

*Farmer-led Integrated Upland Watershed  
Management Trainers' Resource Book*

*Module 2*

Mountain Perspective, Farmers  
and Sustainable Watershed  
Management



Mountain Watersheds are Bestowed with a Greater Biodiversity than in the Lowlands



# Mountain Perspective, Farmers and Sustainable Watershed Management

## Objectives

Since management of mountainous areas in the upland watersheds is the most complex, it would be helpful to talk briefly about the conditions of mountains in the recent past and in the present context of mountain realities and habitats, before the objectives of this module are set (see below).

## Background

### (1) What factors sharply distinguish mountain habitats from areas in the plains?

- The key factors to be considered are those that separate 'mountains' from other areas.
- These dimensions often obstruct the application of developmental or other experiences in the plains to the mountains.
- Slope and altitude and associated conditions or characteristics constitute mountain specificities.

### (2) How do mountain watersheds appear when examined from the perspective of the plains?

- Mountains are often considered to be relatively difficult environments to live in.
- It is not always easy to replicate the development experiences of the plains in mountain areas.
- The mountains are the 'hinterland' and provide 'recreation' for people in the plains.
- Mountains have historically also been the habitats of flourishing civilisations.
- Mountain conditions make a clear-cut impression on the complexes of production, consumption, and trading activities.
- Mountain people try to adopt sustenance strategies in order to maintain mountain characteristics.

The following questions will be helpful for visualising the realities of the mountain perspective.

### (3) What experiences are the mountains undergoing now?

### (4) Is the existing disequilibrium between mountain habitats and their land-based resources largely induced from the plains?

- Present-day large-scale development interventions are a recent phenomenon in mountain areas.
- These interventions are inspired and conceived exogenously.
- These interventions are often associated with operating mechanisms not well known to mountain areas and people; e.g., pace, scale, and priorities.
- Most importantly, many of the development interventions are based on approaches and models that were not conceived and designed for mountain areas.

### (5) What is the consequence?

- These approaches and models have generally proved to be
  - less relevant and
  - quite ineffective for handling the problems of mountain areas.
- This is revealed by
  - poor economic performance and
  - overexploitation of mountain resources.
- The equity issue has been totally disregarded.
- There is extreme environmental degradation.
- Farmers' knowledge and their participation have been grossly ignored in programme design and implementation.

(6) In light of the background presented above, the objectives of Module 2 are:

- to describe the necessity for understanding mountain characteristics and their implications while designing and implementing interventions for

mountain watershed development by farmers, and

- to emphasise acknowledgment of the critical role and knowledge of farmers/ community in programme design and implementation for sustainable mountain watershed management.



A Mountain Watershed without Management

## MODULE 2.1

### *MOUNTAIN PERSPECTIVE*

#### (7) Objectives

- To describe the unique features of the mountains and their imperatives that distinguish them from the plains and other areas
- To advocate the need to endorse mountain specificities on the part of mountain watershed development planners and promoters

#### Mountain Watersheds

#### (8) What are the distinct features of mountains/hills?

These are characterised by:

- an incredibly high degree of relative inaccessibility,
- fragility,
- marginality,
- diversity,
- specific niche opportunities, and
- human adaptation mechanisms (both culturally and in terms of livelihood options).

#### (9) Are these features interlinked?

Because of their common biophysical determinants

- they create objective circumstances,
- influence the pace and pattern of natural resources, and
- ultimately affect the mountain environment.

#### (10) How should the mountain perspective be incorporated?

- At the time of designing and implementing interventions, full attention/consideration should be given to
  - mountain characteristics and
  - their implications.

- Incorporation of the mountain perspective in development interventions will make the programme
  - relevant and effective.

#### Mountain Watersheds and Their Organic Integrity

#### (11) How do the mountain watersheds look structurally?

- The physical appearance of mountain watersheds is more distinctively visible than their counterparts in the plains which are often identified only conceptually.
- The physical appearance of mountain watersheds is dominated by:
  - slope and aspect,
  - undulating topography, and
  - elevation.
- They create strong linkages and interactions between
  - spatially separated biophysical resource components
  - which in turn determine the organic and functional integrity of the mountain watershed.

#### (12) Is the maintenance and improvement of the above organic and functional integrity of mountain watersheds crucial?

How can it be achieved?

- The mountain's organic and functional integrity ensures
  - high productivity and
  - sustainable use of mountain watersheds.

