Women and Natural Resource Management

a manual for the Asia region

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Foreword

Women in developing countries are often directly dependant on their local environment and sustainable natural systems for the survival of their families. They spend the greater part of their time tending, gathering, conserving and using natural resources. As daily managers of the living environment they are experienced in the management of agriculture and food production, fisheries, forests, soil, energy and water resources.

Women have developed skills in conservation which are built into their traditional subsistence activities. At the local level, cooperative action taken by women demonstrates that by sharing their knowledge and experience they can promote environmental management and sustainable development. They can improve on their performance as managers of the environment if they are given access to education and training and the opportunity to participate in decision making. At the same time, environmental management and sustainable development can be enhanced if extension workers and decision-makers make more use of women's knowledge and experience in effective resource management.

The critical role played by women in environmental management and sustainable development has been highlighted at major Commonwealth and UN meetings in the 1990s. Meetings of Commonwealth Ministers Responsible for Women's Affairs have urged governments to provide greater support to enable women to use and share their knowledge, experience and traditional skills on environmental issues, and to gain new ones as a result of appropriate training. The Expert Group on Environmental Concerns and the Commonwealth in their report *'Sustainable Development - An Imperative for Environmental Protection'*, reiterated the vital importance of training women to support their work for sustainable development and recommended that special attention be given to providing women with education and training. In Agenda 21, the Earth Summit Programme of Action on Environment and Development, governments agreed that it was vital to mainstream women throughout sectoral and cross-sectoral sections. Commonwealth Heads of Government have urged governments to ensure that immediate action is taken towards implementation of Agenda 21, especially the Chapter focusing on 'Global Action for Women Towards Sustainable and Equitable Development'. The UN Fourth World Conference on Women also urged governments to involve women actively in environmental decision-making at all levels and facilitate and increase their access to information and education.

This manual which focuses on women in Asia is part of a Pan-Commonwealth Training Module on Women and the Environment which comprises four manuals for the Africa, Asia, South Pacific and Caribbean regions of the Commonwealth, an overview paper on issues and strategies for promoting women's role in environmental and natural resource management and a video "Women of the Rainforest" focusing on Macusi Amerindian women of Iwokrama rainforest. It is a practical contribution to enhancing the provision of training for women in conservation and natural resource management. The Asia manual provides trainers and extension workers with relevant skills and techniques for involving women effectively in conservation activities. It presents success stories of women promoting environmental management and sustainable development in Asia. It acknowledges the valuable indigenous knowledge which women in Asia possess and emphasises that women themselves must be involved in the identification of their needs. We hope that this manual will enable trainers and extension workers to address gender issues in natural resource management effectively and also increase women's participation in environmental decision making.

Sir Humphrey Maud
Deputy Secretary-General (Economic and Social Affairs)

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1. Women and natural resource management: an introduction

about section 1

This introductory section presents a brief rationale for the manual, lists its specific objectives, identifies the target group of users for whom the manual has been developed, and provides guidelines for its use.

It provides a broad overview of those parts of the Asia region to which this manual relates.

This section also presents the profile of the region in the context of natural resources: their status, usage and management.

It highlights the major issues of environmental degradation in the region and identifies the way forward for addressing the issues relating to women and natural resource management in the Asia region.

Why women in natural resource management?

The rapid degradation and depletion of natural resources and the overwhelming dependence of large sections of the population on these resources for survival, underlines the need to focus on effective management of natural resource in the Asia region.

Experience from many parts of the world demonstrates that the most effective and sustainable strategies for resource management are those based on community participation. This means working closely with local communities in order to assess the resource base and ascertain the needs, priorities and constraints that must be considered in the planning, development and implementation of resource management programmes.

A community usually comprises several groups with distinct roles, priorities and constraints. In order to ensure effective community participation and to address the needs of each group within the local community, it is necessary to understand these distinct roles and limitations. When a programme attempts to involve an entire community, without a focus on any one group, the socially and/or economically disadvantaged groups are frequently marginalised from the participation process. In such a situation, these groups gain little, if anything, from such programmes.

Women especially, faced by a range of social, cultural and economic constraints, are often marginalised from formal programmes of natural resource management. Their acceptance as equal partners in community development has been severely affected by continuing barriers to their full participation in the development process. The absence of a conscious and specific focus on women has prevented their needs from being recognised and integrated into the programmes being developed.

It is now accepted that if women are to fully participate in the development process, important adjustments are required in order to increase their access to education, training, resources and decision-making.

Women's marginalisation occurs not on account of their biological differences from men but because of the socially defined differences (in roles and responsibilities) between the two. Such inequalities exist not only between women and men but also between women of different socio-economic and cultural backgrounds.

Programmes intending to reach all sections of the community need to address these socially defined differences that form the basis of gender sterotyping. A gender-sensitive approach would therefore examine the impact of policies and programmes on the status, needs and priorities of both men *and* women within the local community. Hence, any meaningful involvement of women in a resource management activity entails an understanding of gender dynamics in the local community.

Where do women come into the picture?

- women comprise more than half of the world population
- 55 per cent of the world's women live in Asia. Asia and Africa combined account for 85 per cent of the world's rural women

- approximately 14 per cent of Asian households are headed by women, although in some countries this figure is as high as 30 per cent. A disproportionate number of female-headed households live in poverty, as the delivery of the majority of services has failed to acknowledge the large number of female-headed households
- the subsistence sector, the mainstay for a large proportion of rural communities, is largely dominated by women
- women have traditionally provided the majority of agricultural labour in most Asian countries; between 50 to 60 per cent of economically active women in Asia are in agriculture (although sharp contrasts exist between different Asian countries)
- women are the main gatherers of forest products and, in many parts of Asia, have a significantly higher involvement than men in shifting agriculture. Household needs of food, fuel and water and often cash, are usually fulfilled by women
- women are increasingly left solely responsible for the family and farm, as environmental degradation results in large-scale male migration to towns for work
- a salient feature of the Asia region comprises a rapid growth of urban centres, coupled with squatter settlements and high unemployment. Women in such situations are the people most affected by the lack of basic services such as water, sanitation and shelter.

Disadvantages faced by most rural and poor urban women:

- government extension services, training and credit facilities often reach only men as the traditional heads of households. This is largely a consequence of the failure to recognise the full extent and nature of the contribution made by women
- social constraints limit women's access to services, resources and decision making processes at all levels. This prevents them from taking part in the processes that manage the resources with which they work so closely
- in some Asian countries, women are marginalised from most social and economic structures such as access to education, health care, nutrition and employment
- women have heavy workloads, including farmwork, marketing, household chores, casual labouring and working in small-scale home industries for cash income (especially so with increasing male-migration for urban employment)
- women have limited access to technology and tools that would ease their workload. Technological innovations have invariably been made in the activities typically performed by men whereas human labour and traditional techniques continue to be used in most day-to-day activities performed by women, both inside and outside the home
- women have limited access to land and credit facilities.

These disadvantages make women's tasks of producers, home managers and community organisers all the more arduous and time-consuming. Women also face further problems when their environment is degraded. For instance, as forests recede, women must spend more time walking long distances in search of fuel wood and plants for food. The physical effort is greater, there is less time to do the other essential household chores, and they end up working longer hours. Little or no time is available for other activities such as attending health clinics and literacy programmes, forming local organisations, or simply for personal leisure time. This affects their political participation and their level of empowerment. Thus, not only do the women themselves risk ill-health and miss opportunities, but their family, especially children, suffer too.

One reason for focusing on women therefore relates to the impact on women's lives of involving women in resource management. The other equally important reason is the impact on the resources

themselves. As a result of performing tasks based on natural resources, for many generations, a large store of indigenous knowledge and skills in sustainable use of resources has been developed which is invariably passed on from women of one generation to the next. If fully utilised, their knowledge and skills can effectively contribute to sustainable resource management practices. Thus:

- a focus on women would not only address their need for increased income and a reduction in drudgery, but would also give them control over the resources they work with. This would, in turn, build upon their confidence and socio/political status
- the process of women's involvement and a reduction in their workload, as a result of specific interventions, would facilitate women's empowerment through the process of organisation, awareness creation, income generation, education and control over resources, their labour and knowledge.

This manual therefore focuses on rural and urban fringe women, and attempts to address the training needs of the Commonwealth countries in Asia. It nevertheless places special emphasis on the low and middle-income countries of the region, primarily due to the overwhelming numbers of rural and urban fringe women in these areas.

It must also be stressed that women are by no means a homogeneous group. Their roles and work tasks and the environment (social, cultural, economic and ecological) in which these are carried out, define their orientation and their priorities. This manual concerns itself with women as a sub-group of the rural and urban poor, that is, a particularly vulnerable section of the population. Even within this group, there will be many differences in the position of women, in the conditions they face, and in the opportunities available to them.

Aims of this Manual

In the context outlined above, this training manual aims to develop sensitivity on the issues of gender and natural resource management, with the following specific objectives:

- to impart skills of communicating with and learning from women
- to facilitate planning and working with women in natural resource management
- to provide basic information to trainers on techniques of natural resource management.

It should be bourne in mind that working with women does not imply isolating women in a community. It usually entails working with both men and women in a community, but with a specific focus on women to ensure that their meaningful and effective participation is achieved.

This is based on the premise that:

- establishing the links between gender roles and resource use and control is a key prerequisite for developing resource management programmes
- there is a need to learn from rural women and men on how local resources are presently used, in order to jointly plan development programmes relevant to both genders.

Target groups and users

The manual has been designed with two groups of users in mind:

- those working with individual women, women's organisations, or organisations for both men and women, at a local level. These workers may be extension or development field staff of non-governmental organisations or government bodies. They may be female or male
- those responsible for the training of extension or development field staff.

The field level workers should use the manual as a reference guide for adopting a gender-sensitive approach in their work with local communities on natural resource management.

The trainers or advisers should use the manual to sensitise field level workers on gender issues in environment and development activities and to introduce techniques on communication and conservation.

Expected outcomes

Based on the aims and objectives of this manual, it is anticipated that the manual will:

- enhance capability at grassroots level to mainstream women in natural resource management
- lead to the preparation of country-specific manuals on working with women around natural resource management tasks. Each manual would be tailor-made for the needs of an area, so that variations across countries of the Asia region, and even within countries, are addressed.

How to use the manual

The ideas and techniques described in this manual must not be assumed to be applicable to every situation in Asia. They should instead be treated as a basic collection to be built on, modified and supplemented by each manual user as necessary. As all rural workers know, subtle and not so subtle differences exist from one community to the next. This requires that the approach of development agents remains flexible.

Apart from ecological differences, other social, economic and cultural differences exist between various areas that necessitate different approaches to a similar problem. Thus:

- not all methods of communicating with and learning from rural women are equally appropriate in different settings
- not all successful women's organisations' activities are replicable. There exist specific conditions that contribute to the success of an activity and any project activity has therefore to be adapted to the local conditions
- not all conservation techniques are applicable in different conditions. The physical characteristics or ecology of a place will determine which techniques are going to be useful. Other economic and social aspects such as cost of using a particular technique, resource ownership and usage pattern and inter-community dynamics, will also play a role.

This manual therefore provides a range of ideas and techniques from which the user may select what she/he feels is appropriate for any given situation.

Section 1 of the manual provides a general understanding of why women need to be involved in formal resource management and Section 2 discusses how this can be achieved. The issues highlighted by the case studies in Section 3 relate directly to the issues discussed in Sections 1 and

2. In Section 4, a range of conservation techniques relevant to the Asia region are discussed. Section 5 provides a directory for obtaining further information.

The manual is designed for use in small group discussions, and exercises requiring group participation have been included in each section.

Given the diversity of the Asian region in terms of its physical environment, the natural resources and the cultures of its inhabitants, it is obvious that any example or study of the complex interaction of all three of these cannot be applicable to each country. Furthermore, overlying the physical and cultural diversity is a range of political and economic situations which compound this diversity and often influence patterns of development. The examples and case studies given in this manual have been chosen only to illustrate basic principles. They may well be replaced by other examples and studies that users find more appropriate.

The Asia region

The overwhelming diversity of countries in the Asia region, in terms of the economy, the level of industrialisation, income levels, the ecological situation and the social environment, highlight the difficulty of producing a manual that is relevant across the entire region.

On the one hand are the low-income countries, usually with large agricultural sectors, and on the other are the high-income, industrialised countries. In between the two lie the newly industrialised, middle-income nations. Clearly, the dominant issues in one country may be quite different from those in another. For example, whereas for the predominantly rural population of the low-income countries, agriculture and forestry are of prime importance, for the urban population of high-income countries subsistence agriculture (or even commercial agriculture, for that matter) is non-existent. Instead, urban environmental issues are likely to be of greater importance in these more advanced countries.

Based on the nature of the resources, environment and economy, the region's population can very broadly be categorised into four communities:

- agriculture based
- forest dwellers and tribals
- coastal and sea based
- urban.

This classification does not relate to countries as a whole, but to the population of the region covered by this manual. Therefore, any single country is most likely to have more than one of the above communities.

Agriculture based communities: other than exceptions such as Singapore and Brunei, where agricultural activities are minimal, the majority of the population live in rural areas and depend extensively on agriculture. Over the past few decades, there has been a tremendous change in the agricultural sectors of many countries with a shifting focus on high technology and commercial agriculture. This has had a profound impact on social, economic and ecological relationships.

Forest dwellers have for centuries practiced sustainable lifestyles of farming, hunting and gathering in harmony with their environment. Deforestation and the loss of land, forests and other resources, have threatened their survival and upset the traditionally maintained balance between the people and their surrounding resources.

Coastal and sea based communities rely almost entirely on the sea for sustenance and a source of income. In several parts of Asia, people obtain about 55 per cent of their animal protein from fish and other marine resources. A significant proportion of the total catch is contributed by traditional fisheries, which are under increasing threat from falling fish stocks.

Urban communities: some countries, such as Singapore, only have urban areas, while the urbanisation of several other countries in the region has grown at unprecedented rates. The rapid industrialisation and the creation of jobs in towns and cities, and the depletion of resources and the erosion of sustainable livelihoods in rural areas, has resulted in extensive rural-urban migration. This has put immense pressure on urban services and created a large number of slum dwellers without adequate sanitation, water and waste management. At the same time, there has been widespread air and water pollution.

Country profiles

The following presents a brief country-wise profile in terms of the status of natural resources in the countries addressed by this manual.

Bangladesh	**Total land area (km^2)144, 000**
Percentage:	
Arable land	69.3%
Permanent cropland	2.1%
Pasture land	4.6%
Forest & woodland	15.0 %
Other land	9.0%

With an area of about 144,000km^2, Bangladesh is one of the most densely populated countries in the world. Its land is mostly alluvial, very fertile, and flat, except in some mountainous areas.

With water as its' most abundant resource, fishing is important both within Bangladesh's boundaries and in its territorial waters. Ponds and waterways cover more than 10 per cent of the total area. The country has 14.26 million hectares of agricultural land with rice constituting the main crop. Apart from land and water, livestock constitutes the most important resource. It is estimated that more than 90 per cent of rural households rear livestock.

Agriculture is the mainstay of a large proportion of the population and most families depend on a diverse array of products and income from horticulture, livestock, forestry, fisheries, crop production and off-farm employment.

Environmental degradation in Bangladesh is evident in terms of declining soil fertility, low water tables, degradation of natural forests and wetland coastal environments, and depleted fish stocks.

India	
Total land area (km^2)	3288, 000
Percentage:	
Arable land	55.6
Permanent cropland	1.2
Pasture land	4.0
Forest & woodland	22.4
Other land	16.8

With 16 per cent of the world's population but only 2.4 per cent of its land area, India faces tremendous pressure on its natural resources. Although food production has, by and large, kept abreast of the country's population growth, agricultural growth has all too often been achieved at great cost to the environment, with increased loss of nutrients from the land, high soil salinity, and an increase in chemical inputs. A little less than 60 per cent of the country's agricultural land suffers from varying degrees of soil degradation.

India's forests have been shrinking at a rapid rate due to pressures of agriculture, commercial and industrial use and urbanisation. With 406 million head of livestock, India has the world's largest cattle population, which it supports on less than 4 per cent of its land, much of which is over-grazed.

Eighty per cent or more of India's rain falls during four months in the year. Community wastes, industrial effluents and excessive use of chemical fertilisers and pesticides cause excessive pollution to surface and ground water.

Malaysia	
Total land area (km^2)	330, 000
Percentage:	
Arable land	3.2
Permanent cropland	11.7
Pasture land	0.1
Forest & woodland	58.1
Other land	26.9

With an area of around 330,000km^2 and a population of 18.6 million, Malaysia comprises a diverse mosaic of people, economic structures and ecology. One of Malaysia's largest resources is natural forests. With a little less than 60 per cent of the country's area under forest cover, it is one of the

few remaining countries in the world with a large expanse of natural tropical forest. A further 12.8 per cent of land is made up of plantation tree crops.

Malaysia's forest areas, such as those in the state of Sarawak, are home to many communities of indigenous people. Although the total forest area is extensive, Malaysia has actively developed a timber industry which has led to problems of soil erosion, water supply and availability of food for some of these indigenous communities.

Essentially an agricultural country, Malaysia's economy has recently undergone significant diversification and its status is now that of a newly industrialised country. The agricultural sector has seen a heavy focus on commercial production in the plantation sector with large external inputs. The extensive use of agricultural chemicals is common and gives cause for concern.

Maldives	
Total land area (km^2)	300
Percentage:	
Arable land	10.0
Permanent cropland	0.0
Pasture land	3.3
Forest & woodland	3.3
Other land	83.4

With a total land area of just $300km^2$, Maldives is an archipelago of an estimated 1, 200 small islands. Most of its islands are low lying and very few are suitable for agriculture.

Being a country with more territorial sea than dry land, Maldives depends almost entirely on resources from the sea. Fishing and tourism are the country's two main industries, both of which depend on healthy reefs for their existence. The coral reefs, one of Maldives prime resources, rank amongst the most productive ecosystems in the world. These reefs however, have been seriously damaged through activities such as coral mining and boat anchoring.

Pakistan	
Total land area (km^2)	796, 000
Percentage:	
Arable land	26.3
Permanent cropland	0.6
Pasture land	6.5
Forest & woodland	4.5
Other land	62.1

Pakistan is the tenth most populated country in the world. A predominantly arid or semi-arid country, its topography consists of mountains, deserts, and some fertile plains.

Even though urbanisation has been widespread, Pakistan is predominantly a rural and agricultural economy. However, less than 20 per cent of the land has the potential for intensive agricultural use. Soil-erosion, caused by over-grazing and cutting of forest lands, cultivation on marginal lands, the absence of protective soil and poor water management practices have emerged as major environmental issues in the country. More than 40, 000 hectares of agricultural land are lost each year to agricultural production due to waterlogging and salinity.

Agricultural productivity is also limited by water availability, since 90 per cent of food and fibre production is dependent on irrigation. Surface water from rivers is the primary source of water in the countryside. Livestock is an important sub-sector in agriculture and contributes an important source of energy for several agricultural operations.

Pakistan is highly deficient in forest resources, with less than 5 per cent of the total area of the country under forest cover. This necessitates the importing of wood to meet part of the country's needs. Deforestation is currently one of the prime environmental issues in Pakistan. Clearing of forests for agricultural use, land salinisation, soil erosion and development pressures on coastal areas are all hotly debated environmental issues in Pakistan.

Sri Lanka	
Total land area (km^2)	66, 000
Percentage:	
Arable land	14.3
Permanent cropland	15.1
Pasture land	6.8
Forest & woodland	27.0
Other land	36.8

Sri Lanka encompasses a number of diverse ecosystems with varying morphology, climate, flora and fauna and distribution of mineral resources.

A predominantly rural economy, with almost 80 per cent of the population living in rural areas. Its major occupations include agriculture, forestry, and fishing, with over 90 per cent of the rural population depending directly or indirectly on agriculture.

Dependence on forests for energy is widespread in Sri Lanka. Ninety-four per cent of the households use biomass as cooking energy, which accounts for 70 per cent of the country's energy consumption. However, population and development pressures have contributed to extensive deforestation through the conversion of forest lands into settlements and croplands.

The country is rich in coastal resources, with a coastline of about 1, 600kms. Estuaries, peninsulas, beaches and offshore islands support 90 per cent of the fishing industry.

Major issues of environmental degradation in the Asia region

The range and extent of environmental degradation in the Asia region is vast and often difficult to measure. However, the following trends give a broad picture of the environmental issues in the region:

- widespread shifts to commercial agriculture have entailed:
  - falling groundwater tables with over-exploitation of groundwater for cash crops
  - large-scale irrigation schemes without proper watershed management and drainage, causing extensive downstream siltation, waterlogging and soil salinisation
  - indiscriminate use of agro-chemicals and lack of good practice during their application. This creates severe health hazards to workers and the general population through residues in food and contamination of drinking water
- extensive logging of hardwood timber for export as a foreign exchange earner
- drying up of rivers as a result of deforestation and overcultivation of water catchment areas
- loss of more than 60 per cent of the highly productive tropical wetland habitats in Asia through pollution, urbanisation, and conversion of irrigation schemes
- pollution of coastal waters, which yield 90 per cent of the total marine catch, due to:
  - agricultural run-off containing chemicals
  - domestic and industrial sewage from municipal drainage systems
  - toxic industrial wastes
  - oil seepage from refineries
- phenomenal urban growth in the region. It is predicted that Asia will have five of the world's ten largest cities by the year 2000. Its urban population is expected to rise from 700 million to 1.2 billion.
- emergence of problems such as global warming and ozone depletion due to the greater impact of human activities on the environment. The release of carbon dioxide and other gases into the atmosphere has risen sharply with the intensified burning of fossil fuels. As a result it is predicted that global temperatures will be between 2°C and 4°C higher by the year 2100 compared to pre-industrial times. There is however much uncertainty surrounding these figures.
- a rise in sea levels, an increase in severity of storms and changes in fish location and abundance due to climate change. It is estimated that the sea level will rise between 24cm and 38cm by the year 2050. This rise would inundate large areas of land with water and severely affect the world's densely populated delta areas like Bangladesh. The very existence of low-lying island nations such as the Maldives would be threatened
- removal of protective mangrove forests from coastal areas and tidal rivers.

Women and natural resource management: the way forward

The central role played by women in the maintenance and conservation of natural resources in developing countries is often little understood by planners and government agencies. Development planners often focus mainly on the size and growth of the population and economy without recognising and acknowledging the profound and sometimes adverse effects of development choices on a country's social and the ecological balance.

The challenges of addressing the problems of rural and poor urban women in the Asia region and those of environmental degradation therefore require:

- **an integrated approach.** To achieve sustainable development, the plight of rural poor women needs to be taken into account. If women do not benefit from a development activity, or if they suffer in some way because of it, can this really be called development and will it be sustainable? Likewise, the state of the environment is another critical factor that must be considered in development strategies. The effects of development on both the rural environment as a whole and on rural women as a group must be considered
- **positive action.** There is an urgent need to reduce existing damage to the environment and to develop awareness and technologies that use resources in ways that are in harmony with the environment, and therefore sustainable. There is a parallel need to take action to improve the position of rural and poorer women. This means maximising cooperation between men and women. When women's access to information, assets and services improve and when they are given a central role in sustainable development, both women and men will benefit greatly.

The position of women and the issues of environment and development are all linked. To develop policies and practices which best use our assets and benefit women and which are also in tune with the environment requires recognition of this link. The challenge therefore becomes:

How can the role of women in environmental management be taken into account, and supported in order to improve the chances of sustainable development and increase women's share of the benefits?

Key strategies

Some general pointers towards strategies that will both strengthen the position of rural and poor urban women and help them to conserve their resources include:

- recognising the differences of interest and responsibility in different activities, between different members of the household – men, women and male/female children; anticipating and dealing with areas of conflict
- raising public awareness at all levels about the roles women play in natural resource management.
- using more participatory approaches that involve both women and men in making decisions as well as acting on them. Learning from women and men, listening to their points of view and priorities, and deciding with them
- making more use of women's knowledge, experience and their traditional skills of good resource management
- developing a comprehensive gender-balanced environmental curriculum for schools, appropriate to local environmental conditions and social customs
- establishing a broader base for environmental decision-making at all levels, one which takes into account the experience and needs of both women and men in environmental management.

Certain approaches to rural development have failed to benefit women. They can, however, provide useful lessons for the future. These include:

- **the tendency in rural research to assume that household heads are male.** Since women are often responsible for much of the agricultural production and other natural resource-related activities, by-passing them means losing a valuable source of local knowledge and risking poor

implementation of any attempted changes in management. This focus on male heads of household is also based on the misguided assumption that the information and resources given to them will 'trickle across' to other members of the household, including the women. This is often not the case

- **the gender imbalance in extension work.** The vast majority of agricultural and forestry extension workers are male. Because male extension agents tend to make contact only with male farmers, the amount of information women farmers are likely to receive regarding new technologies is therefore limited. The majority of female extension workers are generally found in lower ranking jobs than their male counterparts. They are often directed into home economics extension rather than agricultural extension work
- **the extension services that women receive are often restricted.** Women farmers are often regarded only as gardeners and are accordingly provided with extension services in small-scale poultry or vegetable production rather than staple crops or large livestock, even though they are often also responsible for the latter. In addition, cash crops are normally introduced to men, rather than women, which in turn tends to isolate the women from the financial benefits of this production
- **the emphasis on research.** The emphasis of research is largely on commercial crops grown by men as opposed to the subsistence production carried out by women
- **marginalisation of rural women from improved technology.** The mechanisation of agricultural production also tends to limit rural women's access to improved technology, as it usually men who are targeted for such programmes. The mechanisation is often focused on production tasks (such as land preparation) undertaken by men rather than women. In other cases, the mechanised technologies place additional heavy burdens on the workload of women, reducing the time they have available for other activities.

Sensitivity to culture

The approaches chosen for working with rural women need to be adapted to local conditions, including the local culture.

The status of women within the household and the community differs from area to area and country to country. Their activities and responsibilities also vary. These differences will affect how useful a particular approach can be.

For instance, a tree-planting programme for rural women may be very difficult to establish if women in that area traditionally have no responsibility for planting trees, or social and cultural norms do not allow them to engage in such activities outside their home compounds. If this is usually done by men, an attempt to change this custom may be unpopular and perhaps cause conflict between women and men. If, on the other hand, tree planting can be shown to bring worthwhile benefits to the women, and if they are interested in it, the reasons for maintaining the previous cultural restrictions may need to be questioned.

It would not be appropriate here to give guidelines as to which cultural practices should be followed and which (for instance those restrictive to women) should be questioned.

The thinking behind this manual is that women do play an important role in conservation activities, and the use of natural resources. Anything that serves to improve their benefits from such activities should be encouraged. Factors that prevent these benefits from reaching rural women should be seen as an opportunity for improvement rather than an insurmountable problem.

EXERCISES

A note on the training exercises

In panels like these, you will find exercises for trainers to use with extension workers. Each exercise is intended to help a group think through the issues raised in the preceding section. The exercises are broad suggestions only, and the best way to use them is to think of any local examples you can find to illustrate the points made in each section. They are written for groups of four or more people, since many exercises involve splitting into smaller groups of twos or threes. Again, you should adapt them for smaller or larger numbers. Members of the group should have read or heard relevant sections before beginning an exercise.

Trainers may want to use some of the following exercises in their workshops to generate discussion on the issues raised in this section.

EXERCISE 1

The link between women and the environment

Ask the participants to work in small groups, preparing flow diagrams showing the link between women, environment, and the use of natural resources. For instance, they might want to show how environmental problems affect women, how problems facing rural women hinder their work in agriculture and conservation activities, or how agricultural production or fisheries development might adversely affect the environment. Spend some time comparing and discussing the diagrams produced by each group.

EXERCISE 2

Attitudes towards women, the environment and development

Pose some questions and then ask the participants to form small groups of two or three. Ask each group to discuss the questions, and to then summarise their thoughts on flip charts. Ask each group to present their results and discuss the different viewpoints. The questions should allow the participants to use their own experience and to think about the issues in the context of their own work. Questions might include:

1. In conservation programmes, what are the pros and cons of working with women; what are the pros and cons of working with men?
2. What are the major causes of environmental degradation in your area?
3. In what ways are rural women or poorer urban women as a group particularly vulnerable to problems of environmental degradation?
4. In your work, have you found any traditional practices or beliefs that affect women's role in conservation? What do you think about these traditional practices?

EXERCISE 3

Local cultural practices

Ask the participants to design and perform a short role-play which illustrates how local cultural practices can make working with women both easier and more difficult. For example, which cultural practices can be challenged or changed, which need to be handled carefully?

EXERCISE 4

Community attitudes towards development

Ask the participants to design and perform a role-play that illustrates the different attitudes towards a particular proposed development activity, from the point of view of:

- the development workers
- the men in the rural community who will be involved in the activity
- the women of the same community.

Section 2: Learning from rural women

about section 2

This Section introduces a range of techniques to help development workers understand the needs and priorities of women and to involve them in the planning, design, implementation and monitoring of resource management activities. The majority of the techniques used come under the category of 'Participatory Rural Appraisal' (PRA) method, which relies on the involvement of local people in defining their problems and choosing possible solutions rather than using conventional village surveys and secondary data. The techniques have not been developed specifically for working with women, but are applicable in the more general context of working with any local community as a whole. They can, however, be used to explore the roles, needs and priorities of women by using them separately with groups of women and men. Commonly used processes for analysing gender disaggregated information are also included towards the end of the Section.

Talking to women

Talking to women clearly results in double benefits:

- we are better informed as a result of talking with them and thus they stand a better chance of getting their points of view taken into account in any work initiated
- the women gain from being included in this learning process so that male-biased knowledge does not neglect or adversely affect them.

However, there are usually many constraints in reaching women:

- cultural and social barriers may restrict women's movements and their ability to attend meetings or even informal gatherings
- heavy workloads may mean that they have little or no 'spare' time for meetings/discussions with development workers or others
- when they can and do attend meetings and gatherings, they are often inhibited by the presence of men.

These issues need to be addressed if we are to be successful in reaching out to women. Before we can even begin to talk to women, social and other barriers need to be broken down to open channels of communication. This is often one of the most difficult tasks of working with women. It requires gaining trust and establishing a rapport. To make the process of communication with women effective and useful, we need to identify the subject areas in which such communication would be useful. This in turn means understanding:

- what women know
- what we can learn from them.

What can be learnt from rural women?

