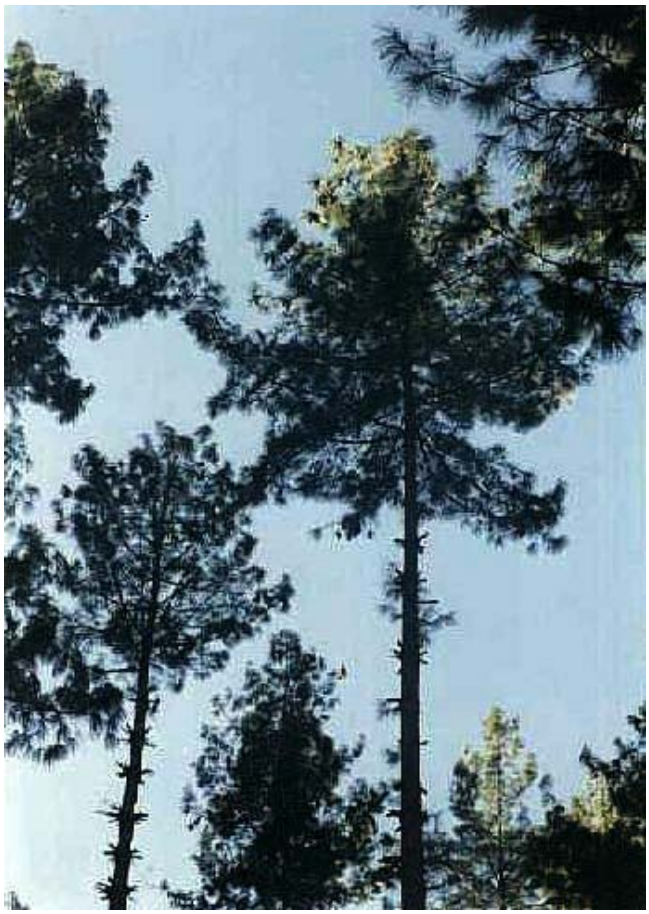


Fig.3. 17: Intensity of forest usage in all transects of Malam in comparison.



Photograph 3.1: Intensive lopping of trees is widely practised in the forested area in Malam.

Photograph 3.2: Splintering and other damage of bark is caused on purpose to weaken trees.

Photograph 3.3: After logging the stumps are burned down and used to gain torchwood until there is nothing left.

Photograph 3.4: Timber and fuelwood stored near a farmhouse in Malam.

3.1.3.8 Malam: Transect I (Foreray)

The site is situated about an hour' s walk away from Malam. The lower forest line is at 1950 m and the transect reaches up to 2020 m. The inclination ranges from 6-30° with an average of 15° (see photograph 3.5).

The adjoining farms belong to a nearby village called Kasona. On both sides of the forest there are houses of tenants and some small farmhouses. The lowest part of the forest is only about 100 m wide.

There is a river flowing down the hill next to transect I. Leaching due to heavy rainfall in spring and during monsoon period, and the drought in-between, enhance soil erosion. The soil is rather shallow and compact. Soil compaction is also enhanced by over-grazing and logging. Through the forest leads a path to the village of Kuh.

Vegetation

Trees and grasses are the dominant plant groups, shrubs and herbs reach only percentages of coverage abundance of < 10% (see fig. 3.18).

The grass is turf-forming due to intensive grazing and tufted grass and tussocks are rare. Nutrient richness and pasturage characterise vegetation as indicated by occurrence of *Plantago spp.* and *Rumex nepalensis.*

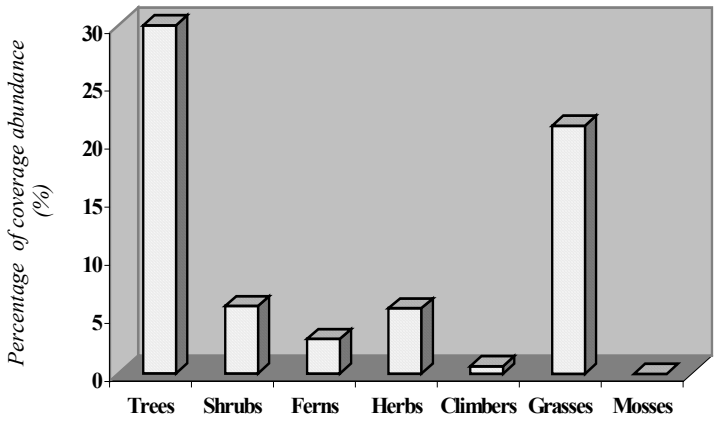


Fig. 3. 18: Percentage of coverage abundance of plant groups in transect I.

TREE LAYER

Trees are the dominant life form, but there is only one tree species (*Pinus wallichiana*). Oaks (*Quercus dilatata*, *Quercus incana*) are degraded and only found as shrubs.

SHRUB LAYER

The shrub layer rises to a maximum of between 80-100 cm. Shrubs are very rare, most frequent occur unpalatable or spiny shrubs, such as *Indigofera heterantha, Berberis lycium* and *Viburnum nervosum*, which are all typical for disturbed zones. Scattered around are specimens of evergreen *Sarcococca saligna* and *Buxus papillosa*. *Spiraea vaccinifolia* grows under more humid conditions.

LAYER OF SOIL

Grasses rank second after trees in abundance - for the major part the layer of soil is covered with turf-forming species, only on dryer spots *Cynodon dactylon* is dominant.

Other dominant herbal plants are *Plantago spp., Duchesnea indica*, *Ranunculus spp*., *Androsace rotundifolia*, *Galium boreale, Trifolium spp.* and *Oxalis corniculata*. Representatives of the *Lamiaceae* family like *Nepeta laevigata*, and climbers *Hedera nepalensis* are scarce.

The most common fern in this transect is *Onychium contiguum*; other ferns occurring are *Adiantum capillus veneris* , *Dryopteris spp.* and *Ceterach spp.*.

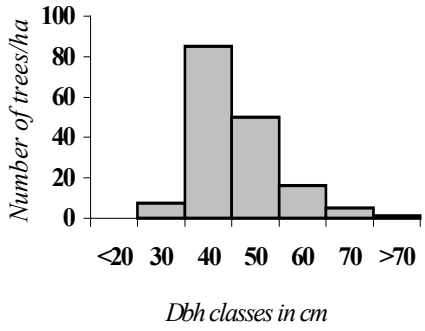


Fig. 3. 19: Stand table in terms of dbh classes in transect I.

Stand table

Most of the trees are between 30-40 cm and 40-50 cm. There are few small trees and few older trees. As the stand table (see fig.3.19) shows, mainly the older and dominant trees were removed. The stand is almost even-aged, possibly due to a regeneration after fire.

There is some natural regeneration, but to a minor extent (45 seedlings/ha), because grazing is too intensive in this area and small seedlings hardly survive for more than a year.

The trees reach an average height of 24.5 m and volume per tree amounts to 1.4 m³/tree. The remaining trees are intensely used for lopping and most of them have thinned crowns.

Forest usage

Stand density amounts to 165 trees/ha (SDI 377 trees/ha) and 158 stumps/ha. In this transect 40% of the plots have more stumps than stems. The stand was used for timber logging to a high extent (see fig. 3.20). Many stumps are hardly visible any longer. In some areas of the forest the forest ground is very rough and uneven – piles have remained there as soil accumulation of old root systems.

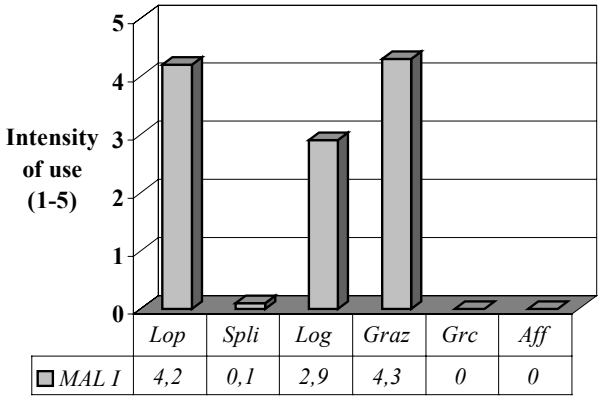


Fig.3. 20: Intensity of different ways of forest usage in transect I.

The stumps of the logged trees are hidden through covering with mud, and because of rinsing (water erosion) and soil compaction (grazing) they emerge as piles from the forest ground.

For logging no saws are used in this area, only axes. 72% of all stumps show also signs of fire. People living close to the forest gather fuelwood for their daily needs from the forest. They very often cut green branches from the pine trees (lopping system). Splintering for torchwood is practised to a lower extent.

All the trees undergo lopping to a very high degree, crown length is usually no more than 3 - 4 m. Some of the trees have only recently been taken for lopping, these trees still had a crown length up to 10 - 15 m at the time of the survey.

3.1.3.9 Malam: Transect II

The site is situated on a N-NE exposed slope with an average inclination of 17° (see photograph 3.6). The slope is rather dry and exposed. It takes about 30 min to walk from Malam to reach the hill. In 1997 it was declared a protected area with the aim to re-afforest the former forested area. In the first year (1997) about 100 acres were planted, in 1998 another 80 acres followed. After only one year of grazing restrictions there was already a very thick grass layer (20-30 cm high) and the shrubs grew up to 2-3 m in height. Apart from the amazing floristic development a large number of animals found a habitat that is almost unique in this area of intense agricultural use. Particularly birds, grasshoppers and several other insect groups inhabit this newly developing ecosystem.
To the east there is a rather thin forest of Blue Pine. Towards the SW there is another forested area with a very low stand density and a younger stand of Blue Pine to the West near a ravine. The trees to the West and below the afforestation are about 3 - 7 m high. People continue to go there to log trees and to collect fuelwood in spite of the restrictions. The next houses are about 300 m away from the area.

Vegetation

The lower part of the hill is dominated by shrubs, mainly *Berberis lycium* and *Indigofera heterantha*. Other bushes scattered around are *Spiraea vaccinifolia* and *Cotoneaster spp.*. This nearly impenetrable shrubby thicket facilitates strong natural regeneration of pine additional to the afforestation. Wild fruit trees like *Pyrus malus* come up as a result of natural regeneration.

About 100 m further up the vegetation changes. Grasses become the dominant plant group (especially *Cynodon dactylon* as the soil is rather dry) (see fig. 3. 21). Shrubs are less dominant here and also smaller in size. On small banks some herbal plants and ferns find refuge. Here the saplings are taller and stronger than on the exposed areas. Further up on the increasingly steeper slope a tussock steppe has developed. Dominant species and taxa associated with the grasses are *Rosa webbiana*, *Hypericum perforatum*, *Ranunculus spp., Galium spp*., and *Salvia spp.*.

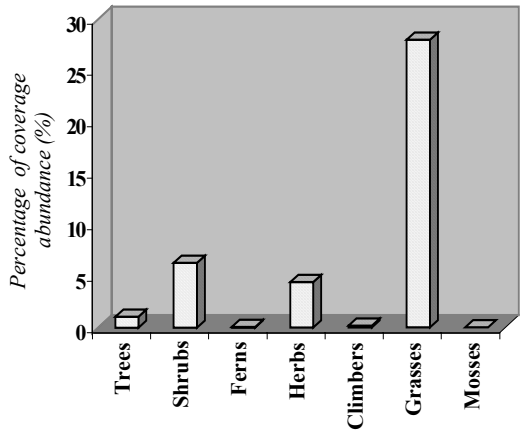


Fig. 3.21: Percentage of coverage abundance of plant groups in transect II.

Afforestation

In Malam the farmers planted nearly 890 saplings/ha on the site. The two-year old plants were mostly of Blue Pine, some of Chir Pine.

Table 3.7: The calculated number of saplings in the afforestations.

Year of afforestation	Area (acres)	Area (ha)	Number of saplings
1997	100 acres	40 ha	35600
1998	80 acres	32 ha	28480

The average height of a sapling was 29 cm. The tallest pine trees in the afforestation had reached 360 cm height. There was also an amount of natural regeneration observed in the survey.

Intensity of use

At the time of the survey around 8 % of the pits no longer contained any living saplings. From the damaged plants 28 % were affected from drought, around 4 % from pasturing (see table 3. 8). On the whole there were hardly any growing saplings to be found. It must be taken into account that of the 890 saplings, that were planted per ha, only around 20 % will remain in the end.

As fig. 3. 22 shows, the protection of the area seems to be widely accepted. There is hardly any grazing and almost no grass cutting.

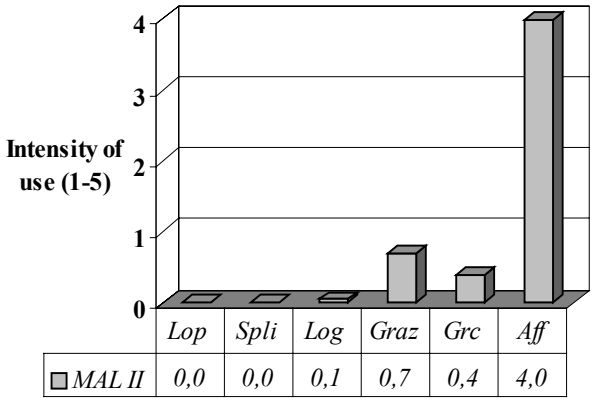


Fig. 3. 22: Intensity of different ways of land/forest usage in transect II.

Table 3. 8: Degree of damage through drought and grazing in transect II, expressed in percentages of affected saplings.

Degree of damage[4]	***Grazing***	***Drought***
No damage	95.9 %	71.9 %
(1)	1.5 %	9.4 %
(2)	2.1 %	11.1 %
(3)	0.4 %	4.2 %
(4)	0.1 %	1.7 %
(5)	0 %	1.7 %
Damage	4.1 %	28.1 %

Of the stems in this transect, 55% show signs of fire. For logging only axes are used. The number of stems increases the further up to the ridge one goes: In the lower part of the transect a dense thicket of thorny bushes makes it difficult to find stems, but normally trees are logged starting from the lower forest line. This explains the lower number of stems there, while near the ridge the number of stems amounts to 11-18 per plot (350-450 stems/ha).

3.1.3.10 Malam: Transect III (Barida)

The site is situated on a very steep slope, inclination ranges from 26-30° (average 30°) (see photograph 3.7). The transect reaches from 1950-2130 m. It is situated about 30 to 45 min way from Malam, but several farmhouses were built next to the forest ending. Due to its steep slopes and difficult access it is still well preserved. There is

[4] Categories according to 2.3.1.4.

only one major path leading through the lower part of the transect. Soil coverage averages to 82%, which is a comparatively high value. Rocks are often protruding in the upper parts, which can be explained in the geological history of the valley (see 1.2.1.2).

All the slopes surrounding the forest were cleared during the last 10-15 years to gain more land. On all sides of the forest there are also recently cleared, already shrubby zones.

Vegetation

Most plant groups occur in low abundance. There are hardly any visible indicators of drought, although the site is dry, but it is better shaded and not as exposed to radiation and heat. The major effect on ground vegetation from a human side is grass cutting and cutting of woody perennials. The main components are therefore grasses, followed by trees, less frequent appear shrubs, herbs and ferns (see fig.3.23).

Dominant in the shrubby zones surrounding the lower forest ending are *Plectranthus rugosus* and *Berberis lycium* as the typical indicators of lower elevation, dryness and recent clearing. Scattered around are large trees (*Pinus wallichiana*), that are mostly topped and severely lopped.

TREE LAYER

There is only one tree species (*Pinus wallichiana*), but it reaches high levels of abundance. Oaks (*Qu. incana*, *Qu. dilatata*) are part of the shrub layer, they do not reach more than 100 cm height in this forested area.

SHRUB LAYER

In the part of the forest where only few pine trees are left, the shrub layer is extremely dense, forming a transition zone to the clearings surrounding the forest. All dominant species are indicators for disturbed zones and resistant to grazing pressure: *Plectranthus rugosus*, *Berberis lycium* and *Indigofera heterantha.* The shrubby zone extends up to 1.5 - 2 m. Towards the ridge these species disappear totally in some plots and are replaced by *Spiraea vaccinifolia*, *Lonicera spp.* and sometimes also *Sarcococca saligna*, a bush that indicates a more intact forest type.

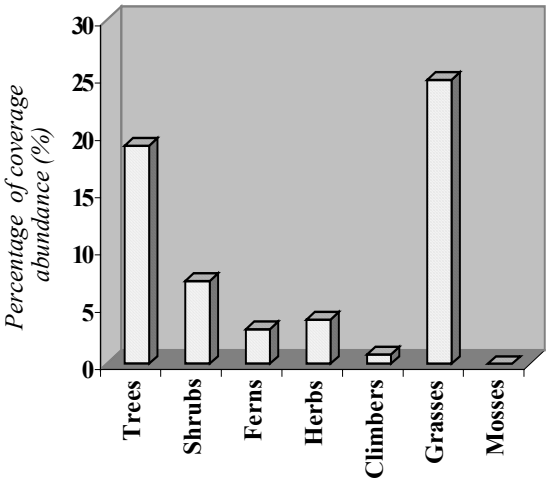


Fig. 3. 23 : Percentage of coverage abundance of plant groups in transect III.

LAYER OF SOIL

Grasses are the dominant plant group in transect III: These are mainly tufted grasses, while turf-forming species are less common. Absence of *Cynodon dactylon* in most parts of the forest indicates moist conditions.

Among the herbal plants *Duchesnea indica*, *Viola spp.*, *Androsace rotundifolia*, *Trifolium spp.*, *Ranunculus spp.* and *Potentilla spp.* are dominant.

Climbers like *Hedera nepalensis* and *Smilax sp.* occur seldom. The ferns *Dryopteris spp.* and *Adiantum capillus veneris* occur rather frequent, other ferns are rare.

Stand table

As the stand table (see fig.3. 24) shows, the stand is almost even-aged. There are certain amounts of trees with a larger dbh (40-50 and 50-60 cm), therefore the stand has more or less the structure of a forest after low thinning practices. It is also possible that regeneration after fire is the reason for this structure.

The stand has already been exposed to a long period of usage and is therefore no longer renewing itself (only 30 seedlings/ha), but for few exceptions (< 20 cm of size). The seedlings are unlikely to survive more than one year due to grass cutting with sickles which is a common and visible practice in this forest. The arithmetic mean height of trees was 28.1 m.

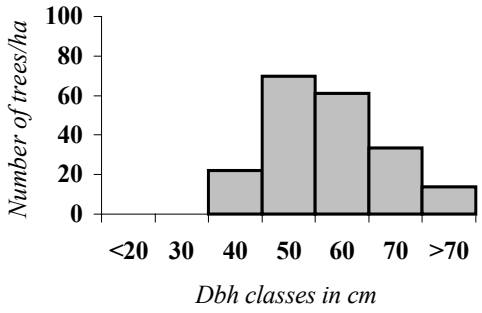


Fig.3. 24: Stand table in terms of dbh classes in transect III.

Forest usage

Although logging for timber is practised frequently, there are still more stems than stumps in most of the plots (89%). Stand density amounts to 200 trees /ha. Together with 153 stumps/ha this is a comparatively high value (SDI 684 trees/ha).

Grass cutting is practised frequently in the forest. Grazing is a minor factor due to steep slopes, as the area is not suitable for cows and buffaloes. Goats and sheep are less common in the area.

Lopping is practised at a comparatively low level. Sometimes crown length is still intact to $^{2}/_{3}$ of the complete length. Even less frequent is splintering for torchwood. Only few trees have a damaged bark (see fig. 3. 25).

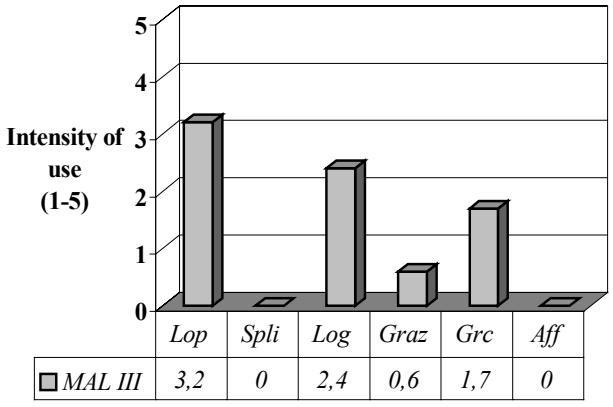


Fig. 3. 25: Intensity of different ways of forest usage in transect III.

3.1.3.11 Malam: Transect IV

The site is about ¾ h walk away from Malam and close to the plots there are only two houses. The area is very difficult to reach and far away from the road and villages (see photograph 3.8).

The altitude is between 2060-2080 m. The site is situated in a ravine-like hollow, with a rather moist and cool microclimate, exposed to the north. The soil is deep and there is almost no sign of soil erosion. There are small paths leading through, but shrubs overshadow most of the area.

Also the ravine itself is the target of encroachment, which becomes obvious due to the high frequency of timber logging. The forest is thinning on all sides, and the slope is rather steep and rocky. The average inclination on the flatter part of the ravine is 22.5°, but on all sides slopes with an inclination of around 40° are visible. For this reason the survey covers only two plots of this type of forest.

To the east there is a forest with rather thin undergrowth, moderately steep and used mostly for grazing and lopping. To the west there is a very steep slope, with hardly any undergrowth and in spite of the steepness still used for both lopping and logging. Grazing is practised to a lower extent here.

Vegetation

The undergrowth is remarkably diverse and indicating moist and shadowy conditions. It clearly differs from all the other transects of the survey. As fig. 3.26 shows, mosses are most abundant, ferns are also common.

TREE LAYER

The only tree species occurring is *Pinus wallichiana.*

SHRUB LAYER

The shrub layer is remarkably high (up to 3 m) and consists mainly of *Viburnum nervosum*.

Other shrubs that occur frequently are *Sarcococca saligna* and *Indigofera heterantha*.

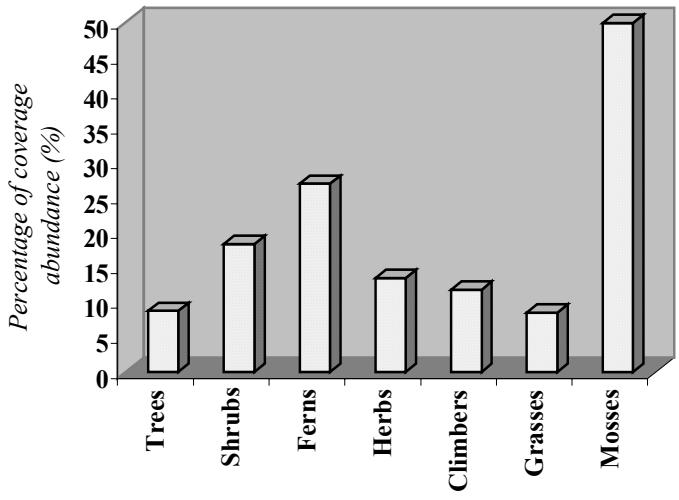


Fig.3. 26: Percentage of coverage abundance of plant groups in transect IV.

