

## Country Reports\*

### INDIA

The country report, given by B.P. Kothyari of the G.B. Pant Institute of Himalayan Environment and Development, was an update of the ICIMOD Project on Rehabilitation of Degraded Lands in Mountain Ecosystems of the HKH Region at the Almora site in Uttar Pradesh (U.P.), India.

#### Summary of progress in project activities in India in 1994

Work on the site covering an area of 9.4 hectares at Arah village in the Gomati Basin of Almora was continued in 1994. Planting of fodder and legume crops started again on the abandoned land of the site area and plantation was completed in 1994. Studies in vegetation, soil biology, and the socioeconomy of the participating community were also completed. Water harvesting and weed composting technologies were introduced at the project site. Peoples' participation was well organised by the site village community forestry committee (*panchayat*).

#### Site description

The study area is located in Almora district of Kumaon District Commissioner of Uttar Pradesh (India). This district is physiographically characterised by the Greater Himalayas and the Lesser Himalayas which have been separated by the Main Central Thrust (MCT). The project site belongs to Arah village in Kature Valley. The project site consists of approximately eight hectares of abandoned agricultural land owned by 60 per cent of the households in the village.

Climatically, the region enjoys a monsoon climate. The minimum temperature during the winter falls below freezing point, while maximum temperature reaches 38 °C during the summer. The area receives moderate rainfall. Monsoon reaches this area in the first week of August and the maximum rainfall has been recorded during August - September (about 1/3 of the annual rainfall).

Approximately 70 per cent of the village population is engaged in agriculture. The majority of households own less than 0.5 of a hectare of agricultural land, whereas only a few own between one to two hectares. The village has a total population of 458. According to the Census report (1991), the village has an overall literacy of 17.25 per cent and the literacy rate for women is lower than for men.

The detailed activities completed in 1994 are highlighted below.

#### Plant Seedling Production and Plantation

- Plant seedlings were produced at the plant nursery established on the site.
- Since only 50 per cent of plantation had taken place in 1993, it was completed in 1994. In all, 12 species were planted (a total of 6,955 plants) and have so far shown a promising survival rate (97% survival on average).
- Soil amendment, by digging pits of 75x75x75cm<sup>3</sup>, approximately two metres apart, filled with topsoil collected during terracing or during terrace repair, for plantation was the method used for rehabilitation.

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\* The country reports are recorded in the order in which they were presented

- Planting of fodder and legume crops started again in October on land which had been abandoned for the past twenty years without any plantation.

### Study of Natural Vegetation, Soil Biology

- A vegetation survey took place and comparative studies were carried out in an adjacent pure oak forest, among pure pine stands, and in agricultural fields.
- Monitoring of phytosociology, soil characteristics, and soil micro-organisms continued.

### Study of the Socioeconomic Conditions of the Area

- A socioeconomic study - including an agricultural calendar, rainfed and dryland agriculture, fruit production, and land use - was completed.
- Consumption of fuelwood in the project area was analysed.
- The energy expended by women in different household/agricultural tasks was studied.

### Construction and Repair

- Two underground tanks of 10x6x1.5m<sup>3</sup> dimensions, as well as a tank of 11x6x1.5m<sup>3</sup> dimensions, were constructed in the upper and middle elevation of the study area.
- Repair of abandoned and damaged terraces and construction of checkdams in gullies were carried out.

### Others

- Weed composting technology was introduced.

## PAKISTAN

This report, prepared by B.H. Shah of the Pakistan Forest Institute, Pakistan, briefly described the project activities on the Mansehra site in Pakistan.

### Summary of progress in project activities at the Mansehra site in Pakistan in 1994

The project funds for the project in Pakistan were made available towards the end of 1993, thus this is a preliminary report of activities so far.

### Site Description

The study area lies in the catchment area of Siran River in Mansehra district at 34° 4' N, 73° 2' E.

