ICIMOD

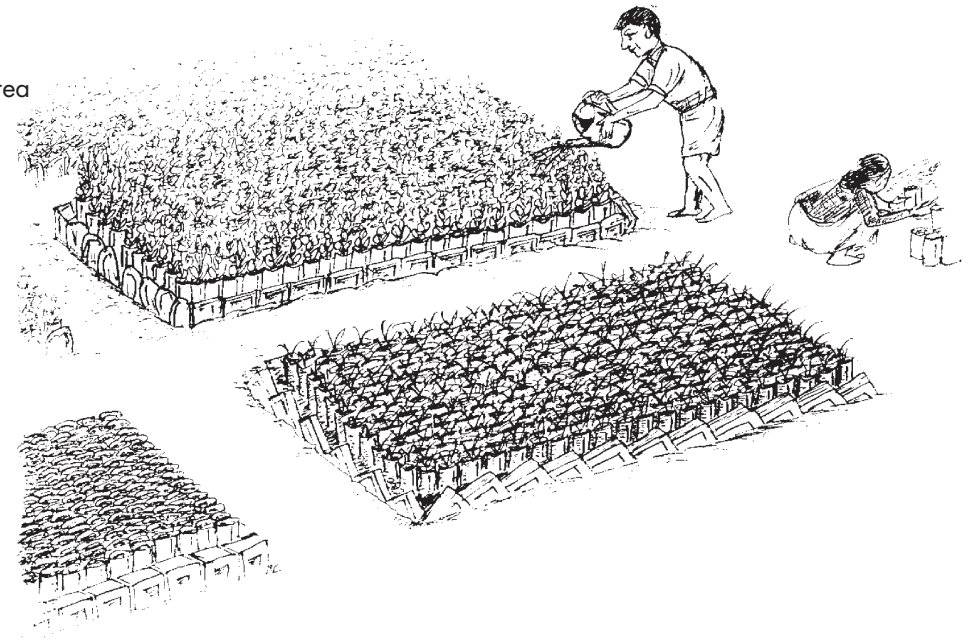
FOR MOUNTAINS AND PEOPLE

Support Functions and Scientific Research

Some general activities are carried out at the Godavari site to support the trials and other activities; to provide the accurate information needed to enable proper interpretation of results; and to provide basic scientific information on important problems that affect mountain farming and natural resource management on a broad scale. Some of the more important are described below.

Nursery (Map Site 9.1)

A plant nursery was established in the lower area of the site to ensure an adequate supply of plant material for the various trials, demonstration, and rehabilitation activities. Seeds can be tested for germination and emergence under controlled conditions, and the results of growing in a greenhouse or outdoors compared. The nursery is also used to maintain and propagate seeds and plant cuttings received from partners in ICIMOD's member countries, and to grow seedlings (around 100,000 per year) specifically for distribution to project partners and farmers groups. Excess plants are sometimes sold. (See Sheet 10)



Meteorological Monitoring (Map Site 9.2)

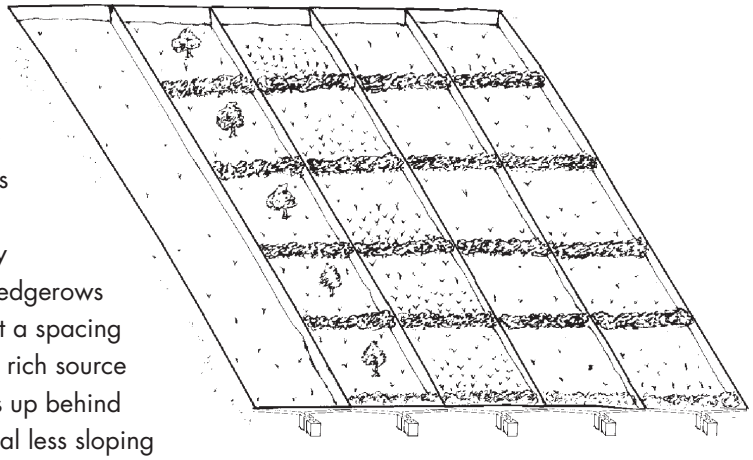
Agroclimatic conditions are extremely variable across the HKH region, and microclimates can have a major effect on the success or otherwise of plant growth and fruiting at specific sites. Farmers are well aware of this, in more isolated areas mountain farmers still use cross-breeding and seed selection to obtain different landraces of rice for use on different small parcels of their own land, for example. The results of trials at the Godavari site are broadly applicable to other areas with similar agroclimatic conditions in the mid hills of the Hindu Kush-Himalayas (HKH), but they are also to some extent site specific. To interpret them properly and make informed evaluations, and for ICIMOD to be able to make proper recommendations, it is necessary to have an exact record of the site and meteorological conditions at the time of trials. A meteorological monitoring station was set up at the site in 1995 at an elevation of 1634m. Air temperature, wind speed and direction, relative humidity, precipitation, evaporation, solar radiation, and sunshine duration are recorded manually on a daily basis, and from an automatic weather station on a 2-hourly basis. The results highlight the variability and fluctuation of meteorological conditions over an extended period. Between 1993 and 2003, the mean annual temperature varied from 16.4 to 18.2°C (1997 and 2000); the absolute maximum temperature in any one year from 23.4 to 33.8°C (May 1995 and June 1998); the absolute minimum temperature in any one year from -0.9 to +2.0°C (December 2003 and January 2000); the total annual rainfall from 1866 to 2256 mm (1997 and 2003); and the single greatest daily amount of rainfall from 60.6 to 228.6 mm (July 2001 and July 2002).