A study of activities in which women are involved will tell us something about the types of knowledge that women make use of in their daily lives. The results will vary, depending on each social structure and how it affects the division of labour, the existence of any taboos on women's involvement in certain activities, the extent to which cooperatives or working groups are responsible for some activities, and whether or not men go outside the community for seasonal or year-round employment. Table 1 shows an example of a general division of labour between rural women and men in Asia.

Table 1: Gender-based division of labour

Activity	Gender	Frequency
Homestead-based		
Cooking/cleaning	F	Daily
Child/elder care	F	Daily
House repair	M	Occasional
Collection of water	F	Daily
Tree/vegetable cultivation	F	Seasonal
Livestock maintenance	F	Daily
Forest-based		
Fuelwood collection	F	Daily
Fodder collection	F	Daily
Timber collection	M	Occasional
Collection of non-timber forest produce	F	Seasonal
Hunting	M	Occasional
Field-based		
Land preparation	M	Seasonal
Sowing	M/F	Seasonal
Weeding	F	Seasonal
Harvesting	M/F	Seasonal
Processing	M/F	Seasonal
Marketing	M	Seasonal

EXERCISE 5

What do rural women know?

1. Think about the situation in your area of work. What determines the types of activities in which rural women are involved? Do any of the above factors apply? Make a list of any other reasons why women are involved, or not involved with certain activities in the communities with which you are familiar. Consider how this differs between different households.
2. Now, consider who does what in the communities with which you work. Seven different categories of work are presented in Table 2. Each category has been divided into a number of different activities. Fill in the table, considering one activity at a time. Mark an '✖' in the box under the person most involved in each activity.
3. When you have completed the table, spend a few minutes identifying those activities which are not traditionally the responsibility of women, but which have become a recent addition to their workload. For instance, in some areas, women's increasing role in agriculture has meant that they are now involved in traditional male activities, such as ploughing the land and looking after cattle. It is useful for us to know which activities women have started doing only recently, not least because they may require some training to develop new skills.

You may like to make use of these completed lists when you talk with rural women, men and children in your work. You can certainly check your ideas on the division of labour and explore in greater depth women's knowledge of a particular activity. Perhaps some activities are undertaken by women during certain times of the day or certain months of the year, and by men at other times.

Table 2: Household division of labour (women = W, men = M, girls = G, boys = B)

	W	M	G	B		W	M	G	B
1. Collection and gathering					**4. Growing trees**				
water					Land preparation				
fuel: wood					Planting				
dung					Protecting young trees				
fodder					Applying pesticides				
wild plants: medicine					Pruning, maintaining				
food					Harvesting fruit, etc.				
other uses					Felling				
2. Looking after cattle					Market produce				
Supervision of grazing					**5. Harvesting and processing fish**				
Stall-feeding and watering					Gathering seafoods				
Tending to sick animals					Harvesting fish from fish traps				
Milking					Fishing from boats				
Processing and marketing of milk					Processing fish				
Selling and buying animals					Selling fish/seafood				
3. Growing crops					Making nets and other fishing gear				
Land preparation					**6. Looking after the household**				
Planting					Cooking				
Weeding					Washing utensils				
Applying fertilizers, pesticide					Washing clothes				
Bird-scaring					Looking after children				
Harvesting					Cleaning the house				
Transporting harvest					Tending the garden				
Processing					Buying household goods				
Marketing					Building and maintaining house				
Buying seeds and inputs					Other				

Table 2 (continued): Household division of labour (women = W, men = M, girls = G, boys = B)

	W	M	G	B		W	M	G	B
7. Making decisions					Credit				
Crops					– when to take loans				
– which crops to grow					– how to repay loans				
– where					– what to use loans for				
– when to plant/harvest					– amount to borrow				
– marketing					Education				
Trees					– which children should go to school				
– which trees to grow					– when to stop their education				
– where					– how to pay for school fees				
– how to use them					Budget				
Livestock					– responsibility for savings				
– when to buy/sell					– responsibility for loan repayments				
– price to pay/sell					– amount to spend on festivals, weddings				
– milk to sell/use for household					– amount to spend on household needs				
– how to manage									

The natural resources that women are familiar with will also be those they use in their daily lives. How we learn about these resources will vary according to what we need to know and what is relevant to our needs. Table 3 makes some suggestions about the types of questions to ask rural women regarding:

- their knowledge of and their ideas about the local environment and the natural resources that they use
- the status of these resources and their management by the local people, in particular by women.

Box 1: Questions about resource use

Availability of the resource

What do the women think about :

- the seasonality of the resource (does its availability change throughout the year and how?)
- any long term trends (is the availability of the resource changing from year to year and how?)
- why is the availability changing?

Quality of the resource

What do the women think about :

- the quality of the resources?
- the seasonality in quality (does the quality change throughout the year, and how?)

Management of the resource

What do the women think about :

- how much the resource is being used?
- the seasonality of exploitation (is the resource exploited more at certain times of the year? When? Why? Is it exploited in different ways at different times of the year? When? How? Why?)
- any long-term trends (is the use of the resource changing over the years? If so, how? Why?)
- how does its use affect the availability and quality of the resource?
- are there any limits or controls set on the levels of use? Who sets them? How do they work?
- what is the best way to manage the resource?

As a general tip it is useful to remember we can ask about any topic from the different angles of :

Who? When? What? Where? Why? How?

You could choose a particular resource with which you are familiar, such as water from a particular stream, pond, lake, or fuelwood and fodder from an area of forest or common land and work through this list to try and ask yourself about this resource. For instance if we were trying to learn about the use of water in a village and we wanted to discuss a particular stream which we knew to be polluted, we could ask :

Who uses this stream?

When do they use it? (time of day, month)

What do they use it for? (irrigation, washing, fishing)

Where does the stream flow to, from?

Why is the water quality getting worse?

How can the water quality be improved?

How can we learn from rural women?

The methods that we use to learn from rural women will depend on the amount of information, level of detail and accuracy and the type of information required. For instance, if we needed detailed information on several households' use of certain resources during one year, we would probably have to spend some time living with the households, observing their daily activities and recording the details in a standardised format. If, on the other hand, we needed to know about the resource use in a whole village or cluster of villages, it would not be possible to devote so much time to a detailed investigation of each household, and therefore a questionnaire might be needed to cover a large number of households in a relatively short period of time.

The learning techniques that will be dealt with in this section are particularly appropriate for use in the following contexts:

- where the learning and investigating takes place informally
- where most of the information to be collected is of a qualitative nature
- where the learning and investigating is being done by local people (researchers, field workers, project staff) together with the rural women and men
- where the focus is at a local (for example, village) level
- where money and/or time is limited.

The techniques will not be so appropriate in situations where:

- much of the information needed is quantitative and will be used for statistical analysis
- a formal questionnaire survey is to be the focus of the work
- information is to be collected on a large (eg, regional or national) scale.

Informal interviews

The simple technique of informal interviews is one with which most of us are familiar and it is at the centre of any rural appraisal. Informal interviews are informal conversations rather than formal question and answer sessions. They take place in the field or at the home of the interviewee and questions are not fixed before the interview. Rather than using a questionnaire, the interviewers draw up a checklist of issues, from which to choose certain topics to cover in any one interview. The success of the interview will largely depend on a relaxed atmosphere and an open learning attitude of the interviewer(s). The interviews should be short – probably no more than an hour for an individual interview and no longer than two or three hours for a group discussion (this does of course depend on how rushed or interested the interviewees are).

Some hints on interviewing

Starting off well

- the first time you visit a village, pay a courtesy visit to the leader to introduce yourselves and to explain the reason for your visit
- approach the place of interview on foot; a vehicle will give the appearance of important, rushed and wealthy intruders

- choose the location carefully. If discussing a particular area or feature in the village, try to make sure its in view. If the topic is sensitive or personal, it is probably best to hold the interview in the home of the interviewee
- sit at the same level as the interviewee(s). If in a group discussion, try to arrange to sit in a circle to ensure maximum eye contact among all participants. If there are several interviewers, don't all sit together in a group.

Sequence of discussion

- begin by introducing yourself: **who** you are, **where** you come from, **why** you have come
- check that you have come at a suitable time
- start the interview by talking about something simple and familiar, such as the crop in the nearby field, the stove in the home, or the livestock in the compound. Discussing the weather and the seasons are always good ways of starting a conversation
- if the interviewee has difficulty answering a particular question, or you feel unsure about any answer, try and think of different ways of asking it and come back to it later in the interview
- always finish by thanking the interviewee and asking whether she has any questions.

Things to avoid:

- don't ask questions randomly. Try to follow up each line of discussion before moving on to a new topic
- try to avoid asking leading questions. For instance, rather than asking, 'Will you plant groundnuts here after harvesting the maize?', ask 'How will you use this land after the maize harvest?'
- don't dominate the interview. Try to spend more time listening than talking
- don't continue the interview if the interviewee seems uncomfortable or anxious to leave.

Box 2: Sequences of checklists for guiding interviews

If interviewing is spread over several days, the investigators will find themselves increasingly focusing their work as their level of knowledge grows daily. As a result, they may use more refined checklists as their learning progresses. Below is an example of the sequence of checklists, used during an RRA exercise that focused on soil and water conservation. Note how the issues in the first checklist are very general, in comparison with the later ones.

First checklist, to be used for the first two days

- current soil and water conservation activities
- climatic factors
- sources of food
- land-use history, future conflicts; security and tenure
- use of external resources; natural and economic
- crops, livestock and trees; multiple functions
- institutional issues
- beliefs, experiences and memories
- labour availability and conflicts
- group/individual approach
- gender issues
- education and training; farmers, children, extension
- health
- farm transect

Box 2 (continued): Sequences of checklists for guiding interviews

Second checklist, to be used on the third day

- livestock – fodder
- manure
- diseases
- second transect
- farm sketch map – intercropping
- livestock
- soil conservation
- water management
- health
- education
- female labour calendar
- soil and water conservation during which months?
- important dates, major achievements, population increase, changes in cropping patterns, future changes
- institutions
- communal works?
- medicinal and other uses of trees and wild plants
- calendar for prices of horticultural crops, livestock and wage rates
- wealth indicators

Third checklist, to be used on the fourth day

- institutions – what does the women's group do?
- seasonal fodder use – for calendar
- artificial insemination problems
- food availability
- alternative sources of income

Fourth checklist, to be used on the fifth day

- historical information – distribution of land settlement arrangement
- dams affecting rainfall – when were they built?
- controlled grazing – when, how organised?
- eucalyptus plantation – when were they cut?
- more dates?
- off-farm male employment – degree of work carried out away from the farm
- wealth indicators?
- malaria peak – check it is in July
- firewood – ask more women, find more about stoves
- soil and water conservation – activities and achievements
- reasons why and why not involved in conservation
- plans
- traditional practices
- more farm sketch maps
- adult education

Choosing whom to talk with

How can we ensure that the women chosen to take part in the discussion groups or in interviews, are representative of the community as a whole? They can be chosen on the basis of:

Location: if the investigators are interested in learning about the range of conditions within the village, they need to choose women from different areas of the community, including those who live at the edge of the village, the homeless, the migrants and the squatters.

Chance encounters: as the investigators walk through the area they will inevitably meet people on the paths and in the fields. These encounters could be valuable opportunities to hold brief interviews.

Recommendation: the investigators may be interested in a particular group of women, such as those involved in a specific task. In this case names may be recommended by someone in the village. However, this has the potential for bias from the person who is recommending. Investigators may also contact women and men such as school teachers, leaders and elders (ie, key informants), to learn from their specialist knowledge.

There are many other ways of selecting interviewees. However, it is clear that without some consideration of sampling we will always tend to talk to those with whom we feel most comfortable. More often than not these will be people from our own social group, people we have met before, people who are friendly towards us. This will obviously produce a biased sample and give an unbalanced and partial view of the issues being investigated.

Observation as a learning technique

Another way of learning from and about rural women is through observation where the 'observer' joins the women in their daily activities. Observations can be made on activities, time allocation, and how resources are used and processed.

A word about men

In the great majority of cultures the leaders and elders of a community are male. It is often necessary to approach them first to explain your reasons for talking with the women. This is particularly important if some or all of the investigators are men, in order to avoid any misunderstandings about their motives for visiting women.

Box 3: Key for success – eight steps to working with women

1. **Explore** gender issues through two-way communication with rural women, recognising that the needs of men and women may not be the same, and that the impact of projects on them may differ.
2. **Investigate** the customs, taboos and time constraints that women face. Remember that knowledge and commonsense can play a major part in overcoming these constraints.
3. **Promote** the role that women can, indeed do, play in resource management at every level. Analyse ways in which they are included or excluded from projects.
4. **Exchange** information with individuals at every level. For example, with local women on forestry activities, with practitioners on involving women in forestry, and with policy makers regarding the contribution made by women in forestry.
5. **Support** existing women's groups, and encourage the formation of new groups that could promote opportunites for women in decision-making and the political process, as well as strengthen women's mutual support for one another.
6. **Work together** to provide access to land and other resources. Acknowledge traditional women's holdings, and ensure that women are included on issues such as land privitisation. Seek creative solutions for landless women.
7. **Collaborate** with relevant organisations to facilitate the availability of credit and income facilities both to invididual women and women's groups.
8. **Consult** with women before introducing new technology or plant species. Ensure that women's needs are considered, and evaluate the impact of new techniques or plants on their lives.

Source: Restoring the Balance. Women and Forest Resources, FAO

A brief overview of local resources

There are several ways of estimating the range and extent of natural resources present in an area. Depending on local conditions and suitability, any one (or a combination) of the following could be used:

- mapping
- transect walks
- nature trails
- aerial photographs.

Mapping

One of the best ways to start talking with rural women about the natural resources in their village is to ask them to draw a sketch map of their surroundings. It is often assumed that rural, poorly educated people are not able to understand or draw maps or other diagrams. However, it has been found that rural, non-literate women and men can understand maps well, especially if they have

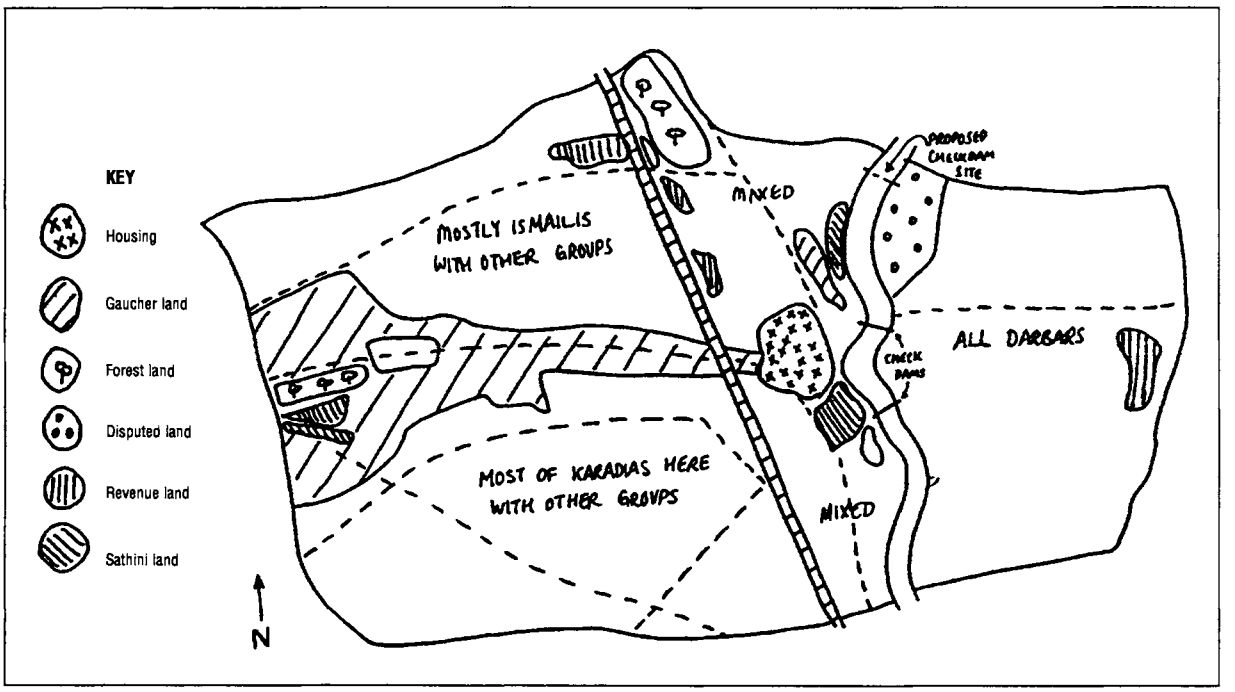
made the maps themselves. Maps drawn by outsiders often introduce unfamiliar perspectives. For example, the orientation with north towards the top of the map is not necessarily how rural people view their village. Symbols of houses and land-use may also cause confusion if drawn by outsiders. In general, unless a clearly understandable map exists of the village, such as one in the village office with which most people are familiar, it is a good idea to ask several women to draw a sketch map themselves. Figures 1 and 2 give examples of maps drawn with the assistance of local people in India.

Here are some tips to remember :

- drawing on the ground is often preferable to using paper and pen, since more people can join in the exercise and changes are easier to make. Sticks, stones, leaves, etc, can be used to represent landmarks. Once completed, the 'map' can be transferred onto paper as a permanent record
- if large scale aerial photographs are available these can be used to first outline village boundary lines, major rivers, areas of forest, etc. Details can be added later
- it is rarely necessary to produce an accurate, scaled, finely drawn map. For the purposes of identifying the local resources and environmental features such as the location of gullies, degraded slopes or sites of conservation measures, a rough sketch is perfectly adequate
- the accuracy of the map can be checked during subsequent interviews and meetings. Changes should be made on the spot. A good map is one which has been scribbled on!
- it is useful to ask a group of people to draw the first version of the map. As they discuss and argue about the correct positioning, an agreement is reached and the final product is likely to be more accurate than if drawn by a single individual.

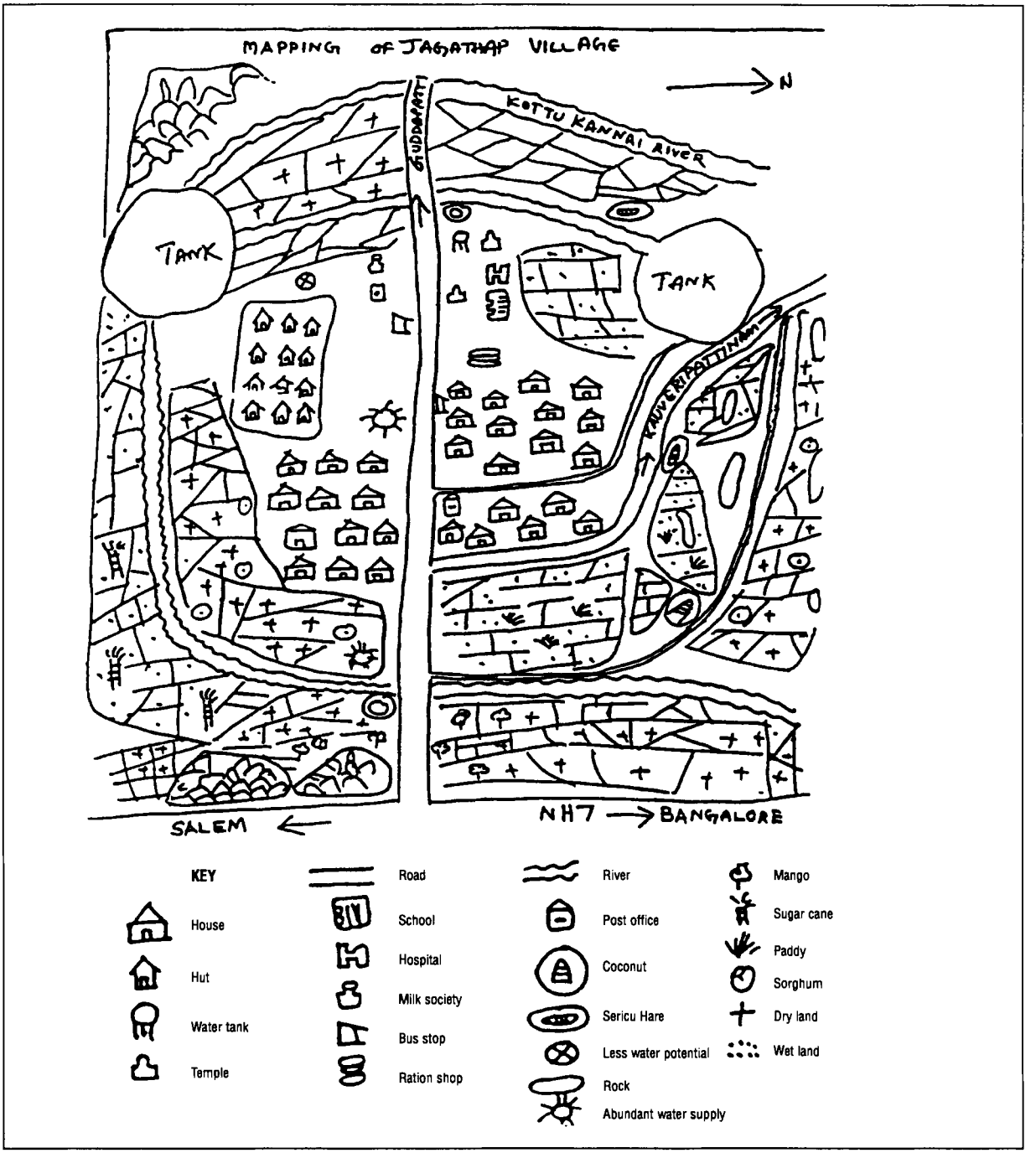
Maps can also be used to help plan which parts of the village the investigator should visit to learn about the different resources and their management. One way to ensure that the range of local environments is seen is to go on a transect walk through the village.

Figure 1: Village resource map of Lathodra in Gujarat, India



Source: McCracken, Jennifer. 1988. Participatory Rapid Rural Appraisal in Gujarat: A Trial Model for the Aga Khan Rural Support Programme *(India). International Institute for Environment and Development. London*

Figure 2: Village resource map of Jagathap village in Tamil Nadu, India



Source: Tamil Nadu Agricultural University, Coimbatore and International Institute for Environment and Development, London. 1992. Participatory Rural Appraisal for Agricultural Research at Aruppukotai and Paiyur, Tamil Nadu

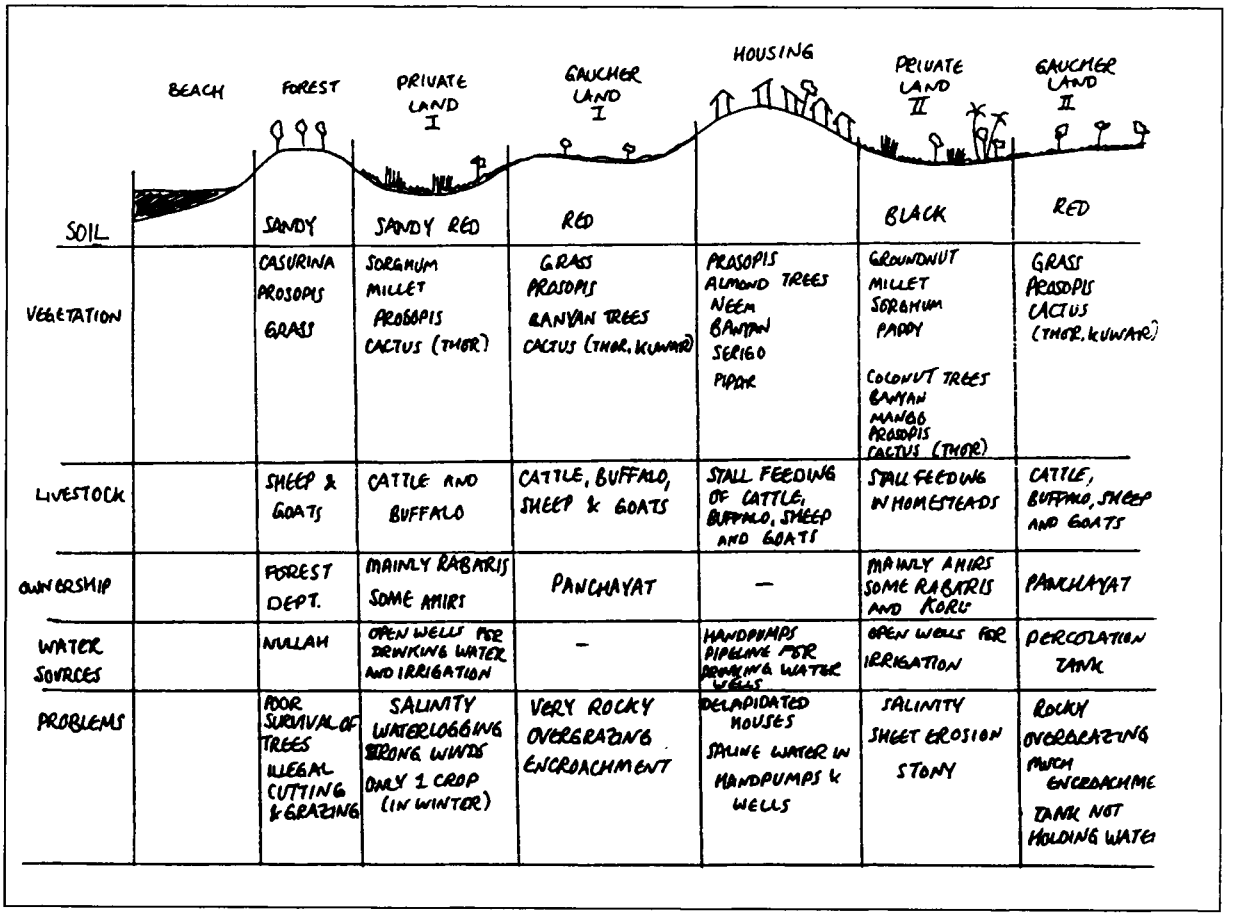
Walking a transect

This is simply a walk (or a series of walks) which takes the investigators through the different areas of a village and allows them to see the range of conditions across these areas. The walk enables investigators to see some of the more remote parts of a village which might not otherwise be visited. Sometimes, surprising and useful local practices are discovered.

Some hints on transect walks

- ask some local women and men to accompany you on the walk. Try to choose guides who have lived in the area a long time. Their knowledge will be invaluable
- take your time. A transect walk can last a whole day. These walks are a good opportunity to meet people living in different areas of the village
- record what you see. Take notes and, if appropriate, photographs
- look for differences between the different areas that you pass through. Ask about any specific problems in each area
- do not advise villagers during a transect walk – only observe and understand
- summarise your walk in diagram form. Don't worry about making an exact drawing – the important point is to keep your eyes open, ask questions as you go, and enjoy it!

Figure 3: A transect of Kambalia village in Gujarat, India



Source: McCracken, Jennifer. 1988. Participatory Rapid Rural Appraisal in Gujarat: A Trial Model for the Aga Khan Rural Support Programme *(India). International Institute for Environment and Development (IIED), London*

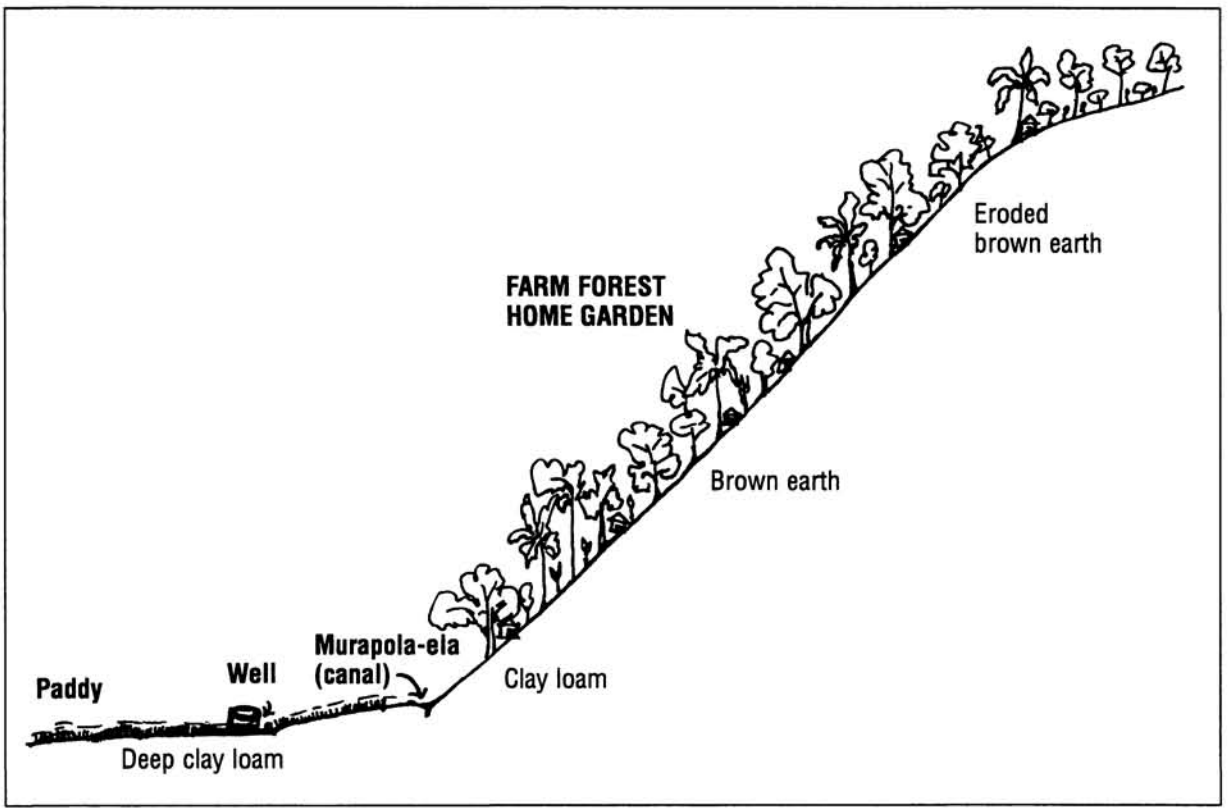
Box 4: Discoveries during a transect

The following local practices were reported to have been discovered during transect walks in different parts of India:

- in the Rajasthan desert, 20 grass and six shrub species, each useful for fodder for different animals at different times of the year, were found
- in West Bengal, the seepage tank technology developed by farmers was discovered
- at Mahilong village in Bihar, 28 different varieties of paddy rice were identified, together with ploughs made from different woods and different designs for each type of soil.