- The mountain perspective framework can facilitate:

- an understanding of the involved conceptual and practical issues;
- identification of indicators of the organic/functional integrity of mountain watersheds; and
- an understanding of the factors and processes influencing the status and usage of mountain watersheds.

**(13) Do mountain watersheds share generic features of mountain areas?**

- The relative importance of specific mountain features (fragility, inaccessibility, etc) vary from one watershed to another.
- The interlinkages between mountain features are common in different watersheds.
- The specific mountain characteristics and their interlinkages offer
  - a persuasive reason for an integrated approach to:
    - sustainable mountain development and
    - sustainable management of mountain watersheds.

**Conventional Watershed Management: The Missing Dimension**

**(14) What is sustainability?**

- It is the ability of a system (e.g., mountain watershed as an integrated system):
  - to maintain and improve its own performance in terms of:
    - products and
    - services;
  - to do so without adversely affecting its potential reflected through linkages and interactions between different system-components that determine the level of the system's performance.

**(15) What influences linkages and interactions between spatially, differently located biophysical**

**resources within a watershed and, thereby, its organic integrity? What are the results?**

- It is influenced by the extent to which usage of watershed components is balanced or unbalanced.
- This, in turn, is affected by changes in the internal or external pressures of demand on watershed resources.
- This may cause overextraction of certain resource components.
- This causes a breakdown of the linkages and complementarities of the biophysical resources of the watershed as a system.

**(16) How can these linkages of biophysical resources as a system be strengthened?**

For doing so, in more practical terms, one has to look for:

- the degree of stability and regeneration of biophysical resources (e.g., soil and plant species) at the spatially differentiated locations within a watershed as determined by nature;
- the degree and pattern of resource flow (e.g., water, energy, nutrient, biomass) between different spaces/locations within a watershed area; and
- the patterns and intensities as well as linkages of supporting activities as listed in the above-mentioned two issues.

**(17) How can the watershed development promoters, facilitators, and practitioners emphasise the above aspects?**

- The different agencies dealing with different subjects or resource components try to improve the situation in their respective fields, e.g.:
  - foresters mainly focussing on reforestation aspects and
  - water specialists focussing on water harvesting aspects.
- While trying to promote sustainable management of watersheds, however, these agencies
  - do not effectively address the basic elements of the sustainability process; namely:

- \* protection and improvement of the organic and functional integrity of a watershed and
- \* the key role of the above 'integrity' in sustainable use and productivity of a watershed.

**(18) How is the conventional approach to mountain watershed development proving unresponsive to present day needs?**

- The conventional mountain watershed development approaches:
  - share the features of a conventional approach to general mountain development; such as, promoting mountain development
  - \* without a mountain perspective and
  - \* thus, ignoring mountain-specific conditions and their imperatives.

- Mountain-specific conditions require
  - an integrated approach to watershed development in the region, but
  - efforts are still by and large based on sectorally conceived and implemented approaches.
- There is inadequate understanding or disregard of widening divergence between
  - the imperatives of the biophysical features of watersheds and those of the changing socioeconomic circumstances influencing the use of watershed resources.
  - This has largely resulted due to persistent emphasis on physical dimensions of watersheds and the inability to extend 'watershed' boundaries to accommodate:
    - \* sociocultural and
    - \* economic contexts of watershed users.