The area falls in a humid, subtropical continental highland climatic region. Two thirds of the annual rainfall in the area is received from July to August. The soil is generally shallow and loamy and the natural vegetation on the site is subtropical pine forest. The study has selected two catchments, one of 21.1ha and another one of 20.3ha. In the former catchment, the work carried out is to enhance production and for soil water conservation, while the latter is treated as a control.

At Tarbela site, two adjacent catchments, having an area of 0.15 of a hectare, were earmarked for the study. Both these sites are on private agricultural land and have a typical land-use pattern, i.e., lower elevations are composed of traditional, terraced agricultural land, middle elevations with medium slopes are pastureland, while the upper steep slopes have some scattered tree growth.

At Mangla site, the two catchment areas are near the reserved forest, have barren stony soil, and are used for grazing domestic animals. The study area is situated in the subtropical chir pine zone and has an annual average rainfall of about 1,100mm under monsoon influence. About 70 per cent of the precipitation is received from July to the middle of September.

Both sites are in the catchment area of the Siran River, which is an important tributary of the River Indus. The area is thickly populated and is under increasing pressure to meet demands for food, timber, and fuelwood.

## The detailed project activities conducted are described below

### Plantation of Fodder Grasses, Legume Plants, and Other Plants for Land Improvement

- 24,700 seedlings of nine different species were planted on the project sites.
- A total of 600 fruit trees (apples, citrus, peaches, apricots, persimmons) were planted on agricultural land.
- For improvement of agricultural land, biotechnical techniques were used, such as plantation of *Robinia pseudoacacia* and *Populus*, on terrace risers and between gaps in agricultural lands.
- A SALT model was established on a sloping agricultural field with nitrogen-fixing hedgerows of *Leucaena leucocephala* and *Amorpha fruticosa*.
- Two plots totalling about two hectares were planted with tea plants in collaboration with the National Tea Research Institute, Shinkiari.
- On 0.5ha of abandoned agricultural, land plantation of different species of grass and six species of legumes was carried out for forage production.

### Monitoring of Hydrology, Meteorology, and Soil Erosion

- Hydrological studies are being carried out, and these include the monitoring of surface runoff and sediment yield.
- A meteorological observation station has been established. It is equipped with instruments to record temperature (minimum & maximum), wind speed, relative humidity, evaporation, the number of hours of sunshine per day, and precipitation.

### Others

- Loose stone checkdams and other types of checkdam have been constructed in gullies.
- *Ailanthus altissima* and *Robinia pseudoacacia* were planted on channel banks and gullies to reduce erosion.
- Three earthfill dams have been constructed for possible use in fish production or irrigation, to recharge groundwater, to reduce surface runoff, and to trap silts.
- A water harvesting tank was dug (20x8x2m<sup>3</sup>) on the upper boundary of the agricultural land to trap runoff from the upper slopes.

## NEPAL - Site I

This country report, given by B.R. Bhatta of ICIMOD, was a description of the activities of the project for "Rehabilitation of Degraded Lands in Mountain Ecosystems" on the Godavari site, Site I, Nepal.

### Summary of progress in project activities at Nepal Site I in 1994

Experiments on and production of the various species useful for rehabilitation of degraded lands were continued in 1994. Studies of useful local plants and soil and biomass surveys were completed. The trial plots were largely expanded during this year and now total an area of six hectares of the sloping area.

The detailed project activities conducted for 1994 at the site are reported below.

### Site Description

The project site is 30ha of government-owned land, 15km south-east of Kathmandu, which has been provided to ICIMOD for the purpose of setting up a demonstration farm. The land has been characterised as degraded land on account of lack of significant numbers of economic species and poor biomass volume.

The altitude of the site varies between 1,550masl to 1,780masl and slope gradients are between 0.5° to 60°. The site encompasses 12 mini-subcatchments of four streams and swamps. The climate varies from sub-tropical to warm temperate to cool temperate. The mean annual temperature is 16°C, with a minimum of -1.7°C and a maximum of about 24°C.