Source: International Institute for Environment and Development and MYRADA. Participatory Rural Appraisal. Proceedings of the February 1991 Bangalore PRA Trainers Workshop. RRA Notes No. 13

Figure 4: Transect of Kolabissa, Sri Lanka



Source: Wickramasinghe, Anoja. (1992)

Nature trails

Nature trails are a particular type of transect walk. They are especially useful for identifying local types of trees and plants and discussing their value with the women who make use of them.

Walking through a plot of relatively remote woodland would reveal many more and different natural resources from those found during a walk in a heavily exploited patch of forest. The differences could form an interesting starting point for a discussion with the women on the changes caused by human activity and the implications of these changes.

Aerial photographs

Looking at aerial photographs can be an excellent way of getting an overview, or a 'bird's eye view' of an area and its natural resources. The photographs can also show us places which we are unable (or unwilling!) to go to see for ourselves. Research has shown that local people are quite capable of using photographs if they can identify one clear feature such as a river, hill or road.

EXERCISE 6

Walking a transect

If all the participants are familiar with the area around the training site, ask them to split into groups to draw a sketch map of the local environment. To make it more interesting, ask one group to draw their map on the ground, another to use paper and pen, another to use blackboard and chalk, and so on, and then to compare the types of maps produced.

If possible, ask the participants to walk a transect across the area in which they are staying. The route of the transect can be decided after drawing the map, and can be designed so as to include all the main types of land use. Ask them to draw a summary of the transect, noting down vegetation type, ownership, water sources, key problems and limitations, and so on.

Learning about environmental changes

The environmental history of a village can explain much about why the present situation is as it seems and can help to explain people's attitudes to present day resources. For example, an apparent over-exploitation of forest land can be better understood if we find that up until very recently there was an abundant area of forest and little difficulty in obtaining wood. Similarly, present trends in use of resources or in environmental degradation can be used, with care, to foresee any problems that may lie ahead and possible ways to prevent these problems occurring. There are several ways of learning about past changes and trends:

Interviews

By talking with older people, we can learn much from hearing about the changes they have seen in their lifetime. They may also be able to remember the stories told by their parents and grandparents, of how the land was used by previous generations. If brought together in a group, they can help to check each other's memories and thus provide more reliable information.

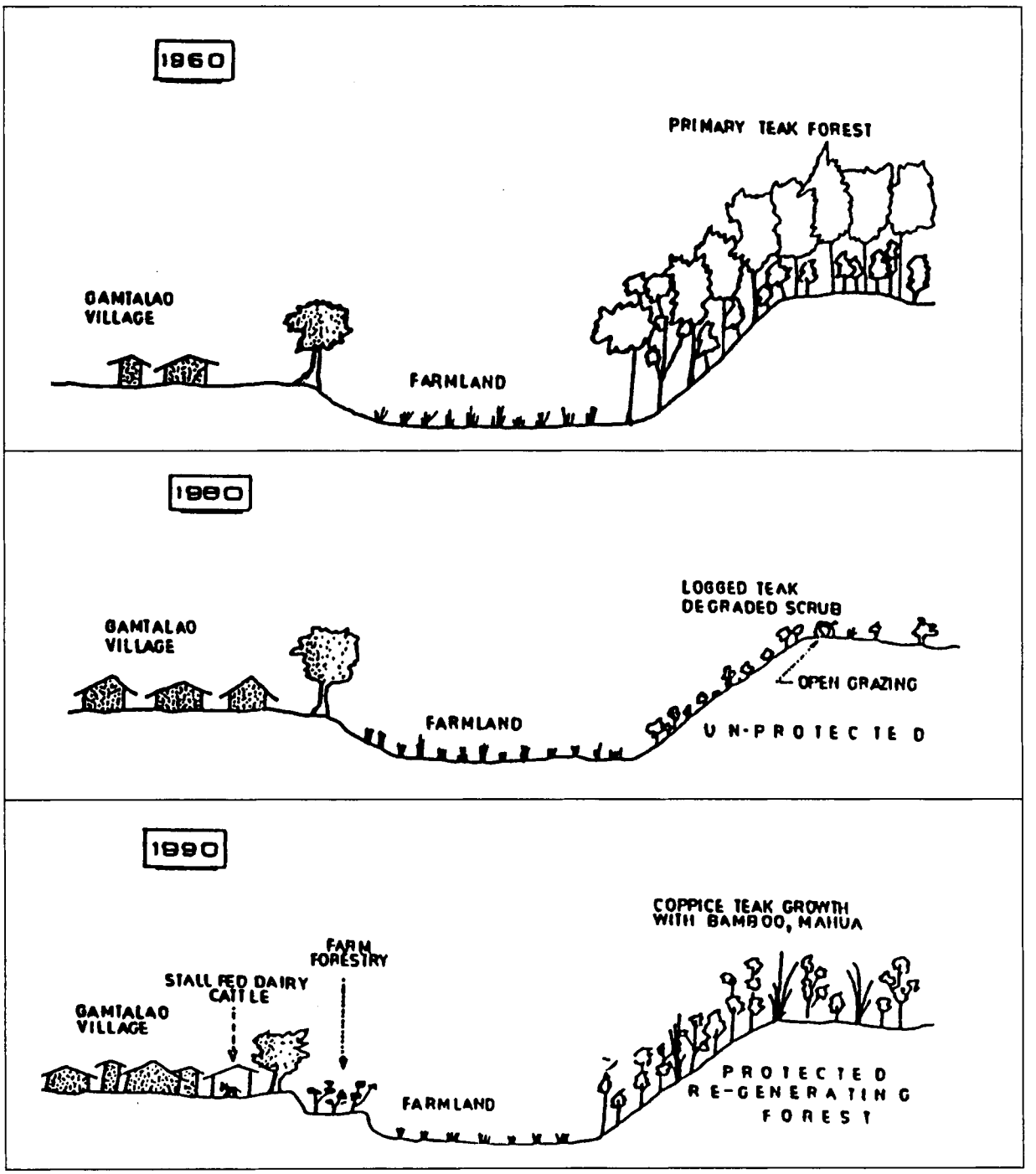
Old aerial photographs

If available, old aerial photographs can provide valuable information on landscapes, for example, showing the original size of lakes, forests, grazing areas, the course of rivers, the extent of housing areas, or the types of crops grown. They are useful tools in helping to jog the memory of older women and men during interviews focusing on changes in the environment.

Historical transects

One way of representing past landscapes is as a series of transects. Historical transects can be drawn either during interviews with older women and men from the village, or can be constructed by the investigators after interviews and discussions in the field. Figure 5, below, provides an example.

Figure 5: Historical transect drawn by villagers of Gamtalao, Gujarat, India



Source: Society for Promotion of Wasteland Development.1992. Joint Forest Management. Field Methods Manual. Vol I. New Delhi

Historical calendars

Previous years' seasonal trends can be shown as a series of calendars, to illustrate changes in and use of resources. As with historical transects, these can be constructed during interviews with elderly members of a community and checked on-the-spot.

Models

One step on from mapping on the ground, constructing a model of a village can be a valuable exercise in learning about the land use and topography of the area. These models do take time and can become quite elaborate but are also a great deal of fun.

Models are also a good way of reconstructing past landscapes, particularly when looking at land use and the status of the environment in former days. They can also show what future landscapes may look like. In India, farmers were asked to construct two different models of how they saw their catchment area in the future. One model, with many trees and well managed slopes showed how they would like it to be. The other model had bare slopes, gullies and a very degraded landscape. Indeed to make it worse still, a farmer collected ash from his home and scattered it over the model! This was how they saw their village if nothing was done to prevent over-use of current resources.

Learning about resource use

Resource use is often a function of:

- perceptions about resources
- preferences
- work roles.

To understand who uses what and for what purpose, it is necessary to understand how different people view their resources and what activities they are required to perform.

How do women perceive their environment?

Everyone views their surroundings in slightly different ways. How can we best find out about these differences?

One way is to use a variation of the mapping technique. Rather than asking a group of people to produce a map on which they all basically agree, several individuals can each be asked to draw the local area from their individual perspective.

Comparing these different impressions of the same area can reveal some interesting points of view. For example, how will personal maps drawn by women and men would differ?

An example (cited in *IIED.* 1991. RRA Notes Number 14) comes from Bangladesh where squatters on a government embankment beside a river were asked to draw maps. The squatters are now landless as their traditional lands lie below the river. The young men resort to migrant labour for

many months of the year. Three sets of people – young men, women and old men – were asked to carry out this exercise.

The resulting three maps clearly illustrated the different priorities, perceptions and orientations of the three groups. Whereas the young men marked the tracks surrounding their settlement and the road and railway links to their places of work, the women, who were restricted to their immediate surroundings and rarely move away from the embankment studiously plotted the individual houses and land use within the settlement. The old men's map charted precisely the land which they still considered their own, beneath the flowing river.

Figures 6 and 7 show two social maps, the first drawn by the men and the second by the women of a village in Maharashtra, India. One major point of difference in the two was the absence of footpaths in the men's map, which focused more on roads. The women, who used footpaths extensively for the collection of fuelwood, fodder and water, highlighted the footpaths in their map. Even though the men were aware of the footpaths in the village, they did not consider them of much significance, since they used roads for travelling out of the village to work.

EXERCISE 7

Men and women's perception of their local area

Ask the participants to look at the maps in Figures 6 and 7. There are several key differences between the image of the village as seen by men and by the women. Ask the participants to work in small groups to see what the maps tell us about the person who has drawn it (ie, what they feel is important, what is less relevant to them, and so on). Ask them to present their key ideas on flipchart paper and discuss the results of each small group.

The workload of rural women

There are two problems in finding out about the workload of rural women:

- unless we spend several months in a village it is very difficult to see for ourselves the types of activities with which the women are involved and especially the different tasks undertaken at different times of the year. The division of labour in a family will vary from place to place and even from household to household
- it is extremely difficult to quantify the work load of rural women, either in terms of hours worked per activity or effort involved per activity, or even hours worked per day. Part of the problem is that a woman may be doing several different jobs at the same time. While she is supervising the family's livestock grazing on the common land she may also be collecting dung and wood for fuel and wild plants for cooking.

Labour calendars

How can we get at least a rough estimate of women's work load? One way is to construct a labour calendar to show how the relative labour demands of women change during the year. Examples of these calendars can be seen in Figures 8 and 9.

Figure 6: Social map drawn by men in Maharashtra, India

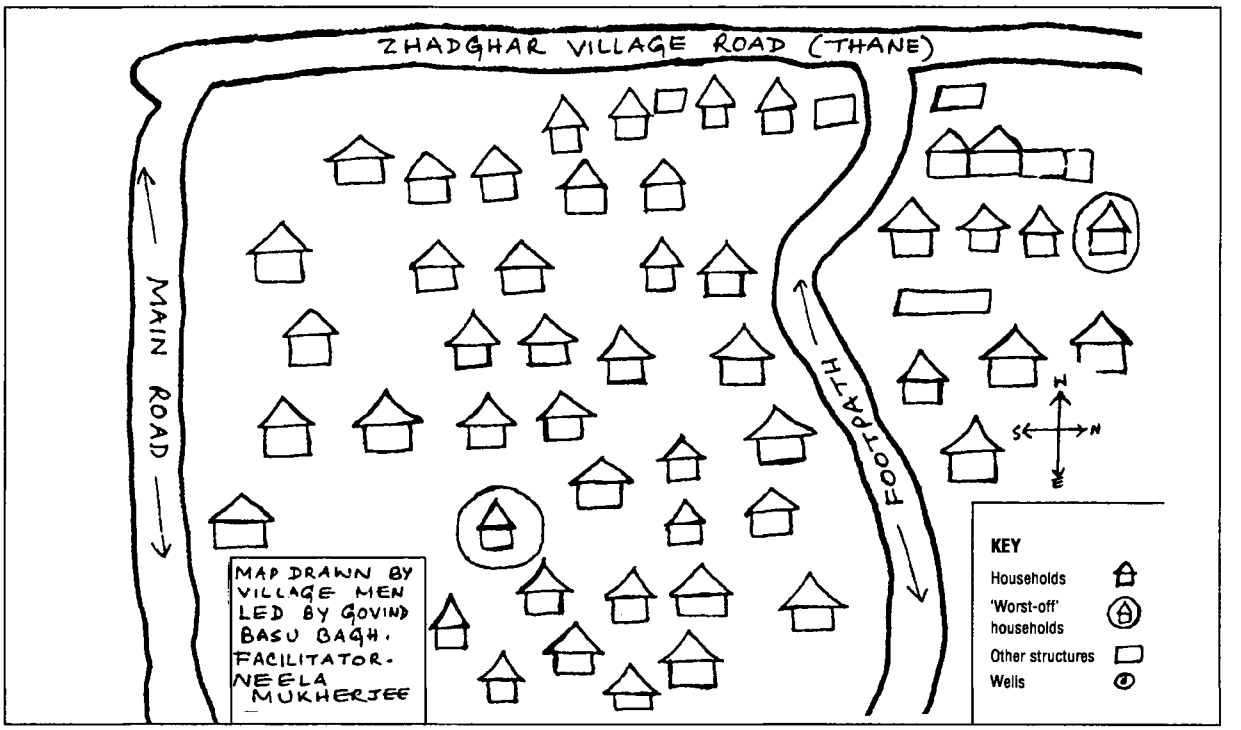
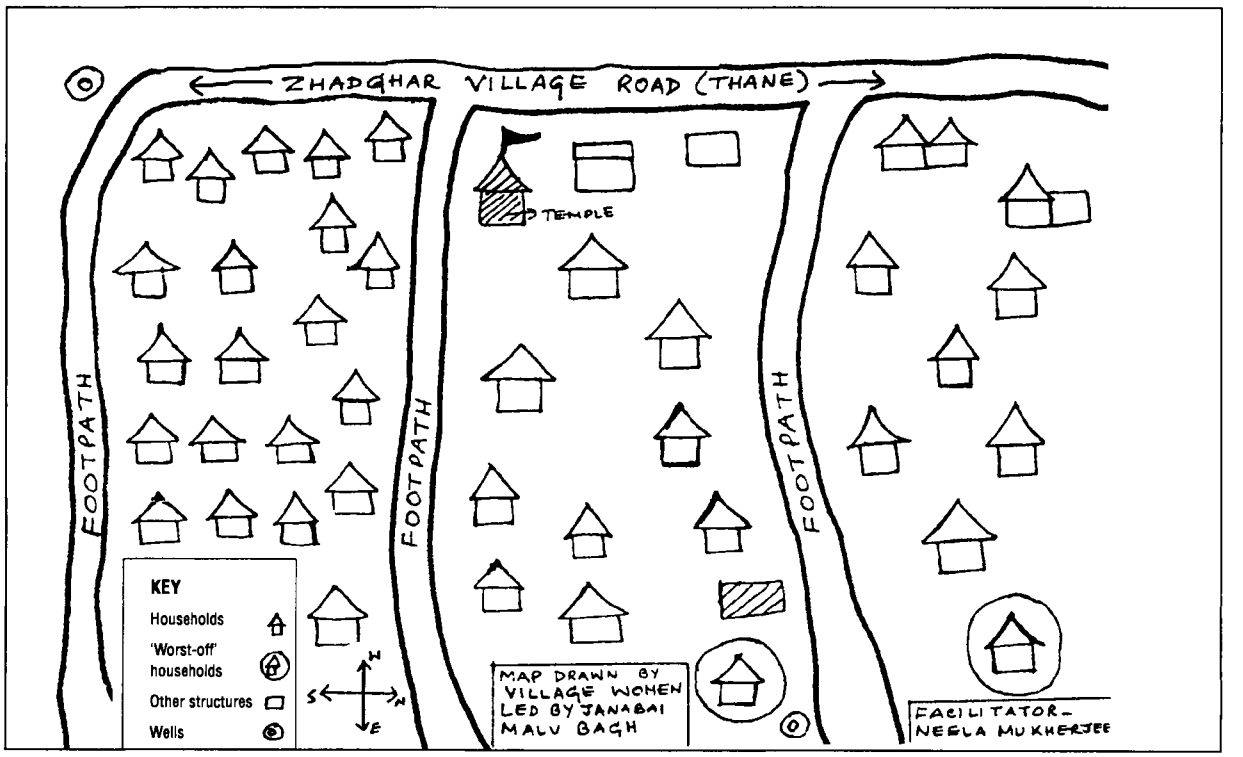


Figure 7: Social map drawn by women in Maharashtra, India



Source: Mukherjee, Neela. 1993. Participatory Rural Appraisal. Methodology and Applications. *Concept Publishing Company. Delhi*

Labour calendars indicate:

- in which months the women and/or men will be busiest
- when the extra activities may have to compete with agricultural or other labour peaks
- when the slack periods occur, during which time the new activities may be most appropriate.

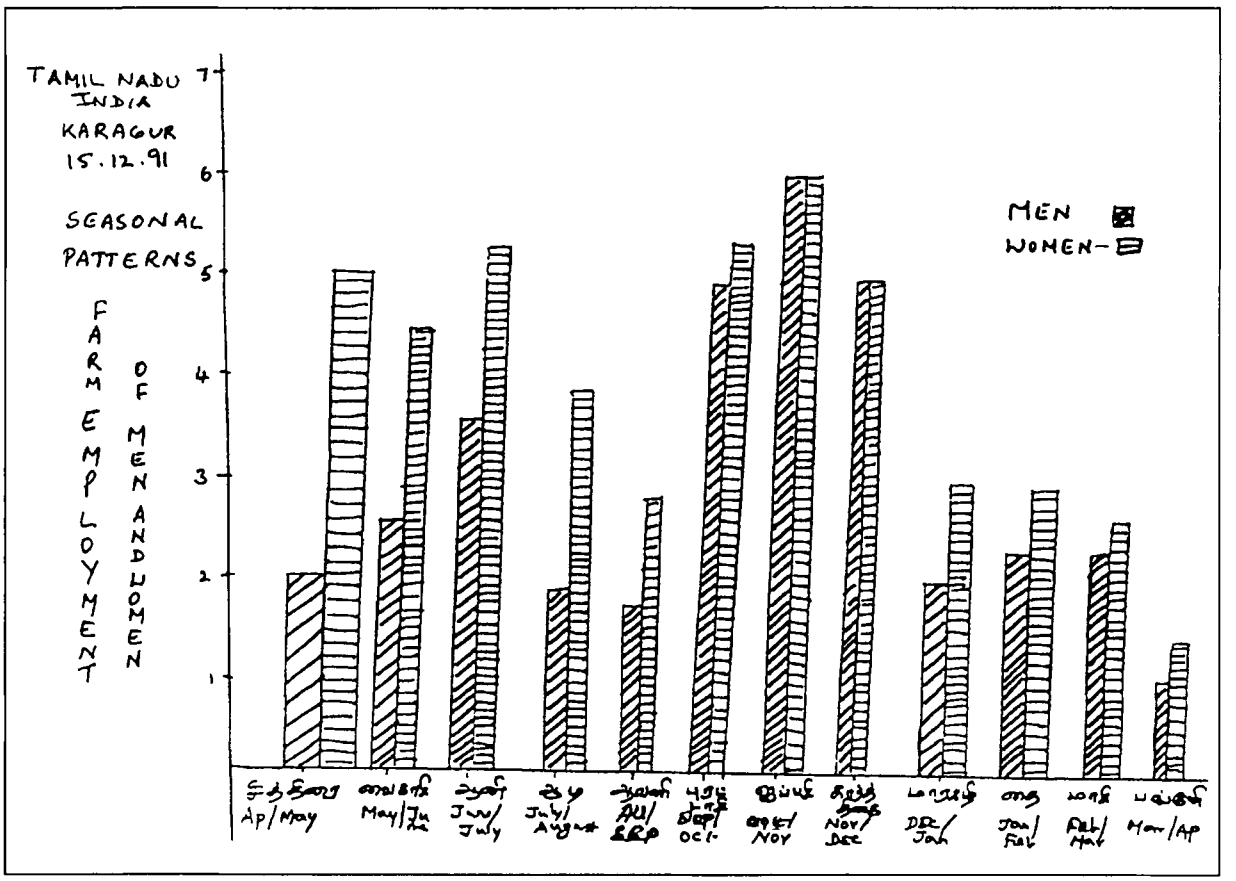
Some hints on constructing labour calendars:

- start by asking the women which month is the busiest for them. Give this month a maximum height on the calendar bar chart. Ask what activities they are involved in during this month. Note these down
- ask for the second most busy month. To get a relative measurement, ask how it compares with the busiest month. Is it half as busy, or three-quarters, or one-quarter as busy? Or, preferably, ask the women to draw the appropriate height of this month's labour demand
- continue with the third and fourth most busy months. Then it may be easier to continue by asking for the *least* busy month, ie, the slackest month, then the second, third and fourth, and so on. The 'middle' months can then be filled in by comparing against others already dealt with
- it may be more appropriate to begin the calendar not with January but with, for example, the month at the beginning of the agricultural cycle. This is the case in figure 10. It is also useful to use the local calendar when constructing the diagram, and afterwards to translate it into the calendar system with which we are most familiar
- all this is easier if each women draws her calendar
- a group of women can be asked to produce a labour calendar. As with the mapping technique, this is a useful way to get a consensus answer, but may hide individual differences
- it may be useful to know the differences between the seasonal labour patterns of women and men in the same village. In this case, repeat the exercise with men.

Box 5: Our labour calendar is wrong

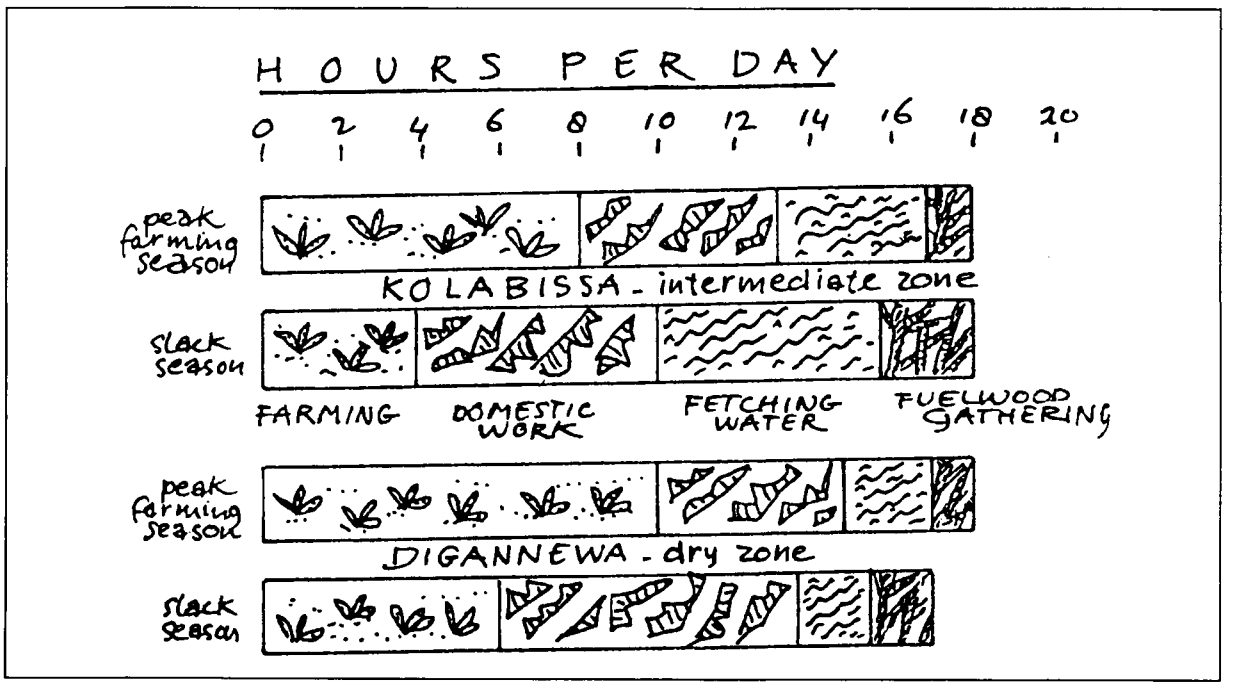
In a village in India, a group of men and women were asked to draw their labour calendars – one for men and one for women. They drew both calendars on the ground, using pieces of straw to mark the bars of each month's labour demand. When both calendars were complete, the women came closer to view the final results. They began to discuss among themselves, and looked quite agitated at what they saw. When asked what the matter was they said : 'When we compare these two calendars, they do not tell the truth. Our calendar is wrong! It only shows agricultural work, not our extra household work. We must add a whole band to the bottom of our calendar, to show that we do extra work at home as well as in the fields!' The adjusted calendar showed the women had a much higher work load than the men.

Figure 8: seasonal calendar for farm employment for men and women in Tamil Nadu, India



Source: Tamil Nadu Agricultural University and IIED. *1992. Participatory Rural Appraisal for Agricultural Research at Aruppukottai and Paiyur, Tamil Nadu.*

Figure 9: Pattern of time allocation of women in rural Sri Lanka



Source: Anoja Wickramasinghe

Daily activity schedules

A typical day's work can also be the topic of an interview and here again, interesting comparisons can be drawn between the ways men and women spend their time. Different women will also have different daily routines.

EXERCISE 8

Labour calendars

To practice drawing labour calendars, ask the participants to divide into groups of three. One person from each group can be the respondent, the other two the interviewers. It is the respondent who draws her/his own labour calendar, ie, their work pattern over a year, while the two interviewers help and ask questions following the hints provided. If there is time, repeat the process with a different respondent from each group. Finally, with the calendars transferred on to large/flipchart sheets of paper, compare the results. Note different work patterns and what they show about the different respondents. Discuss the value of this type of information in planning, monitoring, or evaluating a project initiative.

In a similar way, ask the participants to practice drawing their own daily activity schedules. They may also like to try and recall the different patterns of their youth. Again, present and compare the schedules of each respondent.

Different preferences for resource use

Learning why people make the decisions they do is the key to understanding the ways in which they use natural resources. These choices are usually made on the basis of a number of criteria. In comparing different items, two individuals in similar situations may make very different choices or else may make similar choices for very different reasons. How can we learn something about these complex decisions and how they are made?

One simple, but helpful technique is that of preference ranking. This involves asking an individual (or a group) to rank in order of their own personal preference a set of items, and to give the reasons for their preferences. These items could be anything from tree species, livestock types, or vegetable types, to income sources, types of fertiliser, or land management techniques. The resulting ranked list will show both the order of preference of the items and the criteria on which these preferences were based. There are several different ways of finding out about these preferences. Two of the preference ranking techniques, pairwise comparison and matrix ranking, are outlined below:

Pairwise comparison

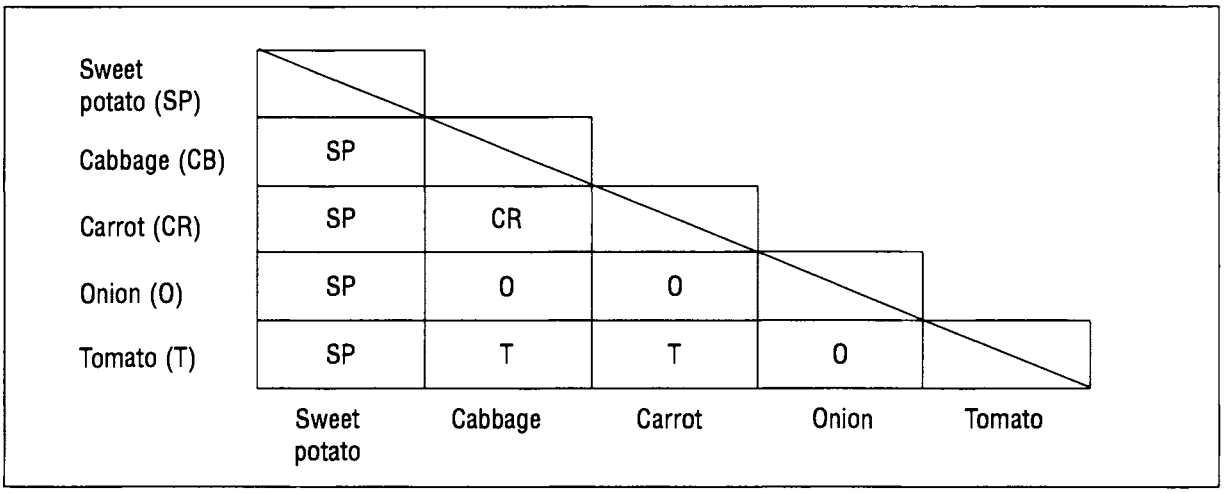
This version of the technique involves a sequence of comparisons, where two items at a time are rated against each other. Here are the steps involved:

1. Ask the woman to choose the set of items to be ranked. For example, if you are interested in learning about women's interest in growing vegetables, ask a woman (or a group of women) to choose a number of vegetables with which they are familiar. For the purposes of the ranking

exercise, it is probably best to limit this number to five. Let us assume the woman has chosen to rank sweet potato, cabbage, carrot, onion and tomato.

2. Pick any two of these five vegetables and ask the women which of these she would prefer to grow. If possible have examples of each of these vegetables to hand, to stimulate discussion. Alternatively, use five pieces of paper representing them, in front of the women. Note which she prefers and use probing questions to find out why she prefers this one
3. Then choose a different pair of vegetables and ask the woman which one of these she would prefer to grow and why
4. Continue until you have worked through all the combinations
5. Draw up the results as a list and ask the woman whether she agrees with the end result

One way to keep a record of each comparison is in a matrix. One for the above example could look something like this:



The 'winner', ie, most preferred of each comparison is entered in the appropriate box. In the case of ranking five items, as above, you can see there are ten different comparisons to make (ie, 10 boxes to fill in). The final ranking is then simply a matter of adding up the number of times each vegetable appears as a 'winner'. Here Sweet potato won four times, onion three times, tomato twice, carrot once and cabbage was never preferred in a comparison. Hence the ranking in this case is :

1. Sweet potato (most popular crop)
2. Onion
3. Tomato
4. Carrot
5. Cabbage (least popular crop)

The more interesting result of the ranking technique however is often the criteria which have been used.