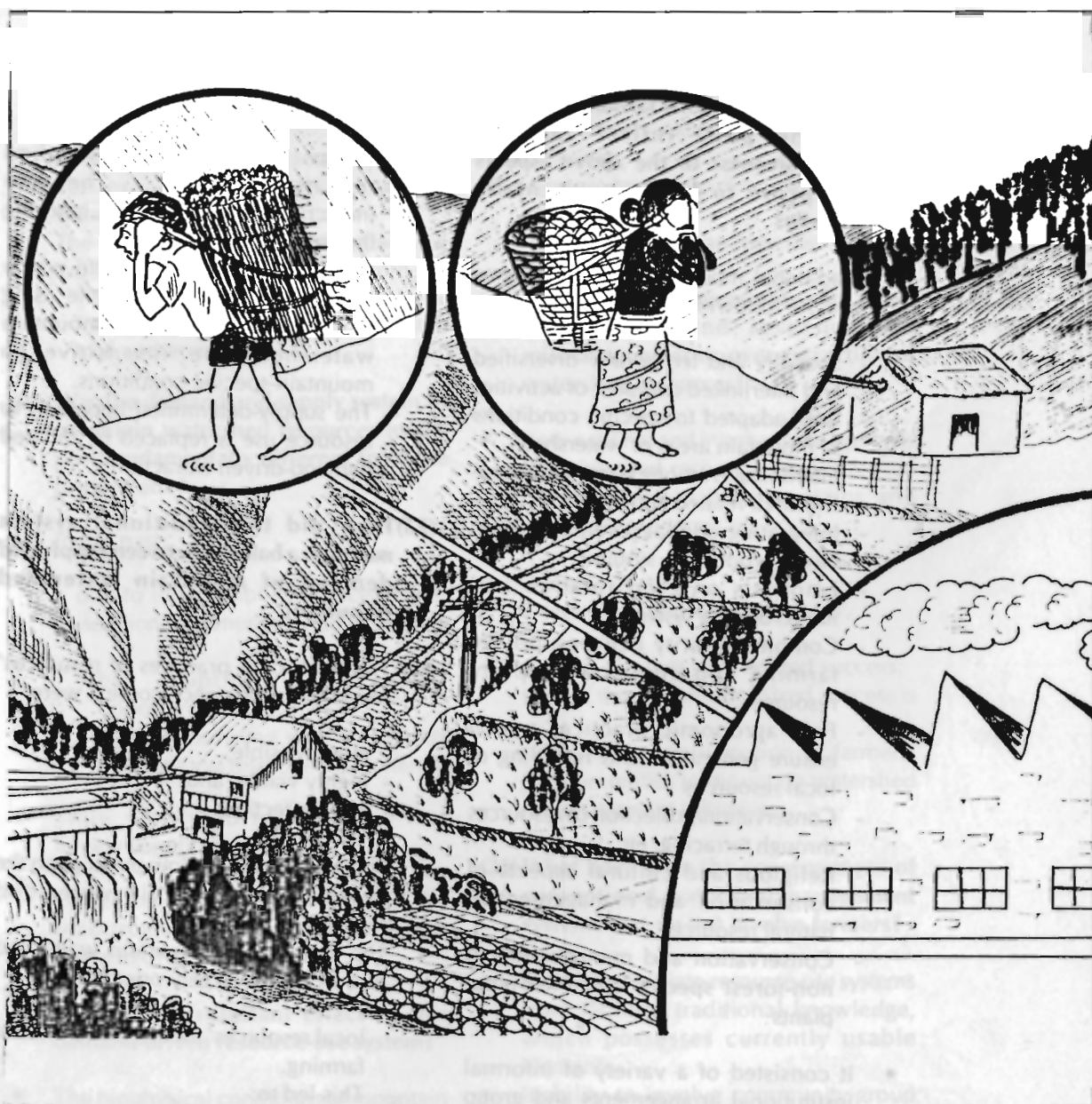


## MODULE 2.2

### THE FARMER AND SUSTAINABLE WATERSHED MANAGEMENT

#### (19) Objectives

- To describe how disequilibrium was induced in the self-sustaining traditional farming systems in mountain watersheds
- To highlight processes of farmers'/community's involvement in sustainable mountain watershed management
- To emphasise how development of mountain watersheds into a 'catchment of economic activities' can lead to their sustainability



Mountain Watersheds Supply Raw Materials to Factories in the Lowlands

### Farmer's Role and Traditional Farming

#### (20) What are the different ways to understand the farmer's role in sustainable watershed management?

- Assess the farmer's or community's position regarding:
  - understanding of the mountain perspective,
  - awareness of the biophysical conditions of a mountain watershed and their imperatives,
  - planning of activities or resource use systems accordingly, and
  - concerns in and activities for maintaining the organic and functional integrity of a watershed.

#### (21) How did traditional farming practices (in the past) reflect farmers' responsiveness to the above aspects and prove to be environmentally friendly?

- Traditional mountain farming systems had the following features.
  - Spatially and temporally diversified and interlinked complex of activities
  - Well-adapted to specific conditions of mountain areas or watersheds
  - Interlinkages among farming-forestry-livestock related activities
  - Integrating annual/perennial plant-based production systems
  - Emphasis on crop rotation and intercropping systems
  - Complementarity between private farming and common property resources
  - Folk agronomic practices which ensure generation and recycling of local resources
  - Conservation/protection of resources through terracing, etc
  - Religious and cultural aspects of conservation and management of natural resources
  - Conservation and management of non-forest species and medicinal plants
- It consisted of a variety of informal institutional arrangements and group actions to regulate resource use.