LAYER OF SOIL:

Ferns are dominant in this forest type: *Onychium contiguum* and *Dryopteris spp*. are the most common representatives, but also *Adiantum capillus veneris*, *Asplenium sp.* and *Ceterach spp.* are dominant. Mosses are widespread and cover rocks, stumps and ground. The bigger rocks are also overgrown with ferns and *Bergenia ciliata*.

Among the herbaceous plants appear most frequently *Oxalis corniculata*, *Stellaria media*, *Galium boreale*, *Duchesnea indica*, *Valeriana spp*., *Androsace rotundifolia* and *Prunella vulgaris*. Grasses occur less often and are mainly turf-forming.

Stand table

The diagram of the stand table is divided (see fig. 3.27): There are some smaller trees (<20 cm, 20-30 cm) and some with a higher value for dbh, but none in-between (30-40 cm). There is still some similarity with a selection forest, except for the lack of smaller trees. The data are in fact less representative than other transects', as there were only two plots of 400 m² measured.

Seedlings had a major height of 20 cm(12.5 seedlings/ha). They were difficult to find due to the dense shrubby undergrowth. These shrubs also hinder germination of seeds through shadowing resulting in a naturally low level of regeneration.

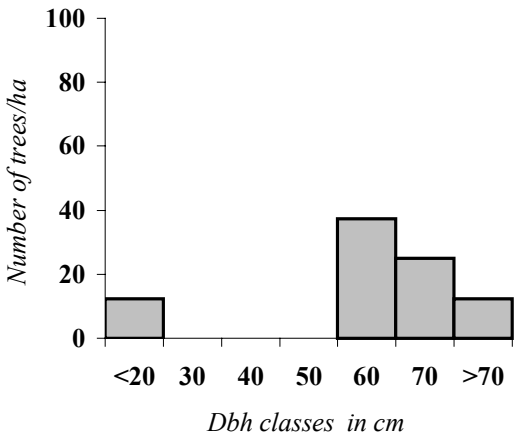


Fig. 3. 27: Stand table in terms of dbh classes in transect IV.

Forest usage

Due to high clearing activities there are equal numbers of stems and stumps in half of the area. In the other 50% there are more stems than stumps. Stand density amounts to 87.5 trees/ha, the number of stumps was 63 stumps/ha (SDI 340 trees/ha).

The remaining trees are all prone to lopping and splintering. People also collect cones from the ground, which hinders natural regeneration. Logging is practised - some stored timber was found in the forest.

The forest has been exposed to intensive usage only recently. Some trees were still totally unaffected, which was hard to find anywhere else. There was also hardly any grazing and almost no grass cutting practised. (see fig. 3. 28)

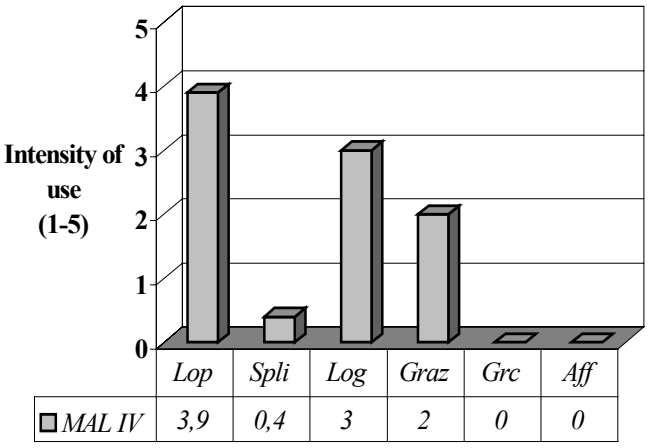


Fig. 3. 28: Intensity of different ways of forest usage in transect IV.

3.1.3.12 Malam: Transect V

This plot was chosen as a representative of a more natural forest type with less intense use. The area is difficult to reach and very steep (altitude 2170 m) (see photograph 3.9). Only one plot could be measured in this area. Continuing from the ravine (transect IV) in the direction of Bango Ser there are densely forested slopes, with an inclination of normally more than 40°. The area is about an hour away from Malam and there are no houses within 15 min walking distance. The slopes are exposed from SW to NE, and altitude ranges from 2100-2200 m. There is not much damage from soil erosion, as there is only one path leading through the forest and because of its steepness there is not much cattle grazing in the area. The soil is rather shallow and sometimes the parent rock is protruding. The respective measured plot was on a rather dry slope, leading down to a hollow, that has to be crossed to reach Bango Ser.

Vegetation

In the forested area *Pinus wallichiana* is the only dominant tree species.

Sometimes *Quercus dilatata* reaches 2-5 m height. The shrubby undergrowth is represented by *Viburnum nervosum*, *Sarcococca saligna* and *Buxus papillosa*. In some hollows, under moist conditions, *Viburnum nervosum* is dominant, together with *Adiantum capillus veneris* and *Dryopteris spp.*.

On the slopes tufted grass appears, ferns are also a dominant plant group here. Remarkable abundance is also reached by *Duchesnea indica*, *Fragaria nubicola*, *Viola spp.*, and several *Lamiaceae,* as in plot V/1.

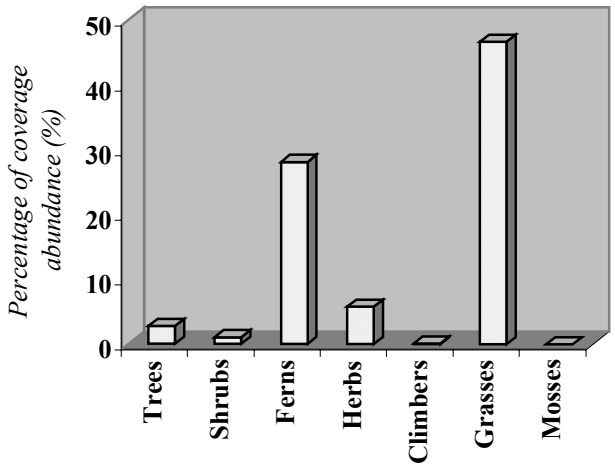


Fig. 3. 29: Percentage of coverage abundance of plant groups in transect V.

PLOT V/1 (see fig. 3. 29):

TREE LAYER

The only occurring tree species is *Pinus wallichiana*, and is accompanied by small shrubby forms of *Quercus dilatata*.

SHRUB LAYER

The shrub layer is very sparse, only a few specimen of *Viburnum nervosum* and *Buxus papillosa* are present.

LAYER OF SOIL

The most common are tufted grasses and tussocks. They profit from the conditions on the southern exposed slope. Herbal plants occur only seldom in this forest type; ferns such as *Dryopteris spp*. and *Adiantum capillus veneris* reach high abundance.

Stand table

In the forested area the trees are around 25-35 m high, most of them from 30-35 m. Diameter varies from 40-75 cm. Age structure is more variable than in the other forests. There are about 20-25 trees in an area of 400 m².

Most of the trees measured on plot V range in the dbh classes from 40 – 60 cm. There are no trees with less than 20 cm dbh, but some are larger than 70 cm. The stand table of the measured plot (see fig. 3.30) shows a distribution similar to that of a forest after low thinning. This is more likely due to a lack of regeneration. The data are not as representative as TI, III, VI because only one plot could be measured.

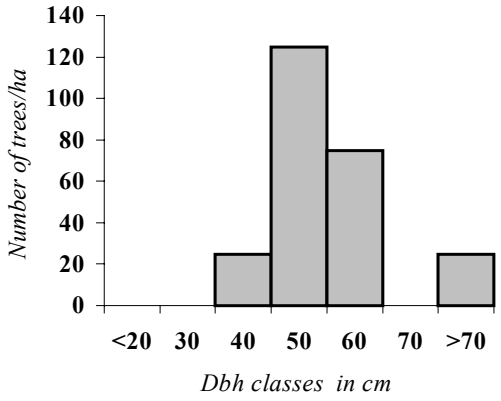


Fig. 3. 30: Stand table in terms of dbh classes in transect V.

Forest usage

Since the area is comparatively remote and far from settlements, there is not such intense usage noticeable. Splintering is rather seldom and also lopping is not practised to a higher extent. Grazing animals are cattle, sheep and goats, but there is no deeper impression visible apart from the lack of effective natural regeneration.

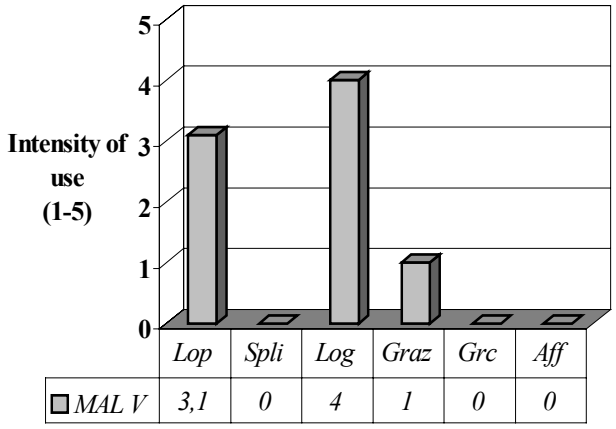


Fig. 3. 31: Intensity of different ways of forest usage in transect V.

The stand density amounts to 250 trees/ha, which was the highest value of all transects measured during this survey (see table 3.6). Also the number of stumps is very high with 350 stumps/ha. SDI amounts to 759 trees/ha.

Logging is practised to a high extent (see fig. 3. 31). The area is known as the most popular place for acquiring timber and fuelwood for the Malam people. Being a very remote and inaccessible area it was only recently chosen as a source of timber and fuelwood.

3.1.3.13 Malam: Transect VI

This forested area is situated opposite to the afforestation area (see 3.1.3.9) of the MAP and planned to become part of it in the coming years. This transect is within 20 min walking distance of Malam. In this forest is remarkably high natural regeneration visible due to already existing grazing restrictions (see photograph 3.10).
Neighbouring the forest are farmhouses: People still use the forest as a source of fuelwood and timber, although the extent of use is the least intense of all transects in Malam.
East of the transect there is a wooded area with a high stand density which is used for grazing and lopping to a lesser extent. To the west, close to the afforestation, stretches a thinned area of trees evidently used for grazing and lopping.
The transect extends from the lower forest line to approximately 60 m below the ridge (1950-2010 m), just below a very steep slope (42°). Inclination ranges from 37-39° (average 32°). At the beginning of the transect there is a very dense and almost impenetrable thicket of thorny and mostly unpalatable shrubs. Below the forest there is a transitional zone where mainly shrubs and young pine trees grow. Only a few older pine trees remain.
Soil coverage ranges from 90-95 %. There are few areas of exposed rock due to geological formations in the valley (see 1.2.1.2). The soil is occasionally shallow, and there is not a great deal of soil erosion. Some paths lead through the forest.

Vegetation

Ground vegetation is variable due to human interference. The lower part of the forest is dominated by a shrubby zone with some regeneration of *Pinus wallichiana*. The shrub layer is dominated by *Plectranthus rugosus* and *Berberis lycium.* The bushes are up to 1.5 m high.
Further up follows a patch where almost no trees remain; pasturing is also practised here. Finally closer to the ridge there is a more intact forested area with a richer species diversity. The undergrowth is still rather poor, but similar to lower parts. Only *Indigofera heterantha* appears more frequently, *Plectranthus rugosus* is scarce. (see fig.3. 32)

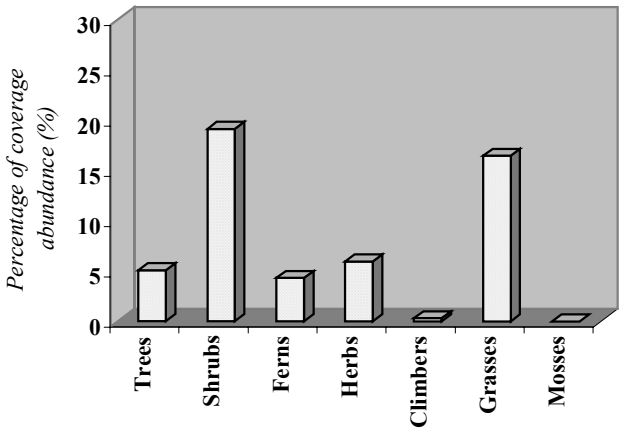


Fig. 3. 32: Percentage of coverage abundance of plant groups in transect VI.

TREE LAYER:

The only occurring tree species is *Pinus wallichiana*. Oaks are only represented as small shrubby forms (*Quercus dilatata*, *Quercus incana*).

SHRUB LAYER:

Shrubs are most abundant in transect VI. Ever-green *Sarcococca saligna*, *Cotoneaster spp.* and the typical shrubs of the disturbed zones *Berberis lycium*, *Plectranthus rugosus* and *Indigofera heterantha* have a very high

percentage of coverage abundance. The shrub layer is up to 1.5 m high and particularly dense in the lower, more disturbed part of the transect.

LAYER OF SOIL:

Tufted grass occurs more often than other herbaceous plants. *Cynodon dactylon* appears to a lesser extent and only on drier and open areas. Other dominant species in this transect are *Galium boreale*, *Trifolium spp.*, *Duchesnea indica*, *Geranium spp.*, *Rumex nepalensis*, *Ranunculus spp.* and *Nepeta clarkei*. Less frequent grow ferns, like *Dryopteris spp.*, *Onychium contiguum* and *Adiantum capillus veneris*.

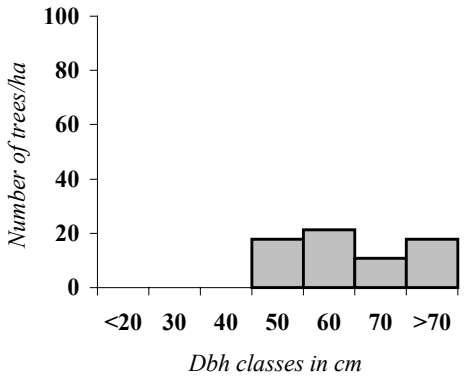


Fig. 3. 33: Stand table in terms of dbh classes in transect VI.

Stand table

The stand table (see fig. 3.33.) shows there are exclusively trees with a dbh larger than 40 cm in the transect. The trees have an average height of 25.8. The stand has been thinned consequently during a longer period and it has not regenerated itself. It was over-mature at the time of the survey and it is doubtful, whether it will fully recover again, although there is a strong natural regeneration (450 plants/ha) as a consequence of recent forest protection. Most of the trees are in the dbh class 20-80 cm, some are of less than 20 cm dbh.

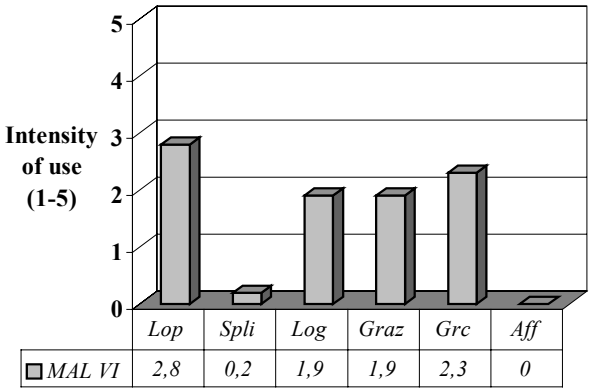


Fig. 3. 34: Intensity of different ways of forest usage in transect VI.

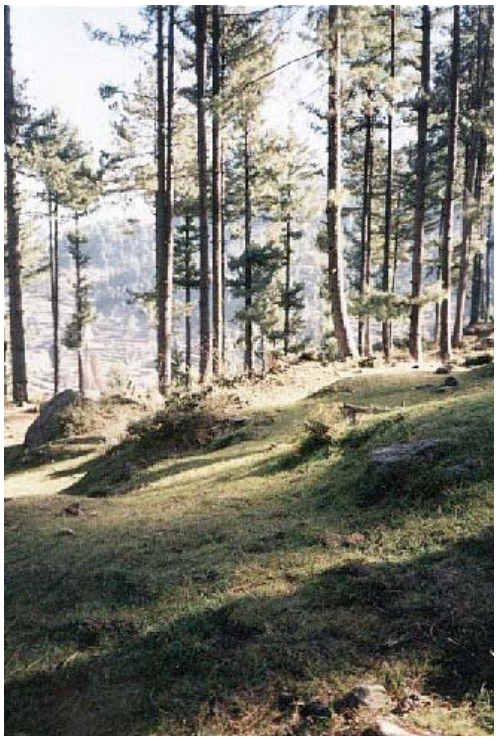
Forest usage

The stand density amounts to 67.8 trees/ha and 93 stumps/ha (SDI 272 trees/ha), which is the lowest value of all transects measured during the survey.

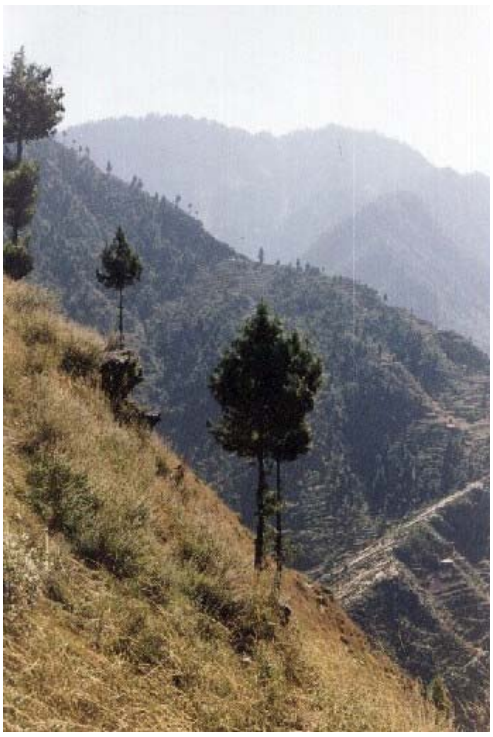
Grazing is restricted in the forest, still it was noticeably practised. Additionally grass cutting with sickles prevents more effective regeneration. (see fig.3. 34)

In spite of this, usage is less intense than in all other forested areas covered by the survey in Malam.

In 57% of the plots there are more stems than stumps. Logging and splintering are not practised to a great degree in the whole transect, while lopping is practised to a higher extent in the lower part of the transect, and less in the upper part.

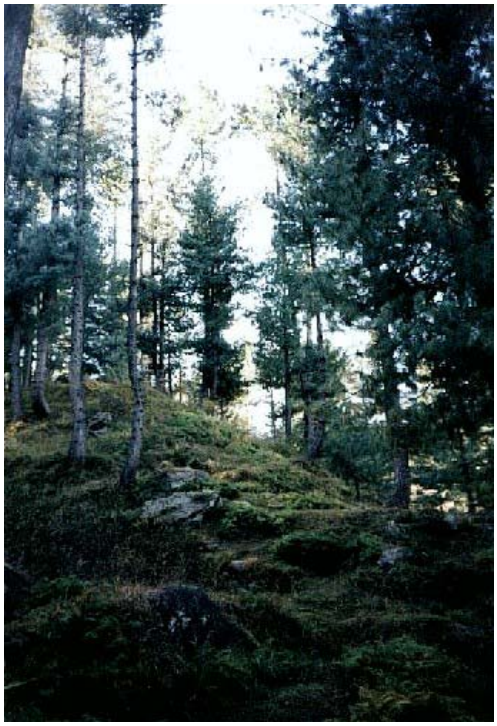


Photograph 3.5: Transect 1 in Malam: Turf-forming grasses dominate. The trees are severely lopped.

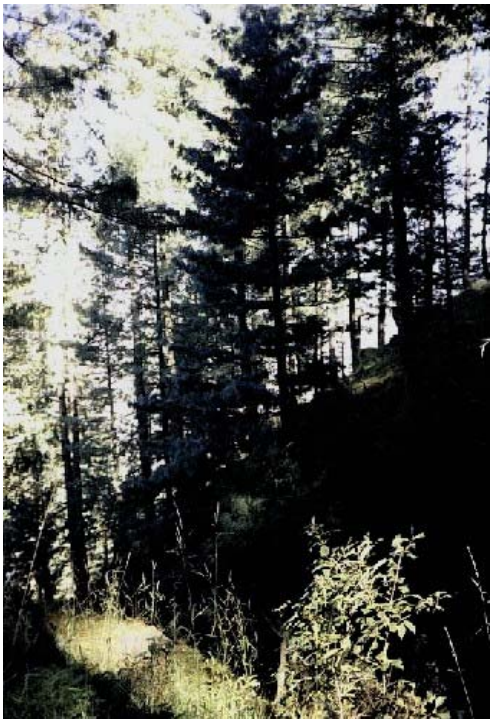


Photograph 3.6: Transect II in Malam: A tussock-*steppe* is developing in the protected area.

Photograph 3.7: Transect III in Malam: The understorey is poorly developed (*Viburnum nervosum, Quercus dilatata, Plectranthus rugosus* etc.).



Photograph 3.8: Transect IV in Malam: This site is shady and humid, mosses and ferns dominate.



Photograph 3.9: Transect V in Malam: The slopes are very steep, but the forest is still comparatively pristine.

Photograph 3.10: Transect VI in Malam: The forest is close to an afforestation site and therefore also protected. The terraces reach up to the forest line and sometimes even encroach into the forested area.

3.2 Mangarkot

3.2.1 Population, livestock and agricultural land

The inhabitants of Mangarkot are mainly landowners. The farmers claim to own the land they are working on, but in fact the land is still disputed (see 1.2.3.1). Asked about their family name, the majority of the villagers claims it is *Bashrikhel*, a tribal name that most of the farmers in Mangarkot have adapted as their own. This is a tribe of Pathan origin but in fact there are many different families and ethnic groups in Mangarkot.

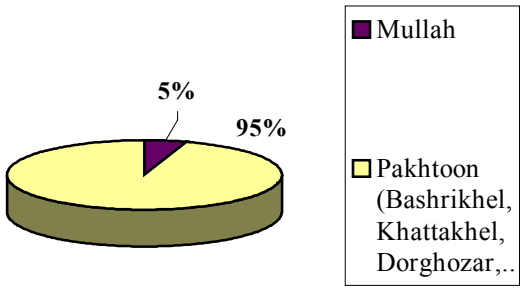


Fig. 3. 35: The population of Mangarkot with regard to social groups.