Matrix ranking

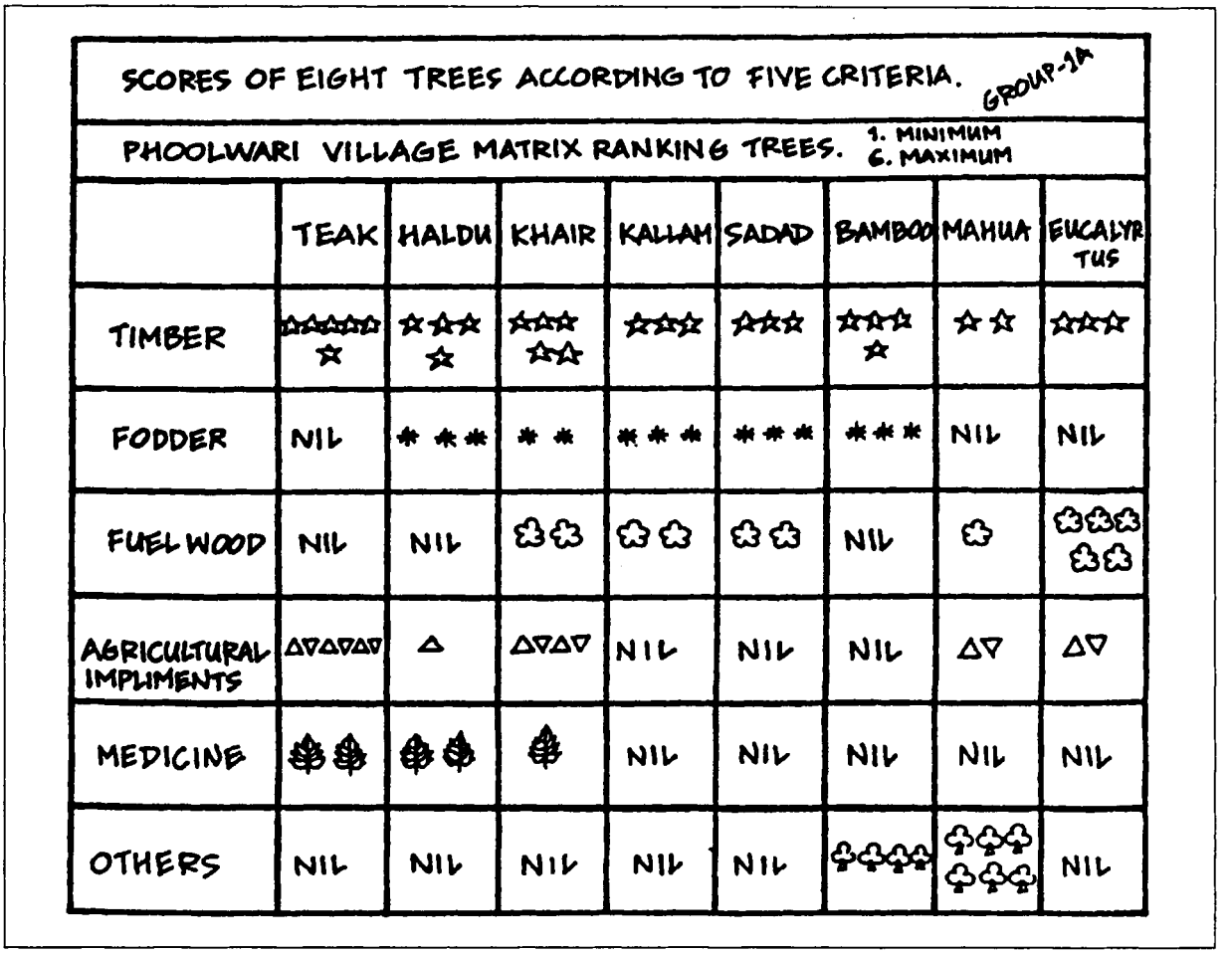
This is a different version of the preference ranking technique. It involves the following steps :

1. Ask the women to choose the items they would like to rank, as in the pairwise comparison technique

2. Taking each item in turn, ask about its good points and bad points. Try to get as many as possible
3. List all these criteria. Turn negative criteria (bad points) into positive ones. For example 'vulnerable to pests' becomes 'not vulnerable to pests'. So all criteria are now positive
4. Draw up a matrix with the items across the top and the criteria down the side
5. For each criteria in turn, ask which item is best. Give this item the value of 1. Ask which is next best, give this item value 2, ask which is next best, and so on
6. Work down the matrix filling in the rankings
7. Finally ask the question 'If you could only choose one of these items, which would you choose?'. This will give some indication of the relative weighting of the different criteria.

An example of a matrix ranking of tree species done in India is given in Figure 10, below.

Figure 10: Matrix ranking of tree species according to villagers' own criteria in Phulwadi village, India



Source: Society for Promotion of Wasteland Development. 1992. Joint Forest Management. Field Methods Manual. Vol. I. New Delhi

Uses and limitations of ranking

The ranking technique can discover the reasons why women and men make different choices. Often women farmers make choices about food crops and fruit on the basis of their nutritional value, their ease of cooking and their medicinal qualities as well as their growth characteristics. Men on the other hand will often emphasise the economic value of the crops, and rarely mention the criteria which women find important.

These differences in criteria can sometimes help to explain the conflicts in interest between men and women when new species, new techniques or other innovations are introduced into the area. It would be useful, for example, if agricultural extension agents planning to encourage tree growing through agroforestry were to first conduct some ranking exercises with a number of local women and men in order to discover what features of the trees are important to each group.

This raises one limitation of the ranking technique. Since the choices made are so individual to every person, a ranking result should not be used to recommend a particular item which appeared as the first in one, or even several, rankings. The idea that a farmer actually chooses one item is in practice a false one. A farmer very rarely grows just one species of tree, or uses a single soil conservation technique. Rankings simply show the need for choices to be available, and should not be used to advocate concentrating solely on the 'winning' item.

Likewise, the results of a limited number of rankings should not be extended to produce recommendations for a whole village or area. They can give some ideas but should not be relied on for anything beyond this.

EXERCISE 9

Consumer preference ranking

You, as the trainer, take on the role of director of a fruit and vegetable development project in your own country. Tell the participants that you have already conducted a survey of the producers, to find out which types of fruit and vegetables they prefer to grow. You now want to know the preferences of the consumers. So, divide the participants into groups of three, with one respondent, (the consumer) and two interviewers in each group. Ask the participants to choose four types of fruits and four types of vegetables to use in the preference rankings. Make sure all the respondents are familiar with all of these. Give half the groups the opportunity to rank the fruit, and the other half can rank the vegetables. Allow each group to decide whether they would like to use the pairwise comparison technique or the matrix ranking. Allow 30-40 minutes for each ranking. Finally ask a spokesperson from each group to report back the findings and identify the key results of use in planning the project.

Local management of resources

Conflicts of interest

A community is generally composed of a number of different groups, some in direct conflict with each other, some more powerful than the rest, and some particularly disadvantaged. Within these groups there may be differences of opinion and points of conflict. For example:

- landless households in a village have petitioned the village council to allow them to farm some of the common land, currently used for grazing. Livestock owners in the village have reacted against this, seeing it as a threat to their herds. Members of the village council are more likely to be livestock owners than landless
- the men of a village have become interested in a coffee project which has just been started in the area. They have heard that their incomes could double if they replaced some of their maize crop with coffee trees. They are keen to work with the project. However, the women are very unsure about the idea. They fear that their workload will increase, as they have heard how much care the coffee trees need. They also feel there will be problems if they grow less maize – where will they get enough food for the family and what will replace the maize stalks for fodder for cattle? They also wonder who will benefit from the extra cash which the coffee trees might provide. The women and men discuss the project and cannot agree.

One way to learn about these conflicts of interest is through focus group discussions.

Focus group discussions

Focus group discussions are a particular type of discussion, where a set of people are brought together specifically to discuss a particular issue. As the discussion focuses on a single issue, it is easier to deal with the subject in some depth. If the group is made up of people with common concerns, or people facing a common problem, a focused discussion allows them to be more frank and honest than they may otherwise be, say in an open meeting in the community.

Focus group discussions differ from other types of interview in that the interviewer's role is one of moderating the interviewees' discussions rather than asking questions of each member of the group. One application of this technique allows discussions to take place firstly within different interest groups, and then between these groups.

Box 6: Organising focus group discussions

- keep the size of each group to a manageable number – the optimum size is probably between three and 15 individuals
- choosing who should attend a focus group meeting is liable to introduce bias. If a leader is asked to nominate participants, his or her choice will be influenced by his/her friends and acquaintances. This is difficult to overcome, but every effort should be made to get a representative group effort
- choose a site where the group will feel comfortable to talk, and where there are unlikely to be any unwanted observers or intruders
- choose a time which suits everyone in the group
- start the discussions on a light-hearted note. Ranking games are ideal
- explain carefully at the beginning of the discussions why you have called the group together, and what you would like them to discuss
- try to ensure that every member of the group gets an opportunity to speak. Don't allow one member to dominate the discussion

Box 6 (continued): Organising focus group discussions

- the discussion should not last much more than two hours, unless all of the local members of the group want to continue
- organising these meetings takes time and attending them also makes use of valuable time for the rural people. Be aware that people may miss important employment opportunities or may have to delay other activities in order to attend the meetings
- following up the meetings by supporting the implementation of any agreements reached is a vital part of the work.

A word of caution

There are a number of risks involved in investigating conflict:

- by making the conflict more public and by providing a forum in which the differences can be discussed openly, these different opinions may become even more hotly contended, and the conflict may actually deepen
- the more powerful and influential interest groups in the community may be put in a better position to force their opinion on other groups. They may use the group discussion sessions for propaganda purposes rather than for constructive discussion with others
- a third potential danger is that the investigator/s may appear to take sides in the argument. If, for example, they spend more time talking with one particular interest group, the other groups may see that as evidence of the investigator's biased support for that group's argument.

Those responsible for managing the group discussions need to be able to control the different interest groups represented, and to encourage the less strong groups to speak out. They also need to be very open and to explain why they are trying to gather such information.

Despite these difficulties, it is often very important to learn about conflict situations. For example, an apparently inexplicable pattern of land-use may make sense once it is discovered that there are disputes and conflicts over rights to that area of land. Also, conflicts between different groups in a community may hinder any planned community-based activities. In such circumstances, it is often worth spending extra time investigating the conflicts in a sensitive and careful way.

EXERCISE 10

Managing conflict

To give the participants some practice in handling situations of conflict, ask them to choose a topic around which they could perform a role-play that highlights the conflicting viewpoints of different groups in a community. For instance, they might choose to explore the issue of firewood scarcity, and show the viewpoints of the poorer women (who spend more time and/or money collecting or buying the firewood), richer women (who have alternative sources of fuel, or who are involved with fuelwood merchants who come to the village to sell the scarce resource), the older women and men (who call for a return to the days when fuelwood was plentiful) and newcomers (who bring reports of what has happened in other parts of the country). When the drama has been performed and the different viewpoints and conflicts discussed, ask the participants to enact a village meeting to further discuss their positions. Assign the role of an outside extension agent to one of the participants. This

person's role is to control the discussion so that everyone has a say, and to try and facilitate a consensus on how the problems can best be solved. Finally, allow the participants to step out of their roles and discuss the problems involved in dealing with such sensitive situations.

Local institutions and groups

Learning about which formal institutions are present in a community is relatively straightforward. But how can we learn about the informal groups and the extent to which the various institutions link together and collaborate? If we are investigating the use of natural resources in a village, we need to know which groups are responsible for deciding how the resources are used, for example, the water management committee (controlling use of irrigation water), the village council (controlling disputes over land), the local women's groups (organising a rota system for working in the village tree nursery), and so on.

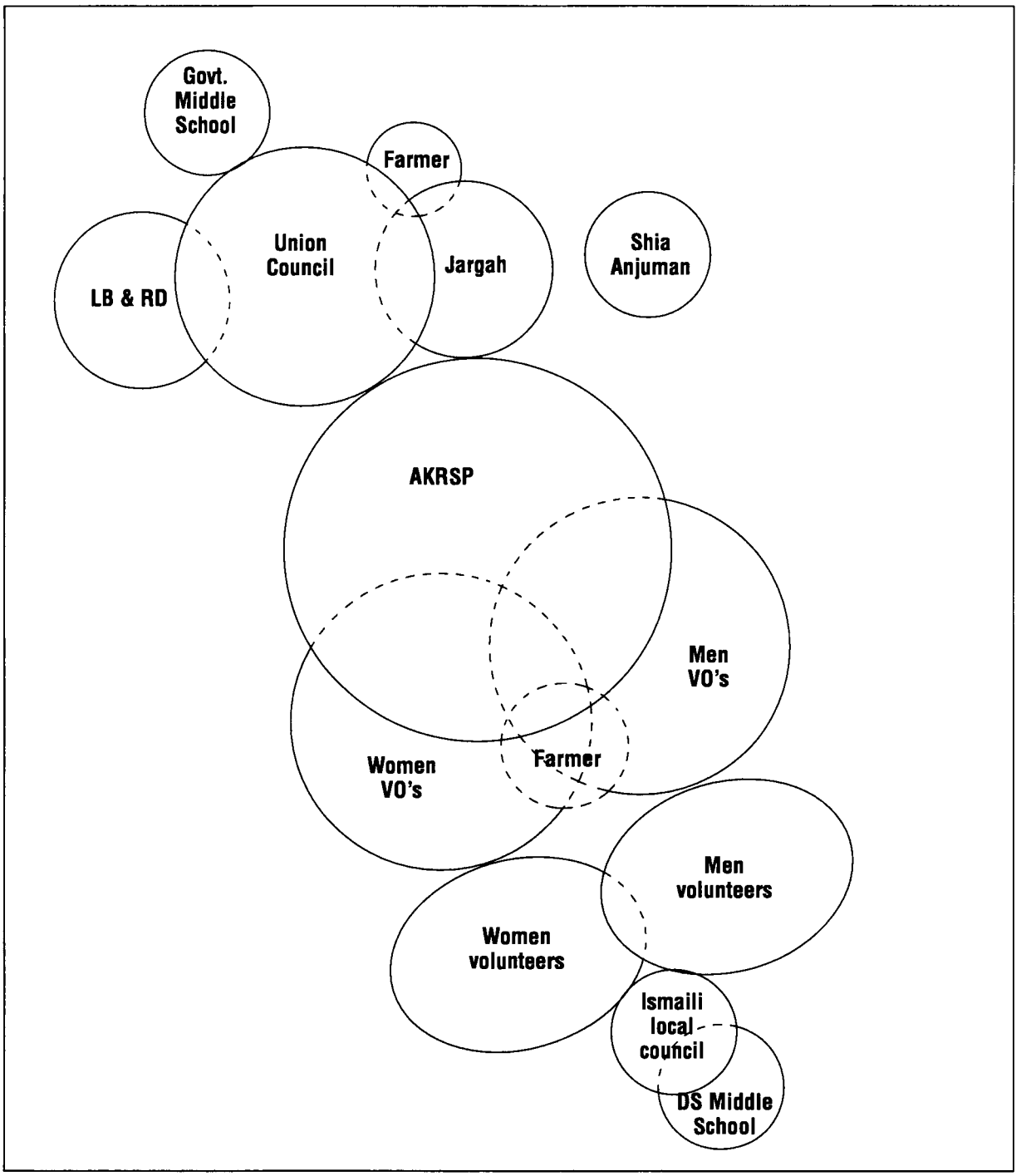
A quick way of starting to learn about this is to construct a venn diagram. This is simply a set of overlapping circles, each circle representing an institution or group and the overlap between circles depicting the extent to which the institutions overlap and collaborate in practice. The relative size of the circle representing an institution is drawn to indicate the relative importance of the institution in the village, ie, the influence which it exerts in the community.

The venn diagram may be first constructed using cut-out circles of card, which are placed overlapping on top of each other. This can be done by a local leader or school teacher or anyone else familiar with the formal and informal groups in the village. Once satisfied with the lay-out of the circles, the diagram can be transferred on to paper.

The completed venn diagrams are summaries of which groups are present within a community, which outside groups have contacts inside the community and how these different groups are linked together.

An example of institutional overlap in a village in Pakistan is presented in Figure 11. The central institution shown is an NGO, the Aga Khan Rural Support Programme (AKRSP).

Figure 11: Venn diagram of institutional overlap of a village in Northern Pakistan



Source: Conway, Gordon, McCracken, Jennifer, Pretty, Jules. 1987. Training Notes for Agroecosystem Analysis and Rapid Rural Appraisal. IIED. *London*

What happens next?

After you have spent some time talking with and learning from rural women, the information you have acculated can be used in the following ways:

Reporting the results

In order to work together well with the local people, it is important that you make time to share your findings with them and keep them up-to-date with your own ideas and plans.

It may be useful to organise an open community meeting to which everyone is invited to attend. However, it is important to remember the following points:

- the size of the meeting should not become too large
- the time of day at which the meeting is held should be convenient to as many people as possible
- the meetings should not be dominated by a few individuals. Everyone should be able to participate equally.

Remembering the above points, good use can be made of visual presentation material to show those results which can be depicted pictorially. Posters, cartoons, maps and calendars can be presented.

In addition to holding these report-back meetings, producing a written report of the newly gained information is a valuable part of the survey/learning work.

Planning activities

There is no single way of turning the learning about an issue to action simply by talking with rural women. This process is very dependent on, among other things, the agency involved and its existing structure, the investigators involved and their preferred way of working, the type of activities being planned and the main initiators.

If, however, there are no plans for any immediate follow-up activities, the information can still be valuable for reviewing the impact of past activities and revising existing work plans. It can also be used as a base for future studies or field activities. In any case, the investigators will now have an 'insider's view' in addition to their own perspectives. If the learning work has been truly participatory, the rural women and men involved will also have learned from the experience. This can encourage cooperative efforts in future conservation activities, as the outsiders and insiders work with each other.

A word of caution

The best Participatory Rural Appraisal (PRA) exercises are the beginning of a process which moves from gathering information, to planning and implementing action in collaboration with the people concerned. This implies there is a realistic hope of doing something at the end of the planning stage. If not, the exercise may only serve to raise false hopes within a community. For example, if it emerges from investigations that the central problem of the village is water supply, are the outsiders in a position to help with a well?

Some practical points to remember

It is impossible to plan a perfect piece of field work – something always changes the programme! But here are a few things to bear in mind when planning the work in order to avoid some obvious pitfalls:

People

The number of people working in this learning/survey work needs to be kept small. The actual number will of course depend on the purpose of the study, the size of the area to be visited, and the way that the survey is to be organised.

If outside people are involved, the team may be most effective (and less intimidating!) if split into small groups of two or three people, when visiting a community.

An equal number of women and men on the team makes the investigation itself more balanced.

Local people make ideal investigators. They generally have fewer difficulties in communicating with the rural communities. They know the local dialect, the local forms of address and customs, and they are less likely to become the centre of attraction when they visit a village. However, it can also be useful to include some non-local people on the team, to bring a different perspective. They may be able to contribute ideas which they have learned elsewhere and since they know less about the area they will be less likely to make prior assumptions about what they will find there. Indeed local investigators often admit that they find it difficult to ask questions in their neighbourhood, as they will usually already have their own ideas about the answers!

Payment

If local women and men are involved in the investigations they may have missed the chance to earn money or had to postpone an important task on their farm. In such a case, some kind of compensation would seem reasonable. However, the use of financial incentives is full of dangers. People may be quick to provide information in order to get payment, but the quality of information they provide may not be as reliable as that provided by those who are genuinely interested in the investigations, even if they are not paid.

One possible option is to pay the local women and men in kind rather than in cash. For example, they may appreciate receiving some tree seedlings, a simple extension booklet, or a hand-tool. The appropriate solution will need to be worked out according to the local situation.

Timing

The work needs to be planned for a period of time when:

- the rural women and men are not too busy to spend time with the investigator(s), for example, *not* during peak sowing or harvesting season in the case of agricultural communities
- the climate is not likely to hamper the work, ie, the roads are not likely to be blocked by heavy rainfall
- the workload of the investigator(s) is not too heavy
- ideas for action which may result from the learning work can be fitted into the planning schedule of the agency involved.

If the work is likely to involve several days of visits in a community, the investigator(s) should first visit the local leaders to explain their plans and to ask their permission.

Where to stay

If the investigator(s) have to travel long distances to reach the communities they wish to visit, or if transport facilities are not freely available, it is probably better to arrange to stay overnight in the community. Staying there also helps the investigator(s) get to know the people and the place more quickly. Evenings are often good times for discussion, and early mornings and late evenings can be interesting times to watch activities such as farmers using night irrigation or outside labourers going to and from their daily work.

3. Case studies in natural resource management

about section 3

This section looks at successful attempts to mobilise women for rural development and analyse the conditions and ingredients for success. The five case studies featured in this section illustrate the current and potential role of women in natural resource conservation, and underline the main reasons for involving women in natural resource management. They have been drawn from different parts of the region, and cover a range of ecological, socio-economic, cultural and technological backgrounds. They provide a useful way of bringing to life the experiences of women's groups working in conservation.

Case study one shows how the initial involvement of Bangladeshi women in their own savings scheme led to the creation of income-generating natural resource projects, such as the Pond Fish Culture Programme.

Case study two describes a wasteland development programme in the semi-arid, drought prone region of southern Rajasthan.

Case study three shows a government-sponsored home garden project in Sri Lanka, that addressed women's need for skill aquisition while training them in natural resource management.

Case study four shows the successful implementation of a community aforestation programme in Uttar Pradesh, India.

Case study five describes how the Aga Khan Rural Support Programme, Pakistan has encouraged rural women to initiate and plan their own development, and provided vital training schemes.

Note: The case studies represent the views of the authors. Minimum editing has been done so that the authentic voice of the authors is preserved.

Using the case studies

The women's organisations discussed in this section are grassroots organisations whose members depend on natural resources for subsistence and who have come together to conserve the resource base. Each of the organisations were formed for very specific reasons, but they all demonstrate a common goal and commitment to conservation. They also have some common needs; for example, the need to access resources, credit systems, and information.

The five case studies serve to:

- illustrate the situations in which women were involved in natural resource management and the nature of their involvement in such activities
- demonstrate how intervention strategies can address constraints to women's participation in conservation without occasioning social and political confrontation
- project a positive image of women's role in natural resource management – a role that is often ignored
- help us to understand the processes involved in mobilising and organising women for resource management and the conflicts that could emerge as a result of such initiatives
- point to the potential of women in enhancing their roles in resource management and in conservation activities
- highlight the impact of recognising the role of women in resource management
- validate some of the new roles undertaken by women in addition to the traditionally accepted ones.

The case studies are not meant to be replicated, or taken as a blueprint for successfully mobilising women, but are intended to provide a basis for discussing practical approaches to involving women in natural resource management.

The following issues from each case could be discussed in small groups:

- an analysis of the project area and in its context, the project, and its objectives
- the process of organising women and the dynamics of group activities
- the nature of women's participation
- the impact on women – both in quantitative and qualitative terms
- the constraints faced by the project – cultural and others
- main lessons learnt from the case study.

After that, the relevance of the case study to the readers own areas of activity can be discussed. A representative set of questions is given at the end of each case study. These should form a basis for understanding the main issues and the practical and replicable aspects of each case. For instance:

- was the central project activity one that was traditionally carried out by women in that area? If not, under what conditions was the new activity introduced?
- what was the nature of constraints encountered by the project? Would these be relevant to your project area, and if so, would the strategies used to address these be applicable to your area?
- what indicators are used in the case study to measure the success of an activity? Are they relevant to your own area?

Often, it is very difficult to discover whether women are direct beneficiaries of conservation activities. Some of the most common measures used to evaluate success in development activities are direct indicators, such as increases in women's incomes, increases in agricultural output, and sustained conservation. These might be ideal within a certain context, but they are very difficult to measure. 'Proxy' indicators can be practical. They include observation of an improved home environment (for example better clothing for women and children), increased participation of women in social activities, social and political acceptance of women as managers and decision makers, as well as improvements in nutrition resources, the farm and rural environment and an increase in/or demonstration of women's leadership roles and organisational skills.

1 Involving women in natural resource management in Bangladesh

Summary: A Bangladeshi women's organisation that specifically targets poor rural women, has promoted improved access to health, education and training facilities to the women and their families. It has also provided the women with much needed income-generating opportunities, including a successful pond fish culture programme.

Background

Thengamara Mohila Sabuj Sangha (TMSS) is exclusively a women's organisation. It came into being in 1985 following the collapse of a male organisation, Thengamara Sabuj Sangha (TSS) which had been set up to organise the rural poor.

A poor young woman from the same village had over the years become convinced of the need to organise women, as she observed their oppression, the helpless condition of parents over dowry requirements, the precarious situation of the divorced, among other problems.

In the late seventies, she began organising the housewives of the village. The women were advised to save a handful of rice from their requirement to create a fund to be used by them during emergencies. The savings practice was adopted by 20 families. The women were advised to sit together when their husbands were out, to discuss their problems and find ways of solving them. Over the months, the size of savings grew. In 1978, at a meeting attended by 26 women, the organiser explained the purpose and use of savings and discussed their status and their rights in society. Emphasis was placed on the need for solidarity and an organisation of their own. This helped to motivate a large number of women who then started involving themselves in income generating activities by using the fund created out of their savings. This marked the beginning of group formation, the practice of having savings and participating in income generating activities.

To obtain a legal basis for their organisations, the women decided to use the name of the existing TSS. They amended its constitution and renamed it TMSS in 1985.

Initially, TMSS activities were confined to only three villages of Sadar *thana* of Bogra district. Currently the area of operation of the TMSS has been extended to 17 *thanas* and 1, 885 villages of six districts and 3, 302 groups. The total number of group members and beneficiaries is 72, 000 and 30, 534 respectively.

Social context for TMSSs activities

Women in Bangladesh live in an essentially male dominated society with almost negligible decision making powers even in family affairs. Deeply ingrained biases lead to gender-based discrimination and social injustices. Lack of access to education, training and therefore income generating opportunities serve to increase women's vulnerability to exploitation. With a low overall national literacy level of 25 per cent, women's literacy stands even lower, at 11 per cent.

TMSS set out to strengthen the socio-economic status of rural women. Its specific objectives were:

- to create awareness and combat illiteracy by imparting functional education and human development training
- to emancipate rural disadvantaged women economically
- to reduce inequality between men and women
- to work against oppression and exploitation of women
- to strengthen poor families through helping women
- to utilize the under-utilised local human and material resources.

Activities of TMSS

Activities of TMSS are broadly service and income oriented. Service oriented activities include:

- group formation, changing social attitudes and education for developing awareness
- health education
- mother and child health services
- primary and adult education
- training and skills development
- relief, rehabilitation and promotion of women's human rights.

The income oriented activities are:

- slab latrine making
- sanitary materials manufacture
- poultry and livestock rearing
- nursery raising
- crop production
- fish culture
- loan programme
- production of handicrafts.

Fish culture constitutes one of the main income generating activities.

Organising women for fish culture activities

TMSS works on a group basis. First, the organisation selects a village where it intends to work. A high proportion of rural poor is the main criteria for selecting a village. TMSS has a team of village organisers (VOs), who work at the grassroots level and start by enlisting the poor families of the village. Families satisfying the TMSS criteria are enlisted with girls and women aged between 15 and 60 years being the target beneficiaries. In order to be eligible as TMSS members, women must belong to a specific economic background. Their total family land holding should be less than 50 decimals, no family member should have an income from sedentary labour, total family income should not exceed Tk 25, 000 and the women should have an inclination towards savings activities.

A primary group consists of 10 to 30 women members. Generally, one woman is taken from each family to join a group. Members of a group should be geographically close to each other. During the formative stage of the groups, the VOs make frequent visits to the members and clearly explain the reasons for forming the group to the women.

The members then start meeting once a week in one of the members houses. They discuss their problems in the meeting and find ways of solving them. Every group has a five member management committee. On joining the group a payment of Tk 5 payment is required. The members are required to contribute Tk 2 per week to their collective group savings fund, which is maintained in a bank. Every group has its representatives who, in case of necessity, can draw money from the bank with written approval from the TMSS. The group members may take a loan from the group's savings fund to undertake income-generating activities.

Following the development of TMSS, women's need for greater solidarity gave birth to larger village wide organisations known as Karmajibi Mahila Shakti. However, the identity of the original smaller group remains intact. The members of the small group automatically become members of the village organisation, which meets once in three months and keep close contact with them including providing support on how the larger organisations should be defined and developed.

Pond fish culture activities

As part of rehabilitation and socio-economic development of oppressed women, TMSS began a pond fish culture programme in 1988. It decided to lease government owned *khas* ponds and disused private ponds in order to increase fish production and improve the protein intake of poor women and their families. The specific objectives of the fish culture programme are:

- to create employment opportunities for TMSS and increase their income
- to increase fish production by bringing the derelict and unused ponds under fish culture
- to expand the horizon of knowledge of the target groups, develop their skills, and introduce a modern approach to fish cultivation.

Since the project began, TMSS has leased 85 ponds of which 17 are *khas* ponds and the rest are privately owned ponds. The lease period varies between three to nine years. Extension of the lease period for the *khas* ponds to 99 years is in process. Fish culture in these leased ponds takes place in two ways. In one, the ponds are leased by the TMSS, that is, the contract is drawn up between TMSS and the pond owners or they are leased directly by the target groups of women. In the former arrangement, TMSS provides all inputs to the TMSS group users, whereas in the latter case, only technical assistance is provided by the TMSS to the group users. TMSS shares costs and profits on the leased ponds with the groups.

The pond fish culture programme has extended to 188 villages of Bogra and Jaipurhat districts. There are altogether 228 groups involved in fish culture with a total membership of 4, 500.

Women participate actively in aspects of pond fish culture and so far 805 women have been given training in different aspects of pond fish culture. The specific areas of training are:

- pond management and development
- pond excavation, re-excavation, preparation and implementation
- nursery pond preparation and management
- integrated fish culture (poultry and fish)
- rice fish integration.

Fertilization, feeding, netting and harvesting are done by the women themselves. TMSS groups have demonstrated the techniques of increasing fingerlings, fertilizing, feeding and so on. The fertilizers in use are cow dung, compost and poultry droppings. Feed used for the pond fish are rice bran,

wheat bran, mustard oil cake, banana leaves, napier grass etc. The participants also raise fries/fingerlings in nursery ponds.

Impact of activities on women

The number of ponds is very low compared to the number of target beneficiaries, thereby reducing the benefit per member. For example, a four-acre pond accommodates 350 members belonging to 10 groups. Therefore TMSS employs women in a number of income generating activities simultaneously. Groups working in fish culture also participate in poultry rearing, vegetable cultivation, sericulture and nursery horticulture.

The benefits of the programme are that:

- women receive training in different aspects of fish culture, including familiarity with semi-intensive methods
- there is a positive contribution to the fish production of the area as well as to the country
- other pond owners are motivated to start pond fish culture following the practices of the TMSS beneficiaries
- the income of the families involved is increased.