- The above-mentioned are some of the indicators of the farmers' or community's knowledge and ability to:

- sustainably manage the limitations of mountain resources and
- exploit the potential of fragile and diverse mountain watersheds.

#### (22) What is the present status of these traditional farming practices?

- In the changed socioeconomic and resource-use context, traditional practices are becoming increasingly:
  - non-feasible,
  - ineffective, and
  - unsustainable.

- The indicators are given below.

- Usage of mountain watershed resources has become indiscriminately intensive, ignoring the carrying capacity.
- The processes and factors to which farmers are responding while using biophysical resources in mountain watersheds are insensitive to mountain-specific conditions.
- The supply-determined approach to resource use is replaced by inflated demand-driven extraction.

#### (23) How did the traditional system maintain a balance between supply and demand of mountain watershed resources?

- The traditional practices of resources' use in the subsistence context were:
  - more feasible,
  - highly viable, and
  - more effective.
- There was relatively low pressure on the demand for mountain watershed resources.
- The demand for mountain watershed resources was largely oriented to
  - local resources' focussed subsistence farming.
  - This led to:

- \* different interlinked natural resource-based activities and
- \* evolution of folk technologies as an integral part of traditional farming systems.

- There was a better balance between:
  - demand and supply and
  - the needs of the people and resources available.

**(24) What disturbed this equilibrium?**

- Rapid population growth exerting pressure on resources
- Improved physical and market linkages with other regions, adding the pressure of external demand
- Various public interventions, disregarding mountain specific conditions
- Creation of a changed socioeconomic context in the use of mountain watershed resources
- The change affecting mountains became too rapid for the farmer/community
  - to evolve new adaptations through trial and error.

**(25) Was the demand and supply system of mountain watershed resources in the past fundamentally different from the present one?**

- In the past:
  - due to inaccessibility-induced semi-isolation, communities had to survive:
    - \* by adapting to available opportunities and
    - \* by compromising with constraints that the local resource-base offered.
- Thus, watershed resource use was largely supply-determined.
- Under the changed circumstances, the resource-use system has become demand-driven.

**(26) What is the resultant effect of this demand-driven resource-use system?**

- The biophysical conditions of mountain watersheds (especially in terms of

carrying capacity) have remained unchanged.

- The socioeconomic circumstances dictating their usage-intensity have completely changed.
- The consequence is:
  - over-extraction of resources and
  - severe damage to the biophysical/ecological integrity of the watershed as a productive unit.

**(27) What is the present concern in the context of mountain watershed management?**

- Developing the approaches which are responsive to :
  - the mountain watershed's existing problems,
  - the farmers' need-based initiatives and efforts,
  - environmentally friendly strategies, and
  - sustainability requirements.

**(28) Can the farmer/community play a role in arresting and reversing the mismanagement or over-extraction of watershed resources?**