The land has been classified into four categories: a flat land/valley floor area suitable for intensive farming; an intermediate gentle slope area for conservation farming and agroforestry (including SALT); higher steep slopes for forestry; and sites for soil conservation, watershed management, and water harvesting.

### Project Activities in 1994

#### Plant Seedling Production, Plantation, and Experimentation

- 50,000 seedlings of 21 plant species were produced in the Godavari nursery. Seed collection, storage, treatment, and germination studies were also carried out. Seeds, seedlings, and appropriate materials were distributed.
- Trials to assess the performances of nitrogen-fixing tree species were continued. Among the 15 species tried, the observations so far show that *Albizia lebbeck* has the lowest mortality (7.07%) and *Amorpha fruticosa* the highest (72.43%). The maximum growth was attained by *Alnus nepalensis* (girth, 1.20-5.98cm; height, 36-285cm).
- SALT model establishment and development were continued, as well as study of species' performances and production of various crops.
- Experiments with biofencing/live fencing were carried out and demonstrate high survival rates and good growth of *Zanthoxylum* and *Pyracantha crenulata*, which also bear useful fruits.
- Germplasm collection and Species' trials of various species such as *Paulownia elongata*, *Anomum sobulatum* cv. *Golshahi*, and *Thysanoloena maxima* are being carried out.

#### Surveys of Soil, Biomass, and Useful Species and Monitoring

- Baseline surveys of soil and biomass were completed and reports have been compiled.
- A list of useful plant species for rehabilitation of degraded mountain ecosystems was conducted. The

usefulness and number of species were identified in various categories such as nitrogen fixers and conservation plants, fast growing fuelwood species, plants of economic value, and so on.

- A meteorological station has been established and plots were established to study and monitor natural regeneration.

### **Training/Visits**

- Demonstration, training, dissemination of information, and networking were important project activities. Farmers from various parts of Nepal and other professionals, both from within and outside the country, visited the site.

### **Others**

- Introduction of other appropriate technologies, such as compost making and biomass mulching, silage making and urea molasses block, beekeeping with improved boxes, and plastic film technology application, took place.
- Inspection trails were completed.

## **NEPAL - Site II**

This was a report of the project activities of the ICIMOD project for "Rehabilitation of Degraded Mountain Ecosystems" at the Kavrepalanchok site or Site II, in Nepal. The report was given by S.R. Chalise, S. Karki, and B.G. Shrestha of ICIMOD.

### **Summary of progress in project activities at Nepal Site II in 1994**

Plant seedling production and extension in plantation areas were the major activities undertaken in 1994. Monitoring of natural regeneration, planted species' performance, and soil erosion were continued. Training and visits were organised for members of participating forest users' groups. The site trial plots established in 1993 were extended considerably (from 3.9ha in 1993 the plantation was extended by a further 3.56ha in 1994, totalling 7.46ha of plantation) due to site villagers' active participation in the project.

### **Site Description**

The site description for the project site is presented in Table 1.

### **The detailed project activities implemented in 1994 are described below**

#### **Plant Seedling Production and Plantation**

- 12,261 saplings of 14 plant species were produced at the Bajrapare Forest Users' Group Nursery and 12,414 saplings of 13 species were produced at Dhaireni Forest Users' Group (FUG) Nursery for plantation at project sites and for distribution among the Users.