It has been estimated that TMSS women could make a net revenue of Tk 37, 202 per hectare in the seasonal ponds and Tk 49, 686 per hectare in the perennial ponds. Per hectare production achieved by the TMSS participants was 2.614 tonnes and 2.879 tonnes for seasonal and perennial ponds respectively. The adoption of a semi-intensive fish culture practice could improve fish farmer's income significantly. Investment in pond fish culture could bring a return of Taka 1.79 for seasonal pond and Taka 2.47 for the perennial ponds.

TMSS documents show that their share of income from fish increased by 10 per cent after adopting semi-intensive fish culture practice. Income from vegetables production through utilization of pond dykes has also increased by 4 per cent.

Following the adoption of the semi-intensive fish culture, local income from fisheries increased from 10 per cent to 20 per cent.

There are also social gains. TMSS target participants' status within the family has increased dramatically because of their increased ability to generate income. The need for women to undertake activities such as heavy earthworks and selling labour is now far less. Increased incomes have enabled them to get houses in the clustered villages. Family disputes and divorce have been minimised.

Identification of constraints

In spite of its success, TMSS is facing some constraints in implementing the programme. At the initial stage male village leaders opposed the formation of the women's group. Religious leaders started interpreting the participation of women in income-generation process as contrary to religious interest and men were advised not to allow their wives to participate in the activities. In many families, wives were physically abused. Some families were penalised in the form of charging fines while some were isolated from the society. TMSS continued its operation despite these hurdles.

Even today, TMSS workers are frequently attacked if found alone in the street when going to and from work. Workers carrying loan money are often robbed. The movement against participation of females in activities outside the home is gaining momentum. Attempts are being made to publicise opposition to female participation in these activities and the women's use of bicycles and motor bikes is not accepted. Interviews with TMSS personnel reveal that this propaganda is being transmitted by the people involved with the village power structure who realize that women are gradually moving beyond their clutches.

There are still some problems with pond fish culture. Fish farmers still have the tendency to overstock the pond, underfeed the fish and use less fertilizers than are required. Tools for testing water and soil quality are not always available. The most important problem is the absence of a hatchery. Fish farmers buy fingerlings from outsiders without being assured of their quality which affects the fish production significantly. If TMSS can develop a hatchery then it can supply quality fingerlings to the target groups as well as to the other pond owners of the area at the right time according to their demand. Thus, the survival rate of the fingerlings can be improved and production in ponds can be increased. TMSS workers believe that some more motivational work is required to convince fish farmers to use the correct types and quantities of inputs. Financial inputs are also required to ensure this. There may also be a shortage of people with the necessary expertise to help overcome these problems.

Questions for discussion:

1. What was the role of TMSS (at the start of project activities as well as currently) in pond fish culture?
2. What implications does the above have for long-term sustainability of activities?
3. What are the different forms of access that villagers have to ponds and what are the implications of each?
4. What immediate and long term needs of women does the project address?

2 Wasteland development in India

Summary: Four and a half decades of savage deforestation had left the semi-arid desert region of southern Rajasthan devastated and barren, with its inhabitants trapped in a vicious poverty trap. As the situation reached crisis point after three years of drought, an aforestation programme was started, initially on a small scale, involving the suppy of saplings to local women. Almost 10 years on, the project has proved to be largely successful, with women acquiring new skills and confidence, in addition to the obvious benefits to the whole community gained from the rejuvination of previously bare and unfertile common land.

Background

This case study is based on the work of the People's Education and Development Organisation (PEDO), in Bicchiwara block of Dungarpur district, Rajasthan.

Dungarpur district falls in the semi-arid belt of southern Rajasthan. Out of its total population of about 682, 850, 64.4 per cent are Bhil tribals (referred to as *adivasis* hereafter) and 4.4 per cent belong to Scheduled Castes. The average annual rainfall in the district is 762mm, most of which falls during the monsoon months of July and August. The large annual variation in rainfall makes the district drought prone. Historical records indicate the occurrence of several major droughts in this century. The most recent drought from 1985 to 1987 was the worst since 1891.

Until independence, the district was heavily forested. Some of the forests were primarily teak while others were mixed deciduous forests of teak, tendu, dhawra, bamboo and a few other species. During the four and a half decades since independence, the district has witnessed devastating deforestation combined with significant changes in land use patterns.

The predominantly *adivasi* population of Bicchiwara block historically subsisted by a combination of cultivation and food gathering from the forests. Even today, over 80 per cent of the local population depend on agriculture, most of it rain-fed.

Unfortunately, this previously thickly forested area has today been transformed into a moonscape of bare, brown hills with barely a blade of grass on them. Semi-starved, low-grade cattle, with a preponderance of goats and sheep, can be seen searching for food for survival. With the symbiotic relationship between the forests and the local subsistence economy destroyed, a vicious poverty trap has been created. The bared hill slopes brought under the plough lose rich top soil each year. The fields in the valleys are deprived of the rich leaf litter coming down the hills leading to reduced yields. If the rains do not come in time, there are few forests to fall back upon for survival. Many water sources have dried up due to limited recharging of sub-soil water. With less firewood available, precious dung has to be burnt as fuel instead of fertilising the fields. If the crop fails due to inadequate or untimely rainfall, people either have to migrate to other areas in search of work or depend on daily wage work generated through government drought relief programmes. The remaining forests are hacked down further to collect firewood for sale to supplement declining incomes. The traditional subsistence economy is on the verge of collapse with mere survival having become a full-time task.

Bhil society is strongly patriarchal with a strong preference for the male child. Ownership of all immovable property such as land and housing is vested in men and the only property considered to be women's is their jewellery. There is strong cultural resistance to giving even a part of the family's land to women.

This cultural attitude principally determines women's status in society, leaving them completely dependent on the whims of men, be it father, brother, husband or son. Despite the tradition of bride price, the money is controlled by men. If there is any conflict in the family, the woman has few options to moving out as she owns neither land nor house. She must either find another man to give her shelter or go back to her parent's or brother's house. This is in a context where domestic violence, alcoholism, bigamy and desertion are common among men.

Moreover, the traditional division of labour between men and women binds her more intimately to the natural resource base. It is she who pays the price for environmental degradation by having to walk longer distances in search of firewood, fodder and water. Thus, while having an intrinsic interest in maintaining a healthy natural environment, she finds herself devoid of control over decision making related to management of a basic resource such as land because its ownership is vested with men.

The Origins of PEDO's Work with Local Women

With the commencement of three years of drought (1985 to 1987), the near total collapse of the natural resource-based subsistence economy started to become evident. Its impact on all local people was severe but once again, women appeared to be the worst victims.

Anxiety and physical workloads increased. With migration of men to other areas in search of wages, women were left behind to shoulder men's responsibilities. There was also the added fear that the husband might pick up another woman while away and the possibility of physical abuse by other men due to the husband's absence.

It was clear that none of these problems could be dealt with on an individual basis. Organised and collective action was a prerequisite. This meant seeking women's reflection and involvement in articulating dominant issues confronting them and defining appropriate strategies of action. With this objective in mind, a large *mela* (fair) of women was organised in Mada in April 1987.

Due to considerable discussion on the causes and impact of the prevailing drought, women from several villages who had participated in the *mela,* asked for fuel, fodder and fruit plants for planting on their private lands. Women of three villages asked for assistance in rehabilitating their totally degraded village common lands. Follow-up meetings after the *mela* were held, with hundreds of women participating. PEDO took its first step in involving women in developing both private and common wastelands.

It was decided that PEDO would supply free saplings of the species of the women's choice on the condition that pits for the plants were dug in advance and they undertook to protect the plants after planting. A demand for 30, 000 saplings was received from the women of about 60 villages.

However, after the first monsoon rain of 1987 when the distribution of saplings was started, the demand for plants from women shot up phenomenally. Ultimately, a total of almost 164, 000 saplings were distributed to 602 women spread over 68 villages! In addition, 6, 000 grafted plants of mango and lemon were distributed.

The large numbers caused considerable confusion resulting in high mortality among the plants. The almost complete failure of the monsoons in 1987 did not help matters. Many women expressed their inability to protect the plants due to having to leave home daily in search of wage work to survive. Hungry cattle roaming in search of anything green made protection even more difficult than usual.

The experience of the drought made women realise the importance of re-establishing vegetative cover on their denuded lands. If provided with some guidance and support, women would come forward in large numbers to plant trees to reduce their problems of fuel and fodder scarcity.

In 1987, discussions on environmental issues during the *mela* prompted women of Ditkon Ka Vela, Bortalav and Baletighati villages to request PEDO's help in rehabilitating their degraded common lands. PEDO agreed to support the efforts of the women's groups of the first two villages that year. By this time, the near impossibility of effective protection of plantations without the community accepting responsibility, had made PEDO realise the importance of involving the community at all stages of its work.

It was in Ditkon Ka Vela and Bortalav that, for the first time, the condition of right-holding families accepting responsibility for protection was made a precondition for the organisation providing assistance for developing common lands. Although initially, people of both villages resisted this concept, the women's group of Ditkon Ka Vela came forward and agreed to contribute a fixed sum from their wages towards building up a village common fund from which payments for protection would be made. The men agreed later.

Tensions Generated by the Focus on Women

At this stage it started becoming evident that the focus on working with women was beginning to generate tension and hostility not only among male villagers but also among PEDO's male staff. The male staff started questioning the objectives of the women's programme. They could see few tangible outputs from it unlike the handpump installation, well-deepening or contour terracing programmes with which they themselves were involved. The women's programme, with its emphasis on group building and eliciting women's total participation, seemed to them to consist of endless meetings with no tangible results. They complained that when they were asked to inform village women about a meeting, the village men wanted to know why they were not being invited. Reports also started coming in of some of the village women being beaten by their husbands when they returned empty-handed from a women's meeting. Due to the prolonged drought, everyone was desperate for even daily wage work. Some men had been permitting their wives to attend the women's meetings in the expectation that the organisation would provide some employment to them. When they returned empty-handed, the men's frustration found release in wife-beating.

They also started realising that although women were the greatest sufferers of environmental degradation and could take the lead in remedial action, the socio-cultural context made them dependent on men's support for taking any initiative. Almost all the private land is owned by men. Very few women are strong enough to assert themselves in deciding how this land should be used. Even some of the women staff, despite their conviction and excitement about the need for better management of their lands, felt unable to see their ideas through unless their husbands agreed.

Similarly, the female staff of PEDO needed the male staff's cooperation and support while working in villages. If the male staff were not convinced about the validity of what the women staff were trying to do, the women had to face yet another obstacle in their already difficult task.

All this led to the decision to involve men in the process of change. The PEDO's objective was not to create yet another divide between men and women. Instead, the aim was to strengthen women's capabilities to deal with their problems and fight their oppression both individually and collectively. If men were made participants in the process of working towards reducing the burden of their womenfolk, they might cooperate in finding solutions. But if, instead, they felt defensive and threatened, it was likely to result in increased oppression of women. Unless accompanied by a powerful social movement, individual women cannot suddenly challenge men's traditional supremacy in decision-making related to land.

Working with joint groups of men and women on common lands

Taking these developments into account, it was decided to modify the approach and involve men in the programme. In order to reduce men's suspicions and hostility to separate meetings, it was decided that joint meetings of men and women be called in every village. The need for having separate meetings with women would then be explained.

Equal emphasis was given to promoting the development of both private and common wastelands. With experience, however, priority was given to common lands. Initially, the staff felt that it would be easier to motivate people to work on their private lands compared to developing a common resource. However, within a year of trying to work with hundreds of individuals on their landholdings scattered over a vast area and dealing with their suspicions and reluctance to replant on land they had cleared with much effort, the staff started feeling that it would be both easier and more desirable to work on common lands. Questions of equity were also involved. While private wasteland development would only benefit individual owners, development of common lands would assure benefits to all members of the community. This necessitated developing the staff's skills to work with groups and resolving conflicts within groups. Periodic follow-up and review workshops with the staff have been held for this purpose.

It was decided that all rightholding families were to be involved in the group. To make every family feel equally responsible for protection, each family was to be assured a right to an equal share of the produce. Each group had to make a prior commitment to protect the plantation before PEDO was to get involved. Day-to-day management decisions had to be taken by a Managing Committee (MC) elected by the whole group. There had to be at least an equal representation of women on the MC which was to meet regularly every month. Regular meetings of the entire group were also to be held and every effort made to encourage women's participation.

In a training programme in September 1988 it was found that, although women were the worst sufferers of environmental degradation, their lack of land ownership combined with traditional male domination effectively inhibited them from playing a leading role in plantation-related decision making, except in a few villages. Joint meetings of men and women, while successful in reducing male hostility and securing their cooperation, tended to diminish free expression and articulation by women. The need to create a separate forum for women in which they could express their views and concerns, uninhibited by the presence of men, was strongly felt.

At the same time, the 1988 monsoon was exceptionally good, after four to five years of poor rains. This, in itself, had created a new situation. Instead of problems of fodder and water, the women were more preoccupied with getting credit for buying grain seeds for sowing. During this training programme, women talked about the extreme exploitation by local money-lenders. They responded

enthusiastically to the idea of starting women's savings groups as a long-term measure for getting out of the clutches of money-lenders.

The growth and development of about 30 women's savings groups has been a remarkable phenomenon and demands for assistance in forming new groups are continuing to come in. Surprisingly, there has been no male hostility to this activity being undertaken exclusively by women. The monthly meetings of these groups have also provided the much needed forum for women to get together regularly for a non-threatening, non-controversial purpose. While some of the groups have kept themselves confined to the savings activity, many have taken up several other issues of concern to women. The existence of active women's savings groups in villages, where plantations on common lands have been taken up, has generally facilitated more active participation by local women in their management. In the process, group members have gained confidence in articulating their problems, acting on them and being able to talk even in gatherings where men are present.

A three-day get-together of more than 400 women belonging to various savings and plantation groups was held in May 1990. During the meeting, it became evident that local women's groups had become dynamic entities and a force to reckon with. On several occasions, women group members have demonstrated greater unity and courage than the men. In many villages, women's groups now command a respect from other villagers.

Ditkon Ka Vela

The common land plantation in this village was initiated in 1987 and was the first to be taken up by PEDO at the request of village women. Six women from the village had participated in the women's *mela* in April 1987.

Plantation has been done on 14 acres of *chernot* land on which all villagers have traditional grazing rights. Due to totally unregulated exploitation, nothing except a few stunted trees were left on the land. A family from the adjoining village had started encroaching on the land which seems to have first motivated the villagers to do something to save their common resource. In 1986, the *gram Panchayats* built a stone boundary wall around the land and began planting with government drought relief funds. None of the plants survived, the boundary wall collapsed at several points and the villagers did not receive full payment for the work they had done on the land. It was to replant on this land that the women approached PEDO in April 1987.

Women's role in the process

It is in the above context that women's role in the common land plantation of this village needs to be traced. Some of the landmarks in the process have been:

- in the initial meetings with PEDO's staff, more women than men took part. Although everyone had immediate interest in getting daily wage employment through the project, women were more willing to discuss long-term protection and management questions following discussions during the mela
- when PEDO insisted on the condition that all the families give an advance undertaking to protect the plantation after the planting was over, the men, were unwilling to accept this. The women

agreed and gave an undertaking to contribute a small amount every month to pay for a watchperson's salary for protection

- in the initial Managing Committee (MC) elected by the villagers in July 1987, out of 17 members as many as 10 were women. However, during the following year, there were many objections to women being made members of the MC. During a meeting in June 1991,the number of members was reduced to nine out of which six are women and three are men
- there was always a much higher percentage of women than men doing the earthwork and planting. Women's productivity was always higher than that of men. When it was found that the cost of the physical work was too high due to payment being made on the basis of daily wages instead of output, women willingly accepted self-monitoring of output to ensure the minimum productivity required
- it was the women who took a stand against the family members of local leaders receiving disproportionate employment on the plantation. As a result, the principle of employing only one person from each family was adopted. This has been used in all subsequent plantations
- in February 1988, seven goats belonging to three villagers grazed on many of the plants. On the insistence of the women, all three were made to pay a fine of a total of Rs 130 as per the rules formulated by the MC. This sent the signal that such violations would not be tolerated in the future. Because of this, protection has been excellent since then with a plant survival of 90 to 95 per cent. Today, the originally barren land looks like a healthy young forest with trees of some species 10 to 15 feet tall and a good grass cover on the ground
- in 1987, the first crop of naturally regenerated grass was harvested from the plantation by voluntary labour. One person from each family came to cut it on a day fixed by the group's MC. Most of those who came to harvest the grass were women. During 1988, the increased grass yield was harvested with voluntary labour and sold for Rs 800 which was deposited in the common fund. There was no demand for grass in the village due to heavy cattle mortality during the drought years
- in November 1988, a women's savings group was started in the village. Sixteen women became members and saved a total of Rs 1, 299 within one year. Regular monthly meetings of this group have further strengthened women's participation in the management of the common land plantation. The women's group has also initiated action against the malpractices of LAMPS (Large Area Multipurpose Societies set up by the government for direct marketing of minor forest produce in the tribal areas) and local money lenders
- the women have taken a clear decision that when fuelwood becomes available from the plantation, it will not be sold to outsiders as women have to labour hard to collect it from distant forests.

Initially, whenever an important decision had to be taken during a village meeting, the men would move aside to discuss the matter among themselves and return to the gathering to announce their decision. During the field visit for this case study, in a similar situation, the women also went aside for a similar discussion! In any case, 11 women attended the meeting compared to only nine men. This is akin to the beginning of a new cultural tradition. When asked, the women said that prior to the women's *mela* in April 1987, women had never participated in village decisions. Only the men took these decisions during their meetings. They are happy to be better informed and consider their involvement in village affairs to be a positive development.

Several women of Ditkon Ka Vela have been exposed to the activities of other women's groups through study tours, inter-village visits, *mela*s and training programmes. The benefit they have

derived from this is reflected in their increased level of confidence and articulation and in their growing group identity.

Unresolved problems

The village group suffers from the following, yet unresolved, problems:

- a sub-group of about 15 families has not been participating much in the village group
- the common fund of the group has no funds left for paying *chowkidar* (guard) and little monetary return can be expected from the plantation in the near future.

There is considerable variation in women's participation in other common land plantation groups with which PEDO is working. First, it is useful to list the factors common to all the groups:

- at least 75 per cent (in some cases 90 to 100 per cent) of the labour for earth work and planting is provided by women
- where grass has already been harvested, whether through voluntary labour or on the basis of payment, most of the grass cutting has been done by women
- in the future, when firewood starts becoming available for harvesting, even this is likely to be cut primarily by women
- where the initiative for undertaking the plantation was taken by women (eg, at Ditkon Ka Vela, Bortalav, Baletighati, and Bhimsor), they have continued to play a leadership role in subsequent management and protection related decisions. They have often made commitments (such as making contribution to the common fund for protection), which men were unwilling to make, and have honoured them
- women have shown greater initiative in villages where scarcity of firewood and fodder is acute as it is women who suffer hardship in collecting these from distant places.

Beyond this, however, there has been nothing 'automatic' in the extent of women's active participation in the development of village common lands, no matter how acute their hardship of searching for fuel and fodder. Even in the villages where women took the initiative and played a leadership role, this was preceded by enabling them to interact with other women's groups through *melas,* visits, training programmes and awareness generation camps. Continuous interaction with PEDO's women staff has been another crucial input for facilitating women's genuine participation.

Where either the opportunities for exposure or inputs by the female staff have been weak or limited, women's participation in decision making has also remained weak. The tradition of women being assigned a passive role in decision making in non-domestic matters and their isolation are just too powerful for women to break through on their own. In most cases, external catalysts are needed to jolt them out of their passivity and isolation.

But, as evident from women's limited participation in villages such as Wagbole, periodic inputs and exposures are also not enough. What is needed is to help women create their own forum in the villages where they can meet and interact regularly to build up their confidence and develop the capability to work collectively as a group. Initial efforts to create such groups around wasteland development brought forth men's suspicions and hostility as it was a threatening land based activity. Modifying this approach to work with combined groups of men and women proved a set back to women's participation. The majority of women (there are always a few exceptions) feel too inhibited to participate equally in groups where men are also present.

Impact on women

This much needed women's forum has finally emerged in the form of Women's Savings Groups. For the first time, women have been able to find a socially accepted space where they can get together regularly and have access to information on a sustained basis. Given the opportunity to participate in an uninhibited manner in exclusive women's meetings, they are increasingly gaining the confidence to articulate their views even in meetings where men are present. Indirectly, this has increased their genuine participation in the management-related decisions of their common lands. In fact, the pattern which is emerging is that once women are mobilised to act on a particular problem, they leave the men trailing behind in initiative and commitment, sometimes having to drag the men along. This was evident in a few villages when the women decided to take collective action against corrupt LAMPS officials and the exploitative practices of moneylenders. The men were too scared of the repercussions of confronting their exploiters and the women often had to drag their men along as the loans were in the names of men! Another pattern which is emerging is that women tend to be less manipulative in their actions. They are more prone to honouring the commitments they make.

Legal Rights to the Land

Most of the land which the groups have developed is either village *chernot* land or revenue wasteland. In each case, a distinct group of villagers, usually the residents of a hamlet, claim traditional grazing rights which are recognised by other villagers and the *gram Panchayat.* All the groups reached an agreement with the authorities saying that the *Panchayat* has no objection to the group's planting on the land and all rights to the subsequent produce will belong to the group and not to the *Panchayat.*

However, there has been some concern within PEDO about the groups' legal rights to the produce. At present, no one is particularly interested as there is little value on the land. But once there is a good stock of valuable trees, what will happen? Will the Forest Department be able to prevent the members from harvesting the produce under some provisions of the Indian Forest Act? Will the *Panchayat* be able to stake a claim to the produce, as the land is supposed to be under the *Panchayat*'s jurisdiction? Most of the *gram Panchayats* cover several villages and if this happens, group members who have protected the plantations with so much effort will get a miniscule share of the returns.

Lessons learnt

Some of the contributing factors to the success (or failure, at times) of the above activities are as follows.

- women were first organised around common problems, which empowered them to question their gender roles and find ways of addressing their needs
- the programme started not as an exclusive natural resource management or forestry programme, but as something more holistic, with a diverse range of inputs, aimed at empowering women's organisations.
- direct action was taken up exclusively with women on land resource management, without sensitivity to gender relations and the gender division in the control over resources. This led to conflicts within the local community

- while the formation of mixed groups eliminated male suspicion and hostility towards women's groups, women's real participation was prevented by their subordinate position
- forming exclusive groups with women around a seemingly non-threatening activity such as savings, created a legitimate space for women to meet and discuss their problems. Only upon initial acceptance of these groups was land management taken up
- women's confidence-building was facilitated through organising visits to other groups, arranging for awareness creation and training camps and maximising opportunities for interacting with other women who had been through empowering experiences.

Questions for discussion

The following questions could form a basis for discussion on some of the key issues emerging from this case:

1. What were the main constraints to the initial organisational efforts with women?
2. In mixed groups, what were the constraints to women's effective participation and why?
3. How were the above constraints addressed?
4. What are the implications of working with women on common land as opposed to private land?
5. What were women's priorities in the project area and how did these differ from men's?
6. What were the reasons for differences across villages, in the initiatives taken by women and their roles?

3 Agroforestry & home gardens in Sri Lanka

Summary: Through training schemes initiated by a government-sponsored rural development project, young women from the highland region of Nuwara Eliya District learnt how to sustainably manage their home gardens. They were made aware of the positive benefits the use of these techniques could bring, not only to themselves and their families, but to the local community as a whole. They also learnt to appreciate the valuable contribution they could make in helping to preserve the fragile ecological balance of their local environment.

Background

In the upper part of the Kotmale valley, located in the Nuwara Eliya district of the Central Province of Sri Lanka, lies the village of Maathagama, where 20-year-old Kanthi lives with her mother, father and sister. She has the Ordinary Level School Certificate. Her father is a retired government officer who draws a small pension and her mother, Wimalawathie, is the keeper and manager of the 0.3 hectare homestead plot. Kanthi's cousin Deepthi lives in the adjoining village and comes from a similar background.

The area

The Nuwara Eliya District in the Central Province of Sri Lanka covers an area of approximately 170, 450 hectares, varying in altitude from 300m to 2, 500m on the highest peaks. The sources of many of the major rivers of Sri Lanka are in this locality. The project area is located in the Kotmale Division of this District, which is characterised by high mountains and narrow valleys. The area is within the wet upland agro-ecological zone and receives a rainfall of approximately 2, 500mm per year. The area receives rain throughout the year but the majority of it during the south-west monsoon, between May and July. Whereas earlier this area was a land of many mountains springs, the clearing of forest for plantations, and land degradation on the steep slopes has resulted in heavy soil erosion and drying up of many springs and depleting water resources.

The inundation of the major valley as part of the large Mahaweli Ganga Development Project has had an unsettling effect on the physical features, climate, ecology and the human population. Fertile land has been lost and hundreds of families who lived in the lush valley of the Kotmale Oya for centuries have been re-settled in different places upsetting kinship and social patterns. Landslides and slips, due to road construction and the introduction of an unaccustomed large body of water, were frequent during construction. This has aggravated an already sensitive land hunger and land-use problem.

The dominant natural vegetation of the area was Wet Montane forest which once clothed the hills but is now reduced to less than 10 per cent of its original area, and wet grassland, now seen in small pockets. There is also degraded forest and scrubland.

All agriculture is rain-fed and consists of large, state-owned, tea plantations on the steep slopes of the mountains. Their establishment was one of the main causes of soil erosion and water depletion. Some plantations are well managed but others are badly degraded with little top soil. Mixed gardens of approximately one hectare or less per household are found on the slopes of the valleys. These are

owned by the traditional farmers of the district who have farmed here for generations. The small plots of terraced rice fields owned by these farmers are found on the hill slopes which are watered by the mountain streams.

The mixed home gardens of these central highland villages, often described as the 'Kandyan Forest Gardens', are a type of agriculture that imitates the energy cycle and the tiered canopy structure of the forest. The tall dominant trees, the mid storey perennials, the lower level of shrubs and grasses, the creepers and climbers and the yams underground are cultivated to bring the maximum products while conserving soil fertility, moisture and biodiversity. Birds, bees and insects, fungi and bacteria contribute to this system, which requires no chemical fertilisers and pesticides. Ecologically one of the most balanced agricultural systems in the world, the homegardens have contributed enormously towards soil and biodiversity conservation after the clearing of the highlands for tea plantations. Easily managed by women, they represent centuries of knowledge of the importance of forests. Apart from the forests and the tea plantations, these gardens are the only areas in Kotmale that do not show soil erosion and land degradation.

The wealth of Kotmale came from the fertile valley. The rice fields and the ecologically balanced mixed home gardens yielded all the farmers' needs – spices, coffee, fruits, vegetables and timber trees – as well as income from their sale. But with inflation this income has become insufficient for the whole family. Most of the rural population are farming families with small (0.5 hectares) parcels of wet paddy land and about the same size of (high land) home gardens.

With the inundation of the valley, many of the families were resettled on tea land, some of it degraded. Agriculture is also severely threatened by wild pigs which attack all agricultural plots far away from the homestead.

Small tea plantations of less than one hectare are owned by the resettled farmers and by farmers who grow tea on their small holdings as a cash crop. These tea plots are often poorly managed due to degraded land, ignorance of cultivation practices or lack of finance for the necessary inputs of fertiliser and soil conservation. While they are a source of income to the owners, they are not sustainable in the long term.

Women in the rural farming community

The women of rural farming communities in these areas have several spheres of activity which include responsibility for all household chores, maintaining and managing the homestead (which includes homegardens), tending animals, other employment, and voluntary work.

There is no gender discrimination in this community regarding education. However, gender roles within the home place impose a greater burden on the girl child who wishes to be educated or take up employment, as she has more household obligations than the boys.

Women as natural resource managers

Wimalawathie's garden is the 'forest garden' type and contains a wide variety of trees. Kitul (*Caryota urens*) is a palm whose flower is tapped for its sap. Arecanut (*Areca catechou*) is a slender tall palm, whose nuts are used for the traditional 'chew' of betel leaves nut and lime. Nuts are gathered and may be further processed. Jak (*Artocarpus heterophylla*) is important for the fruit which provides a substantial meal of starch when fully mature. When young, it is a tasty vegetable,

and when ripe, a delicious sweet fruit. It substitutes for rice and is the life saver of the very poor as the fruit is never sold, but given freely to a neighbour in need. Although a very valuable timber, the cutting down of this tree even in the home garden can only be done with a permit obtained from the authorities on account of its value as a source of food. Breadfruit (*Artocarpus nobilis*), is also a source of starchy food and is eaten as a vegetable. Sapu (*Michelia champaca*) a fast growing timber tree, could be harvested for timber after 25 years of growth.

Coffee, cloves, citrus, and banana are the chief plants of the mid-storey and cardamom, ginger and turmeric form the lowest level. Pepper and betel are vines which creep up the tall trees, and are among the chief income earners. The fruit must be harvested on time, dried and processed if necessary and marketed. Katurumrunga (*sesbania grandiflora*) and murunga (*moringa oleirera*) used as vegetables are also part of the mid-storey.

Many yams (*Colocasia esculenta*) cassava, and herbs such as cotukola (*hydrocotyla javanica*), mukunuwanna (*alternanthera sesilis*) are grown for home consumption and are at the lowest level of this forest garden.

Gender roles in the home garden

Wimalawathie is the resource manager of the home but decisions on what to grow are taken in varying degrees by all the family. The planting of timber trees and their sale or utilisation is a matter for the men. Wimalwathie must see that there are subsidiary food plants for family consumption and also products for sale.

In case of the kitul palm for example, climbing the palm to get at the flower and tapping the sap is skilled work and is done by men. It may be used fermented as an alcoholic drink or be boiled to be used as treacle or crystallised to form a jaggery which is a substitute for refined sugar. Women process the sap into treacle and jaggery. This is exclusively women's work.

Coffee, cloves and pepper must all be picked, dried and further processed by the women. Wimalawathie must be careful in the processing of all products in order to get an optimum price for them.

The marketing of produce also falls to Wimalawathie. She uses the money to provide for household needs. The garden must yield the income for purchasing the needs of the family as there are no other wages coming in apart from her husband's pension. Rice farming merely provides food until the next harvest.

It is also her responsibility to see that there is adequate nourishment for her family and for this she depends on the home garden for leaves, fruit, yams, vegetables. So she must decide wisely what to plant in the garden to serve this need.

Minor ailments are always treated with herbal potions which are grown in the home garden since the forest which has most medicines is far away. This knowledge is passed down to her children and so down the generations.