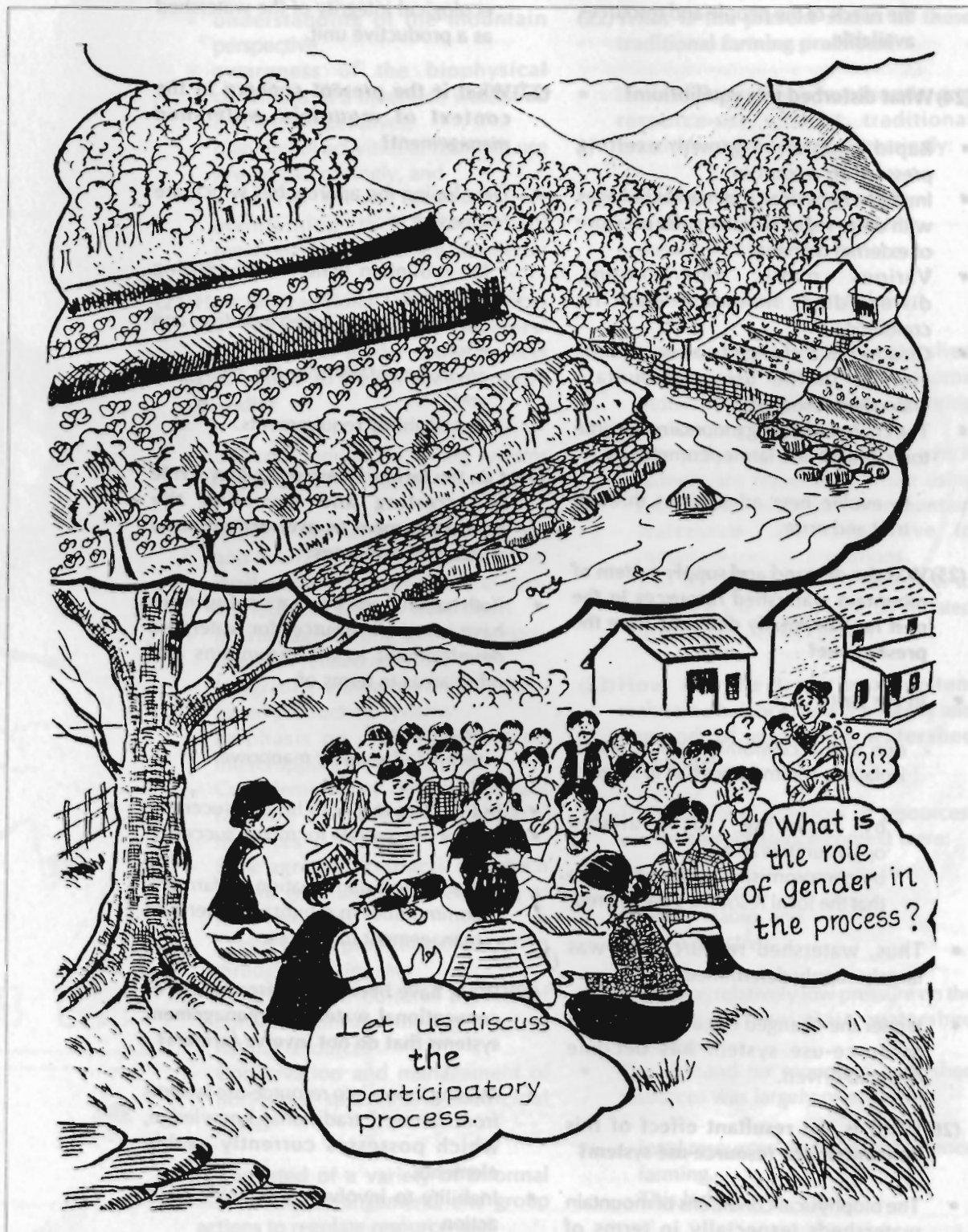
- Both national and international agencies have invested resources for watershed development in the mountains and other areas in terms of:
  - financial and
  - technical/advisory manpower.
- But this has met with limited success.
- One of the reasons for mixed success is
  - the limited participation of farmers/communities in mountain watershed management initiatives.

**(29) What have been the consequences of conventional watershed management systems that do not involve farmers?**

- Missing inputs into resource-use systems from farmers' traditional knowledge, which possesses currently usable elements.
- Inability to involve community-group action



- which is the essence of any effort directed to the management of resources the properties of and stakes in which belong to people both as:
  - \* a group and
  - \* individuals.
- Non-ownership of watershed development initiatives by farmers and local communities
- Planners' lack of insight into and understanding of watershed users' perspective in terms of:



A Mountain Watershed with a Management Plan



- knowledge about underlying factors behind watershed resources' use by farmers and
- knowledge about the key driving forces responsible for making sustainable watershed management a difficult task.
- Failures on the above deprive planners:
  - of fresh thinking,
  - of having different approaches, and
  - of searching for relevant technical and institutional options.
- This has resulted in
  - strengthening conventional, top-down strategies for watershed development.

**(30) Is there a need to bring about an overall conceptual change in watershed development approaches?**

- Farmer or community participation can help more realistically
  - in designing and
  - implementing watershed management components
- The most important issues to be tackled are those of balancing the watershed's carrying capacity and the resource users' increased demand or need for higher incomes (which is the key reason behind the current, extractive management of watersheds).
- There may not be an easy solution, unless the overall approach to watershed development is changed.

**(31) Can we go beyond the physical dimensions of a watershed? What are the problem areas?**

- There is a deficiency, largely of biophysical component-centred strategies for watershed development.
- As long as the problems and potential solutions are mostly conceived in biophysical terms
  - the control and reversal of processes causing degradation of watersheds may not emerge.