About 5 % of the households are of the Mullah family, the rest is all Pathan, meaning Bashrikhel, *Khattakhel* and *Dorghozar* (Kohistani origin) people and many others that have moved there from other parts of the district (see fig.3. 35). The denial of their own family roots is astonishing. Here the motives are to be found to a certain extent in the unclear landownership rights. The Pukthoon are a powerful tribe and recognised as having a right to land, in contrast to Kohistani or especially Gujar families.

The villagers of Mangarkot are more or less equal in standing and even the women move quite freely as long as there are no outsiders around. Most of the farmers are landowners even if only on a small scale. There is also more equality concerning landownership per household and land per person (see fig.3. 37) compared to Malam.

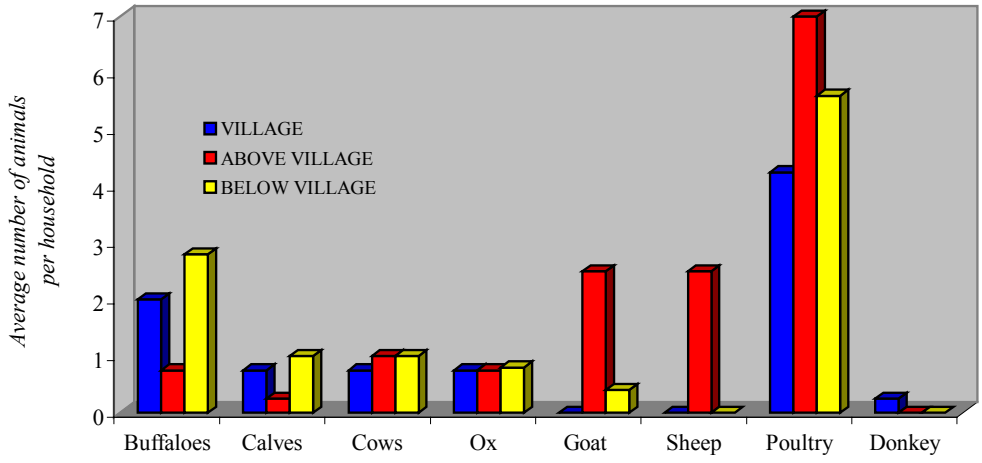


Fig. 3. 36: Average numbers of livestock per household in Mangarkot.

In the run of interviews it became clear that the farmers in Mangarkot have differing interests, depending on where they have settled within the village area.

Different user groups

The three user groups are mainly defined through their area of settlement:

- The villagers and farmers living near the village are the main *decision makers* (according to the other two groups). They have access to irrigation and land is only moderately steep in their area. There are some fruit trees in the surroundings of the village, some farmers can grow vegetables and wheat in the village area. But on the other hand many of them claim to buy fuelwood and sometimes even fodder from other places in the valley. The forest is very far for them. The advantages of living in the village lie in the infrastructure:
  In the village there is a school for boys and a school for girls[1]. There is a mosque, some small shops, a kind of pharmacy (one man comes from a neighbouring village at irregular intervals to provide medication and medical assistance) and there is a bus coming to the village and going to Mingora every second day. It is also used for small business, for example to transport agricultural products to the market.

- The *forest farmers* live above the village, close to the forest, on very steep and dry land. There are no irrigation facilities and the fields are very difficult to cultivate and to protect from soil erosion. On the banks of terraces there are hardly any trees. Only maize is grown in this rainfed area. Women collect drinking water with large bowls from several springs. The animals are sent to graze in the forest and the forest is also the main source for fodder through grass cutting, and the source for fuelwood and timber.

- The farmers living on the opposite side of the valley live far from the forest, they have no irrigation water and very limited drinking water supplies. Maize, wheat and sometimes vegetables are grown there. The area above the settlements on the other side of the river was used as grazing area earlier, but at the time of the survey it was already a partly re-afforested and protected area. As well as the people living close to the forest these farmers complain about the protection, because they could use the area for fodder and grazing.

Both the forest farmers and the farmers living below the village blame the village people for making decisions about their land and rights without asking them, many of these farmers feel excluded from the decision process.

The distribution of livestock is quite equal among all groups (see fig. 3.36): Poultry is reportedly under-represented, because a disease killed most of these animals in the year of the survey. Calves were named separately in this village, but this was due to a different translator.

Farmers in the village keep less livestock than the others. Most dependant on animal husbandry are the farmers living above the village - they have more goats and sheep and also more poultry than the others.

[1] The girls' school is not open because there is no female teacher.

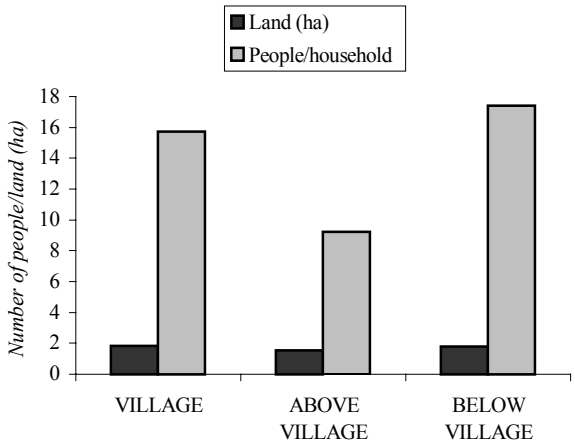


Fig. 3. 37: Comparison of the number of people per household and the available land (ha).

The estimated number of people living in Mangarkot is 1260. This is in fact an average value calculated from all numbers given by officials, the results of the interviews and the results of the last census (1981). The numbers given during the interviews would result in about 1750 inhabitants (see 1.2.2.3).
The average number of people per household in Mangarkot was 14:

Interest group	*Persons/household*[2]
Above the village	9
Village	16
Below the village	17

The main source of income in the village is money from men working abroad or elsewhere in Pakistan. Apart from men working on the farm or in the village, there are in all families male members engaged in off-farm labour. Most of these men work in Hyderabad in winter (November to February). Some stay away for longer and work in Karachi, Saudi Arabia or Kuwait. Other professions practised in Mangarkot are shopkeeper, teacher and miller.

3.2.2 Natural resources

3.2.2.1 Description of the area

Mangarkot is a small village situated at the far end of Malam Jabba Valley in the direction of Shangla. An unpaved road leads from Balakot and Kakot to the village. Every other day a bus is either going to or coming from Mingora.

[2] These area average values, calculated on basis of the statistical data resulting from the interviews with farmers.

The area above the village is very steep and the land is dry. Maize is the main crop there, because most of the area is only rainfed (see landuse map in APPENDIX). Both water supply and irrigation are insufficient. There is also a shortage of grazing areas and fodder. As the forest is diminishing dramatically there is no longer enough fuelwood available. The terraced fields are usually about 5 m wide and 20 - 80 m long, but often they are even smaller than that. Trees on field boundaries are scarce on the steep areas above the village and near the village there are sometimes fruit trees on the banks of terraces. Farmers hardly ever plant trees because there is not enough water. Another reason is that there are usually no trees of good quality available. Grazing with goats and cows also destroys the young plants according to the farmers.

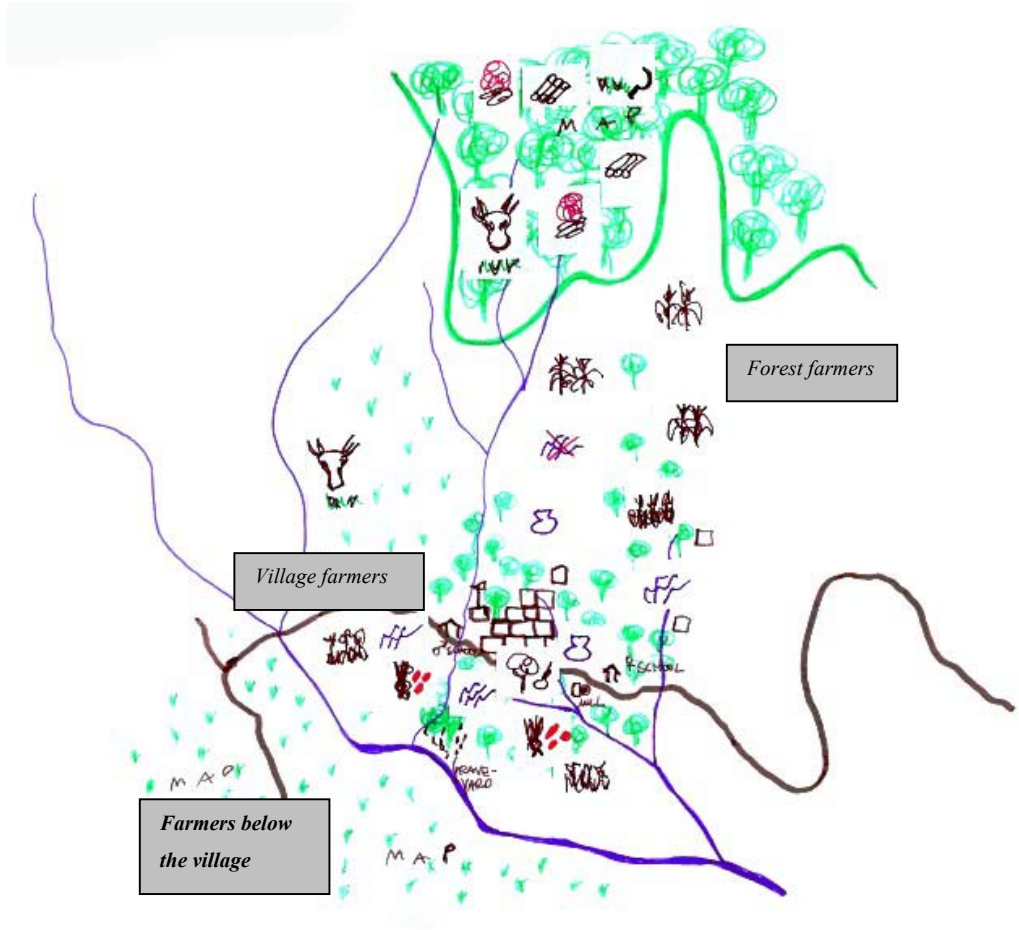


Fig. 3.38: Result of natural resource village mapping in Mangarkot. The map shows locations of the most important natural resources, the settlements of various ethnic/social groups, the location of different crops and important facilities mentioned during group interviews.

In higher areas there are many herbs growing. The surroundings of Mangarkot certainly present a good site for medicinal plants. Reportedly some people collect them to sell, but no local people are involved in such business. They only collect herbs for their own use. Near the forest there are also naturally growing trees like wild fruit trees, mulberry, fig, and older pine trees that have survived from the old forest.

Below 1700 m the land becomes less steep and more accessible. Around the village and along water courses walnut occurs frequently, joined by willow tree, plane tree, ash, poplar, and others. There are often fruit trees and

mulberry and fig along the banks of terraces. Maize, wheat and vegetables are grown in the fields. Some fields in the area are irrigated.

In the direction of Serai the slopes are very steep and dry. Deep gullies run down to the valley bottom and there is much soil erosion. Landslides have occurred in recent years. These areas were used for grazing earlier but the soil has become too shallow.

Below the village and on the opposite side of the valley bottom the land is very dry and there is insufficient water for irrigation and water supply. Some of their former grazing land near their settlements has become part of the afforestation project (1997). This is a very steep and dry barren hillside, that has obviously been prone to overgrazing for many years. But many farmers complain about the status of the afforestation sites. A high number of trees have died due to lack of water and insufficient protection.

The other afforestation site is in the forested area of Mangarkot. The trees were planted in 1998, although this was a very dry year (see Mangarkot Transect I and II). The villagers insisted on this site because they thought protection from grazing would be most suitable here. In spite of this it was used intensely at the time of the survey.

3.2.2.2 Problematic aspects concerning natural resources in the village of Malam

- **Water**

  There is only one well in the village, and tap water is only available in the mosque. The women have to walk to springs and rivers to fetch water. In a dry year like the year of the survey these distances increase and the water supply is then difficult to maintain.

- **Fuelwood**

  Farmers get fuelwood from the forested area. More and more people have to buy fuelwood. Also fruit trees are used for fuelwood (only branches and old trees). The nearest forest is about ¾ of an hour walking distance away from the village.

- **Pasturage**

  Cattle grazes near the village in the fields and field boundaries. There are no real grazing areas remaining.

- **Orchards and fields**

  There are only very few orchards because there is insufficient water. The farmers cultivate mainly maize, wheat and vegetables, if irrigation is available.

3.2.3 Seasonal diagrams

MEN:

- During spring rains the fields are prepared and then maize and potato are sown. In maize fields pumpkin is occasionally sown.
- In May and June wheat and peas are harvested and then maize is sown as a follower crop, as well as cucumber and tomato.
- During monsoon rains there is less work, only weeding and tending of crops and vegetables.
- In October harvest of maize and tomato starts. Afterwards wheat, peas or onion are sown. Before hand and sometimes parallel grass is cut and stored for winter, like maize straw. Fuelwood and timber are collected before the winter.

In Mangarkot men regard the dry summer season to be most work intensive, followed by the dry winter season. Least work intensive is the rainy monsoon period. (see fig. 3. 39)

WOMEN:

All year round leafy vegetables are collected, in summer mushrooms and wild grapes and in autumn chestnuts and walnuts. This is mainly women's work (see fig. 3. 40).

- During spring rain women collect leafy vegetables, besides from their daily work, while the men have to work in other areas and on other people's fields (vegetable plantations,....).
- In May and June wheat is harvested, cleaned and stored, there is a lot of work at home, the fields have to be prepared again and fuelwood and fodder has to be gathered.
- In summer they sometimes work for other people during fruit harvest season and they also take care of the maize crop.
- In October women help with the maize harvest, grass cutting and storage for the winter as well as with fuelwood collection.

Women in Mangarkot consider the dry summer season to be most work intensive (May/June), second they rank the monsoon rainy season (July/August). The dry winter season is least work intensive for them.

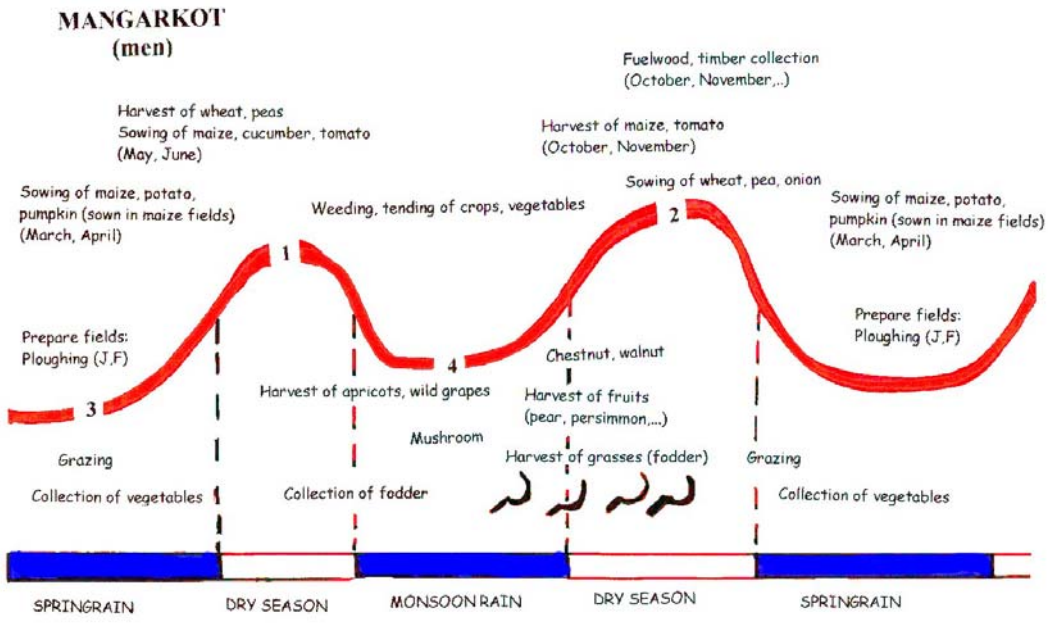


Fig. 3.39: The seasonal diagram as told by the men in Mangarkot.

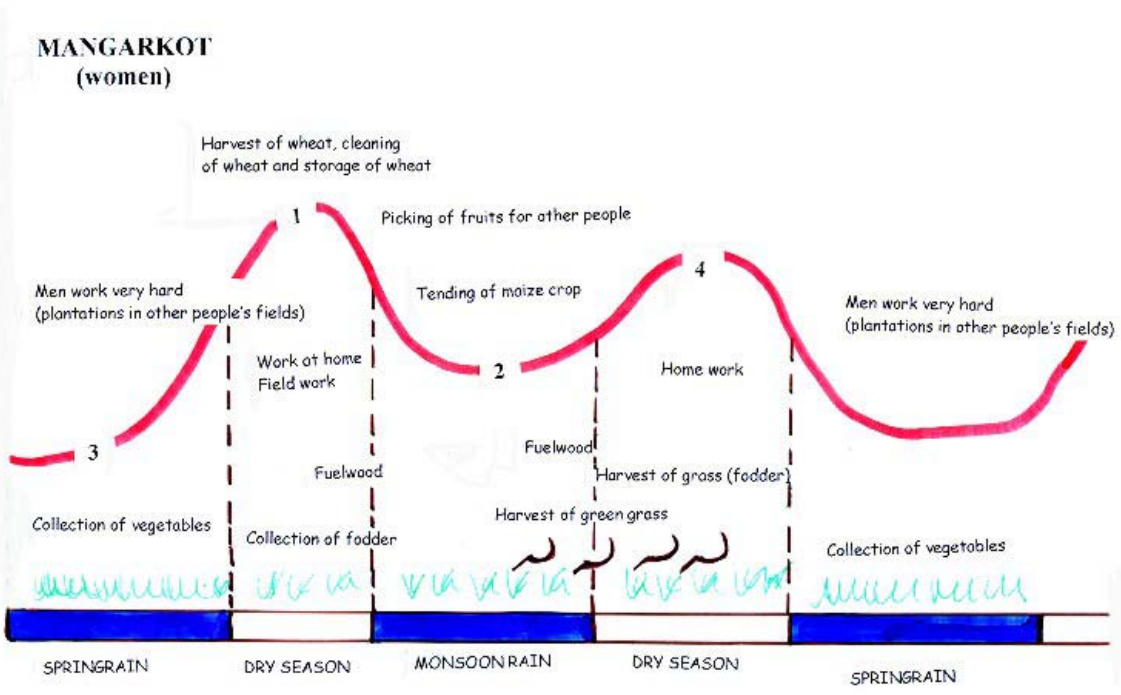


Fig. 3.40:The seasonal diagram as told by the women in Mangarkot.

3.2.4 The importance of various products from agriculture and forestry for farmers in Mangarkot

The results of scoring (as described in 2.3.2.2) of products from agriculture and forestry with beans varied only marginally between priority ranking of products and scoring with regard to specific aspects (compare table 3.9 and fig. 3.41):

- With regard to time consumption only wheat and animals received higher scores.
- Vegetable production is seen as most labour intensive, followed by fodder, maize and animal husbandry.
- Vegetable production and maize are considered to be very profitable. Wheat and fruits follow second.
- Asked about the importance of the products fuelwood and timber were judged as most important and vegetables as least important.

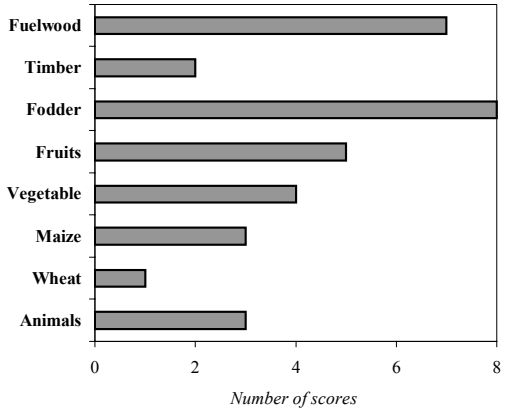


Fig. 3. 41: Priority ranking of products in Mangarkot.

In Fig. 3.41 the ranking according to priorities is shown. By this way of scoring fodder and fuelwood scored highest.

Table 3. 9: Results of scoring of products with regard to various aspects during group interview in Mangarkot.

MANGARKOT	*Time consumption*	*Labour*	*Profits*	*Importance*
Fuelwood	●●	●●	●●	●●●●
Timber	●●	●●	●●	●●●●
Fodder	●●	●●●	●●	●●●
Fruits	●●	●●	●●●	●●●
Vegetable	●	●●●●	●●●●	●
Maize	●	●●●	●●●●	●●
Wheat	●●●	●	●●●	●●●
Animals	●●●	●●●	●●	●●

3.2.5 The main constraints in agriculture and forestry in the village of Mangarkot

Livestock

The main problem is the shortage of fodder. The farmers can not increase livestock numbers due to the shortage of grazing areas. The lack of water is also a big concern. In winter some of the farmers collect water from springs to bring it to the animals in the stables.

The farmers living close to the forest also complain about the protection of the forest, because they do not have enough fodder and can no longer graze animals in the forest. Another constraint in the keeping of livestock is the inadequate animal health care in Mangarkot.

Crops

In areas surrounding the village wheat, barley and vegetables are cultivated. But the people generally complain that the yields are rather bad. Irrigation is a big problem here - the existing channel is broken and due to the disputed ownership rights nobody feels responsible for repairing it.

The farmers have very little income and cannot live on the income from the land alone. The poor quality of seeds is also seen as a problem, as is the lack of fertilisers, and appropriate pesticides. The farmers also desire more technical know-how about other vegetables and crops that would give higher yields and more income.

Vegetables

Cucumber, tomato, carrots, turnip, onion are planted, but irrigation is again a limiting factor. The farmers bring the vegetables to market with the bus - self-marketing of vegetables is a common practice in Mangarkot.

Fruit trees

The fruits grown in the area are apricot, pear, apple, few persimmon and walnut. Farmers sell some of the fruit (self-marketing) and keep the rest for their own use.

Farmers living above the village do not own many fruit trees. Some would wish to plant fruit trees but there is no nursery in the valley to provide them with good quality trees. For further plantations they would also need irrigation channels and investment help from government to be able to buy plants. Knowledge about grafting and diseases, that often destroy most of the fruits, is yet too scarce. Most farmers keep the trees only for their own purpose and also use them for fuelwood and fodder (foliage).