**Table 1: Selected Socioeconomic and Biophysical Characteristics of the Project Sites**

	<b>Bajra Pareko <i>danda</i> (Site I)</b>	<b>Dhaireni Pakha (Site II)</b>
<ul style="list-style-type: none"> <li>● Total Households</li> <li>● Total Population</li> <li>● Number of settlements in FUG</li> <li>● Ethnic Composition</li> </ul>	<p>18 130 1 Brahmin and Kshetri only</p>	<p>259 1667 10 <i>Brahmin and Kshetri 34% HH, Newar 29% HH, Danuwar 21% HH, Sarki, Kami and Damai 11% HH, Tamang 4% HH, Magar 1% HH</i></p>
<ul style="list-style-type: none"> <li>● Land holding</li> <li>● Accessibility</li> </ul>	<p>Mostly between 0.5 to 1.5 hectares/household All weather road nearby</p>	<p>Mostly between 0.1 to 0.5ha/hh Seasonal dirt track</p>
<ul style="list-style-type: none"> <li>● Area of forest land</li> <li>● Altitude</li> <li>● Climate</li> <li>● Rainfall</li> <li>● Temperature</li> <li>● Slope</li> <li>● Aspect</li> </ul>	<p>6.76ha 925-1150masl. Sub-tropical (sub-humid) 1000-1200mm Min. 0°C; Max 35.5°C 15°-25° South facing</p>	<p>15.93ha 900-1,000masl. sub-tropical (sub-humid) 1,000-1,200mm Min. 0°C; Max 35.5°C 10°-25° South facing</p>
<ul style="list-style-type: none"> <li>● Soil</li> </ul>	<p>Red clay loam. Poor in organic matter, pH 4.44 to 6.81. and low CEC; Low N, Available P low, gully erosion prominent</p>	<p>Red clay loam. Poor in organic matter and low CEC, Low Ph, Low P, Low N, gully erosion prominent</p>
<ul style="list-style-type: none"> <li>● Degradation of forest</li> </ul>	<p>Deforestation started around 1947. Pines planted by the government in 1986, only a few remain.</p>	<p>Deforestation date unknown. Pines planted in 1973.</p>
<ul style="list-style-type: none"> <li>● Land Use (1993)</li> </ul>	<p>6ha (38%): Chir pine trees planted in 1973 by the Forest Department, 3.08ha (19%): scattered Chir pine, 2.22ha (14%): barren land, 1.2ha (8%): gullies, 1.2ha (8%): seasonal streams 0.6 0.6ha (4%): stunted pines.</p>	<p>2.44ha (36%): scattered shrubs, 1.73ha sal and other broad-leaved trees, 1.24ha (18%): barren land, 0.75ha (11%): Seasonal stream (<i>Kholchi</i>), 0.6ha (9%): area under natural regeneration of <i>sal</i> and other plants</p>

- Plantation work at Bajrapare mainly concentrated this year on replacement of plants planted in 1993 and the plantation at Dhaireni was extended to three main plots. The first plot of 2.29ha in area represents the most degraded area in the forest area, the second plot (0.22 of a hectare) was designated as a 'fruit plot' and mainly fruits were planted. The third plot has an area of 1.04ha. The trials at the site were largely extended this year due to the farmers' active participation and interests.

## Monitoring of Natural Regeneration, Planted Species' Performance, Soil Erosion

- Measurements of biomass production through natural regeneration and species' emergence were carried out as well as of the performances of species planted in 1993/1994.
- The project has established four soil erosion monitoring plots this year: two at Bajrapare and two at Dhaireni. Manual rain gauges were also stationed near each erosion plot to measure the rainfall. A field laboratory was established at the project field office on the Dhaireni site for filtration of erosion samples collected from the erosion plots of both sites.
- A baseline socioeconomic survey was completed.

## Training / Visits

- Training relevant to actual field activities, such as nursery techniques for seedling production, erosion plot in-charge training, and refresher training on A-frame use for contour establishment, was carried out. FUG members also participated in study and observation tours and exposure training. Visits to Godavari and a visit to Perani (Dang) to look at a successful example of rehabilitation of degraded forest with various grass species by the local forest users' group were organised. FUG members also participated in an Agroforestry Exposure Training course in Kunta and a beekeeping training course at ICIMOD, Kathmandu.