**(32) How can this problem be overcome?**

- The solution lies in:
  - reassessing
  - improving, and
  - harnessing the carrying capacity of watersheds
    - \* in terms of diversified potential and
    - \* high pay-off activities
- This includes:
  - primary production,
  - processing,
  - servicing activities, and
  - that primary, secondary, and tertiary sectors be linked to the resource characteristics of watersheds.

- A watershed development strategy incorporating the above approach can satisfy multiple objectives.

**(33) Can diversified activities facilitate sustainable watershed management?**

Yes, they can.

- Due to focus on diversification they can help maintain its
  - organic and
  - functional integrity.
- By focussing on
  - secondary and tertiary sector activities
    - \* they can help increase incomes and
    - \* reduce direct pressure on watershed resources.
- They can also help
  - to create value-adding exchange-linkages
    - \* outside watershed areas and
    - \* ensure a flow of resources to watershed areas.

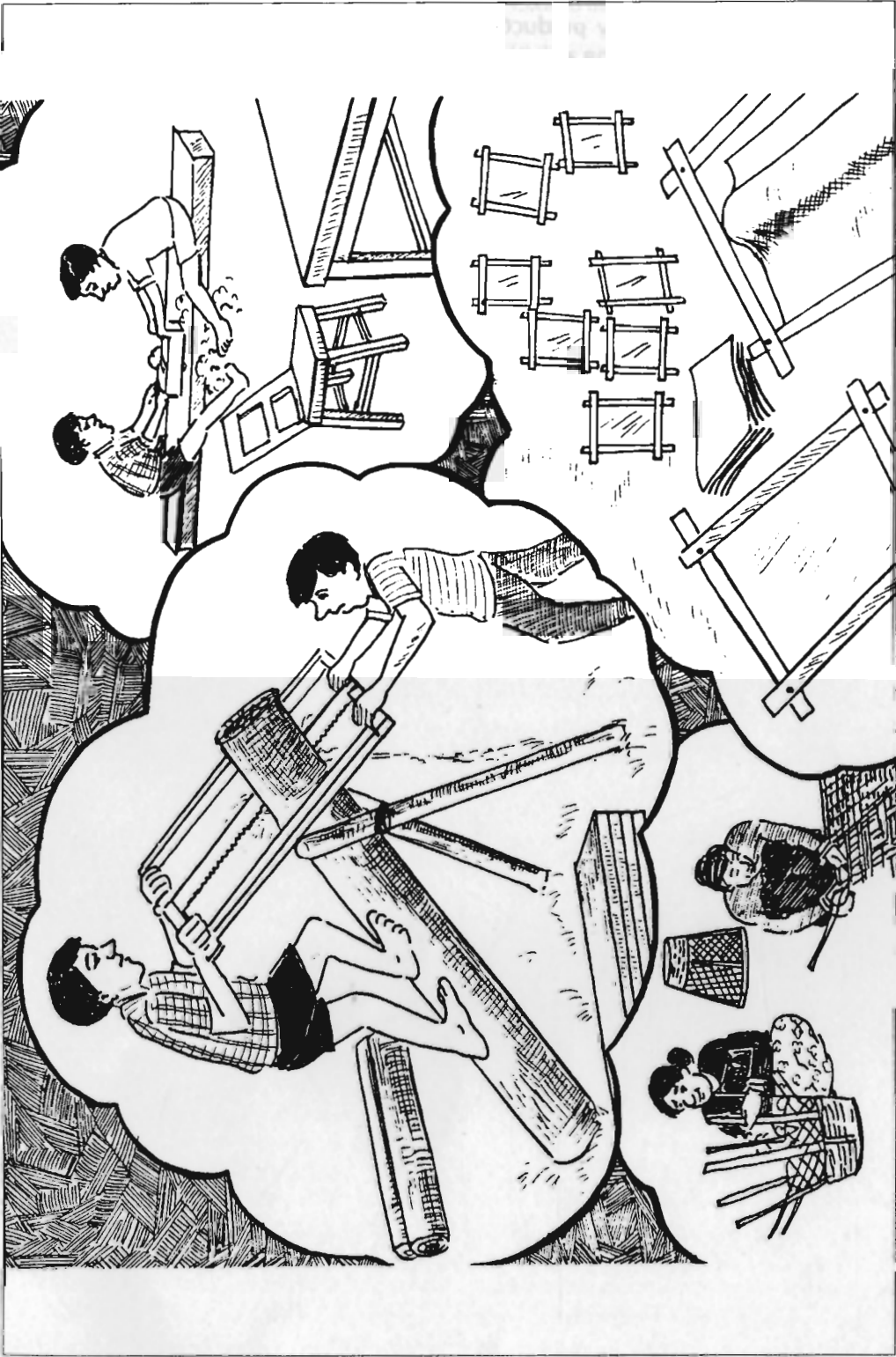
**(34) Can the mountain watershed be a 'catchment of economic activities'?**