Forests

Villagers claim that people from neighbouring villages (particularly from across the Shangla) come to cut trees in their forest. Many farmers also regard the plantations as problematic. Most of the farmers agree that there is enough fuelwood for the moment. If collected in the forest, fuelwood can become very expensive – if the forest guard catches someone, he will have to pay 500-1000 Rps either with a receipt for the government or just as a bribe; if somebody is not able or willing to pay, he has to go to jail.

Especially poor people living above the village see the coming shortage of fuelwood, timber and grazing areas as an existential problem. In general the farmers realise that it would be better to plant on the barren hillsides as was previously done. The main constraint was that the soil was too shallow and therefore plants had difficulties to survive.

The farmers stress their dependence on the existence of trees – they cannot afford to build brick houses instead of using timber. There is also insufficient gas supply, electricity or another fuelwood substitute.

3.2.6 Priorities in agricultural policies

Farmers need agricultural credits for quality seed and fertiliser, because most of them can not pay the costs themselves. Irrigation should be improved to grow more vegetables and the road has to be improved for better marketing. For better yields new varieties of seeds are desired. The farmers propose to set up a government depot to provide the people with new seeds, other agricultural inputs and microloans. They all ask for more support form the Agricultural Extension.

3.2.7 Priorities in forest policies

The farmers have very contradictory opinions on forest policies. On the one hand it is not good to protect the forest, but on the other hand it is also not good to allow any kind of forest usage, so they say.
Forest matters should be decided jointly between community and forest department, but on the theme protection there are still many very controversial opinions: Some say that the forest guards should be more vigilant about the forest, punishment should be harsher so that outsiders will not come anymore and destroy the forest. Others want to remove the ban from the forest for grazing and fuelwood. Others want more plantations of conifers in the forest[3], and others again want only fast growing trees to be planted. Still it is generally accepted that more plantations will be useful for them and also for the next generation.
The evaluation of the afforestation project (MAP) resulted in different opinions among the three interest groups see 3.42).

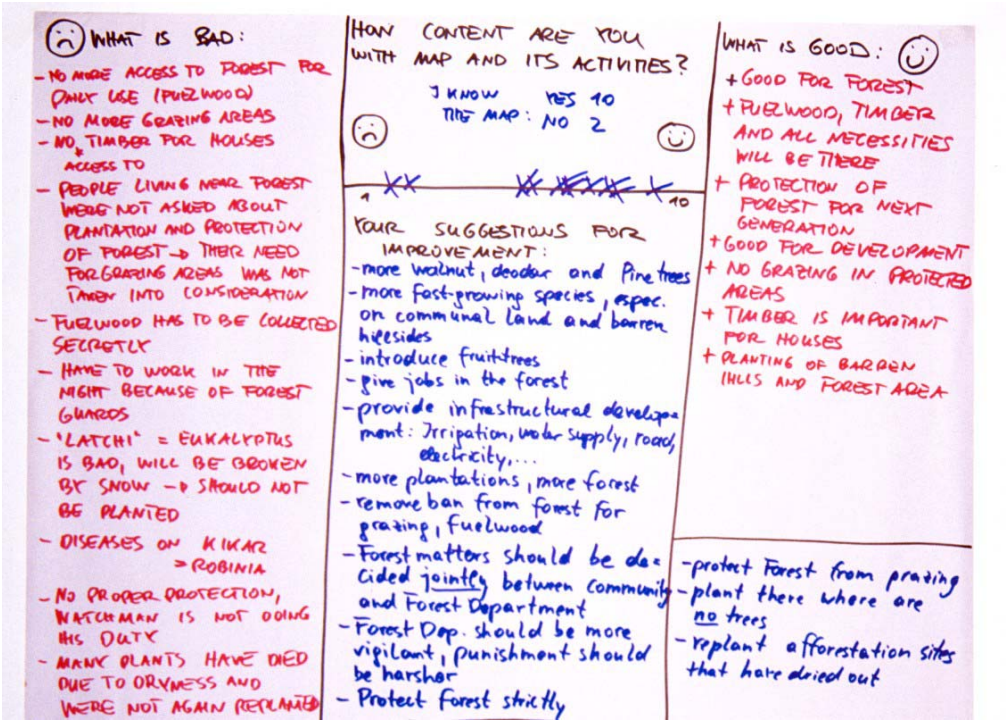


Fig. 3. 42: Results of the evaluation of the MAP presented in an H-Form.

[3] Some farmers believe that after planting the small trees it would be legal to cut out the older trees!

- Most of the farmers living in the village are more or less satisfied with the work of the MAP. The project should also provide infrastructure development (improvement of road, irrigation, ...) according to some of them. Fruit trees should also be introduced and provided, and other trees like Deodar *(Cedrus deodara)*, walnut should be planted. Some farmers mention the plantation of *Eucalyptus sp.* of a previous project with disapprovement, because the trees were not suitable for the area.
- Farmers living above the village propose that the project should also provide fast growing trees and fruit trees for agricultural land. The farmers complain about the protection and that they are no longer allowed to gather fuelwood for daily use from the forest. These farmers are also not so satisfied with the project because they felt excluded from the decision process. They claim that they were not asked their opinion concerning the afforestation. Only people in the village agreed upon these plantations according to them. They claim that for the villagers it was an easy decision because they were not dependant on cattle - they do not live near the forest, they do not need area for grazing. The forest farmers on the other hand want the right for their own use, they are much more dependant on the forest. It was their work to graze cattle and to collect fuelwood from the forest.
- The farmers living below and opposite the village would rather have more walnut and fast growing species planted on communal land and barren hillsides (Robinia, Ailanthus). Most of the other farmers were involved in the decisions concerning the MAP and agreed with the protection of the former grazing areas. They are aware of the need for more trees outside the old forest, they need fuelwood, but also timber to improve their houses. They support the strict protection of the forest, but most of them believe that it would be more reasonable to plant outside the forest and to replant dry afforestation sites.

The results of tree ranking are shown in see fig. 3. 43 and table 3.12:

Apple was named most often, followed by apricot and then Robinia (kikar). It was argued that apple would be easy to grow and fruits would bring a good price. Persimmon, a well liked and abundant fruit tree in the region, does not grow so well in Mangarkot – people argue that it has a high water requirement. People want new varieties of apple, apricot and peach rather than the old, local varieties.

Pine trees scored rather low, as did walnut and fig. Still important seemed to be oak, peach and the local pear (Tongu).

"Other conifers" ranked comparatively high. It became apparent during the interviews that most of the people knew about the value of Deodar (*Cedrus deodara*), a conifer famous for its

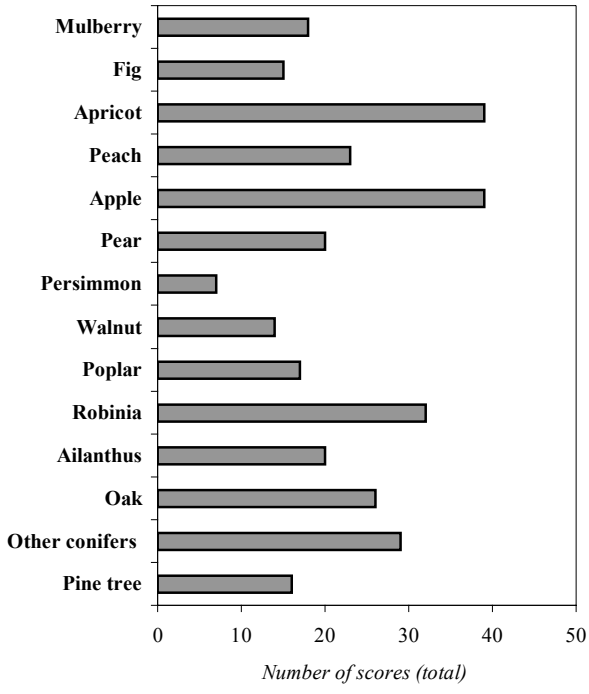


Fig. 3. 43: Tree ranking according to preferences of farmers in Mangarkot.

precious timber, which occurs rarely at higher elevations in the Malam Jabba Valley. The tree is also source of an oil called *Ranselo* that is used to cure animal diseases .

Table 3. 10: Some characteristics of popular trees growing in Mangarkot.

	Timber	Fuelwood	Non wooded products	Edible for humans	Characteristics
Deodar	Precious timber for furniture	Yes	Oil called Ranselo, used to cure animals	No	Slow growing, older trees start to rot rather soon
Walnut	Timber for furniture	Yes	Bark is used to clean teeth and for cosmetics	Nuts	Fast growing
Robinia	No value; but it can be used for small carpentry	Yes	Good fodder value	No	Fast growing
Poplar	No value; but it can be used for house improvement	Yes	Accepted as fodder	No	Fast growing

The ranking of trees by different persons resulted in completely differing lists (see table 3.11):

- A farmer from the area below the village, on the opposite side of the river, ranked apricot first, then oak, other conifers, apple and robinia. He also gave walnut a high score – walnut is well liked in the area, it grows rather fast and can be used for many purposes (see table 3. 10). Oak used to be a fodder tree, but it occurs very seldom nowadays mainly due to overgrazing.

Table 3. 11:The ranking of trees split up among different groups in Mangarkot.

Farmer from below the village	Village farmer	Group discussion
Apricot	Apple	Apple
Oak	Robinia	Apricot
Other conifers	Apricot	Oak
Apple	Peach	Other conifers
Robinia	Local fig	Local pear
Walnut	Ailanthus	Robinia
Poplar	Mulberry	Peach
Pine tree	Local pear	Pine tree
Mulberry	Other conifers	Ailanthus
Ailanthus	Persimmon	Poplar
Peach	Poplar	Mulberry
Local pear	Walnut	Local fig
Local fig	Pine tree	Walnut
Persimmon	Oak	Persimmon

- A farmer living in the village gave apple the highest score, then Robinia and again fruit trees (apricot, peach). Conifers and pine trees ranked low, but mulberry and fig ranked rather high. Again there was a high consciousness concerning the need for fruit trees and fuelwood substitutes.
- A group discussion finally led to the following result: Apple and apricot scored highest, followed by oak and conifers. The farmers of Mangarkot are very much aware of what trees they have a use for. The user groups were not so opposed, since the extinction of the pine forest is already within sight, most people are already focusing on alternatives in one or an other way.

3.2.8 The main constraints in everyday life in the village of Mangarkot

3.2.8.1 Interviews with farmers

The people living in Mangarkot complain about the poor condition of the road, the irrigation channel, insufficient drinking water supply and the lack of improvement of the educational system. There are no jobs in the villages, and the farmers can only work as tenants for rich landowners or migrate. The inadequate health care and the lack of food supply are also criticised. The entitlement to land is also seen as a big problem - the farmers have "owned" and used land for a long time, but they don't have the legal ownership of the land.

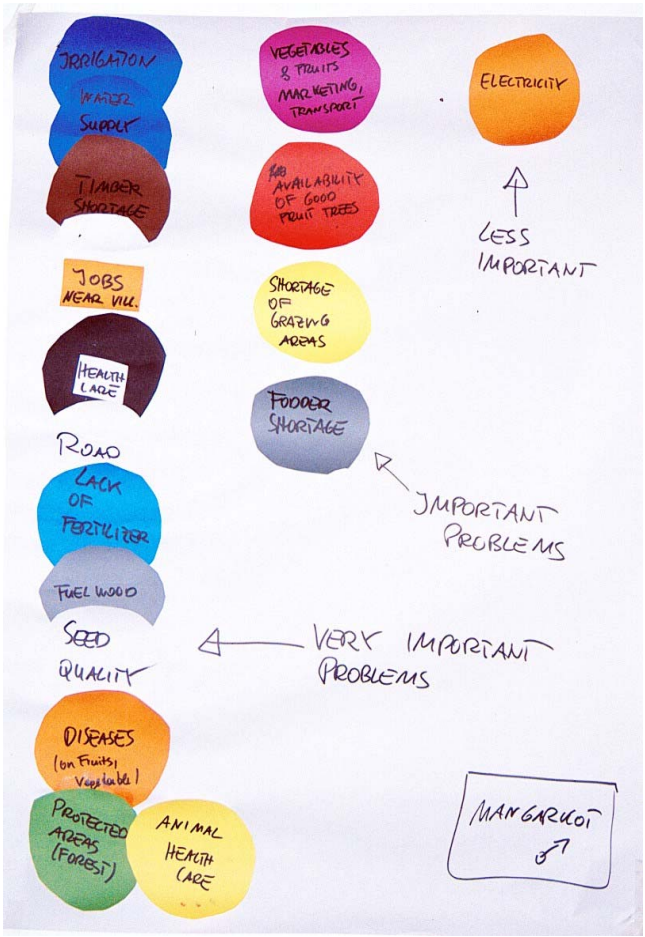


Fig. 3. 44: Outcome of problem ranking with farmers in Mangarkot during a group interview.

3.2.8.2 Group interviews

The farmers name irrigation as the most important problem during the group interviews (see fig. 3.44), but asked for the reason why nobody started to construct simple irrigation channels, as there is in a typical year plenty of water available, they argued that they did not want to invest money and work due to the unclear ownership.

Due to the destruction of the forest there is hardly any timber left for house construction, and to take it from the forest is illegal. Very often houses have to be rebuilt, they are not very stable and therefore prone to damage during the monsoon period and also from snow during the winter.

People also complain about the lack of work in the area – in almost every household there is someone working outside the valley. There is also insufficient health care in the village.

Other constraints in agriculture are poor seed quality, lack of fertilisers, diseases on fruits and vegetables, etc.. Availability of high quality fruit trees, the lack of grazing areas and fodder shortage are also seen as important problems.

3.2.9 Situation of women in Mangarkot

3.2.9.1 Social life

The major problem for women in Mangarkot is poverty. Landholdings are very small, there are insufficient irrigation facilities and the men find no jobs in the area and have to travel far for work.

For many women high fertility is also a big problem: They have many children but they can hardly feed and look after them. The children do not go to school regularly (people cannot afford to buy books and clothes) and the girls' school is not operating at all. It is very difficult to sustain such big families under these conditions – not enough food, insufficient medical supplies, no money..... Especially the future of daughters is a major concern for many women, because to get them married they need money and gifts for the bridegroom's family.

If the man in the family is not healthy, then the whole future of the family is in danger, because they cannot live from agriculture alone. The women would like to work, but there are no jobs for them. They help with the field work sometimes, but this does not increase their income. Women in Mangarkot face a very hard and difficult life. Often they work like men, they take care of everything while the men are away, with the help of their children.

3.2.9.2 Agricultural issues

There are only a few orchards in Mangarkot and therefore there is not much fruit production. Maize and wheat are the major crops. The corn is cleaned and stored for the winter and sometimes sold. Food processing of vegetables and fruits is not possible because there is hardly ever any food surplus. If there was an ample supply of water, people would plant more trees like walnut, peach, plum, apple, apricot,.... and they would also grow more vegetables.

Asked to rank the various products, wheat was considered most important (see table 3.12). Most of the time is invested in the animals, also in gathering of fodder which is regarded to be very hard work. Collection of fuelwood is extremely labour intensive as is wheat crop. Everything else, according to the interviewed women, is less important, with regard to time consumption, labour, profits and importance.

Table 3. 12: Results of scoring of products with regard to various aspects during interviews with women in Mangarkot.

	Time consumption	*Labour*	*Profits*	*Importance*
Fuelwood	••	••••	•	•••
Timber	men work!!	-	-	-
Fodder	•••	•••••••	-	-
Fruits	very little!	-	-	-
Vegetable	very little!	-	-	-
Maize	only 5 days work	-	-	-
Wheat	•••	•••	-	••••
Animals	••••••	••••	-	-

The main constraints according to women:

- Water scarcity:

  Water supply was especially in the year of the survey a big problem – after four months without any rain women had to walk up to 40 minutes to the next spring to get water. There is only one well in the village and it is very unreliable. Because there are hardly any irrigated fields, cultivation of fruit trees and vegetables is difficult.
- Fuelwood shortage:

  To gather fuelwood people had to walk a long way. If the men were not at home the young children would have to go and collect fuelwood and fodder.
- Uncertain harvests:

  Due to the lack of irrigation systems and the local climate, harvest is very much depending on precipitation and varies from year to year.

3.2.10 Forest Survey

In Mangarkot two transects were included in the survey. 20 plots and 104 trees were measured. The forested area comprised of about 80-100 ha (200 acres) at the time of the survey. Stand density was low, only in the upper part of the forest were still reserves (400 m^3/ha). As in Malam, most of the encroachment has taken place during the last 15-20 years. The forest is still an important source of living for many farmers, especially for the forest farmers living near the lower forest line. In spite of this, part of the forest was declared a special protected afforestation area of the MAP. In 1998 the first afforestations in the forest were started.

3.2.10.1 Description of sites of the forest survey

The lower forest line was at 1910 m at the time of the survey. The ridge where the upper communal border of Mangarkot lies, is at 2200 m. From the village Mangarkot (1660 m) there is a rather steep slope rising, then followed by a less steep area up to 1750 m. From there to the lower forest line the hill is very steep (25-45° inclination) (see table 3.13). It is likely that this area was formerly forested area until encroachment intensified. There are many houses scattered on the hill and the fields extend until just under the forest (see map in APPENDIX).

Although there is a climatic difference to Malam the forest type is the same: The *Himalayan Moist Temperate Forest* (according to CHAMPION et al., 1965) as the primary forest type has been replaced by degraded types of moist temperate forests, now classified as *Secondary Blue Pine Forest* (*Pinus wallichiana*).

The forest can be reached from the ridge, where a unpaved road leads from Shangla to Spin Obo. From the village the forest is only accessible by climbing up terraces on several footpaths. Still this is the most important access for the villagers. The farmers carry trunks of 1-2 m length down the hill on their shoulders or pull them downhill with ropes.

Table 3. 13: The status of the Mangarkot forested area.

	Mangarkot I	**Mangarkot II**
Status	A	C/D
Intensity of use[1]	2	1
Distance to next settlement/Mangarkot	5-10 min/ 1 h	15-20 min/ 75 min
Altitude (m)	1910 – 2040	2100 – 2200
Inclination (°)[2]	10-30 (22)	0-38 (18.3)
Exposition	W	W

GROUP A: Very intensive use over longer period (10-15 years)
GROUP C: Used, but well preserved
GROUP D: Under MAP protection

[1] Number 1 stands for most intense, 2 for less intense

[2] The average values for inclination are given in brackets.

The slope is exposed to the west. The lower part of the forest (transect I) is very dry . Stand density is low and crowns are severely lopped. Further up (transect II) the forest is rather dense and shady. It is still used for grazing, lopping and above all timber logging. Especially this part of the forest was still well preserved in 1998.

3.2.10.2 Soil and erosion

The main soil material is silty clay loam and moderately deep silt loam (FMC PLANNING REPORT, 1998), apart from locally appearing differences. The soil is naturally rather shallow, but severe human interference enhance natural processes in the forest. Soil coverage ranges from 40 – 80 % (see table 3.14). The forested slopes are moderately steep (average about 20° inclination), but rinsing due to massive rainfalls in monsoon and early spring rain combined with low vegetation coverage have destroyed the upper soil frequently (see photograph 3.11). There are also some large paths leading through which are used for timber transport (groundwood, pulpwood).

Table 3. 14: Comparison of soil coverage and soil erosion in the transects of Mangarkot.

	Mangarkot I	**Mangarkot II**
Soil coverage (%)[3]	40 - 80 (60)	60 - 80 (73)
Soil erosion	(5)	(4)
Soil layer	(A)	(B)

(1)	No visible soil erosion	(A)	Very shallow soil
(2)	Not much visible soil erosion	(B)	Rather shallow soil
(3)	Visible soil erosion at a moderate extent	(C)	Soil is only sometimes shallow
(4)	Visible soil erosion at a remarkable extent	(D)	Soil is rather deep
(5)	Visible soil erosion at a very high extent	(E)	Very deep soil

3.2.10.3 Vegetation

Grasses are the dominant life form, followed by trees, as there are still some densely forested areas remaining. All other groups are in comparison under-represented. The percentage of coverage abundance in the forest ranges between almost 0 and 21% (see fig. 3. 45 and 3.46).

TREE LAYER

Pinus wallichiana is the dominant tree species, joined only by some oaks (*Quercus dilatata*) at the lower forest line. Because of the intense usage of the forest for grass cutting (especially in transect I), grazing, lopping and timber logging there is almost no natural regeneration. Some specimen of *Pyrus pashia* were found near the lower forest line.

[3] The average values for soil coverage are given in brackets.

SHRUB LAYER

Oaks (*Quercus incana, Quercus dilatata*) are mostly existing as small, degraded bushes affected by over-grazing. Shrubs are very rare in the entire forest. This indicates over-grazing, and frequent cutting of grass and woody perennials. Near the lower forest line there are typical indicators of disturbed zones:

Berberis lycium, *Plectranthus rugosus*, *Indigofera heterantha*,.....

In the less dry forested area there is some occurrence of ever-green *Sarcococca saligna* and deciduous *Spiraea vaccinifolia* and *Viburnum nervosum*. In the upper part of the forest there are almost no shrubs at all, except for few *Viburnum nervosum* and *Berberis lycium*.

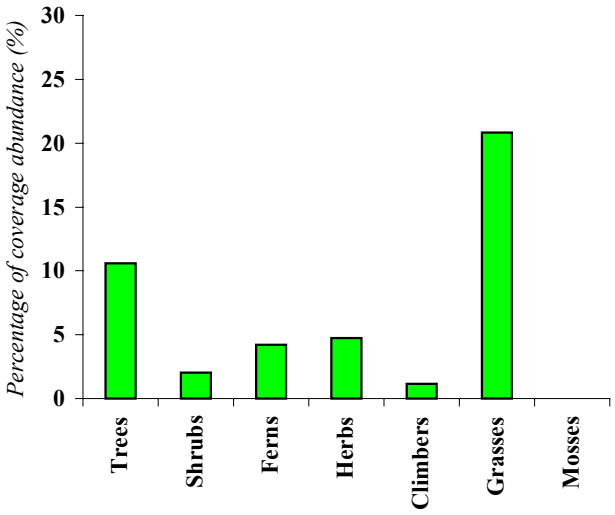


Fig. 3. 45: Comparison of various plant groups with regard to dominance and abundance.