Impact of home garden activities

For women, particularly those who do not go out to work, the home garden is a place of great importance. Not only does it provide for the needs of the family, but it gives women status in

providing for the household. The home garden therefore contributes to their economic and social emancipation. Money can be saved after household needs are met. Wimalawathie can give something to her favourite charity, have the bus fare necessary to visit relatives or use the money for any other purpose.

The IRDP project for forestry

The young women in these communities have little interest in involving themselves in the management of home gardens or other traditional activities related to natural resource management. They are instead keen to develop new skills for employment. In this context, the Integrated Rural Development Project (IRDP) was introduced to address women's need for skill acquisition and at the same time increase their role in natural resource management.

The project is a government sponsored, district-wide integrated programme for rural development. In the Nuwara Eliya district, the IRDP Land Use Upgrading Programme has a number of facets *viz* development of agro forestry through development of plant nurseries, upgrading of home gardens and degraded land through agroforestry, sloping agricultural land technology for soil conservation, and improvement of monoculture plantations and degraded land.

Nursery raising activities are carried out exclusively by women, whereas natural resource management and improvement in home gardens is done through a partnership of men and women.

The short term goals of the project were:

- to provide sufficient trees for the agroforestry project
- to help young unemployed women acquire new skills and income
- to enrich the mixed home gardens by introducing improved varieties of trees to increase productivity
- to increase the role of women in the management of natural resources.

Mobilisation for the nursery project

Village meetings were held to which all the families were invited and the scope of the project was explained to them. Volunteers were invited from the young female population. It was explained that they would be given three weeks training in techniques of raising seedlings, bud grafting and other agricultural techniques at the government farm school. On completion of the training they would be assisted with planting material, polythene bags, and fertiliser. Their product would be purchased by IRDP after deducting the cost of the initial inputs.

As word spread about the prospect of skill acquisition and training, the number of girls attending the meetings increased. Kanthi and Deepthi were among the first to go for training. They were taught the basics of soil conservation and fertility, the importance of drainage, contour planting etc. It was during these training sessions that they realised that in maintaining home gardens they were contributing to the conservation of natural resources: they also realised the worth of the knowledge which they had gained from their mothers. They received training in bud grafting, other forms of vegetative reproduction, methods of setting up nurseries and caring for plants, composting vegetable manure, and so on.

Constraints faced by the project

During the process of mobilisation, questions were asked about the rationale for confining the participants to young women and not men. It was explained that such an activity, which does not necessitate going away from home, would be more suitable for young women. On the other hand, tree planting in different areas would be more suitable for men. For the young women, leaving home for the three-week training programme also created some concern; therefore only those who were able to get parental consent were able to participate.

Impact of project activities

Kanthi has raised over 1, 000 budded plants, of which 800 have been already distributed to farmers. A further 250 are now ready for distribution and 250 more have been grafted on to the root stock and will be ready for planting in a few months. Water is not easily accessible on these hill slopes but fortunately for Kanthi the new road which runs just above her homestead is supplied with a roadside water tap. This supplies the needs of her small nursery.

Kanthi has received Rs 6.00 per plant after deductions. From her first batch she earned Rs. 4, 800. She would like to expand her nursery to get a variety of plants and make it financially successful. Even though she has the necessary training there still exist many constraints. For instance, Kanthi can't find sufficient shade-free space for expansion. A quicker disposal of plants that are ready would mean a quicker turnover and provide money to obtain the fresh inputs necessary for the next batch.

Deepthi has a nursery consisting of about 500 citrus plants of both root stock and budded plants. She has already supplied 250 plants to farmers through IRDP to improve their home garden stock or for the agro forestry programme of farmers woodlots. Apart from the citrus she is also experimenting with horticulture on her own. Deepthi has not only received training in Kundasale but has also attended a number of refresher courses and a training programme for livestock care on her own initiative. She is an orphan and lives with relatives who have their own priorities on the 0.3 hectares of land which is their homestead, a part of which is planted with tea. Finding employment by which she can support herself and which she can combine with her nursery activities, is one of her priorities.

At present, both Kanthi and Deepthi are dependent on IRDP to supply all inputs and to market the plants and make payment. They must move on to the next stage of independence from IRDP by using their initiative to get their own stock.

Kanthi, Deepthi and many other young women in the area now appreciate the importance of home gardens, not merely in terms of financial return, but in maintaining the ecological balance of the area.

Lessons learnt

Some of the following lessons have been learnt from the experiences of this project:

- the importance of training in skills which are relevant to the participants' everyday life and which can be practiced, particularly by young girls in their cultural context. These skills can be passed on to others, and be used by separate organisations in other parts of the country

- this programme was not intentionally designed to improve social and political development. And yet the process of taking part in this activity, in having to develop skills, produce results, handle their own money and being part of a district-wide programme, has had a tremendous influence on the confidence of the girls who were earlier frustrated in their search for jobs and their inability to put their education to use
- so far there has been a certain lack of dynamism in the approach to further development. Initiatives to improve the project would have been assisted by women forming themselves into a society or co-operative.

Questions for discussions

The following questions could form a basis for discussing some of the key issues emerging from this case:

1. What were the main objectives that were addressed by the project activities?
2. What was the wider applicability of these objectives?
3. What were the gender specific constraints encountered and how were they addressed?
4. Did the project use any special knowledge that women have and how were project activities affected by this?
5. What were the priorities of women in the project area and how were these addressed by the project?
6. What specific impact did the project activities have on the short and long term needs and status of women?

4 Community forestry, India

Summary: In response to a growing ecological crisis, a local agency set up 'tree planting camps', which, with the aid of volunteers and local people, have helped to alert villagers to the importance of aforestation. Local women have proved to be much more interested (as well as more successful!) than men in the planting of the trees, their aftercare and indeed the initial choice of species to be planted. The project has not only stimulated a long-term interest in the conservation of their local environment; women have gained the confidence to assert themselves over other important issues affecting their day-to-day lives; common lands have been brought back under control of the village community; and food and fuel shortages have to a large extent been abated.

The area

Uttarkhand is in the northern part of Uttar Pradesh, India's third largest and most populous state. It consists of high Himalayan mountains and is made up of eight hill districts covering an area of 51, 122kms, with a population of 4.8 million people. Uttarkhand is one of the poorest regions in the state and experiences high rates of out-migration.There are vast stretches of barren common lands, which were once under forests but are now unsuitable for agriculture.

Because of this degradation, despite the availability of land, the grazing pressure on Chamoli's forest lands is extremely high. This prevents regeneration of vegetation and leaves the common lands barren. Agriculture is the predominant occupation of Chamoli's people, even though the area under cultivation is small – only 13.2 per cent of the land is sown in the district compared to the state average of 59.9 per cent. Land suitable for agriculture is not only less than in the rest of the state, but is relatively less fertile. The soil is shallow and of poor texture, except in the valleys. With a predominance of cereal crops, agricultural cropping is of a subsistence nature.

Non-agricultural sources of income are few. The manufacturing sector contributes 4.5 per cent to total income and accounts for 3.7 per cent of total employment in all eight districts of Uttarkhand.

Degradation of the environment and the consequential soil erosion are further reducing the fertility of the land and the already meagre returns. Men migrate to the plains in search of jobs and cash, leaving behind the elderly, the women and their children to tend the soil. Women are the backbone of the villages' subsistence economy. In comparison with the state average of 6 per cent, 43.5 per cent of all women in Chamoli are classified as workers, and 95 per cent of women workers are cultivators who do all agricultural work except ploughing.

With the degradation of the environment, the task of the women became more and more difficult. They had to walk at least 10km, three out of every four days for an average of seven hours per day to bring back about 25kg of wood per headload. In addition to this, an extraordinary amount of time was spent in the fields. Due to male migration the male-female ratio in the villages was 1:1.4 for the working age group of 15 to 50 years. During the peak agricultural season, women worked seven hours a day in cultivation and animal husbandry. The amount of energy expended as human labour for fuel and fodder collection averaged two and a half times the amount of human energy spent on cultivation.

People's movement against deforestation: the background

The forest bureaucracy in Uttar Pradesh consistently blamed expanding agriculture and the fuel collection activities of local people and their grazing animals for the extensive deforestation in the region. The local people themselves saw the Forest Department as the plunderer of the region's forest wealth, as large areas of forests in the region were cut down as part of their work plans. The Forest Department was therefore seen as an agency that denied local people access to their neighbouring forests but which readily allocated these same forests to the powerful and wealthy outsiders from the plains. It was in this context that the world-famous Chipko Movement against deforestation was born in the remote hill town of Gopeshwar in Chamoli district.

Another dramatic movement took place in Dungari-Paitoli village where the battle was not only bitter, but which set wife against the husband and mother against son. The Government Horticulture Department negotiated with the male-dominated *Panchayat* (village council) for the acquisition of a nearby community forest in order to set up a potato seed farm. The men were led to believe that the village would in turn receive a motorable road, electricity and a health centre, and that the primary school would be upgraded to a high school. When the women learnt that the forest had been given away by the *Panchayat,* they protested strongly. The destruction of the forest for them would have meant walking at least another 5km every day to fetch fuelwood and fodder. Emboldened by the support they received from the Chipko activists, the women refused to allow the destruction of the forest. After a bitter struggle in which the women were strongly opposed by the men and threatened with arrest by the district administration, the women finally won and the district administration decided not to fell the forest.

The project

In Chamoli, the Dasholi Gram Swarajya Mandal (DGSM), the local agency that had pioneered the Chipko Movement, started to promote village-level industries based on the use of local raw materials. It had a small cottage unit producing turpentine from pine resin, and a saw mill.

DGSM workers began to plant trees in degraded areas with the help of concerned students and held a month-long tree-planting camp above the town of Joshimath. This camp drew the attention of the civic authorities to the increasing deforestation being caused by the military encampment above the town. As a result of their work, the Uttar Pradesh Government set up a committee to investigate the ecological problems around the town. But there was limited involvement of the local population and the survival rates of the trees was poor.

Around that time, there was a landslide near Pakhi village which highlighted for local villagers the consequences of the growing ecological crises. A camp was set up to organise tree planting to help stabilise the landslide. This led to a dialogue with the local villagers, and their subsequent involvement in tree planting. Soon, women also began to participate, and simultaneously the survival rate of the trees planted began to rise. As word of this effort spread, DGSM's contacts began to grow with other villages. The camps became more than tree-planting camps, as villagers began to discuss their other problems of health, roads and the absence of various services. From Pakhi, the afforestation effort spread to Dwing village and then to Bemru village until the DGSM was working with some 250 villages.

DGSM concentrated work in a few micro-catchments of the Alaknanda watershed which had witnessed the worst impact of floods. This watershed, in the upper reaches of the Himalayas, is

extremely degraded. Every year tonnes of silt from these mountains flows down into the river below, burying fields and houses.

The mobilisation process

The first meeting held with local villagers' participation took place in Bemru and was attended only by men, who did not exhibit much enthusiasm for planting trees. Women soon started coming hesitantly to village meetings. DGSM workers continued to visit neighbouring villagers to convince people of the need to plant trees around their villages, and to slowly build contacts with village elders, women and young men. In many instances it involved repeated visits and much persuasion to interest people in planting trees.

The DGSM's afforestation work gradually spread to other villages. More than 60 village camps were organised in five years and at least 5, 000 villagers participated, the majority women.

DGSM's strategy for involving people in afforestation is multi-pronged. The first step is to spread awareness about the importance and benefits of afforestation. Once people realise the value of trees and evolve a system for community management of the plantation, DGSM then supports the villagers in planting trees on their degraded lands.

The main tool that DGSM uses for education and involvement of the local people is what it calls 'eco-development camps'. On the face of it, these camps are simple two to five-day meetings of some 50 to 300 villagers, students, scientists and social workers who come to undertake community tree plantation work. Really, the camps are the first step to helping local communities gain enough confidence to take control of their lives and of their natural resources. For DGSM, tree planting is a symbol of the integrated development of the environment and of the people dependent on it.

Nearly 75 per cent of participants in the camps are women. Women from many neighbouring villages come to attend these camps, leaving their families and husbands back home. The programme of the camps is divided between discussions on local concerns, planning for the future of the village, and physical work. All participants join to dig pits, plant trees and at times carry stones to build walls. In the evening, everyone participates in songs and prayers.

While creating people's organisations to deal with the task of environmental enrichment, DGSM clearly recognises the role of women in all development work in this region. DGSM has therefore made special efforts to develop women's organisations, known as *Mahila Mangal Dals.* Every village has a Dal which includes women from each family. These organisations have no written constitution but effectively take on the work of afforestation. The members of the local *Mahila Mangal Dal* are the main participants in the camps and often its organisers. Women chair the meetings and put forward their proposals for the development of their village.

Opportunities and constraints

The camps organised by DGSM helped the villagers to gain confidence in themselves, to assert themselves against external interference, and to explore ways within their control that could help to improve their lives. The camps also encouraged the people to set their own priorities.

Instead of building walls around the afforested areas, villagers preferred to build walls around their agricultural fields because of heavy crop losses from marauding wild animals. DGSM was able to

convince a government agency to use funds available to it under a food-for-work programme to finance building these walls. DGSM gained enormously in credibility with the villagers as it was seen as an organisation responding to their priorities. The walls did not only help to increase agricultural output, but the entire experience led to one significant development. Space was left between the fields and the walls, and trees were planted along this corridor. Long before the trees started giving any returns, grass started growing profusely in the corridors because animals were no longer grazing there. The women were very excited to see all this grass growing next to their fields, reducing the drudgery involved in collecting and carrying the grass from distant forests. This made women very interested in afforestation.

The increased involvement of women highlighted the fact that women were much more interested in afforestation than men. Despite their heavy work burden, women came forward to put in much more work than men in planting and taking care of trees by manuring them and if necessary watering them. Secondly, the initial camps brought out the differences between men and women over the choice of tree species to be planted. While men were more interested in species that would help them meet cash needs, women wanted trees for household needs such as fuel, fodder and fruit. The species to be planted were discussed at the camps and the wishes of the women were given priority. The species that were planted included walnut, soapnut, Himalayan hazel, green oak, mulberry, orange, lemon and several local fodder species.

Saplings are supplied mostly from DGSM's own nurseries, free of charge, to the *Mahila Mangal Dals*.

The *Mahila Mangal Dals* look after the plantations. They regularly water, weed and give manure to the plants. Once or twice every month – usually on the eleventh day of the Hindu month, which is considered auspicious for tending and watering plants – the women gather to work on the plantations.

Land for plantation

The land used for plantation work is chosen by the *Mahila Mangal Dals* and is normally community land, that is, land under the control of the *Panchayats*. Occasionally, even civil land under the Revenue Department, forest land under the Forest Department and, in one case, private land has been chosen.

Unlike other parts of the country where permission is first sought by the agency to plant trees on government lands – which can take many years – the women in Chamoli, backed by DGSM, take up afforestation and management of the land without hindrance by state authority and regulation.

These 'common lands', of which there are vast plots around the villages, were traditionally managed by local communities, and are essential to meeting the biomass needs of the village.

In the case of Dwing village, the land used for afforestation is under the control of the Sericulture Department of the state government. Civil land, under the control of the district magistrate, had been given to this Department and then closed to the villagers, exacerbating their shortage of fuel and fodder. The Sericulture Department then used a mere tenth of the land, making the villagers extremely angry. The *Mahila Mangal Dal*, supported by DGSM planted between 4, 000 and 5, 000 trees in the area.

If the land chosen is private land, a contract is drawn up specifying that the land and the accruing benefits are for the entire community. In Langi village, the land chosen by the Dal organisation benefited 19 families out of the 21 in the village. The work was started only when the village agreed that all families would have an equal share in the produce from the land.

Community control over distribution

In each village, the *Mahila Mangal Dal* lay down new community control systems for the use of the biomass from planted areas. Equity and control are basic preconditions in the work of the Chipko women, and it is the equal distribution of benefits that has made community afforestation a success. Women have evolved simple ways of sharing the produce from the common lands. While trees take many years to bear fruit, grasses grow quickly and provide valuable fodder. In order to share this fodder equally, particular days were agreed by the *Dal* for one woman from each household to collect grass from the protected area. As the trees are still young, equitable distribution of their produce has yet to be worked out. But in this way, women have already started asserting their right to control the piece of common land which they have jointly enriched and cared for.

In some cases, this assertion by the women's groups has led to conflicts with *Panchayat* leaders over trees planted on panchayat lands. In Bached village there was a clash between the *Mahila Mangal Dal* and the head of the *Panchayat* over the rights to the grass growing on the *Panchayat* land protected by the *Dal.* The police became involved and the women took the matter to the district authorities forcing the *Panchayat* to withdraw the case. The *Panchayat* thus had to informally accept the *Dal*'s rights over the afforested *Panchayat* land with regard to distribution of produce.

Impact of project activities

The afforestation work taken up by the Chipko Movement has helped the local communities in many ways. Fuel and fodder shortages have greatly eased and will reduce further as the plantations grow and more land is brought under protection.

An interesting aspect of the Chipko plantations is their high survival rates which in many places are as high as 90 per cent. Walls were essential to protect the seedlings against the high grazing intensity of the area. They were accepted because they protected the interests of the people.

The biggest effect of this people's movement for afforestation is that it has given the women a voice which has started a social transformation in the fabric of Garhwal society. Getting together to plant trees was just the beginning and led to them later getting together to demand drinking water and other basic necessities. In addition, the groups' militancy over the control of forests is growing, whether these be government forests or *Panchayat* forests.

Mahila Mangal Dals are taking control of the existing forest lands near their village, demanding that the local people be given first right of use to the forests in their vicinity. They want forests to be managed not as short-term revenue earners, but on a sustainable basis for meeting basic village needs and for village-based industrial development. In Khalla Mandal, near the town of Gopeshwar, the Forest Corporation was given the contract to cut 333 trees for firewood supply for the towns of Gopeshwar and Chamoli. Only 16 were cut when the local women stopped further felling.

In Gopeshwar town itself, the *Mahila Mangal Dal* has a tough time protecting its forests. These forests, literally the only remaining green space for miles around, perch precariously near the

growing town. After the formation of Gopeshwar as a township, local agricultural land was taken over by the Government to develop the district headquarters. With deforestation, the problem of fodder for cattle has become acute. Milk must be sold to buy essential consumer items, lowering the nutritional intake of the families. The forest is protected by the women and any local person caught entering the forest is fined by the *Mahila Mangal Dal*. Every day two women take time off from their busy schedules to patrol this forest. The other vital reason for protecting this grove is that it is the only space where women can go for their adulations without any inhibitions.

In Bached village, the women took over the formal *Van Panchayat*, the village body which controls the village forest land. In village elections, women alleged that the former *sarpanch* (village head) had been illegally cutting the forests, and demanded fresh elections. The district authorities conceded fresh elections and five of the seven positions were won by women – a totally unprecedented development.

Lessons learnt

Some of the factors that have affected the success of the afforestation and conservation efforts in the area were:

- common lands were brought under the control of the village community
- the benefits of protection from the common lands were shared equally. A simple procedure was evolved by the women for distribution of grass resources to ensure equality for all
- the women were able to negotiate with the leaders of the local political bodies that legally controlled the commons for their right to use and manage the land
- the activities were carried out in an area of high rainfall with relatively good soil conditions and high biomass productivity
- it is an area of low population density with a high common lands to private lands ratio
- one of the biggest obstacles faced was the villagers' lack of confidence and their general dependence on the government.

Questions for discussions

The following questions could stimulate discussion on some of the key issues of this case study:

1. What led to the increased involvement of women in the project activities?
2. What has been the impact of project activities on women's lives?
3. What indicators have been used for the above?
4. To what extent have women's priorities been addressed by project activities?

5 The Aga Khan Rural Support Programme in Pakistan

The Aga Khan Rural Support Programme was set up to promote the formation of village level organisations. It has been especially successful in its work with women, who have, for example, been encouraged to set up their own savings scheme, and has created much needed health, education and employment schemes.

The area

The northern regions of Pakistan are characterised by high mountain ranges, where its people live in tough and largely inaccessible areas. This region is made up of the Northern Areas (Gilgit and Baltistan regions) and Chitral District of the North West Frontier Province (NWFP) of Pakistan, and covers an area of about 100, 000km^2. It has a population of about one million inhabitants of mixed ethnic and religious origin, speaking five different languages.

The women of the northern regions of Pakistan lead a secluded life. Bound by cultural constraints they seldom have the opportunity to leave the village, so their exposure to the outside world is extremely limited. Women's access to health and education facilities is restricted as are job opportunities due to the low literacy rate of 3 per cent. In many villages, women have to walk for miles to fetch drinking water and fuelwood to heat their homes during the severe winter months. Much of women's time is spent on farming and caring for their children. The region has a population growth rate of 3 per cent.

Rural women, in particular, face grave health problems due to lack of doctors and medicines. Also, family planning facilities are not available to the female population, despite an overwhelming demand for this service. Only 30 per cent of villages in Gilgit and Baltistan have ready access to clean drinking water. The number of villages with adequate sanitation systems is even lower. This is a major factor contributing to frequent outbreaks of disease and the generally poor health status of women and children.

The project

The aim of the Aga Khan Rural Support Programme (AKRSP) was to encourage and support the formation of village level organisations, which would act as a forum for village level development; a system that would replace the old princely administration at the village level and ultimately complement government efforts in all fields. AKRSP's objective was to involve village communities in planning for and undertaking their own development, with the Village Organisations acting as a democratic platform and a conduit for this purpose.

The nature of support offered by AKRSP can best be captured in the three basic principles of the Programme, which are:

- organisation
- capital
- skills.

These principles have been a means of assisting the people of the Northern Areas and Chitral District to improve their livelihoods by forming organisations, building capacity through skill development programmes and depositing regular savings which gives them access to loans.

The present area covered by the AKRSP is 74, 000km^2, (71 per cent of the 2, 000 villages in the region). Today there are more than 2, 000 village organisations (VOs) in AKRSP's Programme Area (with larger villages having more than one VO). Of these, 674 are exclusively Women's Organisations (WOs). The total membership of both VOs and WOs is 96, 409, with WOs membership totalling 23, 000.

The projects in which women are involved largely concentrate on providing the necessary skills and inputs to increase farm output. Women are being trained in improved methods of cultivating vegetables and are provided with vegetable seeds.

Women are setting up private fruit and forest nurseries to earn income. About 100 private nurseries have been set up by women and nearly 150 are collective ventures. They are also making use of appropriate technology items introduced by the Programme, which target labour intensive activities in order to reduce women's heavy workload. The most successful of these items has been sulphur tents, which are used for drying apricots, a speciality of the region. The women are running small hatcheries and learning the technicalities of producing vegetable seeds.

Under the WO Credit Programme, around 80 WOs are also using their savings to offer simple bank services, ie, the AKRSP provides lump sum loans to WOs, with their savings being held in WO accounts as collateral. This money is then lent by the WO Bank (based in the village) to individual WO members. Apart from the village banking system, women are also taking small loans directly from the Programme, investing mainly in buying agricultural items.

As is the case with VOs, the WO forum has provided an opportunity for local leaders or activists to develop. All WOs have women presidents, with a few of them also having women managers. These office bearers are responsible for the smooth functioning of their WOs. This has provided women with the opportunity to discuss their demands. Educated women managers have often proved to be tough customers. However, most WO managers are still male, due to the limited number of educated women available to take up these positions

The Aga Khan Rural Support Programme has been successful in supporting villagers to create and run their Organisations. With the passage of time, these organisations are taking on increasing responsibilities independent of AKRSP. The survival of the Village and Women's Organisations is a sign of the strength of the women's capacity which AKRSP has encouraged them to develop.

Many of the WOs deal not only with projects specific to the AKRSP but are becoming increasingly active in linking up with agencies that provide other services such as primarily social sector services. The Aga Khan Health Services, Pakistan (AKHSP), for example, works exclusively through Women's Organisations to implement their Maternal and Child Care programme. They have also assisted a cluster of 13 villages in setting up a health centre in their valley. This Programme seeks to provide health, education, sanitation and drinking water supply facilities to village

communities through devolution of certain responsibilities to VOs and WOs. The government's initiative to work through VOs and WOs is a major step not only for this region but for the country as a whole.

The process of mobilisation

AKRSP's ability to meet the needs of small farmers has been the main reason for its success. The fact that the AKRSP has been able to reach thousands of rural households, coupled with the fact that rural populations themselves have ready access to AKRSP's support is in itself a commendable achievement. AKRSP's emphasis on supporting VOs and WOs in the productive sector, ie, in providing improved agricultural inputs and related skills as well as credit, has led to the creation of a cadre of village level 'specialists' in the natural resource management field.

In a remote area like the northern regions of Pakistan, it is encouraging to see that women are coming forward and forming organisations, and that they are playing a more active role in the development of their villages. This they are able to achieve through being members of WOs, through regular meetings of these organisations, through saving money, and through micro-level planning.

Working with rural women has been a challenging task for AKRSP. Bearing in mind the constraints within which the programme must work it is a considerable achievement that today there are 674 WOs in AKRSP's area of operation.

AKRSP's approach has been to invest in building the capacity of the local people at the village level. Village women have been trained in the natural resource management fields, ie, poultry rearing and disease control, vegetable cultivation, forestry, livestock, vegetable seed production. This cadre of village specialists provides services to other members of WOs and are remunerated by WO members for these services.

Constraints faced during the project

Despite being members of WOs, the women of the region are still not fully in charge of making decisions that would affect their lives. AKRSP first needs 'permission' from the menfolk of a village before approaching the women. In existing WOs, women often have to confirm their decisions with the men before embarking on a project. In the field of credit, although it has been a major step for women to understand credit and to have their own money, this money is often handled by village men. Similarly, women who take loans to purchase inputs or those who wish to market their farm produce, still depend heavily on the men for assistance.

One of the constraints faced is the lack of well-educated women in the region. This problem is particularly grave when seeking technical and senior management staff, or other levels of employees.

The Women in Development section of the AKRSP is often compelled to give field-based training due to constraints on women's mobility. This requires additional resources, plus the time spent reaching remote areas on rough roads.

Impact of project

Over a period of 10 years there has been a total increase of 6 per cent in cultivated land area, with an increase of more than 100 per cent of land used for vegetable cultivation. The land has been developed through construction of water channels built by the village organisations. Most households are consuming more vegetables than they did before and some are now earning income through the sale of vegetables in local markets.

Poultry is also increasingly becoming the main source of meat, partly due to WO members having been trained in poultry disease control and improved management practices. Ten years ago the average number of poultry birds per farm was about five. This number has increased to 12.3, a 141 per cent increase.

Real *per capita* incomes in the region show a 94 per cent increase since the inception of the Aga Khan Rural Support Programme, compared with a 25.7 per cent increase for the rest of Pakistan. This growth essentially reflects the fast changing nature of the local economy and the people's ability to keep up with this change through support offered by the AKRSP. The total savings of the existing 2, 000 village organisations is Rs 1, 64.7 million, of which the WOs have saved Rs 23 million.

For the women of this region it has been a slower process, although the nature of the changes have had a greater impact on the lives of women. For women to be able to sit and discuss their problems in the WO forum is in itself an achievement. Members of WOs see their savings as the most significant change in their lives. They say it has given them better status in the home and the village. More importantly, the local organisations have provided women the opportunity to discuss their needs and demands, and to develop through the adoption of new roles, specially leadership roles.

Lessons learnt

- AKRSP's mandate was to set up a network of village level institutions which would act as a body responsible for grassroots development; this is perhaps the greatest lesson learnt. This large village level network of women's and men's organisations has provided a sense of cohesion to activities undertaken by villages of northern Pakistan. Villagers capacity to plan and to execute their plans in a democratic manner has been the strength of these organisations
- the 'development partnership' that AKRSP offered to people gave them the confidence to tackle many of their problems on their own, proving that local initiative exists if given opportunities and support in the form of skills, capital and infrastructure. Most village organisations now have a working capital from common savings.

Questions for discussion

1. What has been the main factor responsible for the success of the project?
2. What immediate and long term need of women did the project address?
3. What role did AKRSP play and what implications did this have for the success of the project?
4. What was the main gender-specific cultural constraint faced by the project?
5. What indicators have been used for the success of the project?

What can we learn from the case studies?

The case studies demonstrate the key role that local communities, and especially women, can play in environmental conservation. With formal organisations, this role can be recognised, enhanced and their productivity increased. Local communities are able to recognise the links between resource degradation and their own lives in terms of agricultural productivity, food availability, income and employment and their own labour input. For women especially, the case studies show the links between resource access/management and their own status.

The following issues are demonstrated in the studies:

- the total involvement of community members (in all respects) has a crucial role to play in environmental conservation, without which the effectiveness of conservation activities is most likely to be undermined
- women have particular potential for group conservation, not only because they are often the main victims of environmental degradation, but because such efforts have also addressed key issues of empowerment and access to resources for women
- activities involving women around resource management often require the creation of specific local organisations, distinct from existing structures. The cases of AKRSP, Chipko and TMSS demonstrate this
- employment or income generation is usually an effective way of mobilising local women, as immediate benefits can be combined with long-term benefits. Conservation alone may not be enough of a motivating factor to mobilise women and sustain their interest. Activities may therefore have to address some primary need of the women/community in order to stimulate interest
- involving women in resource conservation activities goes far beyond the environmental implications, affecting the social, economic and political status of women. For example, control over a productive asset by a local women's organisation increases women's bargaining power and may bring about changes in intra-family and intra-community dynamics
- acceptability of women's groups at the community and the individual family level is greater when there are tangible financial and/or environmental benefits from their activities
- when working with common resources, either the entire community should be involved in its management and have control, or there should be a homogeneous section of the community that gains control over the collective resource. In the case of a heterogeneous group, intra-group dynamics and clash of interests are likely to adversely affect the flow and outcome of the activities. The problems faced by PEDO and TMSS arose precisely out of such a conflict
- local level women's organisations can become more credible and effective through institutional links with local bodies which are acknowledged by the community as structures of power
- local communities or organisations need a range of diverse inputs other than financial ones. Training in technical aspects, the development of managerial skills including accounting expertise and marketing abilities are imperative for long term sustainability of activities. Thus project activities should include an equal focus on human resource development as on achieving physical objectives
- women can work exclusively or collectively with men, complementing each other to achieve a common goal. The case of Chipko demonstrated that women need not necessarily work in isolation in order to be effective. The most appropriate mechanism of mobilising women would depend on the local social, cultural and economic conditions.