Transboundary Air Pollution Station (Map Site 9.3)

ICIMOD, as a UNEP GRID node, is a partner with UNEP, the Scripps Institute of Oceanography at the University of California, and others in the Atmospheric Brown Cloud (ABC) Project, a collaborative programme on transboundary air pollution with a system of strategically located ground-based observatories in the Indo-Asian and Pacific regions. ICIMOD hosts a radiation and aerosol measurement station at the Headquarters site, and a rainwater and aerosol measurement station at Godavari. The

measurements taken at Godavari will help improve understanding of the composition, origin, and properties of the carbonaceous fraction of the aerosols distributed across the Asian region. Samples of particulate matter are being collected, and analysed for black and organic carbon at the University of Wisconsin, USA. The rainwater and aerosol measurement samples are analysed at the Department of Meteorology, Stockholm University (MISU), Sweden, to identify the characteristics of particulate matter in both air and rain. The research will contribute to understanding of the impact of global climate change on agriculture, human health, and the water cycle in the mountain ecosystem.

Soil Erosion Monitoring (Map Sites 9.4)



Detailed scientific research is carried out at the site to acquire better information about the conditions that favour or hinder soil erosion, a factor of major importance in mountain areas. Soil conservation on farmland and maintaining or improving its fertility are key research themes for ICIMOD. One of the main approaches used to control soil erosion is sloping agricultural land technology (SALT), or contour hedgerow intercropping agroforestry technology (CHIAT) (see sheet on Soil Conservation). In this method, double hedgerows of nitrogen fixing trees or shrubs are planted along contour lines at a spacing of 5-6 m. The hedgerows act as a barrier to water runoff and as a rich source of organic matter. Sediment washed down the slope by rain builds up behind the hedgerows, slowly transforming the slope into a series of natural less sloping terraces.

A series of plots were established in 1995 to measure the impact of nitrogen-fixing hedgerows on soil erosion and investigate the conditions that favour or hinder erosion. The surface runoff from each experimental plot is diverted through a gutter system into collection tanks and the soil erosion is evaluated from sediment concentration in runoff and total runoff.

The hedgerows are very effective in reducing soil erosion to a very low level, with a marked impact from the second year of planting and a reduction in soil loss by 80-99% from the fifth year on. Distribution of erosion over time is extremely inhomogeneous. Soil loss is associated with intense rainfall events, but only at certain times of year. Soil loss from control plots varied from around 3-8 t/ha in most years to a massive 131.6 t/ha in one year with a cloudburst event in the premonsoon period. This reflects the type of, often very localised, events that are devastating for mountain agriculture.

Biomass Study (Map Site 9.5)

A timeline study of the total biomass and the biodiversity per unit area at different sites is being carried out in order to assess the status of the vegetation, to improve understanding of the processes underlying degradation, and to assess the need for and impact of measures to rehabilitate natural species and support natural regeneration. The species' composition and biomass production is measured in seven different locations at regular intervals. At most of these sites simple protection measures are being used to support rehabilitation of the ecologically-degraded land. The long-term study will also help determine whether areas infested with the weed species *Lantana* and *Eupatorium* will be able to become more productive through natural processes. There has been considerable improvement in the vegetation status of the site since it was taken over by ICIMOD in 1993. Initially 394 plant species were identified, by 1996 the number had risen to 405, and by 2002 to 694, including 3 endemic, 4 rare, 4 endangered, 22 threatened, 41 multi-purpose tree, and 87 medicinal and aromatic plant species. Between 1993 and 2002, the average biomass of the natural forest on steep slopes increased from 93 to 182 t/ha; that of shrubland on mixed slopes from 27 to 40 t/ha; and that of shrubland on the valley floor from 35 to 61 t/ha. Overall, the average biomass of the site nearly doubled from 51 t/ha in 1993 to 90 t/ha in 2002. This is still much less than the 247 t/ha that can be expected in a well-preserved natural forest area in a similar ecological zone, but the trend shows clearly that rehabilitation is possible and the approach successful.

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