LAYER OF SOIL

From the ferns only *Onychium contiguum* and *Dryopteris spp.* are more abundant in the lower part of the forest. In the humid parts they are joined by *Adiantum capillus veneris*. Almost everywhere in the forest there are plants growing which indicate nutrient richness and pasturing: *Trifolium spp., Plantago spp.*, *Galium boreale,* and *Duchesnea indica* are ubiquitous. *Plantago spp.* and *Rumex nepalensis* appear regularly in the upper part of the forest, where pasturing is more common. In the lower part there is more grass cutting and consequently grasses are dominant. On very exposed places occurs *Cynodon dactylon*, while on very steep slopes there are mainly tufted grasses. On moister land turf forming grasses dominate. Climbers are very rare: *Hedera nepalensis* and *Smilax sp*. are to be found in the lower part of the forest.

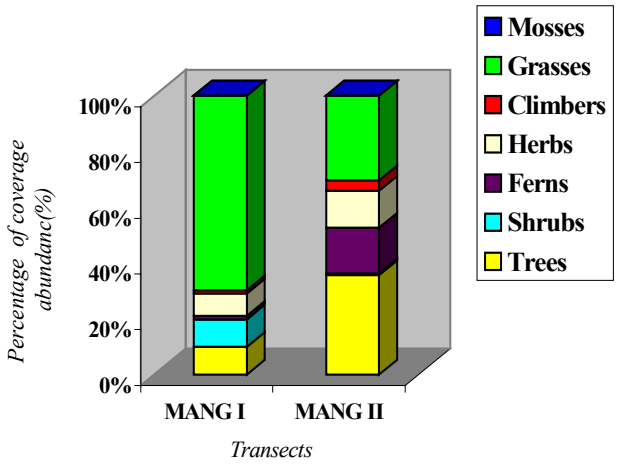


Fig. 3. 46: Plant associations of all transects in Mangarkot in comparison.

3.2.10.4 Stand density

Stand density varies from 90 trees/ha in the lower part of the forest to 170 trees/ha in the upper part. SDI ranges from 253 to 539 in the same areas. (see table 3.15)

Table 3. 15: Stand description with average values for all transects of Mangarkot.

Number of transect	Stand density [stems/ha]	Number of stumps [stumps/ha]	SDI [stems/ha]	Volume [m³/ha]	Average volume [m³/tree]	Basal area [m²/ha]	Arith. mean tree height [m]
Mangarkot I	90	138	253	155	1.8	16.2	23.3
Mangarkot II	170	100	539	374	2.4	35.3	26.7

The volumes (m³/ha) rank from 155 to 374 m³/ha. This results in an average volume (m³) per single tree of 1.8 and 2.4 m³, matching the average value of pine in final stands (see 4.2.1).

The area is suited for timber growth (FMC PLANNING REPORT, 1998) and was densely forested until about 15-20 years ago. This can also be concluded from the forest structure: A high volume per ha coincides with a rather low stand density, but a high SDI.

The remaining trees have a low quantity but are high quality in terms of volume and height (see table 3.15). The curve in fig. 3.47 shows the characteristics of a forest stand after crown thinning practices or even a more or less natural forest.

Basal area (m²/ha) is low in transect I due to low stand density and crowns were usually thinned. The arithmetic mean height is 23.3 m in the lower part of the forest and 26.7 m in the upper part.

There were still better supplies in the dbh classes higher than 50 cm, with the maximum from 50-70 cm. (see fig. 3. 48)

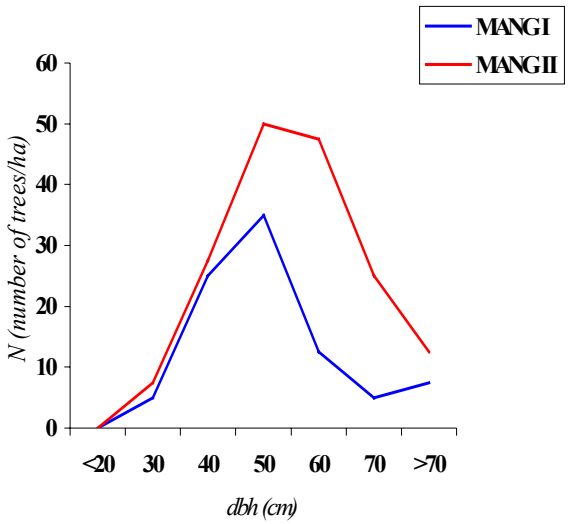


Fig. 3. 47: Comparison of stand structures with regard to stand density (trees/ha) and dbh (cm). The classes are subdivided in groups from <20, 20-30, 30-40,....to 60-70 and >70 cm.

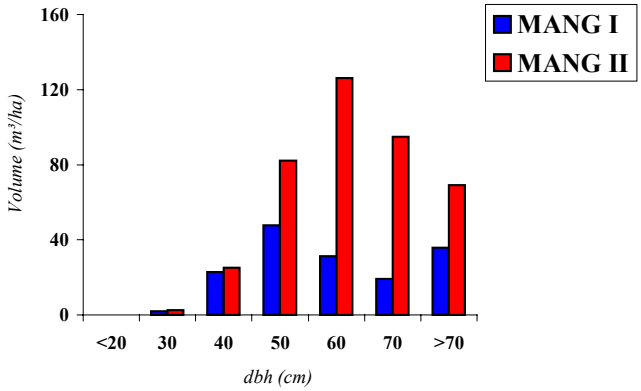


Fig. 3. 48: Remaining volumes (m³/ha) per dbh class (cm): The classes are subdivided in groups from <20, 20-30, 30-40,....to 60-70 and >70 cm.

3.2.10.5 Regeneration

There was hardly any natural regeneration. Only very small seedlings were found, above all in the upper transect (II), but they were not counted. The reason for the lack of regeneration was forest usage for timber transportation, grazing and grass cutting.

In both transects some afforestation plots were found. The saplings were counted. Almost all of them belonged to the species of *Pinus wallichiana*, with some *Pinus roxburghii* scattered around.

Name of site	Average of saplings/ha
Mangarkot I	570
Mangarkot II	715

It is doubtful whether these small saplings will survive under the conditions of such intensive forest usage. There is no full approval from the local population regarding the afforestations.

3.2.10.6 Stems and stumps

The stumps are usually difficult to find, and stumps dating back to more than 5 years ago are no longer visible. Although in Mangarkot I there were in 70% of the measured plots more stumps than stems remaining, in Mangarkot II it was vice versa (see fig 3. 49).

Forest usage is in fact more intense in II, except for logging which is practised at a much higher extent in the lower part of the forest. The value of SDI (539 trees/ha) also differs much from the sum of stumps and stems (270 per ha) in transect II.

There has been a lot of timber logging before the five-year-limit, that marks the withering of old stumps. In transect I SDI amounts to 253 trees/ha. In reality there was an amount of 228 stems and stumps per ha.

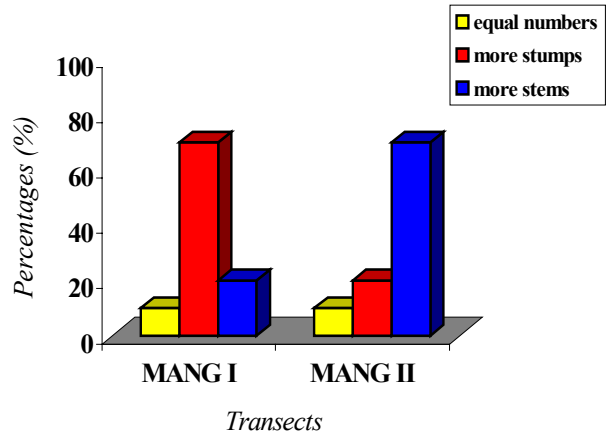


Fig. 3. 49: Comparison of the number of stems and stumps.

3.2.10.7 Forest usage

Intensity of use is about the same in both transects regarding the average value, but it is differing very much in the various means of use (see fig. 3. 50). The upper part of the forest (II) was afforested. Here is also most of the grazing and lopping. Cutting of grass is scarce in this part of the forest, in contrast to the lower part of the forest (I) where this practice causes the main effect on vegetation. In transect I logging is also practised at a much higher extent, along with lopping and grazing.

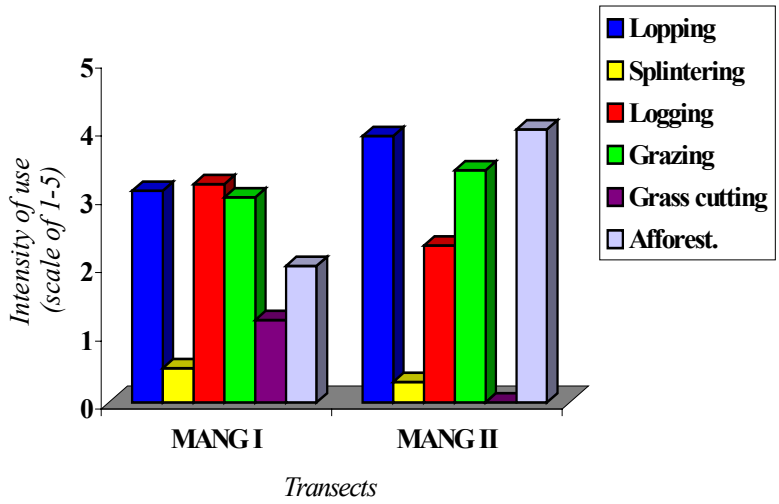


Fig.3. 50: Intensity of forest usage in all transects of Mangarkot in comparison.

Photograph 3.11: Soil erosion in the forested area almost uproots pine trees.

Photograph 3.12: A forest farmer's settlement, situated closely to the forest.

Photograph 3.13: Logging of intact, vital trees is illegal, but to take a "dying tree" is not against the law. Often this process is artificially accelerated – e.g. by setting fire to a pine tree; the fire is usually put out before it spreads.

Photograph 3.14: The terraces reach right up to the lower forest line and often expand into the existing forested area.

3.2.10.8 Mangarkot: Transect I

The site is situated about an hour's walk away from Mangarkot on a very steep, western exposed slope (see photograph 3. 15). The average inclination in the transect is 22°. The transect reaches from 1900 - 2040 m. To the south the slope declines into a ravine like hollow. This slope is very steep (40-45°), but it is still used for grazing and lopping.

Transect I begins only about 60 m away from the last farmhouse below the forest. There are only few trees left there, only a little bit further up the lower forest line there are more trees and additionally more undergrowth, also richer in diversity.

Beginning with plot Nr.6 the MAP afforestation starts. The year 1998, when the afforestation was started, was very dry. Following the last plot of this transect there is a flat area with a very strong soil compaction and not much ground vegetation. This area was not very representative and was therefore not further investigated. The survey was continued approximately 400 m further up the hill with transect II.

Vegetation

TREE LAYER

Pinus wallichiana is the dominant tree species, accompanied by some oaks and specimen of *Pyrus pashia* near the lower forest line. But oaks (*Quercus incana*, *Quercus dilatata*) existed mostly as small, degraded bushes affected by over-grazing. There are relatively few trees in transect I. (see fig. 3. 51)

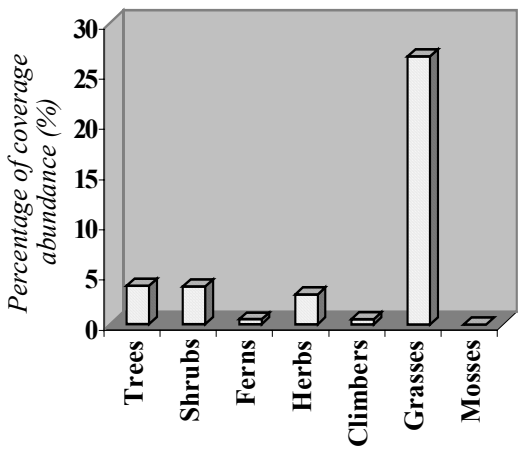


Fig.3. 51: Percentage of coverage abundance of plant groups in transect I.

SHRUB LAYER

Shrubs have a very low percentage of coverage abundance due to over-grazing and frequent grass cutting. All woody perennials are cut regularly. Near the lower forest line there are typical indicators of disturbed zones: *Berberis lycium*, *Plectranthus rugosus*, *Indigofera heterantha*,.....In the less dry forested area there are examples of ever-green *Sarcococca saligna* and *Cotoneaster spp.*, as well as deciduous *Spiraea vaccinifolia* and *Viburnum nervosum*.

LAYER OF SOIL

Grasses are the dominant life form, mainly as tufted grass. On drier aspects *Cynodon dactylon* dominates. Among the herbs are pasture-tolerant *Trifolium spp.*, *Chenopodium album* and *Plantago spp.*, together with *Galium boreale*, *Duchesnea indica* and *Androsace rotundifolia*. *Nepeta clarkei*, *Nepeta laevigata* and *Clinopodium umbrosum* are abundant representatives of the *Lamiaceae* family.

Less common are moisture containing *Oxalis corniculata*, *Rumex nepalensis* and ferns - only *Onychium contiguum* and *Dryopteris spp*. occurred in abundance in the lower part of the forest. Climbers like *Hedera nepalensis* and *Smilax sp.* appear rather seldom.

Stand table

The stand table diagram (see fig. 3.52) shows a low number of trees/ha (90). Most of the dbh are in the classes 30-40 and 40-50 cm, while smaller and larger dbh are largely underrepresented. The structure is similar to that known after crown thinning, which would indicate that mainly dominant, older trees were taken out.

Natural regeneration could not be verified since recent grass cutting destroyed the seedlings that possibly existed earlier.

In the upper part of the transect saplings were planted. These plantations amount to 22.8 plants per 400 m² on average which would result in 570 plants/ha.

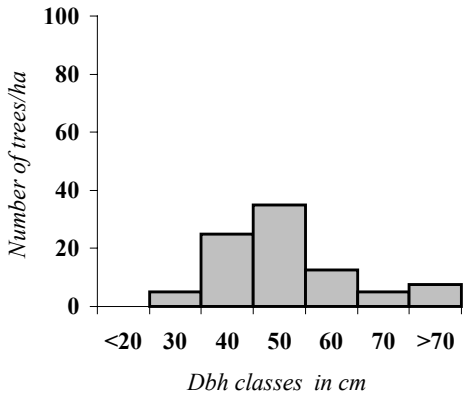


Fig. 3. 52: Stand table in terms of dbh classes in transect I.

Although it is unlikely, that more than 20 % will survive for a year, especially in a dry one like the year of the survey. Also grazing, grass cutting and logging affect the plantations.

Forest usage

In 70% of the plots there are more stumps than stems counted. The further up one goes the more stumps could be found.

Stand density is already very low with 90 trees/ha and 138 stumps/ha (SDI 253 trees/ha). Both logging and lopping are still practised to a very high extent. Saws were frequently used to log trees in this forest.

There is a certain amount of pasturage, but the major interference is the cutting of grass and woody perennials. (see fig. 3.52)

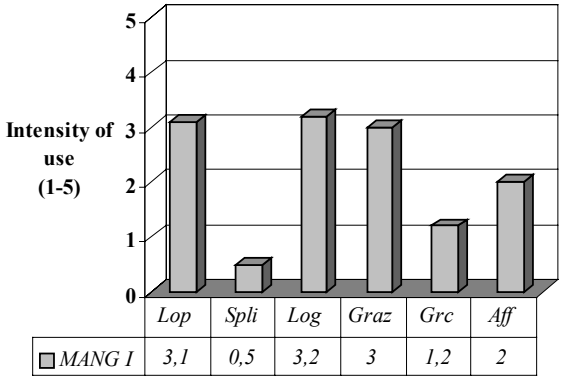


Fig.3. 52: Intensity of different ways of forest usage in transect I.

3.2.10.9 Mangarkot: Transect II

Transect II is exposed to the west. The average inclination is 18.3°, varying from very steep to exceptionally flat areas (see photograph 3.16). The walking distance to Mangarkot is about 1 hour and 15 minutes. The transect starts about 400 m above transect I and ends below the unpaved road from Shangla to Spin Obo. The altitude ranges from 2100-2200 m. On top of the hill, near the ridge, the forest ends.

The forest is used for lopping, grazing and logging but it is still well preserved. There are also many seedlings (one year old) growing on the forest ground (ca. 5 cm high), but no other trees of less than 20 m height. In this transect many saplings were found but they were unlikely to survive on long term basis.

Vegetation

TREE LAYER

Pinus wallichiana is the dominant tree species, occurring with the highest abundance among all plant groups in this transect (see fig. 3.54).

Oaks (*Quercus incana, Quercus dilatata*) exist mainly as small, degraded bushes.

SHRUB LAYER

In transect II there are almost no shrubs at all, except for some *Viburnum nervosum* and *Berberis lycium*, joined by very few specimen of *Indigofera heterantha* and *Cotoneaster spp.*.

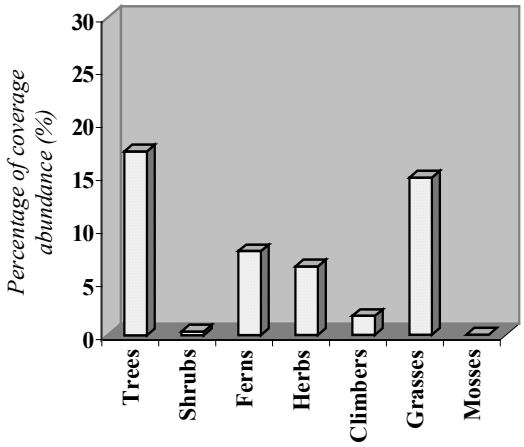


Fig.3. 54: Percentage of coverage abundance of plant groups in transect II.

LAYER OF SOIL

Grasses rank second in average coverage percentages after trees, next are ferns followed by herbal plants. The dominant grasses are turf-forming grassed, the next most prolific is *Cynodon dactylon*.

In transect II indicators of pasturing and nutrient richness are plentiful, like *Trifolium spp.*, *Plantago spp.*, and *Rumex nepalensis*. The latter appears very often, also together with *Duchesnea indica*, *Galium boreale*, *Geranium spp.*, *Ranunculus spp. and Androsace rotundifolia*. The *Lamiaceae* family is represented with *Prunella vulgaris*, *Nepeta laevigata*, *Nepeta clarkei, Clinopodium umbrosum*.

Ferns are more common in this transect, above all *Onychium contiguum* followed by *Dryopteris spp.* and *Adiantum capillus veneris*, while climbers are scarce.

Stand table

The stand table (see fig. 3. 55) is similar to that of a natural forest without impact of thinning, although there are no trees in the smallest dbh class in this transect. Most of the trees are in the dbh classes between 40 - 60 cm.

Intense use for logging, grazing and cutting of grass prevents effective natural regeneration, therefore there is lack of smaller/younger trees.

The plantations of MAP amount to 29 saplings per 400 m² average. This would result in a density of 715 plants/ha.

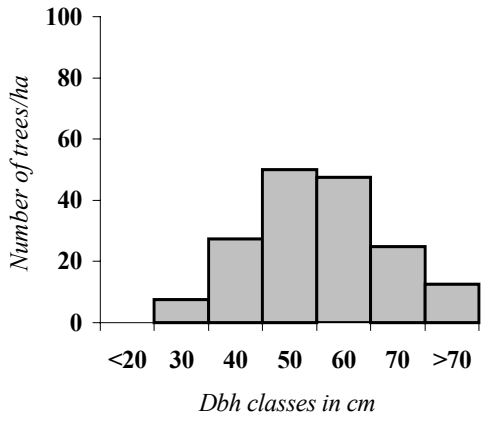


Fig.3. 55: Stand table in terms of dbh classes in transect II.

Forest usage

Forest usage is most intense in the near of the main footpath leading through. Lopping is practised at a very high extent. Logging has started at such a high extent only in the last couple of years. Stand density still amounts to 170 trees/ha and 100 stumps/ha (SDI 539 trees/ha). Only in 20 % of the plots there are more stumps than stems to be found.

Grass cutting plays a less important role. In spite of grazing restrictions due to the MAP afforestation inside the forest grazing is still widely practised. (see fig. 3. 56)

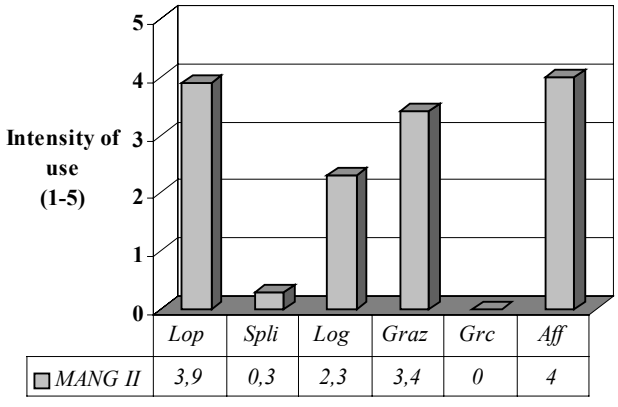


Fig. 3. 56: Intensity of different ways of forest usage in transect II.

Photograph 3.16: Transect II in Mangarkot: There are both tufted grasses and turf –forming grasses represented in the transect. Stand density is high, but forest usage is about to become increasingly severe.

4 DISCUSSION

4.1 The socio-economic situation

The villages Malam and Mangarkot are very different from each other with regard to ethnic groups, social hierarchy, landownership and village structures:

In **Malam** there is one ruling family of landowners (Miagan) and a few smaller landowners (Sirimar). The majority of villagers are tenants (Gujar). There is no VDC and it will also be very difficult to establish such self-organisational structures in this strictly hierarchic and feudalistic system.
But the system already started to break up - as the establishment of the afforestations (MAP) imposed restrictions to grazing and ban to forest usage in some areas, especially Sirimar felt excluded from the decision process. They claim their right to participate in future planning, as their existence as livestock dependant farmers is threatened through landuse planning without their consensus.
Very difficult is the situation of tenants – they depend totally on the landlords, who often enough take advantage of that power and exploit these farmers. Their situation is very frustrating – they do not own the house they live in, they do not own the land they work on and have to cope with very little income and large families.

In **Mangarkot** there are several families of different ethnic origin: Bashrikhel, Khattakhel, Dorghozar,....The families are quite equal among each other. There is even a VDC established, and it was started officially in 1998. Within the village there are several different user groups – forest farmers for example are directly dependent on the forest, especially as a grazing area for their livestock. Agricultural land is very poor in their area of settlement. Consequently they are not satisfied with grazing restrictions imposed on forested areas.
The farmers living near the village favour afforestations in the forested areas, as they do not graze their animals there so often. For them the barren hillsides near the village are more important for grazing and grass cutting.

The establishment of a VDC should help to find compromises in future that are more or less acceptable for all user groups in the villages.