Replication of the case studies

In considering whether these case studies can be replicated, it is important to recognise the great variety of ecological zones, group constitutions, social, cultural and economic backgrounds. These factors mean that it is impossible to use any of the case studies as a blueprint for success. Women worldwide may have parallel problems and aspirations, but all live under very diverse conditions. This must be considered when planning for development activities. It does not however, prevent cautious use of the case study experience as relevant background information for planning purposes.

What is more important is to use the core elements of success in the process of planning and intervention. For example, the demonstrated respect of cultural norms as a core element of success should be practiced within each cultural setting. Another core element is the need to recognise and place within the right perspective women's role within the social and economic system. All over the developing world, there have been many instances where women's workload, and even marital problems have been made worse through efforts to bring them into the mainstream of social and economic activity. Instead of replicating a particular group, other organisations should seek to emulate the spirit of the group and ask key questions in order to draw from their experience. For example:

- what process did they follow?
- how did they get together?
- what were the triggering factors?
- how have they shared their workload?
- how have they maintained group cohesion and achieved their common goals?

Most importantly, it is important to remember that knowledge of successful experiences is not enough by itself. Detailed knowledge of the women's social and economic setting, and their needs and problems, is a key element for success and is integral to any attempt to draw lessons from the case studies provided.

Exercises

These two exercises may be used to stimulate discussion. They should be adapted as appropriate.

EXERCISE 10

Indicators of Success

This exercise is designed to help participants identify, describe and assess different indicators for measuring the success of development activities.

Divide the participants into groups of three or four people. Allow each group sufficient time to work through the case study chosen and to discuss and answer the following questions:

1. What indicators are used in this case study to measure the success of the activity?

2. What type of indicators are they (qualitative, quantitative, or proxy measures)?

3. How might these indicators be relevant to the area you are working in?

Ask a spokesperson from each group to report back on their discussions. Compile an overall list of the indicators identified, and discuss how they could be measured in practice.

EXERCISE 11

Recognising women's roles

This exercise is designed to help participants identify the special role of women in resource use and management. Once the different roles of women and men are better understood, the formulation of plans for community management may be more effective.

Divide the participants into small groups of three or four and allocate a case study to each group. Allow each group sufficient time to work through their case study and to discuss and answer the following questions:

1. Which decisions about resources are made by women and which by men?

2. Which activities were undertaken by women and which by men?

3. How much knowledge of resources do women have? What was well known by men?

Examine the case study for ways in which the special knowledge of women has been used to formulate and implement this case study's activities.

4. How has women's use of this knowledge affected the project's success?

Ask a spokesperson from each group to report back on the discussions.

4. Conservation Techniques

about section 4

This section of the Training Manual explains the concept of conservation and brings together a variety of conservation techniques. It is not intended to be treated as a textbook or field manual, but should instead be used as a source book, encouraging users to ask questions, discuss ideas and to seek advice from technically qualified people. Section 4 is complementary to Sections 1, 2 and 3, which illustrate how to use the advantages of women's groups in tackling issues pertaining to natural resource conservation.

It would be an impossible task to include all the possible conservation practices in one brief section. The techniques included have therefore been selected to give a flavour of what can be achieved rather than describe each technique in detail. The scope of techniques listed and discussed will depend on several factors such as land size, economic factors, skills and resources available and the magnitude of the problem. This section also includes several case studies.

Conservation of natural resources

Natural resources such as the soil, water, minerals and biodiversity are our natural heritage, sustaining our lives on earth. The human population is therefore dependent on the conservation of these resources, which require the maintenance of an ecological balance.

How does natural resource degradation begin?

Although the causes of degradation of natural resources are many, some of the most common are:

- inappropriate use of land leading to excessive erosion and degradation of soil
- consumption pressures on resources from increasing numbers of human and livestock population
- deforestation for a number of reasons
- floods caused by silting up of water bodies.

What are the symptoms of natural resource degradation?

Soil erosion results in the loss of topsoil which manifests itself as reduced productivity. This is immediately felt in rural areas with a predominantly agriculture and livestock economy. Intensive cultivation of high yielding crops, which draws heavily on soil nutrients, results in depleted topsoils unless fertilisers or manures are used. In the case of overstocked pastures, vegetative cover is lost very quickly, exposing topsoil to erosion from the direct impact of rain and floods. This is turn results in the formation of gullies and silting downstream. Such an impact is obvious, even on gentle slopes, and becomes severe when slopes are steep. When soil is lost or topsoils lose their nutrients, land use undergoes a change. Crop lands become lowgrade pastureland and pastures turn to scrub.

Erosion also causes silting, which in turn degrades waterways and reduces water reservoir life, thus damaging aquatic resources such as fisheries. Soil erosion therefore adds further to the maintenance cost of the local communities and exposes them to increased impact of natural calamities such as floods. A downwards spiral is quickly apparent.

Soil conservation

Preventing soil erosion is much easier than curing it, since soil washed away from fields and into the valleys below can never be brought back. However, once erosion has been controlled, it is usually possible to restore fertility to the land.

Where traditional soil and water conservation techniques are used, the most logical step is to use them as the starting point. However, these techniques are often not widely known outside the immediate area due to poor documentation.

Where soil and water conservation projects have to start from scratch, the local population should be involved, as closely as possible, in the planning and design, using a participatory approach.

Ideally, techniques should be simple enough for farmers to apply with little or no external support. Moreover, the maintenance requirements of soil and water conservation structures should be minimal, otherwise farmers will be unlikely to maintain them due to time and labour constraints.

Soil conservation means:

- increasing soil productivity and preventing removal of precious topsoil
- conserving soil fertility and nutrients
- conserving soil moisture.

The choice of technique

The techniques used depend entirely on the cooperation of the farmers and other land users. In order to involve the farming community there needs to be a clear commitment to the participation of the landusers from the outset. This may sound easy and indeed sensible but the many failures in soil conservation projects throughout the world all have a common feature: the farmers were interested not in soil conservation but in increased productivity, better yields, new varieties, a reduction of the labour required and better access to markets among other factors. While the soil conservation problem may seem like a priority to the outsider, in reality it is a symptom of other weaknesses in the farming system.

The key to successful soil conservation therefore rests in its subtle integration into the overall farming system already in existence. The old approach, on the other hand, viewed soil erosion as 'the problem' and soil conservation as 'the answer', and encouraged the use of expensive and labour intensive methods such as terraces and drains.

Nowadays there is a shift of emphasis that includes two key principles:

- that it is possible to combat land degradation through the adoption of management practices which yield production benefits and at the same time are effective conservation measures
- that rural people, educated or not, have a greater ability than previously assumed by outside experts, to analyse, plan, implement, and evaluate their own development projects.

Several key concepts underlie the new approach to better land husbandry:

- loss of soil productivity is much more important actual than loss of soil
- land degradation should be prevented *before* it happens instead of trying to cure it afterwards, ie, the focus needs to be on sustaining the productive potential of the soil
- soil and water conservation should be promoted as an integral part of a productive farming system rather than as a separate land management exercise
- to be attractive to farmers, any proposed soil conservation activity must provide short-term benefits such as higher yields, greater availability of fodder, or fuelwood, and reduced costs.

Conserving soil

The following is a list of methods used in soil conservation, grouped in terms of different land use categories. Most of the terms/techniques used here are explained in the glossary at the beginning of this section, except for a few which are elaborated on in the text.

Arable soils:
contour farming
contouring with vegetative barriers, for example, vetiver grass
contouring with earth banks and waterways
earth banks on field boundaries
furrowing, ridging, ridge tying
tillage practice, subsoiling
vegetative ground cover, mulching, manuring
grass cover, grass strips, grass barriers
improved farming (cropping) systems
agroforestry
terracing
land levelling, smoothing

Non-arable soils:
vegetative barriers on the contour;
earthen or rock barriers
afforestation, reforestation, re-vegetation
area closure to livestock
reduced grazing pressure, stall feeding, zero grazing
pasture improvement
silvipastoral plantations
buffer zones
trail, rural road and forest road treatments

Drainage lines:
gully control structures
checkdams, silt traps
diversion drains
stabilisation of natural drains

Wastelands:
vegetal cover
bunding
gully plugging
contour trenching
stone dykes
vegetal barriers

Gully plugging

Torrential flows of water cut into the soil forming rifts, which gradually deepen into gullies. Gully plugs can be vegetative or mechanical barriers placed across the gullies to slow the water flow and check further growth of the gully. Vegetative gully plugs are made by planting of hardy grass species such as *Chrysopogon, Vetiver* or *Munj* grass. The gully plugs need to be close to the gully head, and a series is usually required. These step series of plugs are usually labour intensive and require careful planning.

Different types of mechanical gully plugs:

Drop structures
A series of small masonry drop structures can be used to check the further growth of an already wide gully to slow down the flow of water. This also contributes to surface water storage for short periods and enhances groundwater recharge.

Brush checkdams
These are gully plugs made of different brushes, bamboos, local vegetation, tree logs, etc. A barrier is erected using these materials to help reduce the erosive velocity of the water.

Boulder/Gabion structures
These are constructed using locally available boulders that are placed to form a stone wall across the gully. Gabion structures are boulders surrounded by a wire mesh. Both structures act as barriers to reduce the force of flowing water and thereby soil erosion. As silt fills the structure. its height needs to be increased. Silt deposited on the upstream side of the barrier helps to conserve moisture for a longer period, which ultimately raises the moisture regime of the area.

Earthen bunds
These are simple traditionally built structures made from soil and boulders.

Contour trenching
These are dug across the slopes of hills to catch any run-off and to reduce soil erosion. The trenches are rectangular in shape and the soil excavated from digging the trench is formed into a berm (narrow path) on the downside of the trench. Grass and legume seeds can be sown on the berms during the rains which not only protects the berm but also provides forage. The number of trenches of a fixed dimension per hectare is determined by the slope/gradient of the area, average rainfall on a normal rainy day (over 24 hours) and the type of soil.

Box 7: Vegetative systems of soil conservation

In some cases, the use of vegetative treatments is intimately mixed with cultural practices, such as in contour cultivation with grass strips. In other instances, vegetative measures stand alone as in the establishment of permanent cover. Vegetative measures have been shown to be highly effective in minimising erosion by reducing the impact of raindrops as they strike the soil. Mulches, certain agroforestry options and permanent cover crops can all perform this function.

Plants can also be used to form a physical barrier to slow down run-off and arrest existing soil erosion. The species used in this manner include napier grass, vetiver grass, and the tree species *Leucaena.* The use of different species in this capacity will vary, depending on circumstances. The particular features of vetiver grass, discussed in detail in Box 8, make it particularly well suited for this application.

Vegetative systems, of whatever species, have a number of advantages over structural systems:

Cost: vegetative measures for soil conservation can generally be promoted at low cost. The cost of establishing vetiver grass hedgerows in India, for example, is estimated to be US$18 per hectare. In many cases, the major expense in promoting these measures is for extension advice.

Adaptability: unlike structural measures requiring detailed engineering and site planning, vegetative approaches are relatively insensitive to issues such as correct alignment on contours, irregularities in field boundaries and minor errors in placement.

Farmer-controlled: because vegetative methods are relatively inexpensive and do not require use of machinery or sophisticated surveying, individual farmers are able to take the initiative in adopting conservation measures. A particular advantage is that the cropping area sacrificed to the conservation measure is considerably less than with the typical structural approach, and is especially true in the case of grass contour hedgerows. Farmers' willingness to devote arable land to essentially permanent cover is often largely dependent on the degree to which livestock are integrated in the farming system.

Box 8: Vetiver grass

Vetiver grass, which belongs to the same part of the grass family as maize, sorghum, sugarcane and lemongrass, is a practical and effective barrier to soil erosion and is used in many locations around the world. Although other grasses and trees have been used for this purpose, there are certain characteristics that make vetiver grass special:

- it reduces erosion when in a hedge just one plant wide
- it is able to survive drought, flood, windstorm, fire, and grazing animals
- it does not appear to compete seriously with neighboring crop plants for moisture or nutrients in the soil
- it is cheap
- it is easy to establish and to maintain
- it seems to be largely free of insects and diseases
- it can survive on many soil types, regardless of fertility, acidity, alkalinity or salinity
- it is capable of growing in a wide range of climates, ie, where rainfall ranges from 300mm to 3, 000mm and where temperatures range from slightly below 0°C to above 50°C.

In the Asian region, vetiver is currently known to exist in Bangladesh, Burma, China, India, Indonesia, Japan, Malaysia, Nepal, Pakistan, Philippines, Singapore, Sri Lanka and Thailand.

In Sri Lanka

Vetiver has traditionally been used to stabilise slopes and terraces in tea plantations around Kandy. In 1989, in an attempt to address soil erosion from hillside tobacco fields, nurseries were established to supply vetiver planting material to farmers. It has also been used extensively by tobacco cultivators who discovered that couch grass, a creeping weed almost impossible to keep out of crops, could not penetrate a vetiver hedge.

In India

In several parts of India, vetiver has demonstrated that it can hold back more than just soil; the moisture that gushes off the land in flash floods is also trapped. In parts of Andhra Pradesh, farmers using vetiver lines got a harvest while their neighbours faced only crop failures. In some villages, water levels rose dramatically after vetiver hedges were grown.

Soil fertility

The productivity of soil and its ability to produce biomass depends upon many factors, namely soil fertility, water supply, slope of land, height of water table, soil depth, climate, and cultivation practices. Any factor may be responsible for low yields; often, more than one is involved. However, low soil fertility is a major cause of low biomass production.

Under natural conditions, all the plant material produced on a piece of land is returned to the soil and thus fertility is maintained. This is seen in virgin forests or grass lands that have been untouched by biotic interference. In fact, in these situations fertility tends to improve over time.

Under agricultural practices part of the plants produced are removed from the land for human and animal use. In such a situation soil fertility decreases. Repeated cropping over years with similar crops or high productivity crops tends to deplete the land of soil nutrients, thus reducing the productivity of topsoil. However, the nutritive quality of topsoil can be rebuilt using the following methods:

Arable lands: crop rotation and mixed cropping
mulching of crop residues and green manure
fallow land cultivation with grass and legumes
animal manure and chemical fertiliser

Watersheds: water harvesting measures
watershed reclamation measures (silviculture, silvipasture, agroforestry horticulture).

Box 9: Indigenous knowledge of soil fertility

- indigenous practices on farm lands in India included the collection of animal manure which was spread on fields to enrich the soil. This acted as an excellent bio-fertiliser
- in southern of India, stray cattle were penned on agricultural fields in the dry season to provide manure to enrich the soil before it was ploughed
- the roots and stocks of the rice plants or sugar cane were left behind in the fields after harvesting the crop. These were then either let to rot or were burnt on the field, leaving a ready source of manure in the field for the next crop.

(Contributed by Suvarna Rani, India)

Conserving soil moisture and groundwater recharge

The moisture retaining capacity of soil has a direct bearing on its productivity. Conservation of soil moisture is therefore essential for the beneficial use of land. All of the methods used to improve soil fertility also contribute to improved soil moisture availability, and so soil conservation is really about the control of soil moisture. Indiscriminate use of groundwater where its use far exceeds the recharge capacity, or excessive surface run-off from barren lands, results in falling groundwater levels which in turn has a bearing on the productivity of the land. Groundwater recharge for barren lands can be achieved by afforestation, vegetal cover and checkdams.

Box 10: Indigenous methods used to conserve soil moisture in Sri Lanka

Women in Sri Lanka have traditionally formed bunds of coconut husks around roots of trees to retain moisture and control run-off. In some cases shallow trenches are dug around trees, about 0.5m to 1m away from the trunks, and filled with organic residuals to control run-off, retain moisture and improve infiltration. This conserves water in the soil for off-season use.

Barricading the run-off is achieved by appropriate planting and accumulation of debris across the slopes. For this purpose, women plant shrubs along narrow terrace bunds. The species selected – *Gliricidia sp., Croton laccifer, Tithonia diversifolia* – survive during seasonal droughts and, apart from controlling surface run-off, produce mulch for their lands.

Crop residues and paddy straw are spread over land to minimise soil moisture losses through direct evaporation. Along with conserving soil moisture such methods also enhance soil fertility.

(Contributed by Anoja Wickramasinghe, Sri Lanka)

Box 11: Groundwater recharging in Madhya Pradesh, India

In Chirula village in Datia district of Madhya Pradesh, a medium stream, 12m to 15m wide runs past the edge of the village. Although the soils of village cropland were fertile the agricultural productivity was very low because of an acute shortage of water for irrigation. This was due to the wells being mainly dry during the summer months.

During January-June 1990, two checkdams were constructed on the stream, both of which were full by the end of July. The spillway height of the structure was 1.5m above the stream bed and the impounded length of water was approximately 600m for the first checkdam and 800m for the second. The groundwater charging in the first year itself raised the water levels of wells on either side of the impounded water by 1.5m to 2m. An area covering approximately 50 hectares of wheat crop was provided with four irrigations during 1990-91 and the recharging of wells after withdrawal of water was very swift. Earlier these wells had provided one or at best two irrigations.

The following year, two more checkdams were constructed, and the situation today is that the wells on either side of the stream cater for a cropped area of approximately 100 hectares. There is adequate water for paddy during the summer and a wheat crop in winter, followed by a green fodder crop on 20 to 25 hectares. The total cost of the four structures was approximately Rupees 200, 000 which makes it the most cost-effective irrigation facility developed in Datia district.

Water conservation

There is a long history of the existence of water harvesting in Asia, both for crop cultivation and drinking water. Harvesting water involves its collection either through diversion or by storage. The choice of a water harvesting system is a response to the source and availability of water, and topographic characteristics. Availability of water depends on the average annual precipitation, groundwater potential and water carried by rivers. Because of its long history, harvesting water techniques in use today comprise both traditional methods and more recently developed systems.

Traditional methods

The evaluation of large-scale canal irrigation systems in recent years has revealed that it is not usually possible for these systems to reach remote and harsh terrains. Moreover, with administrative convenience usually being the guiding principle, variations in natural resource base, agro-climatic conditions, soil characteristics and social dynamics are often ignored. In addition, these systems usually tend to benefit only the rich farmers. The majority of small and medium farmers in Asia therefore continue to depend on indigenous water harvesting structures. While these mostly exist in their traditional forms, others have been modernised to some extent. These systems are essentially site-specific and are limited by regional conditions.

Checkdams

A checkdam is a barrier built across the direction of the flow of water in a stream to store some of the excess flow that takes place during the monsoon. The advantage of these structures is that they store surface water for use both during and after the monsoon, and aid in groundwater recharge of the area. This water source can also be used for fish farming. Checkdams therefore serve two main purposes. They:

- decrease the damage caused by uncontrolled floods
- provide a dry season water supply.

Checkdams can be of various sizes and built using a variety of materials including stone, clay and cement. Individual farmers can build small checkdams of clay, whereas masonry and cement concrete structures require some degree of construction skills and financial input.

Before building a checkdam, the following points should be borne in mind regarding site selection:

- the structure should be able to store a high volume of rain water
- it should provide a long length of stored water
- there should be a high percentage of cropped area on either side of the length of stored water
- risk of submergence of cropped lands during flash floods should be minimal
- it should have a high cost-benefit ratio.

Major benefits of checkdams

Some of the major benefits of a checkdam constructed using the above mentioned designs are:

- an improvement in the local moisture regime, which results in increased biomass production

- an increase in groundwater recharging, thus making available greater amounts of water for irrigation and household use from the farmers wells. A single crop production can easily become a two- or three-crop cycle per year
- fish farming becomes possible
- availability of drinking water for animals
- the water is available to the farmer on call, so that he can extract it when he actually needs it. This is not the case in canal irrigation
- a short gestation period: a medium structure catering for 20 to 30 hectares can be built in just two months.
- no displacement of people
- the cost of construction is generally recouped in one or two seasons due to increased agricultural production.

Diversion systems

Diversion of natural springs and rivers is the most widespread system in the hilly regions and plains of Asia. It is commonly seen in the Himalayan region stretching between the gorges of the Indus and the Brahmaputra and, in the Western Ghats running along the west coast of India.

The different types of diversion systems are:

- channels
- roof-top harvesting
- checkdams and other diversion systems on river beds.

At higher elevations, the main system of water harvesting is by diversion through channels. These channels are usually unlined and are constructed along the slope's contours to distribute water to the fields located at suitable levels. At lower elevations, the diversion channels utilise the sloping terrain to carry water, or else the depth of the channel itself is reduced gradually to facilitate gravity flow.

In the Himalayan region, the diversion system is known by different local names such as *kuhl, gul, kulo* and *diggi.*

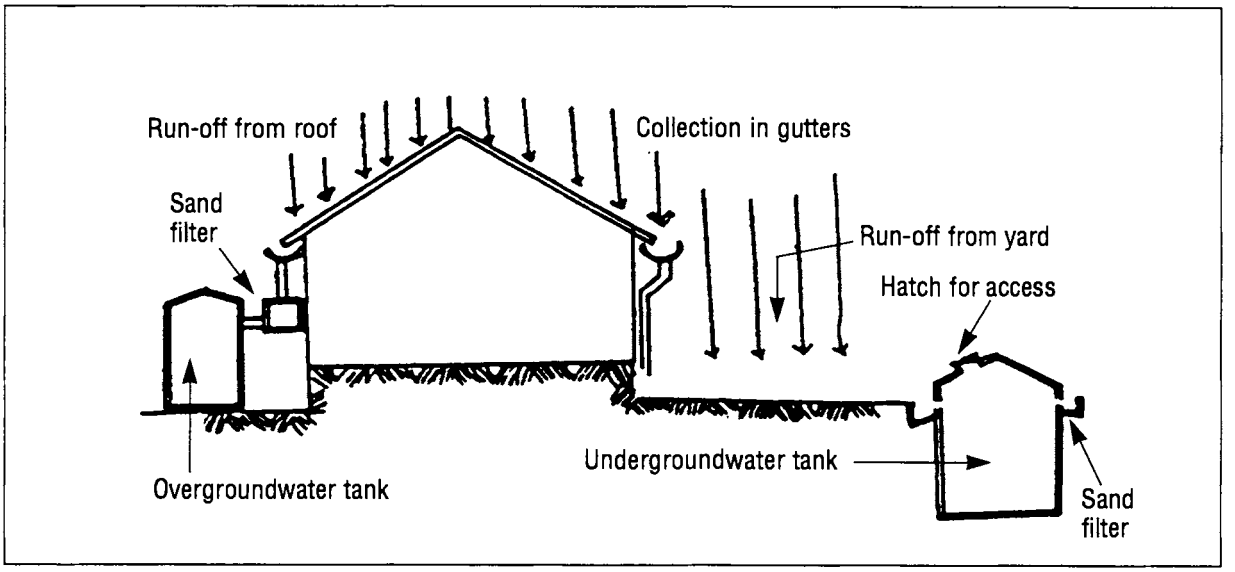
Another water harvesting system gaining popularity in this region is that of roof-top harvesting. Rainwater is diverted from the roof-top through tin pipes into a small tank and is used for household purposes and growing vegetables (Figure 12).

Open pipes made from split bamboo or arecanut are also used to bring water from natural springs for drinking and other household purposes.

Diversion by checkdams is another widespread system in the foothills and sloping plains. A river and its major branches is diverted at different points by temporary weirs made of stone and mud. They are referred to as *pat, dong, kalvai* and *korambo.*

Down on the plains, rivers usually carry more discharge than the hill springs and so diversion structures are more sturdy and complicated. The materials used to construct the diversion structures on river beds to check waterflow, range from clay, stone, cement and bamboo to palm and banana leaves. Malaysia has heavy rainfall for seven to eight months each year and therefore diversion of rainwater to paddy fields and rubber and palm plantations is the predominant water harvesting system. Small earthen and stone checkdams are also constructed on individual fields to store rain water.

Figure 12: Roof-top harvesting



Diversion systems tend to enlist local support in the construction and maintenance of channels, and to ensure equitable distribution of water. Regular interaction and cooperation is essential not only with a village benefiting from a particular stream or river but also with villages located downstream that depend on the same water source for irrigating their fields.

6 Water irrigation at Sarai village in India

Summary: An ancient water irrigation system used by more than one thousand families is informally but successfully maintained by individual farmers.

The area

Sarai village is situated at a distance of 10kms from Tehri township in the Tehri district of Uttar Pradesh in India. Sarai has approximately 1, 200 households belonging to a variety of caste groups. The majority of Sarai's villagers are dependent on agriculture. Because of the area's sloping terrain, step cultivation is practiced and paddy, wheat and other crops are grown. The average landholding size is two acres.

In Sarai, the waters of a fast-flowing mountain stream have been partially diverted. This water is used to irrigate 200 acres of agricultural land belonging to 1, 000 families. The diversion structure is a simple stone and lime mortar wall. The water is then brought down by gravity through unlined channels to the agricultural fields. Excess water runs off into the Bhagirathi river.

Institutional Arrangements

This irrigation system has long been in use and its exact age could not be recalled by the villagers. Since its inception, there have been only minimal changes to the system.

The *Gram Sabha* (village council) deals with matters pertaining to irrigation. The village council is an informal body of nominated village elders and also deals with other aspects of village life such as social problems. *Gram Sabha* meetings are open to all villagers and decisions are reached by consensus. This being an informal system, there are no written rules and regulations.

The cost of maintaining the physical structures is borne by the user community. A token water tax is collected by the village council from each of the users, and the amount is in proportion to their land holding. The responsibility of maintaining the field channels lies with the individual user through whose field the channel passes.

Distribution of water is done on an hourly basis. Three hours of water supply constitute a unit, locally known as a 'pahar. One pahar usually irrigates half an acre of land. A maximum of four 'pahars' are allocated to a farmer. While major conflicts regarding the supply of water have not occurred, minor conflicts do arise. This happens when an individual neglects to perform his duty by failing to turn-up for the voluntary labour contribution, or does not bund his fields properly, thus causing damage to other plots. In such cases, the village council uses social pressure or minor fines to settle the matter.

Dong irrigation system in Assam, India 7

Summary: The Dong system is an ancient but now largely unused water irrigation system in Assam. However, part of the system is still in use during the summer months. Because it is used by more than one village, maintenance and overall management depends very much of the mutual cooperation of everyone involved.

Background

Dong is a traditional system of irrigation practiced by the Bodokachari tribal community in the north-eastern part of Kokrajhar district. Presently, the system has fallen into disuse in most places. In areas where it is still functioning, the water is used only for *sali* (summer) cultivation. The origins of this system can be traced to the frequent flooding of the Brahmaputra river, which forced many of the Bodokacharis on the northern bank of the river to move up into the hills. They are known to have cultivated a number of traditional varieties of rice and even harvest three crops a year. This was achieved by utilising the water of the streams leaving the Bhutan hills and entering Assam.

Dong System of Irrigation

The streams leaving Bhutan lose their course in the boulders. The dong system involves tapping the water upstream. Boulders are used to direct the flow of the stream into an unlined main channel. At places, cross bunds are also constructed to regulate the flow of water. A major part of the channel is rocky but at certain places where the soil is loose, bamboo mats and weeds are used on the sides of the channel. The size of the main canal may vary from one dong to another, depending on the location of the water source and the agricultural fields. It is not unusual for the Bodos to dig canals varying in length from 1km to 20kms. The depth and width of the canal is generally 8ft and 5ft respectively.

Institutional Arrangements

Since the dong system serves more than one village, it requires co-operation among villages for the successful overall management of the system. For this purpose, each dong system has a dong committee with representation from each village served by the dong. In addition, in each village, committees are informally elected by the entire village. The dong committee is responsible for the overall management of the irrigation activity. The responsibility of guarding the channel is assigned to different villages on a rotation basis. In case of breaches in responsibility, a signal is sent to all villages and the dong committee meets immediately. The labour for any repair work is organised and undertaken immediately. The main channel is repaired annually before the monsoons, with a member from each household providing voluntary labour for the purpose. In the case of anyone failing to turn up for the annual maintenance of the dong canals, fines are levied.

Depending on the availability of water, the number of households and the land cultivated in each village, the dong committee allocates a share to each village. Each village committee takes on the responsibility of internal distribution. Both committees take decisions on water distribution by consensus.

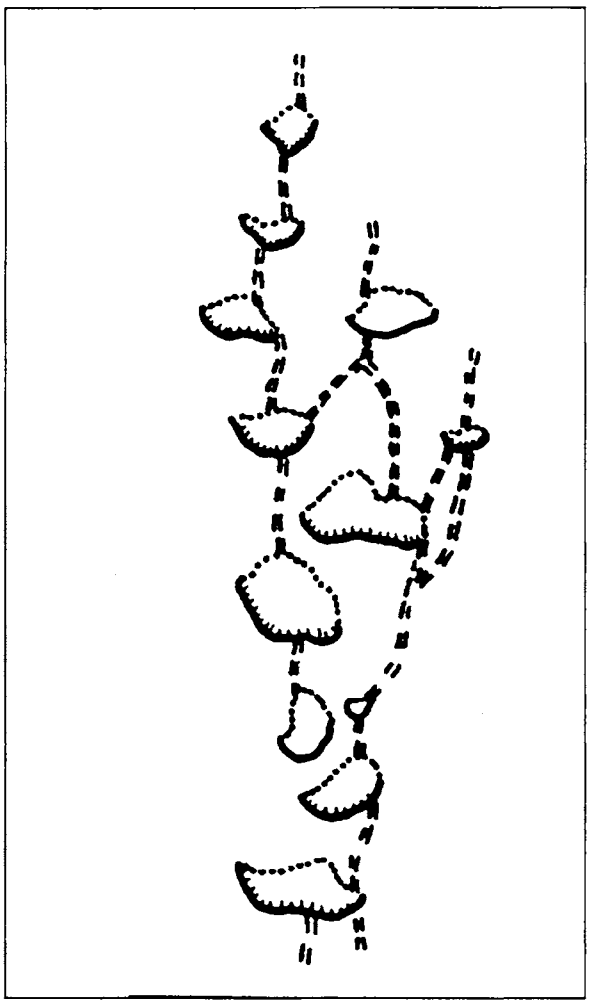
Storage systems

In regions with low rainfall (less than 1, 200mm annually), non-perennial rivers and undulating terrain, the predominant water harvesting structures are the storage works. The design of these structures depends a great deal on the physiographic features of terrain and availability of water.

In India for instance, 90 per cent of the annual run-off in the peninsular rivers occurs during the four months of the monsoons. Hence, year-round and short-term storage systems are very important both for irrigation purposes as well as for drinking water for human beings and livestock. In the plateau region of South India and Sri Lanka, storage works are the predominant water harvesting structures. These storage structures are typically ponds, tanks or other reservoir types.