- This approach implies looking at the 'watershed' beyond its:

- physical boundaries and
- biophysical production possibilities.
- This attempts to define a watershed in terms of:
  - a 'catchment of economic activities'
  - linked to the biophysical base of the watershed.
- (35) **Does this require a fundamental change in mountain watershed management approaches?**
  - Such approaches call for basic reorientation at conceptual as well as operational level for:
    - refining,
    - advocating, and
    - implementing the new paradigm.
  - This has to be followed by
    - appropriate capacity building both in:
      - \* institutional and
      - \* technical fields.
  - This also requires a new set of incentives and support systems.
  - The work should begin on several fronts including:
    - reorientation of watershed planners and policy-makers by field agencies,
    - factual validation of the new formulation of a watershed development approach with a database and synthesis of available information, and
    - facilitation of farmers'/users' leadership of IWM programmes for their own benefit and control of watershed programmes.
- while designing and implementing watershed development programmes
- together with an understanding of the critical role and knowledge of farmer/ community.
- Incorporation of the mountain perspective in watershed development intervention will make programmes relevant and effective.
- The organic and functional integrity of the mountains ensures high productivity and sustainable use of mountain watersheds.
- Conventional mountain watershed development approaches:
  - ignore mountain-specific conditions and their imperatives and
  - disregard the widening divergence between biophysical features of the watershed and changing socioeconomic circumstances influencing the use of watershed resources.
- Traditional mountain farming systems had adapted well to
  - specific conditions of mountain areas/ watersheds
  - with interlinkages among diversified components
  - which ensured generation and recycling of local resources.
- In the changed socioeconomic and resource-use context, the traditional practices are becoming increasingly unfeasible, ineffective, and unsustainable.
- Development efforts have met with limited success due to lack of farmer/ community participation in watershed management initiatives, thereby missing farmers' input, leadership, and ownership of watershed programmes.
- Farmer/ community participation can help more realistically:
  - in designing and implementing watershed management components,
  - thereby balancing the watershed's carrying capacity against the resource users' increased demand or need for higher income.

### (36) Conclusion

- Many development interventions are based on approaches/models not conceived and designed for mountain areas, consequently these are generally found to be less relevant to such areas.
- Such approaches/models have also grossly ignored farmers' knowledge and their participation.
- There is a necessity to understand mountain characteristics and their implications
- There is a need for



Mountain communities can receive greater economic benefits by marketing processed products



- reassessing, improving, and harnessing the carrying capacity of watersheds in terms of potential diversification and high pay-off activities.
- This includes primary production, processing and servicing activities.
- This means looking at the watershed beyond its physical boundaries and biophysical production possibilities and making it a 'catchment of economic activities' and
- facilitating farming initiatives in management of watershed resources.

This module has presented a dialogue on the complexities of mountain watershed management. The following module deals with processes for facilitating farmers' leadership of mountain and other upland sustainable, watershed resource management.





### Further Reading

- Jodha, N.S., 1995a. *Transition to Sustainability in the Next Century: Hopes and Dismays in Mountain Regions*. Washington, D.C.: World Resource Institute, WRI 2050 Project.
- Jodha, N.S., 1995b. 'Enhancing Food Security in a Warmer and More Crowded World: Factors and Processes in Fragile Zones'. In Downing, T.H. (ed) *Climate Change and World Food Security*. London: Springer.
- Jodha, N.S., 1997. In Messeli, B, and J. Ives (eds) *Mountain Agriculture in the Mountains: Global Priority*.
- Jodha, N.S., Banskota, M., and Partap, T. (eds), 1992. *Sustainable Mountain Agriculture. Vol. I Perspectives and Issues; Vol. II Farmers' Strategies and Innovative Approaches*. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.
- Jodha, N.S., and Shrestha, S., 1994. 'Sustainable and More Productive Mountain Agriculture: Problems and Prospects'. In *Proceedings of the International Symposium on Mountain Environment and Development*. Kathmandu: ICIMOD.