Table 4.1: The land/family ratio in the two villages (data from Agricultural Extension Dep., Mingora , 1998)

	Area (acres)	*No of farmer families*	*Land/family*
Malam	1206	368	3.3 acres
Mangarkot	588	73	8.0 acres

4.1.1 Interviews with farmers

The interviews with farmers were conducted in both villages. Due to the translators the results of the interviews have to be seen with a critical eye. The translators often tried to manipulate answers of farmers to the benefit of their own families[1]. The farmers still provided a lot of interesting information during interviews. The interviewed farmers were from different parts of the village, of different ethnic groups and also of different age to cover a broader aspect of the local society.
The results of these interviews where however evaluated in the group interview to control the content of the answers and their relevance for other user groups. The group interviews were conducted by a more neutral person[2] to guarantee objectivity.

4.1.2 Group interviews

4.1.2.1 Village and natural resource mapping

Village mapping and natural resource mapping, (see 3.1.2.1 and 3.2.2.1) revealed problematic zones with regard to availability of natural resources and zones of intensive forest usage.
In both villages areas of high quality arable land are confined to the surroundings of the village, while most of the new settlements on the hillsides near the forests are problematic. These areas are highly underdeveloped – there is no drinking water supply in spite of numerous springs and small rivers, there are hardly any irrigation channels, the soil is often very rocky and poor in nutrients due to improper handling and terraces are very steep and often improperly laid out. The terrace banks are hardly ever used for plantations, only for grazing, which has again very negative effects, as the heavy buffaloes destroy vegetation, thus leading to increased soil erosion. Landslides often destroy areas that were made arable with many difficulties by very poor people. For these farmers there is often no other way than to migrate to the cities.

4.1.2.2 Problem ranking

Problem ranking resulted in similar priorities in both villages (see table 4.2): Irrigation and water supply are seen as most important problems. This decision was certainly influenced by the fact that at the time of the interviews the last rain had occurred 5 months previously and not only fields were dry, but also most of the springs for drinking water had run dry. Most of the farmers could not even sow wheat crop in that year. In the rainfed areas the situation was especially critical, as the year's previous harvest had also been very poor.

- The problem with irrigation exists mainly due to disputed rights among farmers: There are in fact several channels in both villages, but some of them are broken or cannot be used due to private disputes. Irrigation and other communal issues were formerly decided in the Jirga or similar communal, hierarchical

[1] In particular in Mangarkot this was a big problem, as the translator's father was Malik of the village in the Wali-period. In Malam the translator was a member of the Miagan family, which meant that his relatives' tenants naturally would not speak freely in his presence and did not express their real opinion.

[2] The facilitator is an experienced forester with a broad knowledge on communal forestry and joint forest management, currently working for MAP.

organisations. Nowadays there is an authority vacuum leaving a sort of anarchic situation concerning user rights of natural resources. This gap will hopefully be filled by the VDC's in future.

- Timber and fuelwood shortage were also ranked as "most important" problems in both villages. Here the problem is similar to that of water – there is no longer a communal institution deciding over user rights and therefore all community members exploit the natural resources to their own advantage, or disadvantage if seen in a long-term perspective. The Forest Department and the corrupt forest guards have not been very helpful in solving the problem until now. To fine people or simply ask bribes from them does not exactly increase their feeling of responsibility to their forests, especially if they are officially in state ownership.
- Infrastructure development would open many possibilities to the farmers: The road leading to Malam is very steep and in a very poor condition and the desire for improvement of the road is high. At the moment farm to market transport cannot be handled by the villagers themselves, but with regard to increased production of cash-crops such as vegetables self-marketing will become a necessity.

  In Mangarkot there are other problems with infrastructure: Health care is inadequate, there is not even a pharmacy in the village. The people also complain that there are no jobs in the area. The farmers are very poor and most of them have to work off-farm, but leaving the family alone for a longer time causes many problems.
- Seed quality, lack of fertilisers, fruit and vegetable diseases, etc. were ranked in the category of "most important problems" in both villages, but only at a lower rank. Seeds, fertilisers and pesticides are scarce and also very expensive. That is the reason why many farmers try to cope without these modern items of the "green revolution".

  A major problem concerning fertilisers is the fact that there is also a lack of manure: The dung is dried and used as fuel, and due to the extraction of biomass there is little humus regeneration on the fields. What is left after harvest is consumed by hungry cattle and buffaloes browsing on winter fallow.

  Vegetable diseases spread easily and farmers cannot afford to apply pesticides. The fact that most of the farmers cultivate the same vegetable each year is often detrimental (onion crop 1997 was almost totally destroyed). Crop rotations are also underdeveloped due to the small quantities of available land for agriculture, which does not allow much flexibility or any risk-taking.
- In Mangarkot shortage of grazing area and fodder shortage was only ranked in the second category (important problems). In Malam shortage of grazing areas was divided in two categories as the farmers could not agree whether it should be among the most or the less important problems.

  Not only the lack of fodder is a problem also the quality of the dried straw of maize and wheat. The corn is used for flour and the animals have to cope with low-nutrient, almost indigestible straw, stored in huge heaps near every farmer house, during the winter. Consequently dairy production is extremely low.
- In contrast to men, women are worried about the scarcity of food, the size of their family and complain about their hard work and difficulties in life. Men tend to name issues like improvement of the road, irrigation, and fertilisers as their priorities.

The results are in some respects contradictive to the interviews with farmers. For example fodder shortage and shortage of grazing areas were often named as a constraint during the interviews with farmers, but in the group interview other priorities were set. In the group some farmers tried to present their opinions with more authority, and other farmers attending gave way and kept their opinions to themselves.

Table 4.2: Problem ranking in both villages in comparison.

MALAM			*MANGARKOT*		
Most important problem	**Important problem**	**Less important problem**	**Most important problem**	**Important problem**	**Less important problem**
WATER SUPPLY	LACK OF FERTILISERS	SHORTAGE OF GRAZING AREAS	**IRRIGATION**	VEGETABLES AND FRUIT MARKETING AND TRANSPORT	ELECTRICITY
IRRIGATION	FRUIT STORAGE AND MARKETING		**WATER SUPPLY**	AVAILABILITY OF GOOD FRUIT TREES	
ROAD	FODDER SHORTAGE		**TIMBER SHORTAGE**	SHORTAGE OF GRAZING AREAS	
FUELWOOD			**NO JOBS NEAR THE VILLAGE**	FODDER SHORTAGE	
TIMBER SHORTAGE			**HEALTH CARE**		
FOREST RIGHTS			**ROAD**		
SEED QUALITY			**LACK OF FERTILISERS**		
DISEASES (ON FRUITS AND VEGETABLES)			**FUELWOOD**		
VEGETABLES AND MARKETING			**SEED QUALITY**		
TREES FOR PLANTATIONS			**DISEASES (ON FRUITS AND VEGETABLES)**		
SHORTAGE OF GRAZING AREAS			**PROTECTED AREAS (FOREST)**		
			ANIMAL HEALTH CARE		

4.1.2.3 Bean scoring

Asked to give scores for the most important product among a list of eight (see fig. 4.1), farmers in **Malam** chose fuelwood to be most important, next was timber, then wheat and maize. Vegetables and fruits seem to be less important to them, animals and fodder scored the least.

In **Mangarkot** farmers ranked fodder in the first place, then fuelwood and animals. Fruits and vegetables appeared more important to them than maize, and wheat and timber also scored rather low.

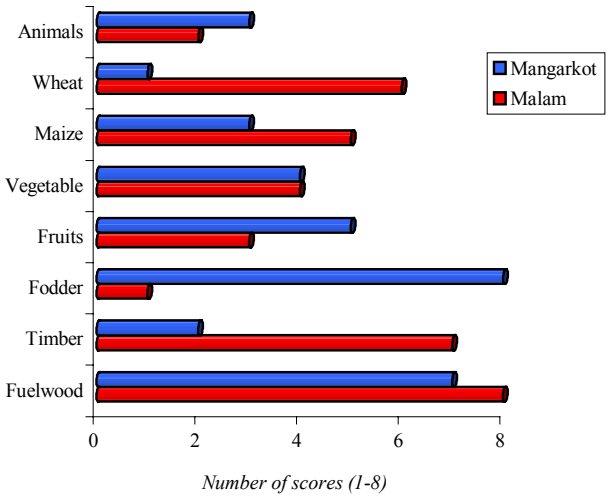


Fig. 4.1: Bean scoring in both villages in comparison.

These results are rather surprising because in reality there is a lot more production of fruits and vegetables in Malam, than in Mangarkot. Still people in Mangarkot value these products higher.
In Malam the majority of people gains only low profits has from such products: Most people do not own land; self-marketing is not possible, the available fruits are sold to middlemen. Only the landlords sell fruits on a large scale to them - thus it is an unattractive source of income for most other farmers in Malam. Similar it is with vegetables, as they cannot be grown in rainfed areas but only in fertile and irrigated land. Such land is only available near the village, and it is almost exclusively owned by the Miagan.

It is also astonishing that farmers in Malam ranked timber on the second place, unlike farmers in Mangarkot, who gave priority to products such as fodder, because the majority of farmers there depend on livestock. Generally the timber/fuelwood issue is more discussed in Malam and there is a dispute on this issue in the community: One group is blaming the other of being involved in illegal timber trade. Of course timber is also important for house constructions and carpentry, but still there remains the impression that profitable illegal timber trade is still encouraging many farmers to destroy the basis for their own existence in Malam Jabba Valley.

4.1.2.4 Tree ranking

Ranking of trees showed different priorities in the two villages (see fig. 4.2):

In **Malam** pine were ranked first, followed by fruit trees (persimmon, pear and apple). Fast growing trees such as Robinia and Ailanthus were given less importance. This is very contradictive to what farmers had said during interviews when asked about plantations: Most farmers had expressed preference for Robinia and Ailanthus, and that they did not want indigenous trees to be planted. It could be the fact that indigenous trees fulfil the required tasks of a forest tree much better at the moment that made the farmers rank the pine trees first in the end. The fast-growing trees are good for fuelwood, but not for house construction. The timber value of pine is also a great deal higher and therefore pine trees seem to be more profitable, at least to men. Women in Malam prefer fruit trees and fast growing trees. They are aware of the daily need for fuelwood and generally appreciate the value of fruits more than timber.

Farmers in **Mangarkot** rank fruit trees much higher: Apricot, apple, peach, pear receive high scores. Next are fast growing trees (Robinia, Ailanthus) and only after these follow pine trees. "Other conifers" reach higher scores because people in Mangarkot favour Cedar *(Cedrus deodara*) very much, although it is not growing there naturally, but people have heard of the "precious Cedar timber" that has a very market value. Women would also desire more fruit trees and fast growing trees.

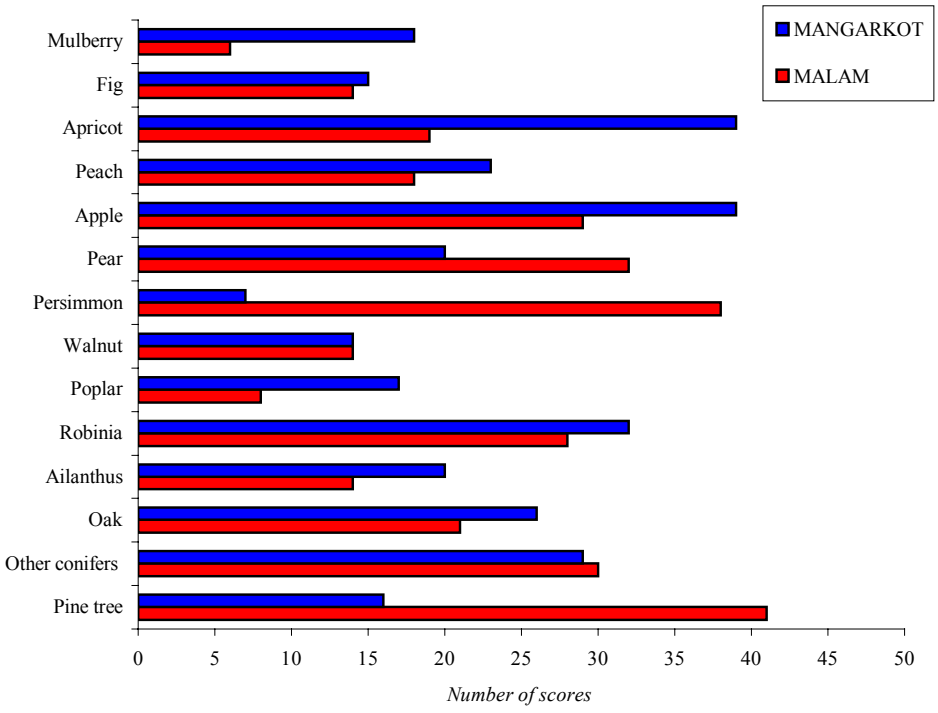


Fig. 4.2: Tree ranking in both villages in comparison.

It would certainly help to establish nurseries in the villages, where farmers could obtain trees to plant themselves on their land, such as local varieties of fruit trees and fast-growing trees. The afforestation project should in any case not abandon indigenous pine trees, as there is still a high demand for these trees.

4.2 The status of the forested area

4.2.1 Summary of the most important stand parameter

Pinus wallichiana is the dominant tree in the forested area in both surveyed villages. Table 4.1 shows minimum, maximum and average values measured for all trees in transects of Malam and Mangarkot. Standard error (S_e) and standard deviation (S_d) were calculated for the most important stand features.

The surveyed area shows remarkable differences in stand density and volumes within the respective forested areas. Basal area, dbh, arithmetic mean height and species dominance and abundance vary in a much smaller range.

Table 4.3: The six surveyed transects in Malam comprised 39 plots (240 trees), while in Mangarkot two transects were measured with a total of 20 plots (104 trees).

	MALAM					MANGARKOT				
	Min	**Max**	**Average**	**S_d**	**S_e**	**Min**	**Max**	**Average**	**S_d**	**S_e**
Stand density [stems/ha]	25	300	153.8	78.9	12.6	50	275	130.0	64.7	14.5
Number of stumps [stumps/ha]	25	425	144.9	92.9	14.9	0	225	118.8	55.5	12.4
SDI [stems/ha]	120	843	436.9	206.4	33.1	107	934	395.8	212.9	47.6
Volume [m³/ha]	35	1455	366.4	309.1	49.5	47	671	264.8	157.6	35.2
Basal area [m²/ha]	7	57	28.1	13.7	2.2	6	65	25.8	14.5	3.3
Dbh [cm]	33.5	73	48.9	9.8	1.57	38	72	49.3	8.2	1.8
Arithmetic mean tree height [m]	21	32	25.8	2.5	0.4	16	30	25.0	3.4	0.8
Species dominance and abundance (scale 1-5)	2	4	2.5	0.5	0.1	1	3	2.5	0.6	0.1

Stand density

In **Malam** stand density amounts to 153.8 stems/ha (S_d =78.9) and 144.9 stumps/ ha (S_d =92.9) on average. The differences depend on altitude, relief and accessibility. The more remote areas (see 3.1.3.10 and 3.1.3.12) are less intensely used (see 3.1.3.7) and therefore more intact. Exposition, soil and climatic pre-conditions are similar in all transects except for transect V.

In **Mangarkot** stand density averages to 130 stems/ha (S_d =64.7) and 118.8 stumps/ha (S_d =55.5). The forested area is a "monoculture" of pine (as in Malam), but inhomogeneous with regard to relief, moisture and light conditions (see 3.2.10.1). The lower part of the forest (transect I) has a low stand density and has been intensely used since a longer time period (see 3.2.10.8), while the upper part of the forest (transect II) still has a comparatively high stand density in spite of recent and severe lopping and logging.

SDI

SDI was calculated to compare the surveyed stand with a similarly treated stand (with regard to stand density) of an average dbh of 25 cm. The resulting values show a high S_e in both forested areas (Malam and Mangarkot):

In Malam potential density is 436.9 (S_d =206.4, S_e =33.1) and in Mangarkot it is 395.8 (S_d =212.9, S_e =47.6). According to MARSCHALL, J. (1975) guide values for SDI of pine range from 600-750 trees per ha (see 2.3.1.3). The SDI in the forested area of Malam and Mangarkot is much lower than these guide values.

Volume

Volumes per ha average to 366.4 m³/ha in **Malam** (S_d =309.1, S_e =49.5). Volumes are very high in Malam III (see 3.1.3.4 and 3.1.3.10) and especially in Malam V (1455 m³/ha). But in Malam V (see 3.1.3.12) only one plot was measured and the plot was differing from Malam I,III,IV and VI with regard to exposition, and intensity of usage, due to the rugged terrain.

The average amounts of volume per ha in each plot are also correlated with the number of stems/ha in the respective sample area: Exceptionally low values for N (stems/ha) result in unproportionally high volumes/ha if, as it was often the case in Malam, the basal area of the remaining trees exceeds the average values in the other sample plots of the transect.

Table 4. 4: The average volumes were taken from SCHOBER, R. (1975) (table modified after KRAMER, H. , 1988).

	Author	Age (years)	Volume m³
Oak	JÜTTNER	200	7.6
Spruce	WIEDEMANN	120	3.2
Pine	WIEDEMANN	140	2.4

In **Mangarkot** volumes are on average 264.8 m³/ha (S_d =157.6, S_e =35.2). The average volume/ha was very low in transect I: It was less than half of the amount in transect II, where there are still high reserves.

Concerning the average amounts per plot in case of a low number of stems/ha, the situation was alike to Malam, in particular in the lower part of the forest.

KRAMER, H. (1988) mentions that the volume of forest trees depends mainly on locality*, Wuchsraum* and age of a tree. The collection of yield tables of SCHOBER, R. (1975) contains average volumes for the most important European trees. In the first yield class (*I. Ertragsklasse*) and under strong thinning trees of final stands reach average volumes as shown in table 4.2.

The calculated average volume (m^3) per single tree matches or even exceeds the value of pine ($2.4m^3$) in all transects except for Malam I ($1.4\ m^3$) (see 3.1.3.4) and Mangarkot I ($1.8\ m^3$) (see 3.2.10.1). This reflects the past management of stands, when no conventional forest management was practised, but single trees were mainly logged for fuelwood and house construction.

KLEINE, M. (1990) also mentions that intensive management of the high hill conifer forests in Northern Pakistan started only in the early 80ies: "*Mainly the single tree selection system without proper measures to enhance natural regeneration, the lack of systematic stand management and traditional felling and extraction methods (scantlings) led to undesirable conditions of these forests."* As such he lists overmaturity of the stands, poor stocking and therefore low productivity and considerable loss of valuable timber in terms of quantity and quality.

SOERIANEGARA, I. and LEMMENS, R.H.M.J. (1993) describe the attributes of *Pinus L*. with special regard to pines of South-East Asia. According to them, pine is a good general-purpose timber, although in woodworking and finishing aspects its resinous nature requires special attention. The wood is medium-weight and moderately hard. Pine timber is only moderately durable and often prone to termite attack. It is also susceptible to blue stain, ambrosia beetles and dry-wood borers.
"*Pines are much planted trees because of their fast growth, ability to grow on comparatively poor soils and at high altitudes, and because of the detailed information available on their silviculture. The quality of the wood is, however, often very poor.* " (SOERIANEGARA, I. and LEMMENS, R.H.M.J., 1993)

VIDAKOVIC, M. (1991) describes *P. wallichiana* in particular: This pine is up to 50 m high, the crown is broadly pyramidal. Needles are in fascicles of 5. *P. wallichiana* is native to the Himalaya. It often forms pure stands, and is known as a fast growing and very frost hardy tree that grows preferably on fresh and rich soils.

4.2.2 Natural regeneration and afforestation practices

Pines are pioneers and their natural range is extended by colonisation following disturbances such as fire. They are light demanding and habitually grow in pure stands. Successful natural regeneration is only possible where a relatively large amount of sunlight reaches the ground. (SOERIANEGARA, I. and LEMMENS, R.H.M.J., 1993)
In the surveyed forested area was enough sunlight reaching the forest ground due to low canopy density (except for transect IV, see 3.1.3.11). Stand density and canopy density influence microclimate on forest ground. The amount of radiation reaching forest ground through the canopy, influences mixture, density and growth of seedlings (AMMER, C., 1996).
In the case of Malam and Mangarkot forest usage is far too intense for any efficient regeneration: Over-grazing, frequent cutting of grass and woody perennials, logging and consequent timber transport (as in Mangarkot, see

3.2.10.1) destroy seedlings and small trees. If forest usage decreases, then natural regeneration will rapidly increase, as it has already happened in Malam VI (see 3.1.3.13).

The afforestation in Malam II (see 3.1.3.9) is situated on a slope not far from the village. In 1997 and 1998 about 180 acres in total were afforested. The amount of 890 plants/ha[3] appears to be extremely low, considering that LÜPKE, B. (1995) recommends 3000-5000 plants/ha in afforestations of pine under European conditions (however, nothing objects to lower the density to 1000-2000 plants/ha according to him). KHAN, M. and KLEINE, M. (1990) write after a two-years study on natural regeneration of Chir Pine (*P. roxburghii*)," *The increase in the number of plants which are taller than 20 cm also reached a level of about 10 000 plants/ha after two years which is sufficient to build up future stands of suitable stocking*." A study on seedling mortality revealed that a height of 20 cm is sufficient for the survival of seedlings – in the afforestation of Malam 24 % of the seedlings were smaller than 20 cm, and 57 % between 20-30 cm.

To make afforestations more efficient it would be important to have a full acceptance from the farmers' side in the first place, additionally the following aspects should be taken into account:

- Density should be increased to at least 2000 plants/ha. Reportedly there have been drop-out rates of about 80% in the first two years of the afforestations. Considering an average amount of about 800-1000 plants/ha in the afforestations this would only leave a number of 160-200 plants/ha after only two years.
- In any case the sites have to be replanted regularly – besides the practical effect, there is also some psychological side-effect if the site is not neglected but in a "hopeful" condition. If there are only dead saplings left, there will be no more reason for protection.
- Protection should be organised by the villagers themselves, to create a sort of social responsibility and a "social fence" protecting the afforestations.
- Besides an increase in density, it also seems reasonable to start afforestations with plants of at least 20 cm height. Especially in dry years and if grazing was not fully given up yet in the concerned area, smaller plants have less chance to survive.

The afforestations in the forested area in Mangarkot were chosen because some villagers asked for it, but it is doubtful whether it will be successful: It is situated in the middle of the forest where restricted grazing would enhance natural regeneration sufficiently (see Malam transect VI). Density is rather low, only 570 – 715 plants/ha, and many saplings were planted in ditches, along the path and on other unsuitable areas, which again makes their destruction most likely.