## Others

- At the request of the Bajrapare FUG, the project supplied 3,000m of high-density polythene pipe to bring water to the village for the plant nursery and for the use of the FUG.
- Seventy bamboo-woven checkdams and many small loose stone checkdams have been constructed at Dhaireni for gully control.
- The baseline survey maps prepared in 1993 on the contours and types for both Bajrapare and Dhaireni have been digitised on the computer.
- A video film has been produced about the activities of the project.

## CHINA

The country report from China gave an account of the ICIMOD project for "Rehabilitation of Degraded Mountain Ecosystems" on the Baoshan site in China. The report was prepared by Xu Jian-chu and Tong Shaoquan of the Kunming Institute of Botany, CAS, Yang Qixiu, of the Chengdu Institute of Biology, CAS, and Qiu Xuezhong of the Kunming Institute of Ecology, CAS.

## Summary of progress in project activities in China in 1994

The maintenance of the established trial plot on a site totalling 45 hectares was continued in 1994. Site development was also continued and construction of erosion control checkdams and rehabilitation of irrigation ponds, as well as biogas demonstrations in two households in the site village, were completed. Monitoring and research activities, including a socioeconomic survey and studies on indigenous knowledge of local plant species, were the other major activities carried out. Capacity building of local institutions and training of manpower were continued at the site village.

## **Brief Introduction to the Project Site**

The Baoshan project site is located about 40km south of Baoshan Municipality, near *Damay* village in Pupiao Township. The village has 136 households belonging to two production units.

The annual rainfall in this area is 600mm, most of which falls during the monsoon season between May and September. The soil is nutrient poor with phosphorus deficiency and generally shows low water-holding capacity. The project site can be divided into five zones, which include an air-seeded pine forest, shrub land, pasture, upland fields, and paddy fields. The altitude of the area is from below 1,400masl to 1,600masl. The slope is between 0 to 400 degrees.

The project used Participative Rural Appraisal (PRA) tools to formulate community action plans to manage the different zones as well as to study the indigenous knowledge on plants in the area.

## **Project Activities**

The detailed activities completed in 1994 are highlighted below.

### *Plant Seedling Production and Plantation*

- Supplementary planting was carried out at the rehabilitation site, with 10,000 seedlings produced in five private nurseries operated by local farmers from the site village under contracts from the project.

### *Continuation of Assessments on Species' Performance, Monitoring of Soil Erosion*

- Regular monitoring of rainfall, water-soil losses from erosion plots established, and species' performances were a major research component of project activities in 1994.

### *Studies of Indigenous Knowledge, Useful Indigenous Species*

- An inventory of indigenous species available; which include suitable nitrogen-fixing trees for soil conservation and bank stabilisation, fruit trees, cash crops, fast-growing timber, and fuelwood trees; was completed.
- Studies of indigenous technical knowledge for rehabilitation and upland resources' management; such as terracing, erosion-control checkdams, non-timber forest products' harvesting, live fencing, crop rotation and cover crops, and indigenous agroforestry and indigenous plant species' profile were completed.

### *Training/Visits*

A cross-farmer visit was organised to several project areas in Chengdu, Sichuan Province, for farmers from the project area.

### *Land-use Inventory and Management Plans*

An inventory of land use in the project area was completed and with the help of the PRA method community action plans were formulated for management of these different land use types.

### *Other Activities*

- Biogas plants were installed in two households in the site village for demonstration of this alternative energy source.

- Fodder crops and cash crop cultivation were introduced in the home gardens and these performed pretty well.
- Four cement checkdams were constructed in the gullies as well as another four, simple stone walls (indigenous-based checkdams) with living barriers, which were also tried.
- Two water ponds, which are important for paddy irrigation, were rehabilitated in the site area.

The project has identified that participation of local people and the use of indigenous technical knowledge, combined with local leadership development and security of tenure, are important factors for sustainable rehabilitation of degraded upland ecosystems.