Due to afforestation attempts two introduced species have reached an enormous spread - *Robinia pseudoacacia* (originates from North America) and *Ailanthus altissima* (originates from China). Already after five years first harvesting is possible and thus the trees are widely accepted and preferred to slow-growing indigenous species. The trees are avoided by grazing animals because they are slightly poisonous and because of thorns (Robinia only). Still foliage is used as fodder, thus replacing oaks that used to be a common fodder source before.

[3] This value is a result of the survey on afforestation, see 3.1.3.9).

4.2.3 The extent of forest usage

The intense use of forested areas for grazing, cutting of woody perennials and grasses are the reasons for slow and insufficient establishment of natural regeneration. Changes in nutrient circulation due to pasturage influence vegetation and alter the original flora.

Lopping and splintering to gain torchwood weakens trees in the long run, and are frequently practised for this purpose.

Single tree selection is a common practice, nevertheless forest soil is often destroyed through logging and the consequent downhill transport of poles.

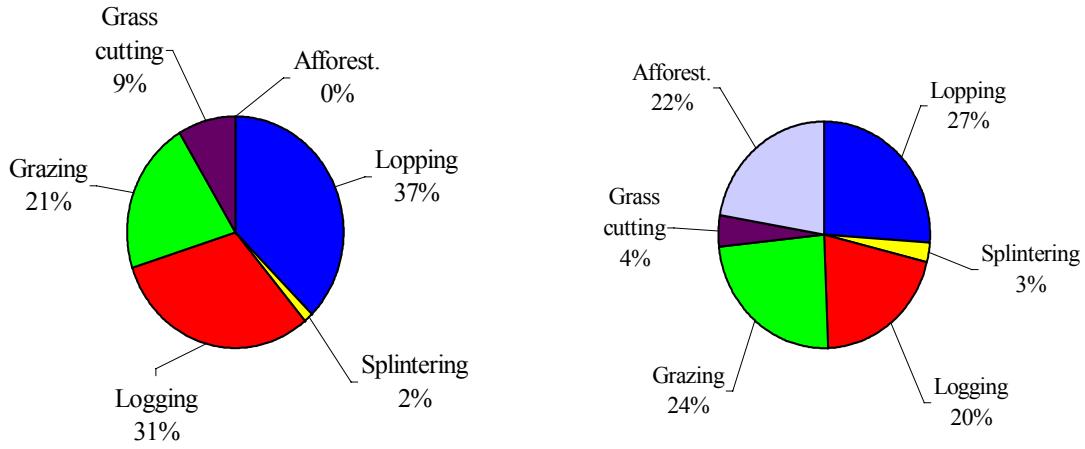


Fig. 4.3: Share of the various ways of forest usage in Malam(left) and Mangarkot (right).

Fig. 4.3 shows the importance of the different ways of forest usage in the two surveyed villages: In both forested areas lopping and logging have the severest impact on forest structure and are practised almost everywhere. Grazing is a common practice on the slopes with a lesser inclination, while grass cutting is confined to the steeper forested areas. Splintering is not practised to a larger extent. There are no afforestations in the forested areas of Malam, only in Mangarkot the forest is partly afforested (see 4.2.2).

Table 4.5 shows the correlation between various parameter and forest usage:

- Inclination is significantly correlated with forest usage: The steeper the slopes are the less intense is forest usage. Only cutting of grass is practised more often and therefore positively correlated with increasing inclination in Malam.
- Natural regeneration in the forested area of Malam is significantly correlated with grass cutting, as in higher areas there is less impact on forest ground and almost no pasturage. Lopping has a negative impact on regeneration, as many trees are so severely lopped that seed production is reduced drastically.
- Species dominance and abundance is positively correlated with altitude, inclination and soil coverage on the 0.01 level. Forest usage has a negative impact – grazing reduces species dominance and abundance of vegetation and severe lopping reduces canopy density: Sunlight reaches the forest ground and it often turns very dry, thus negatively influencing typical forest plants.

Table 4. 5: Correlation of forest usage with other parameter in Malam.

Correlation (Pearson Index)	**Inclination [°]**	**Regeneration [seedlings/ha]**	**Species dominance and abundance (numeric scale)**
Grazing intensity	-,802**	-,259	-,535**
Lopping	-,620*	-,416**	-,397*
Logging	-,075	-,072	-,200
Splintering	,062	,232	,169
Cutting of grass	,591**	,476**	,291

** Correlation is significant at the 0.01 level (two-tailed)

* Correlation is significant at the 0.05 level (one-tailed)

In Mangarkot logging is practised to a much higher extent in upper areas, because the road is closer there and therefore illegal timber logging is more common than in the inaccessible lower part of the forest.
There is less correlation of forest usage with other parameters in Mangarkot than in Malam: Cutting of grass is for example negatively correlated with afforestations. Probably there was less grass cutting due to protection of the afforestation.

4.2.4 Vegetation resulting from intensive human impact in Malam Jabba Valley

The primary vegetation in Malam Jabba Valley is replaced by secondary and tertiary vegetation almost unexceptionally: Over-population and expanding settlements have had many consequences on environment. With the increase in human population an increase in livestock population went hand in hand, although there are already now certain limits visible with regard to livestock increase: Fodder and grazing areas are already alarmingly scarce. A study in District Mansehra (Hazara Division N.W.F.P.)[4] showed that protection of vegetation (through fencing) resulted in an increase of 2 ½ times in percentage of coverage abundance of grasses and forbs (NOOR, M., 1989). But the current situation of disagreement within different user groups on total protection of parts of the hillsides and forests requires different approaches to protection than simple fences.

The effects of intensive grazing, as described by HOLZNER, W. and KRIECHBAUM, M. (1998) in the Inner Himalaya and Tibet, could also be observed in Malam Jabba in a similar way:
Primary vegetation is only remaining as isolated trees or shrubs in Malam Jabba. These may be the remnants of the former plant cover in a landscape otherwise bare of woody plants together with protected areas such as

[4] The area is situated in the subtropical humid ecological zone at an elevation of 1122 m.

graveyards. On graveyards oaks and the indigenous olive tree (*Olea cuspidata*) can be found, which is otherwise almost extinct in Malam Jabba.

Inaccessible areas, that have been scarcely or not at all visited for various reasons, often give an impression of how landscape and vegetation look like without strong human influences. In Malam Jabba this phenomenon is confined to areas of higher altitude and rugged terrain.

In vegetation unpalatable plants are predominant: Unpalatable species increase due to their competitive advantage. In contrast to unprotected plants they are "armed" with mechanical means of defence such as hard tissues and spiny organs. Other plants prefer chemical protection devices such as bitter or acrid compounds, ethereal oils or poisonous substances. (HOLZNER, W. and KRIECHBAUM, M., 1998)

Unpalatable shrubs occurring in Malam Jabba are for example *Dodonea viscosa* (bitter taste, hard tissues) in lower areas on barren hillsides, and *Berberis lycium* (spiny, poisonous fruits) in the forested areas. *Indigofera heterantha*, *Plectranthus rugosus*, *Sarcococca saligna* and *Buxus papillosa* are also mostly avoided by grazing animals.

Spreading of pioneer plants over the whole landscape indicates a high grazing pressure according to HOLZNER, W. and KRIECHBAUM, M. (1998). Plants that are specialised to colonise on open soils invade if vegetation is destroyed and soil lies bare. Characteristic pioneers are annual plants (poor root system) or biennial growth (often producing a rosette of leaves pressed to the soil). HUSSAIN , F. et al. (1997a) conducted a survey in Swat District and observed a high abundance of therophytes and nanophanerophytes indicating "*...that the habitat is disturbed, a condition which has resulted through human activities such as deforestation, over grazing and uprooting*."

In Malam Jabba species diversity is generally low – only one tree species grows in the surveyed area (*P. wallichiana*), eight different shrubby species (phanerophytes and chamaephytes), some ferns and few different grasses (hemikryptophytes and therophytes) in high abundance. Herbal plants are mainly hemikryptophytes (rosette plants or with creeping shoots) and chamaephytes.

4.2.5 Wooded and non-wooded resources

Forests offer people much more than timber and fuelwood. Especially in areas like the HKH there used to be a wide range of non-wooded products that people gained from the forest:

Trees

Besides from fodder and sometimes fruits, trees offer a wide range of possible benefits for farmers. The indigenous pine trees are utilised for house construction, thatching, simple furniture and fuelwood. Other valuable resources are:

- *P. wallichiana:* SAHNI, K. C. (1998) reports of a sweet liquid known as honey-dew that is secreted by aphids infesting leaves of *P. wallichiana* and is eaten by the Himalayan people.
- *P. roxburghii* produces resin of commercial importance.
- Walnut *(Iuglans regia*) is very popular with farmers; it is renowned for its valuable timber, use for fuelwood, edible nuts, and its fast growth is also appreciated. Its bark is used for teeth and also as cosmetic.
- Cedar (*Cedrus deodara*) is not only known for its precious timber, but also for "Ranselo", an oily liquid that is used to cure animals.

Mushrooms

Mushrooms (in particular black mushrooms and morels) were reportedly collected in earlier times, but no longer. This is due to intense use of forest for pasturage and grass cutting, and climatic changes due to massive deforestations. Nowadays mushrooms are hard to find in forested areas.

Wild fruits and nuts

Due to favourable climatic conditions in the area there is a variety of fruits available:

- Wild persimmon (*Diospyrus lotus*) is a small black to bluish fruit, with a taste similar to plum (*Prunus domestica)*. It is a very popular fruit that is collected in late autumn and semi-dried for the winter.
- Walnut (*Iuglans regia*) has very tasty nuts that are also collected and stored.
- Mulberry (*Morus alba*) and fig (*Ficus glomerata*) also grow in Malam Jabba, but they are not very popular, also berries such as blackberries, strawberries and rose hips are usually neglected.

Honey

Local bees (*Apis cerana*) are unable to compete with commercially reared European bees (*A. mellifera*) and therefore dwindling in natural populations. Honey used to be a good source of income for forest dwellers – the demand is still not met and prices are high on the market. (SIAL, M., 1994)

Medicinal plants

Reportedly people used to cure themselves with plants collected from the forests at the time when medication and medical treatment were inaccessible due to transport difficulties, which is however still a problem. But the valuable knowledge of generations before has become almost extinguished and local people do no longer collect plants on a larger scale. There is still a variety of plants that is known or used to cure both human and animals, in particular in Mangarkot people mentioned several plants, that are still utilised (see table 4.4).[5]

Table 4.6: Non-wooded resources reportedly collected and used by local people in Mangarkot.

Local name	Scientific name	Parts of the plant that are used	Purpose of use
Tarukay	*Rumex sp.*	Leaves	Spice
Leghunay	*Daphne?*	Roots	Used for intestinal worms
Khwaray	*Berberis lycium*	Roots and berries	For wounds
Buti	*? Centella asiatica?*	-	Medicine for animals and humans
Banadscha	*Viola serpens*	Flowers and leaves	Food and medicinal plant

[5] Compare also SIAL, M. (1994) and ÍNTEGRATED REGIONAL DEVELOPMENT PROJECT (1998).

4.2.6 Agroforestrial landuse

Some farmers in Malam Jabba Valley have already started to specialise on agrisilvicultural and agrihorticultural landuse systems: Both can be applied on marginal lands and embankments of terraces thus preventing soil erosion to some extent. Intercropping is possible and improves agricultural income. The shadow of trees protects crops in the dry and hot months of May and June, and during the rainy seasons trees prevent surface soil erosion with their root systems.

Agrisilviculture

This way of landuse should help to meet the increasing demand for fuelwood and construction timber, as well as material for thatching and fodder for animal husbandry. Possible trees are fast growing trees such as *Ailanthus altissima*, *Robinia pseudoacacia*, *Populus sp*. and *Melia azedarach*. Indigenous species such as oaks and pines are also suitable for such plantations. They are slow-growing compared to the trees mentioned above and therefore less appreciated. But local farmers are still more familiar with these than with newly introduced tree species such as Ailanthus and Robinia.

Agrihorticulture

Horticulture in intercropping offers a wide range of possibilities to improve landuse and to increase household income: Apple, pear, peach, persimmon and apricot are the most common fruit trees in the area. Wheat, rape seed, maize and vegetables can be cultivated in intercropping. Pasturage is also possible.

Fodder and fuelwood can also be gained to some extent from fruit trees. Fruits can be sold on the market or kept for household use. This would also mean a benefit for women in particular as their role in food processing and storage would consequently gain importance.

5 CONCLUSION

The silvo-pastoral systems in Malam Jabba Valley are characterised through excessive over-use of natural resources. The rapid population growth in this century has lead to hillside agriculture in former forested areas and to numerous settlements expanding into forested areas.

Over-grazing, grass cutting and intense forest usage for timber and fuelwood have altered the natural vegetation. *Pinus wallichiana* is the only tree species still occurring in the surveyed forests between 1700-2200 m altitude. Species diversity is generally low. Therophytes and hemikryptophytes grow in high abundance together with several nano-phanerophytes.

The original advantages of the systems are no longer existing, the variety of products that the forests formerly offered, are now restricted to timber and fuelwood.
Stand density in the forested area ranges from 25 to 300 trees/ha, the number of stumps indicating logging intensity reaches from 25-425 per ha. The trees are on average 25-26 m high and arithmetic mean dbh is approximately 50 cm.
Volumes average to 265 (Mangarkot) and 366 (Malam) m^3/ha. Although natural regeneration is fast and effective once established, it remains questionable whether the forests, that are now over-mature and over-used, can fully recover again.

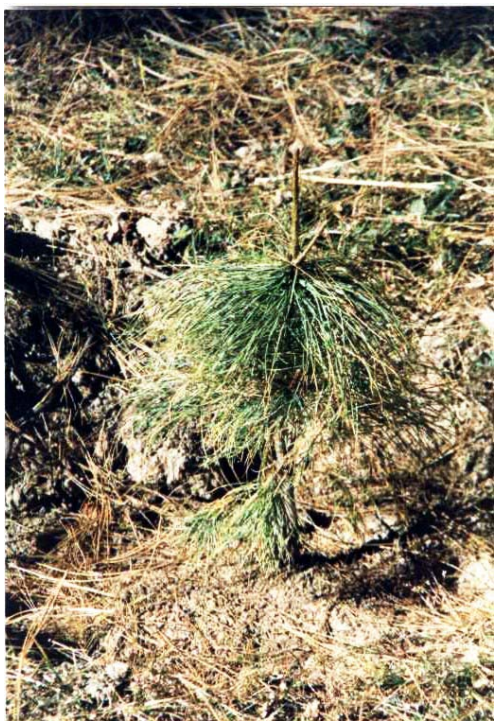
Under the current socio-economic conditions it is also doubtful whether the required consensus for total protection can be reached in the near future, as many farmers are still depending on silvo-pastoral systems. The limited availability of natural resources and the lack of communal management deprives the local people more and more of the fundaments of their lives. To avoid social erosion in form of migration to the cities alternative ways of agroforestry have to be supported and developed.

Agrihorticulture and agrisilviculture are already practised to some extent by farmers in Malam Jabba Valley – they are most likely to replace the traditional silvo-pastoral systems in future.

APPENDIX

Photograph 1: Typical milk buffalo in Malam.

Photograph 2: Cattle searching for food (Mangarkot).



Photograph 3: Sapling of *P. wallichiana.*

Photograph 4: *Sarcococca saligna.*

Photograph 5: *Cedrus deodara*.

Photograph 6: Local fig in Mangarkot.

Photograph 7: Local pear in Malam.

Photograph 8: Persimmon fruits in Kashora.

Farmer interviews (social survey)

1. STATISTICS:

a) Age group
<20 20-30 30-40 >40 >60
b) Number of people in the household:
c) Ethnic group:
d) Family name:
e) Professional group: Landowners
Tenants
Seasonal workers in the valley
Seasonal workers outside the valley
other
f) Livestock: owned:
in care:

2. NATURAL RESOURCES

From where do you get water
From where do you get fuelwood
Where is the nearest forest
Where do your animals usually graze in summer
Where are your orchards and fields and what do you grow

3. PROBLEMS AND CHANGES:

- What are your most important problems concerning:
  Livestock
  Crops
  Fruit trees
  Vegetables
  Forests
  Daily use

- What should be the first three things that should be changed concerning:
  FORESTRY

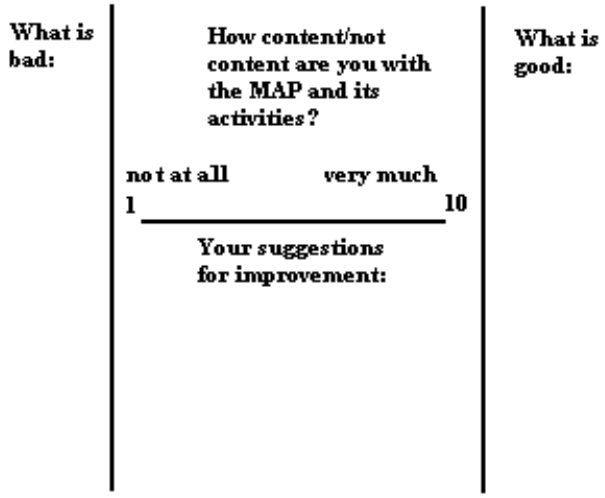
  AGRICULTURE

4. SEASONAL DIAGRAMS:

What products do you obtain from fields, orchards etc. throughout a year:
J F M A M A J J A S O N D J F M A M
SPRINGRAIN DRY MONSOON DRY SPRINGRAIN

What products do you obtain from forests, meadows, throughout a year (vegetables, medicinal plants, bark, fodder,....):
J F M A M A J J A S O N D J F M A M
SPRINGRAIN DRY MONSOON DRY SPRINGRAIN

5. EVALUATION OF MAP:



Guidelines for Social Translators

1. Make sure that you understood the task and the questions all right and do not hesitate to ask again and again!
2. Explain to the people before we start that we have come here to learn from them and that we are very thankful for their willingness to help us.
3. Tell the people that they do not have to write anything unless they really want to, we will do all the necessary writing for them.
4. Explain the task in a simple and clear way and make sure people understand what you mean.
5. Do not interrupt people once they are ready to explain and give answers, do never correct them even if you are sure you know better!
6. Do never take the pencil out of their hand, leave them at their work.
7. Do not underestimate people, each opinion counts!!!

Interviews with officials and project staff

Questions concerning livestock

1) What are the numbers of

Goats
Sheep
Buffalo
Cattle
Poultry
Horses
Mules
…

2) How many of these are always in the valley, how many migrate (approximately)?

3) What is the average milk production during the run of the year?

4) At what age is the first calving, at what age are the cows sold to the butcher?

5) How long is the average lactation period of the buffalos and the cattle?

6) What are the three major constraints in animal husbandry in the area?

7) What should be the first three things to be changed in animal husbandry in the valley?

8) Consider the knowledge and the skills of the farmers in the valley concerning livestock, what number out of ten would you give them?

Very good 1_____ 10 Very bad

Questions concerning forestry

1) Which trees are most important in the valley (ranked by importance according to your opinion) with regard to afforestations?

2) What are the most important products people obtain from the forests according to your opinion?

3) How many local people out of 10 do you think are involved in illegal wood cutting?

4) What are the three major constraints in forestry in the area?

5) What should be the first three things to be changed concerning forestry in the valley?

6) Consider the knowledge and the skills of the farmers in the valley concerning trees and forestry, what number out of ten would you give them?

Very good 1_____ 10 Very bad

Questions concerning agriculture

1) What are the numbers of farmers in the valley?

2) How many of these are …
- Landowners
- Tenants
- Workers on farms (seasonal workers - Gujars)

3) What is the average area of land per farmer/ tenant?

4) What are the major crops at the moment (including vegetables) and what were the major crops before?

5) Where is the main market for the farmers?

6) How many family members does a farm sustain in the area according to your opinion?

7) What are the three major constraints in agriculture in the area?

8) What should be the first three things to be changed in agriculture in the valley?

9) Consider the knowledge and the skills of the farmers in the valley concerning agriculture, what number out of ten would you give them?

Very good 1_____ 10 Very bad

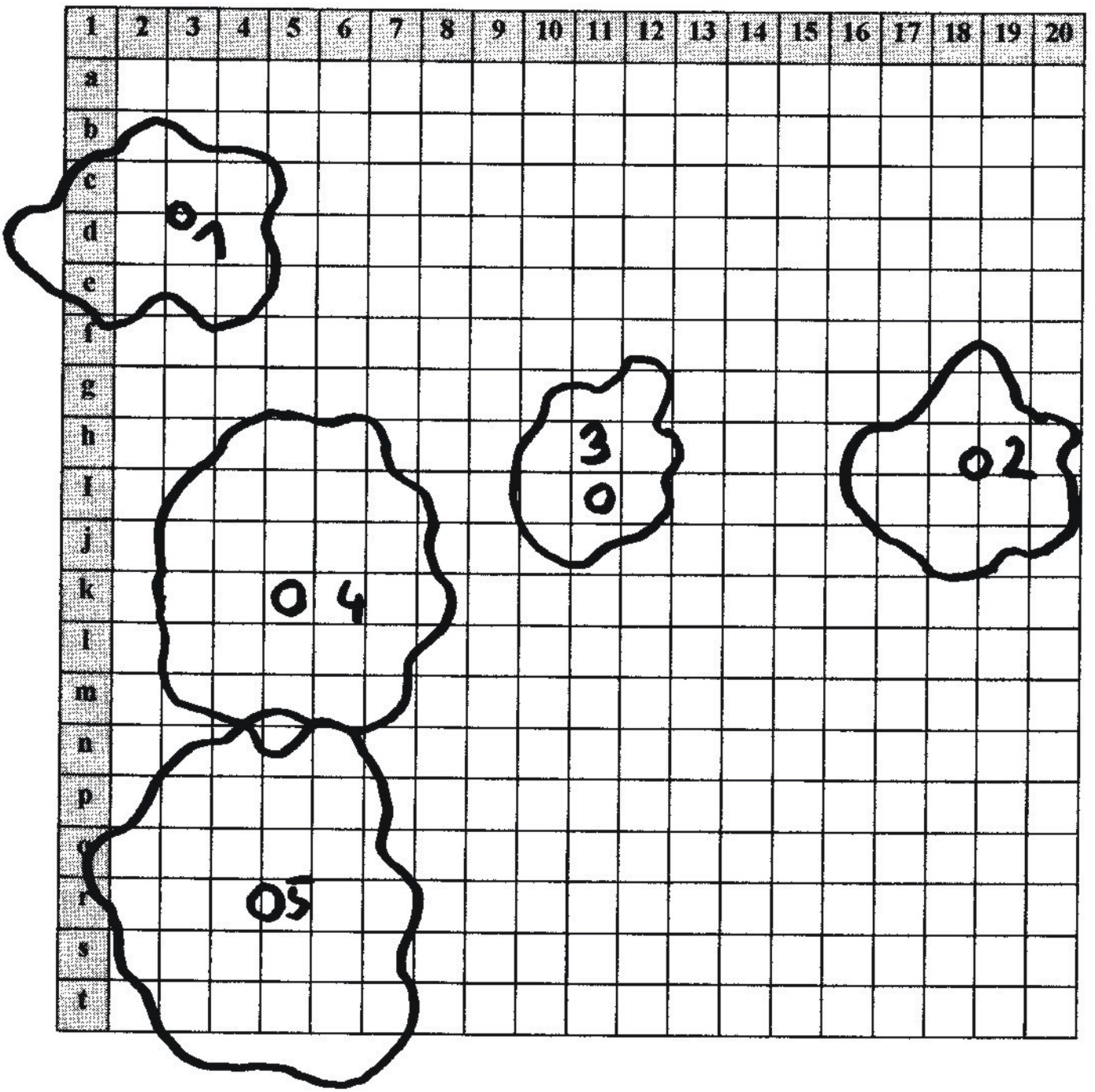
	Transect walk	Key persons	Field survey	Semi-structured interviews	Natural resource mapping	Tree ranking	Problem ranking	Bean scoring (product scoring)	Seasonal diagram	Interviews with officials	H-Form
Non-timber resources	×		×	×	×				×		
Timber-resources	×		×		×				×		
Importance of trees	×	×	×			×		×			
Agricultural products (fruits, vegetables, crops)	×	×		×	×			×	×	×	
Non-agricultural products/non-wooded products	×		×	×	×				×	×	
Grazing, livestock, fodder sources	×	×	×	×	×		×			×	
Number of farmers, farm sizes, ethnic groups		×		×						×	
Forest use	×	×	×		×		×				
Afforestation, plantations	×	×	×	×		×				×	
Importance of forest products						×		×			
Changes in land use	×	×	×		×		×				
Major problems in the area		×		×			×			×	
Which changes are most desired/important		×		×		×	×			×	
Evaluation of MAP	×	×	×	×			×			×	×
Evaluation of institutional work (extension services, projects,...)		×					×			×	

Booking sheet (forest survey)

Date		Village:		
NR /		Photograph:		
Site:	Exposition	…….		
	Altitude	……m		
	Inclination	…….		
	Hollow, lower slope, slope, upper slope, ridge			
Soil:	Type of soil			
	Soil depth			
	Erosion damage			
	Soil coverage	……...…..%		
Regeneration:	<20			
	20 -80			
	80-150			
	>150			
Forest use:	Grazing		Stumps:	……..….
(1-5)	Logging			Axes
	Splintering			Saws
	Lopping			Fire
	Others			
Stand:				
Crown density:	…..…..%			
NR	Species	Height (m)	dbh (cm)	Crown width (m)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

CROWN PROJECTION MAP

I/9



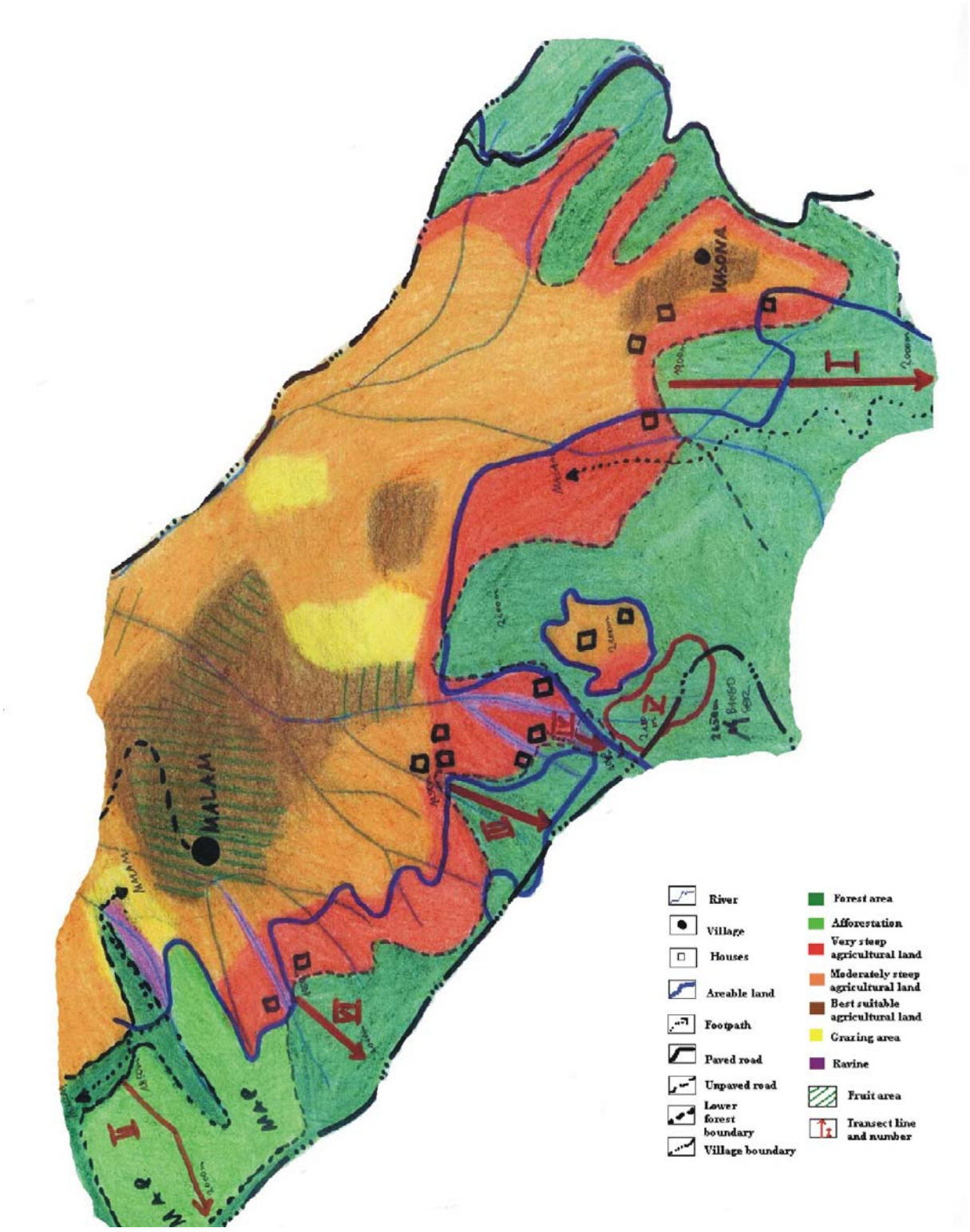


Fig. 1: Landuse map of Malam.

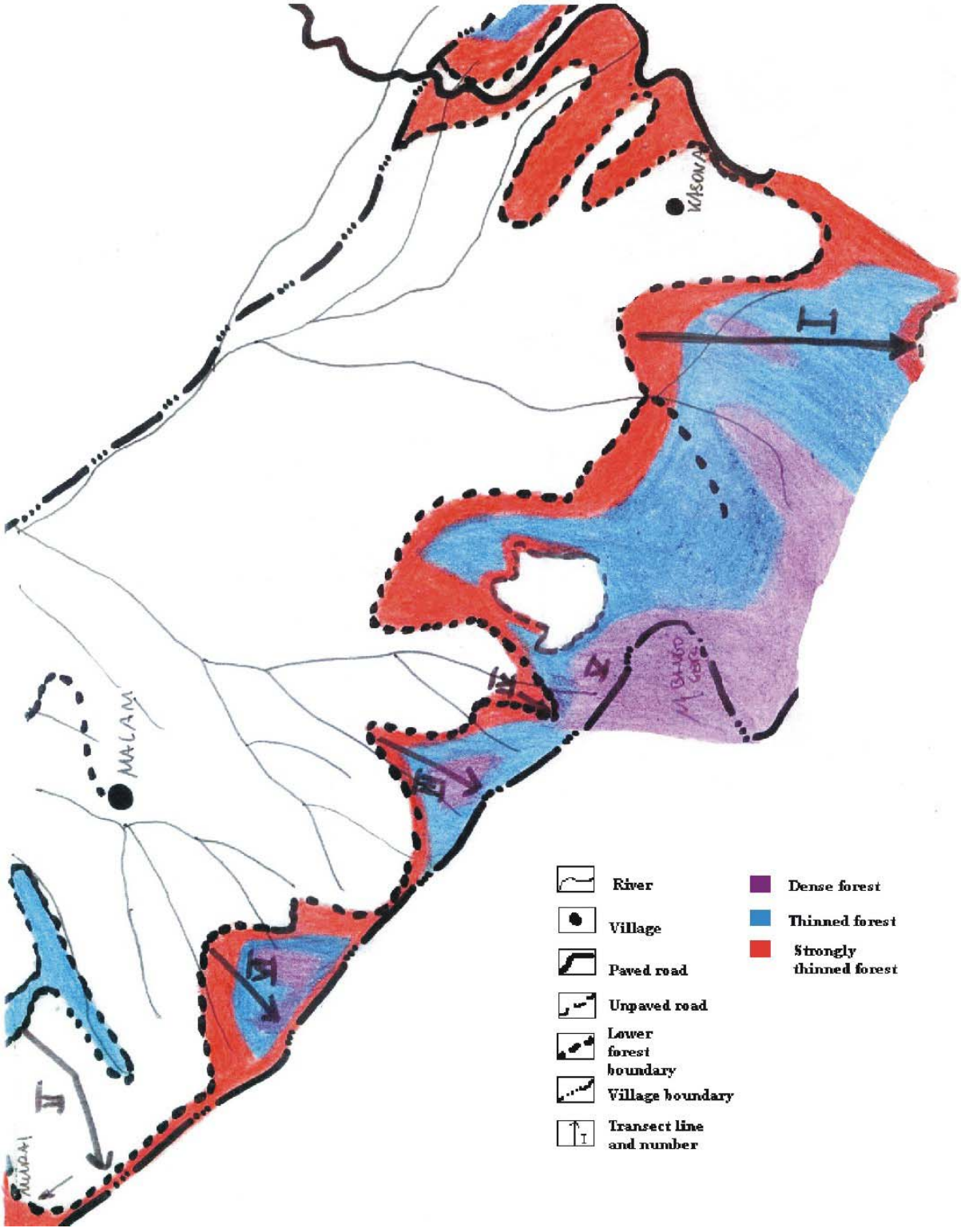


Fig. 2: The status of the remaining forested area in Malam.

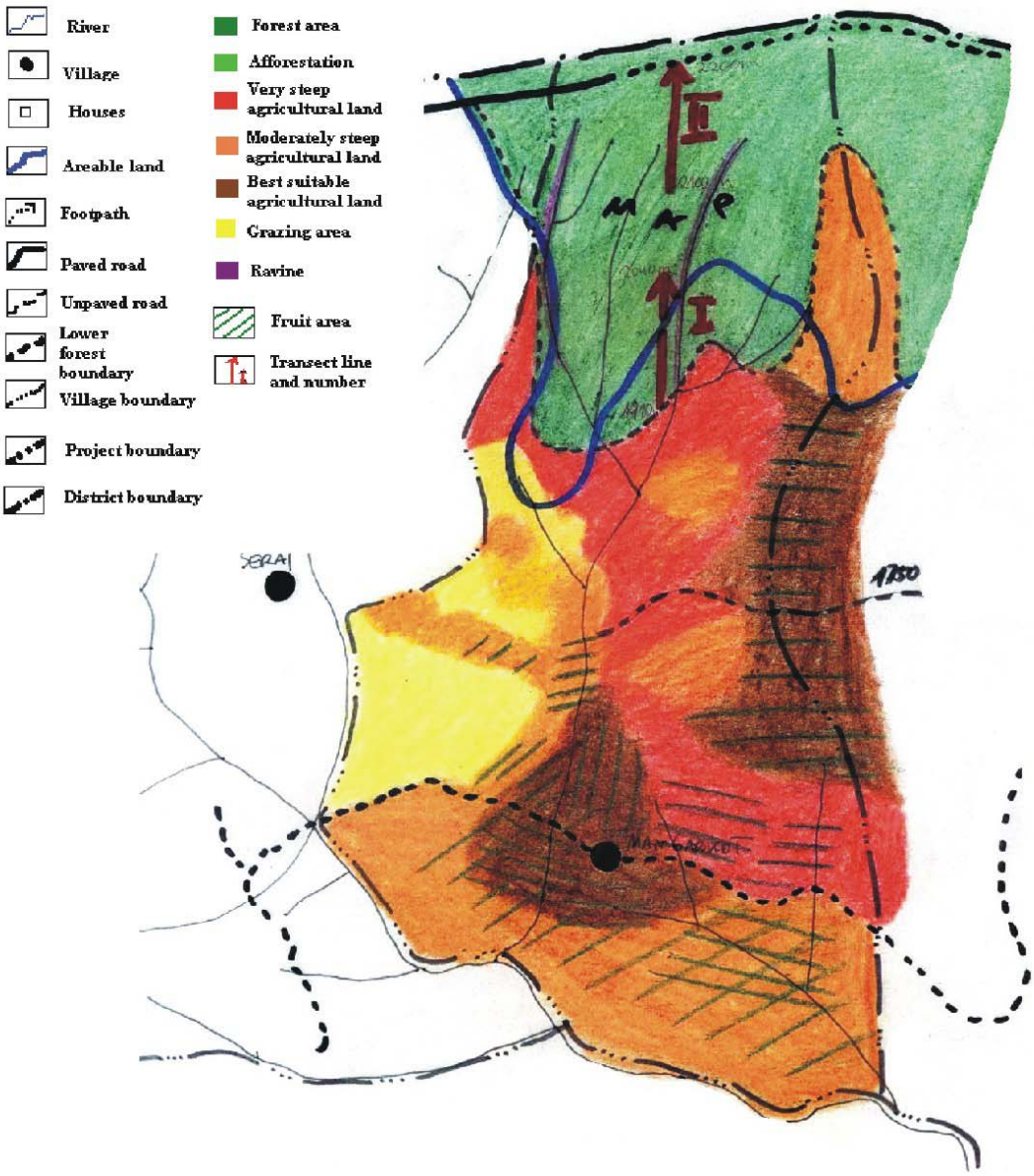


Fig. 3: Landuse map of Mangarkot.

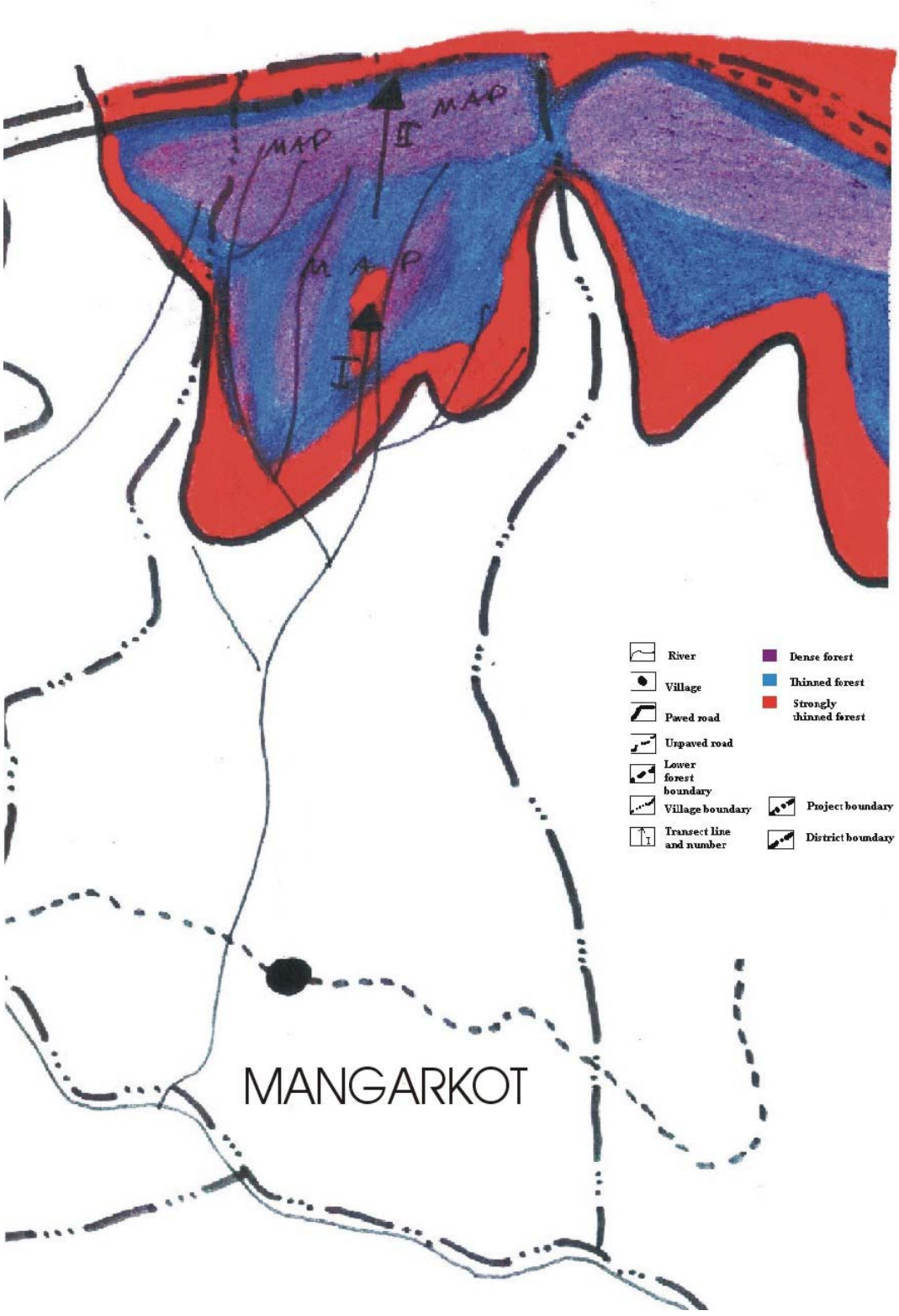


Fig. 4: The status of the remaining forested area in Mangarkot.

EXPLANATIONS

Akund of Swat	also: Saidu Baba; famous Saint who lived in Saidu Sharif in the 19th century; grandfather of the first Wali of Swat
Amlok	persimmon
Anjeer	local fig
Astanadars	permanent settlers in the villages belonging to the Daftars
Bakyana	*Ailanthus althissima*
Banadscha	*Viola serpens*
Bandra	grazing areas in summer, used by the villagers of Malam
Barida	name of a forest in Malam
Bashrikhel	Pathan tribe
Buti	medicinal plant, used for animals and humans
Dardic	referring to ethnic groups and languages of Dardic/Indian descent
Daftar	land owned by one clan
Deodar	*Cedrus deodara*
Dodonea	*Dodonea viscosa*
Dorghozar	family name of Kohistani origin
Foreray	name of a forest in Malam
Ghee	clarified butter
Gujar	nomads and shepherds, migrating and also settling in Swat Valley
Hujra	guest house
Ismaili	Shiite sect, widespread in Kashmir, in particular in Hunza Valley
Jirga	assembly of the male family heads
Kafir	pagans
Kail	Blue Pine (*Pinus wallichiana*)
Kharif	summer crop
Khattakhel	Pathan tribe
Khwaray	*Berberis lycium*
Kikar	*Robinia pseudoacacia*
Kohistani	mountain people; the term refers to the indigenous population of Swat before the Pathan invasion in the 16th century; live mainly in Upper Swat and the higher mountain areas
Leghunay	medicinal plant; roots are used for intestinal worms
Maira	dry land in hillsides
Malik	a kind of mayor, presiding over a village/community
Miagan	family name – Miagan are Syed (descendants of the Prophet and therefore Saints)
Miangul Abdul Wadud	first Wali of Swat
Miangul Jahan Zeb	last Wali of Swat

Mullah	preside over the community and organise prayers
Pathan	ethnic group inhabiting parts of Afghanistan and Pakistan
Pir	descendant of a Pathan-Saint
Pukhtunwali	code of honour controlling social life in Pathan society
Purdha	system for the protection of women, based on seclusion of women to the house, separation of men and women and wearing of a veil or Purqua
Purqua	a veil that covers the head completely
Qoum	caste-like category in hierarchical system in Pathan society
Ranselo	oil, gained from *Cedrus deodara*; reportedly used to cure animal diseases.
Schorgera	riceland, permanently flooded land
Sirimar	farmers of different ethnic origin who own small landholdings in Malam
Syed	descendants of the Prophet and therefore Saints
Shaftal	clover; fodder plant
Rabi	winter crop
Tappa	area owned by a tribe in Swat Valley
Tarukay	medicinal plants leaves are used as a spice (*Rumex estata*?)
Tehsil	administrational unit of the Agricultural Extension (e.g. Mingora) in Malakand Division
Toor	oak (*Quercus dilatata*)
Tongu	local pear in Malam Jabba Valley
Vesh	system of re-distribution of communal property within the Yuzufzai clans in Swat Valley
Wali	title of the king of Swat
Wat	periodically irrigated land
Yuzufzai	Pathan tribe; conquered Swat in the 16th century

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CURRICULUM VITAE

Habermann Birgit

DATE OF BIRTH: 1.9. 1974

PLACE OF BIRTH: Amstetten, Austria

1980 - 1984	Primary School (Hürm, Lower Austria)
1984 - 1992	Grammar School (Stiftsgymnasium Melk, Lower Austria)
1992 - 1995	University of Vienna: Study of Biology/Ecology
1995 - 1996	ERASMUS - Exchange Program at the University of Lund , Sweden (Ecology)
1996 – 1999	University of Vienna: Study of Biology/Ecology

1997/98	Integrated Regional Development Project in Developing Countries, a case study in Malam Jabba Valley, N.W.F.P., Pakistan – Technical University of Vienna
1998/99	Thesis/Diplomarbeit "*The Status of Traditional Silvo-pastoral Systems in Malam Jabba Valley, N.W.F.P., Pakistan*"