The rivers and streams in these regions carry a heavy supply of water in the form of flash floods during the months of September to December. A system of interconnected reservoirs divert river water and store rain water. They are locally referred to as *system ery* and *chain ery* respectively

In some areas, the undulating terrain promotes rapid run-off and therefore single-unit or isolated reservoirs are designed to divert and store rain and river water. These are known locally as *ery, kulam* and *keri.*



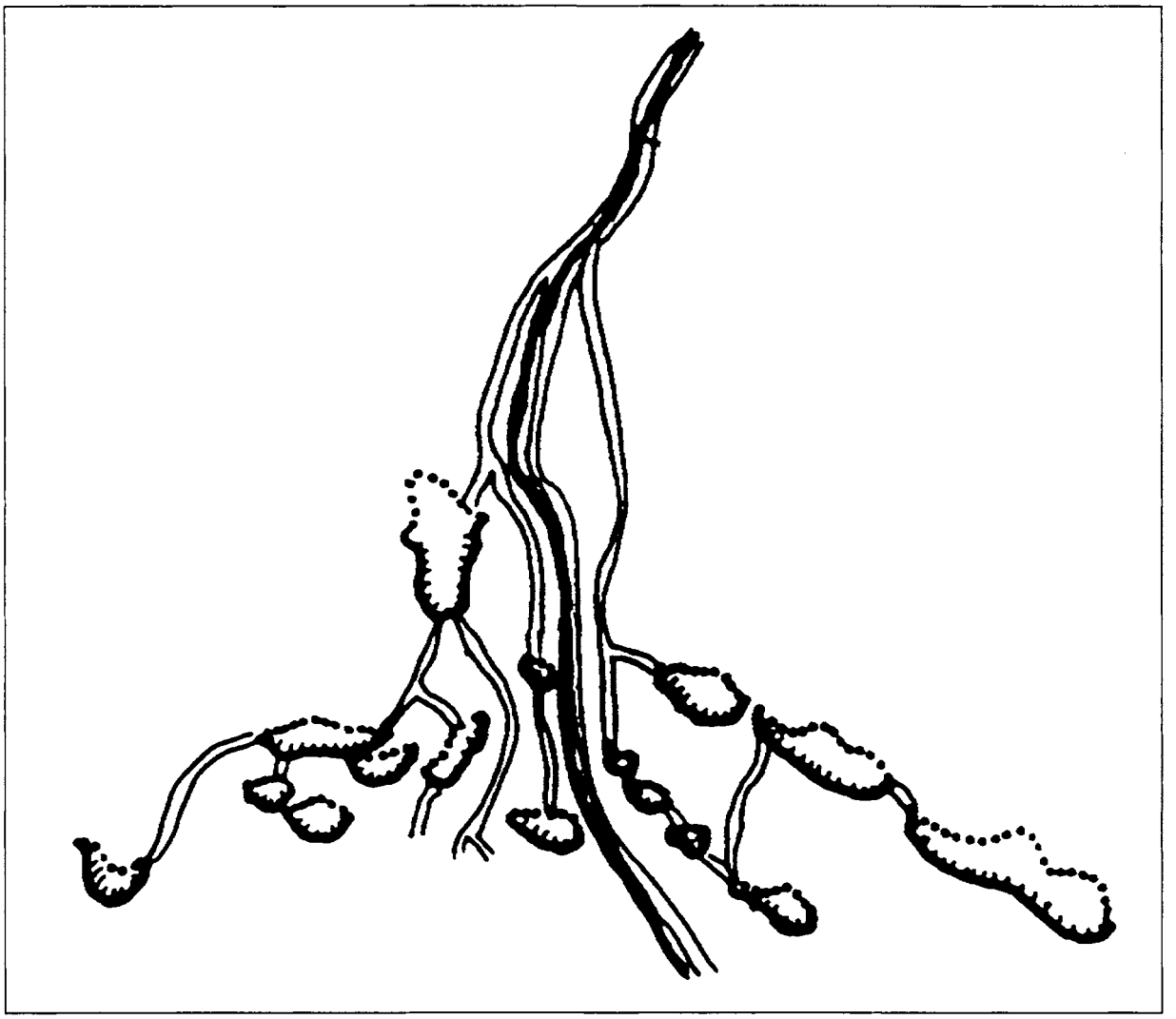
Figures 13: 'System' storage system

These interconnected and isolated storage structures have embankments on three sides. The fourth side is left open to collect run-off. Water stored in the reservoirs/tanks reaches the fields through a canal system or earthen channels. Water from the tank is allowed into the canal by operation of sluice. Spillways are provided for passage of excess water.

Storage structures below the surface or dug out ponds co-exist with diversion channels in the plains of Indus-Ganga which extends to Bangladesh. Natural as well as artificial depressions known as *pokhar, talaab, jhil,* and *saagar* are fed from all sides and store both rain and flood water.

In the Western Plains of India (including the Thar Desert) and adjoining parts of Pakistan, scanty rainfall (400mm to 800mm annually) and absence of rivers has led to the construction of *in situ* water harvesting structures. These include elevated earthen embankment constructed on one side of a sloping terrain to arrest rainwater run-off as well as depressions. These are locally referred to as *johad* and *khadin* and *topa* and *nadi* respectively. In the arid region of Baluchistan, stone structures called *gabbar baandhs* predominate.

Figures 14: 'Chain' storage system



Another type of storage is the use of submergence tanks, whose use extends all the way from Central India to Baluchistan. They are different from *in situ* water harvesting structures in the sense that they have higher embankments and collect run-off from a wider catchment. They are constructed in a series across the same stream, with cultivation following after submergence of the fields. In India these are referred to as *bundhee* and in Baluchistan, as *khushkaba* and *sailaba*.

The storage structures discussed so far are characterised by multiple use. They are used for irrigating fields, for supplying drinking water for livestock and human beings, for controlling evaporation, for better water distribution and for reducing the loss of water through of run-off. Storage structures are labour-intensive during both construction and maintenance and therefore the involvement of local communities that benefit directly from them is imperative. Annual de-silting and repair of tanks is taken up at the community level and formal or informal groups monitor the distribution of water.

8 Tank irrigation in Chandrapur, India

Summary: Focuses on how two villages collect and store river and rainwater in ancient water tanks situated at the bottom of local foothills. Maintenance is shared between villagers (for the main channels), with individual farmers taking responsibility for the field channels. Use of the water from the tanks is regulated by the local *Panchayat*, with disputes over usage being settled at a local level.

Background

Chandrapur District is located in the eastern part of Maharashtra, India. As part of the Wardha-Wainganga plain, it is characterised by lowland relief and an undulating terrain. The soil is black cotton and average annual precipitation ranges from 800mm to 1m. The chief crop is barley.

Two rivers, Wainganga which flows along the northern boundary of the district and Wardha in the south, have terraces that utilise river water for irrigation. In areas away from the rivers, rainwater is the main source of irrigation. For this purpose, tanks known locally as *malguzari* tanks are constructed at the foothills of the hillocks to arrest run-off and store rainwater. These tanks have earthen embankments on three sides, with the fourth side left open to collect run-off.

Tanks and Bandharas

At the two villages of Bondegaon and Naokhala, rainwater is stored in tanks which are more than hundred years old. At Bondegaon, there are two tanks. The smaller one is called *bodi.* It acts as a de-silter and overflow from this goes to the bigger tank located downstream.

To raise the level of water to the level of paddy fields, from the middle of the channel onwards, special weirs or structures called *bandhara* are constructed across the main channel. It is a traditional technique whereby wooden poles are inserted into the bottom of the channel at intervals of 3ft. A net of *sarkanda* (creepers) is woven around the poles and the structure is then plastered, firstly by mud and grass and then mud alone. Nowadays, a modified version, *vasant bandhara,* is in use. H-shaped steel beams are inserted vertically into the bottom of the channel. Wooden planks, 4ft in length, 6" wide and 3-4" thick, are stacked along the beam.

Institutional Arrangements

In both villages, the *Panchayat* is responsible for the overall running of the system. The *Panchayat* fixes the share of water for each farmer according to the land irrigated by him and the availability of water. In a season, a farmer is allowed only two irrigations from the tank. As a general rule, tailenders (farmers furthest from the tank) receive water first. This is to prevent over-use of water by farmers whose fields are located close to the tank. In Bondegaon, if the level of water is below that of the channel outlet, farmers are allowed to pump out water at their own expense. Maintenance of the main channel is a collective responsibility of the villagers. Field channels as well as construction of *bandharas* is the individual farmer's responsibility. The *Panchayat* fixes certain days before the monsoons for cleaning and repair of the channels and the tank. If disputes arise over sharing of water when the flow of water is slow or there is less water in the tank, the matter is referred to the *Panchayat* and settled locally.

Lift irrigation systems

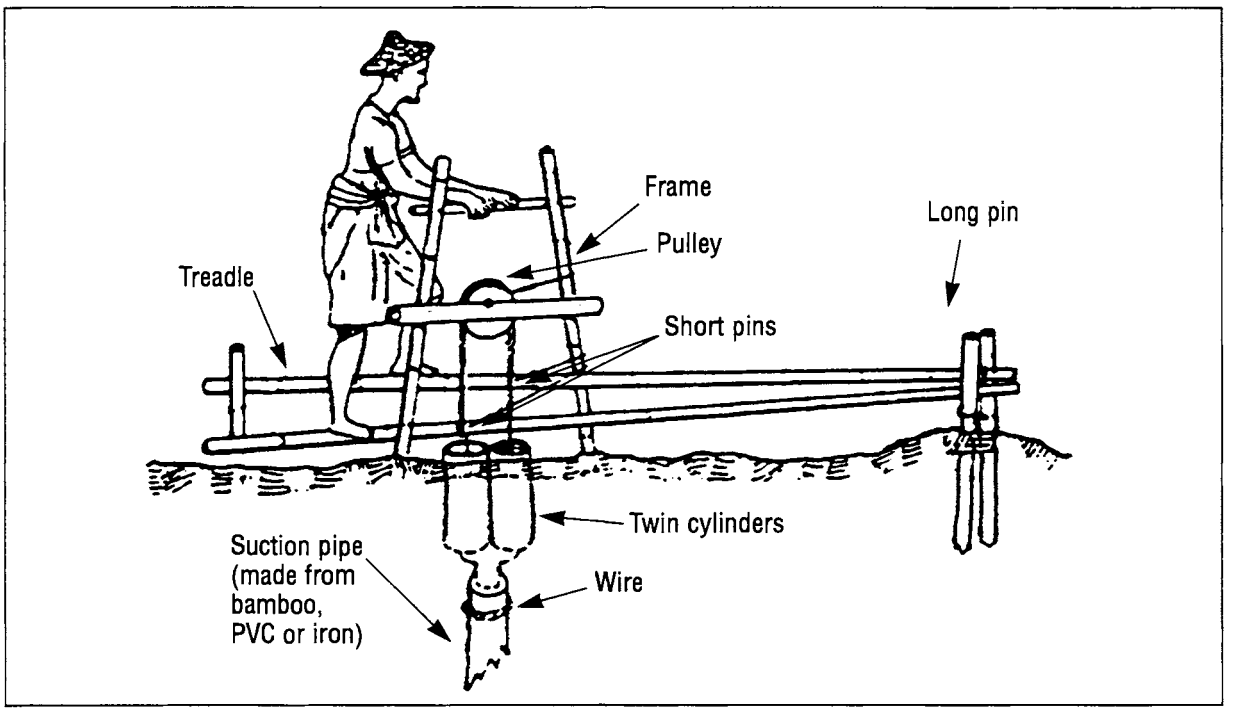
Lift irrigation systems (LIS) include lifting of groundwater for irrigation and drinking purposes as well as for acquiring surface water sources for irrigation.

Dugwells and tubewells are a common feature in all parts of Asia. In the desert regions of India, dugwells are covered to reduce evaporation losses and are locally referred to as *tanka.*

Traditional methods of lift irrigation from rivers, streams, channels and tanks using human and animal energy have in most cases been replaced by diesel pumpsets. However, in Western India (Kolhapur district), the traditional system of *phad* is still prevalent, where eight to 10 bullocks and a similar number of men raise water level to some 14m-15m.

In Bangladesh, a minor revolution has taken place in the field of manual irrigation. The treadle pump – a human powered, twin cylinder pumphead with a bamboo or PVC tubewell – was first introduced in 1979 by an NGO, Rangpur Dinajpur Rural Service. It has since become one of the most successful irrigation pumps made in Bangladesh. A modification of the indigenous *dekhi* system, it is easily operated by both men and women alike to lift water from ponds and channels to the paddy fields.

Figure 14: Treadle pump



Notes to trainers

In the context of the community-based nature of the majority of the indigenous systems discussed here, the critical factors for the revival and replication of these systems are:

- **appropriate system**
  - the system should take into account the physical configuration of the area, resource availability, user group size and the local demand pattern
  - it should be comprehensible to everyone. Use of local materials and skills and involvement of users in construction/ installation facilitates this
- **participation of users**
  - in defining their needs
  - in the choice of the water harvesting system
  - in the designing of the distribution system
  - in formulating rules for benefit sharing and management
  - in the decision making process
- **homogeneous group**
  - users belonging to the same caste/tribe
  - users with uniform landholdings, common problems (for example, scarcity, migration) and common needs
- **local institutional arrangements**
  - for demarcation of responsibilities to ensure regular maintenance and overall management of the system
  - for setting up mechanisms for decision making and conflict resolution at the community/local level
  - for defining users' rights, regulating resource use and ensuring equitable distribution
- **stake in the system**
  - ownership of and access to the resource is clear
  - benefits from community effort are transparent and equitable and their continuing into the future is assured
  - ownership/management of the system rests with the community
  - principle of cost sharing and voluntary labour in construction and/or maintenance.

Recently developed systems

Despite the wide range of indigenous systems, there has been a tendency in large parts of Asia to move towards the use of modern systems. In part this is because of government bias in favour of large systems, managed by the irrigation department, and partly due to the shift in cultivation practices towards cash crops requiring large amounts of water – a need not easily fulfilled by traditional systems. In addition, these large-scale irrigation systems require expensive externally financed dams or barrages with all the associated environmental hazards such as resettlement and downstream problems. These schemes now require some type of Environmental Assessment (EA), often referred to as Environmental Impact Assessment (EIA). In many countries these are a legal requirement.

Energy conservation

Energy constitutes a basic need for survival and a critical input to development. Firewood and other biomass such as crop residues and animal dung constitute the principal source of energy in developing countries and are used for cooking and heating. In quantitative terms, rural households are the main users of energy in poor countries, cooking comprising the major energy use.

Energy scarcity affects not only productivities, but basic needs such as family nutrition and health. Reducing fuel use in cooking and spending scarce cash on fuel instead of food, have immediate repercussions on these needs. In terms of the differential impact by gender, fuel scarcity has a disproportionately higher impact on women.

Box 12: The differential impact of fuel scarcity

The symptoms of fuel scarcity ...	... results in increased workload for:
• Use of bushes, twigs and roots as fuel	women and children (gathering, preparing)
• Use of residue fuel for cooking	women and children (gathering, preparing)
• Walking long distances to collect fuel	women
• Cutting living trees	women and men
• Use of carts/animals to collect fuel	men
• Purchasing fuel	women or men (depending upon who provides the cash)

Source: Linking Energy with Survival. A Guide to Energy, Environment and Rural Women's Work. ILO. Geneva.

There exist several different ways to conserve energy. The two methods discussed below relate to domestic waste management and fuel use.

Domestic waste management

Domestic wastes are produced at several different levels: kitchen waste, used-up consumables, packaging, clothing and animal waste, to name just a few. The nature of waste generated in an area is to a large extent a function of the nature of its economy and level of income. Therefore, whereas in low-income, predominantly agricultural communities most generated waste was accepted back into nature's cycle, waste generated in a high-income, industrialised environment requires special systems of disposal.

An important dimension to waste generation and disposal is the resource-scarce nature of several Asian countries. Depleting national resources and spiralling costs of imports on the one hand and an increasing consumerism on the other, necessitate resource recovery from waste. Even in rural areas, where consumerism may not be an issue, the inability to fulfil basic survival needs such as those of fuel, indicates the need to recover waste. Thus, given the decreasing productivity of soil, harnessing the organic component of city waste for agricultural lands through composting not only addresses the issue of lowered soil fertility but might also help solve the growing problem of waste disposal.

Waste, in most Asian countries, as in most developing countries, offers tremendous opportunities for resource recovery. In its waste, Asia has a hidden asset, which currently tends to be viewed only as a liability. With few technical inputs, waste material can be used to overcome the costs and shortages of a variety of raw materials while simultaneously addressing issues of pollution, health and shortage of land for disposal. Depending on the nature of waste, resource recovery from waste can take place at several different levels, to affect urban, peri-urban and rural populations. Some of the common methods are listed below:

Type of waste	**Management method**	**Recovery**
Inert	Recycling	Re-used by others
Organic	- Composting - Vermi-culture - Biogas	Farmyard manure Farmyard manure Fuel
Mixed	Landfill	Methane, power
Mixed	Incineration	Power

Recycling of non organic material.

Used and discarded material such as paper, plastic, glass, metal and cloth are separated from other waste and sold to recycling industries (often through a whole network of intermediate traders) where they are used as raw material for the manufacture of a wide range of consumables. This activity is typically carried out in most Asian cities by those surviving within the informal sector.

Collection of reusable items takes place at various stages:

- residential and commercial establishments
- on the streets
- community bins or community waste collection centres
- landfill sites.

Composting of waste

Given the high organic content of waste in several Asian countries, composting of waste is an easily adopted method of producing organic material which can be used for replenishing soil fertility and improving soil structure and moisture retention capacity. Composting entails the decomposition of the organic content of waste under controlled conditions, either through anaerobic or aerobic bacteria, to produce manure. Anaerobic decomposition, which takes place in the absence of oxygen, is a low cost but lengthy process whereas aerobic decomposition is much more rapid.

Resource recovery through composting, therefore, achieves:

- conservation of resources by recycling
- support of nature's cycle by returning to the earth valuable organic material
- reduction of landfill space requirement.

Box 13: Garbage farms of East Calcutta

In Calcutta, India, the municipal corporation leases out plots of mature dump land at the main refuse dumping site in the city. The plots, amounting to about 800 hectares, are used for vegetable farming. The city's refuse forms an extremely productive substratum, where besides vegetable matter and coal ash, there are large quantities of animal dung, sewer sludge, bones and other organic material. Twenty-five varieties of vegetable are grown throughout the year without the addition of chemical fertilisers.

Vermi-culture or vermi-composting

The traditional methods of composting are largely slow and tedious, involving aerobic or anaerobic decomposition which can take between three to six months. In comparison, the recycling of organic waste through selective tropical species of earthworms under semi-natural conditions called vermi-composting, is an economical and speedy method of composting.

During the process of vermi-composting, the worms bring about biodegradation of organic waste and yield organic fertiliser. Under a cover of green manure, earthworms feed on waste to produce castings without any unpleasant odour. One tonne of worms consume about one tonne of organic wastes in a day and produce 40 per cent in dry weight castings.

The climate in several Asian countries is highly appropriate for worm culturing, making earthworm vermi-composting a very feasible activity. Though the technique involves scientific methods of breeding and rearing specific varieties of earthworms under controlled conditions, it is a simple technology, highly cost-effective and easily adaptable and affordable by a majority of small, marginal and sub-marginal farmers.

Box 14: Vermi-composting

In a residential area of Bangalore, waste picker children have been organised around a vermi-composting scheme to improve their earnings and working conditions, reduce waste collection and transportation costs of local municipal authorities and decentralise waste treatment. About 400 houses in the area have been persuaded to separate organic, dry recyclable and toxic waste at source and hand it over to waste picker children.

The organic material is taken to a compost site in a public park, used with the authorisation of the municipal corporation. Earthworms are provided by the University of Agricultural Sciences and the use of earthworms removes the problem of smell since once they act on the waste, the smell is reduced considerably. Additionally, leaf litter is used to cover the pits used for storing the waste. About 200 to 250kgs of organic waste is collected every day from the 400 households, producing about one tonne of compost every two months, which is sold to floricultural farms at Rs 4, 000 to Rs 6, 000 per tonne.

Biogas production

Given the low calorific value, high moisture content and high fermentable matter of most Asian waste, one of the most optimal uses of waste lies in the production of biogas for fuel and the use of residue as manure. A mixture of 60 per cent methane and 40 per cent carbon dioxide, biogas is produced by anaerobic bacteria through the fermentation of organic matter inside an airtight digester. The gas can be used for a variety of purposes from cooking and lighting to running internal

combustion engines. It has been calculated that two cubic metres of biogas is roughly equivalent to one litre of gasoline or diesel.

Extraction of methane and generation of electricity

Methane can be extracted and supplied as fuel to areas near a landfill site or else the gas can be converted into electricity. Such methane extraction is especially feasible where the organic and moisture content in the waste is more than 40 per cent and the landfill site is properly covered by following sanitary landfill methods. This technique does require complex safety precautions.

Power from incineration

Although power can be generated by incinerating waste, for several areas in the Asian region this may not be appropriate because of the composition of waste. In other words, the low calorific value and high organic content would necessitate the use of extra fuel which would make the generated power impractical as well as very expensive. Where the composition of waste allows incineration without additional fuel, power generation may be viable.

Box 15: Using biogas

Even as most of the rural households in India have yet to get power connections for lighting, tribals living in villages near Bishunpur in Gumla district of Bihar have their homes well lit. The tribals use all the gas generated from biogas plants for lighting since firewood is not scarce and can be used for cooking food. Although a biogas lamp is not as efficient, the light produced is comparable to that of an electric bulb. At present more than 200 houses are benefiting from this kind of lighting in and around Bishunpur

Feedback from different parts of India on the impact of the use of biogas technology on peasant women found that:

- women saved time spent in cooking food
- time saved in cooking allowed women to participate in other activities or better childcare, or even greater leisure
- drudgery in fuelwood collection was reduced
- biogas effectively removed the need for preparing cowdung cakes
- utensils did not get coated with soot when food was cooked using biogas
- biogas provided a smoke free environment inside the home
- smoke induced-lung and throat infections were reduced
- houses remained cleaner
- vegetable cultivation in kitchen gardens using biogas slurry could be taken up as a gainful activity
- food cooked with biogas was free from the smell of kerosene.

Fuel use

The ever increasing scarcity of biomass fuels is well established and documented. 'Free' gathered biomass fuels are expected to become even scarcer in the future with estimates of more than 2, 000 million people in developing countries suffering an acute scarcity of fuelwood by the end of the century. The brunt of this scarcity is borne primarily by rural women, who are normally responsible for fuel collection. Even in areas where this responsibility does not lie with them, they suffer the

consequences of dwindling supply through the necessity of using poor quality fuels which increase health hazards and make cooking more time-consuming.

The household energy sector has a considerable potential for fuel savings, since it accounts for up to 90 per cent of total energy use in poor countries (if biomass fuels are included in the total). Increasing the efficiency in the use of household fuels could improve national energy balance, increase energy availability for meeting different needs and reduce women's workload in fuel collection and use.

In some rural areas fuel savings may be of less interest since fuel is often gathered free by women and children and is relatively abundant . In urban areas on the other hand, where households purchase fuel, savings are likely to be of considerable interest to households. Fuel savings in urban areas are also important from the point of view of the proportion of rural woodfuel resources that are diverted to urban areas.

The different types of household fuels typically used in rural and peri-urban areas include wood, coal and kerosene.

Conservation through innovations in fuel use

Even though reforestation has often been the first response to rural cooking fuel shortages, the relatively long-term benefits from tree planting often seem too remote, especially for poor families. Fuelwood for household use, in any case, is the lowest value product of trees, which are more often that not grown to provide raw material for different industries or fruit. The most commonly used mechanisms therefore have included:

- use of improved cookstoves
- fuel processing to generate biogas. When biomass such as cattle dung is subjected to anaerobic digestion to produce methane rich biogas, a much higher percentage of thermal value is obtained from the same quantity of dung than when it is used as fuel in the form of dry dung cakes
- use of alternate energy systems such as solar energy
- use of indigenous alternate fuels
- women have traditionally innovated processing combinations of biomass to produce fuels that save consumption and cooking time.

Improved cooking stoves

Although conserving biomass has been the main thrust in improving the efficiency of cooking stoves, the scope of such stoves extends to the provision of a better cooking environment, reduction of health hazards and generation of employment.

Improved stoves can broadly be categorised into four groups:

Chimney stoves

The basic design of a chimney stove has a firebox with a door opening at one side and the first pot directly on top. From the firebox the flames and smoke pass through a tunnel and underneath to three pots before leaving through a chimney. The maximum performance of chimney stoves is dependent on the proper draught of the stove, which will vary with the chimney dimensions and installation.

For this type of stove, the removal of smoke and the ability to use a wide range of pots have taken priority over fuel efficiency and cooking speed.

Chimneyless stoves

Chimneyless stoves are traditional through much of Asia, although improvements have been made to the original design's performance, largely due the addition of a more enclosed firebox.

These stoves are easier and cheaper to build than chimney stoves and they do not have the inherent problems associated with the correct installation and maintenance of a chimney.

Chimneyless stoves with hood chimney system

These stoves emerged as a response to the problems faced with chimney stoves. Most of the problems of mud clad ceramic stoves are caused by chimney fixation, sealing and cleaning. Difficulties faced in shifting the stove from one place to another because of changes in cooking sites on account of weather, are also due to the fixed chimney.

The hood chimney system is such that the stove is independent of the chimney by constructing the hood in the corner of the kitchen used for cooking during the winter. The hood can be permanently fixed with attached chimney or made movable. With this system, any portable or fixed type stove can be used for optimal thermal performance along with removal of smoke.

Box 16: Smokeless stoves in Pakistan

The traditional mud stoves used by 72 per cent of the rural population in Pakistan consume a lot of firewood, which is found with considerable difficulty since only 3 per cent of the country is forested. The stoves also produce a lot of smoke, which is inhaled by the women during cooking. It is estimated that the amount of smoke inhaled by a woman during the day is equivalent to her smoking 200 cigarettes. Smoke inhalation has been the cause of respiratory problems and lung cancer, and has affected women's eyesight.

In 1986, a group of three women from the Paasban Women's Association introduced smokeless stoves in five rural locations. They organised a series of workshops in which women from the communities were trained to build, repair and maintain stoves. In addition, a national training workshop was conducted in which women learnt to be master trainers.

The smokeless stoves have a fuel saving of about 30 per cent. Women in the communities which adopted the new stoves save time and energy by collecting less fuelwood. A woman can now cook two meals using the same amount of wood previously used to cook one meal. Women's health conditions have improved, since they no longer inhale that much smoke. Kitchen walls and utensils no longer become smoke blackened, and women spend less time and water cleaning them.

Charcoal stoves

Charcoal stoves are lightweight, portable, have one fire per pot and no chimney. Design improvements to increase cooking performance centre around changes to the stove body that surrounds the firebox. The most important factors that affect its performance are: wall material (insulated pottery is best), the density of the ceramic material (which should be light and porous), the size of the grate hole and the exhaust gap.

Organic farming systems

What is organic farming and what is its relevance?

Organic farming is a method of growing crops without depending on artificial fertilisers and chemical pesticides, with the aim of maintaining a healthy and balanced environment where plants can thrive.

As discussed earlier in this manual, environmental degradation leads not only to soil erosion but also to declining soil fertility. Soil may be physically damaged when it is repeatedly worked with heavy equipment in wet weather, or when it is compacted around water holes in grazing land. Damage may also occur when soils are deprived of their natural nutrients and their organic matter or humus content.

When little attention is paid to maintaining the humus content of soil, the biological activity of the soil becomes imbalanced, resulting in an increase in pests and diseases, a decrease in water holding capacity of the soil, and an increase in soil erosion. As with the undernourished human being, poorly fed soils produce undernourished crops and animals, which easily fall prey to pests and diseases. Where land is intensively mono-cropped (ie, crop rotation is not practiced), it becomes increasingly difficult to maintain soil fertility.

The nutrients required for plant growth can be replaced by artificial, or chemical fertilisers. Such fertilisers cannot, however, replace the humus content; only crop rotation and other good farming practices can achieve this. In addition, artificial fertiliser is expensive, requires transportation and often has to be imported from abroad. A system based on chemical inputs hence tends to favour rich farmers. By reviving traditional sound husbandry practices, which optimise on the resources available in a region, it is possible to obtain good yields, build up soil fertility and improve soil conditions.

This is particularly relevant in the context of many Asian countries, for example, Malaysia, where commercial agriculture has been adopted extensively, as well as the widespread use of chemical fertilisers and pesticides/insecticides.

Organic farming is based on the principle of mixed farming and makes optimum use of humus through the composting of organic matter produced on the farm by both plants and animals. Benefits of organic farming include:

- improved moisture-holding capacity of the soil
- less soil erosion
- better plant and animal health
- crops are better able to resist drought conditions
- less damage from insects
- better yields, sustainable over longer periods
- little, if any, environmental damage.

However, these benefits need to be balanced against an understanding that if correctly used, chemical fertilisers and pesticides do lead to marked gains in productivity. As is often the case, the stark choice between organic and non-organic is misleading. In fact, the best yield increases are often obtained by the combined application of chemical fertilisers and organic material. As most

farmers know intuitively, one does not exclude the other. The system of using external inputs, such as fertilisers, together with applications of manure and/or compost is often described as improved land husbandry. This includes the management of crops, bio-control methods and integrated pest management.

Management of crops

This entails using different cropping practices, without the use of synthetic chemicals to control pests, weed and plant diseases. Methods include crop rotation which is a traditional agricultural practice used to control insects, weeds and plant diseases. When a farmer grows one crop continuously on the same piece of land for many years, several things may happen. The soil fertility declines, weeds grow in large numbers, and pests and diseases affecting the crop increase more than previously. However, the situation can be arrested through crop rotation.

Growing a variety of crops in the field improves the nutrient supply to individual crops. Crops with a lot of leaf growth – for example, maize, spinach, cabbage and kale – have different nutrient requirements from root and bulb crops such as cassava, sweet potatoes, onions and carrots.

Other crop management methods used are:

- intercropping
- altering the planting date
- variation in plant spacing
- (more recently) seeking resistant varieties.

Bio-control methods

Enriching soil through composting or mulch

A farmer can use compost to obtain a good crop without having to rely entirely on expensive chemical fertilisers. Compost can be made by converting manure, leaves, crop stalks, roots, kitchen waste and other vegetation into humus, which is valuable plant food. When applied, compost provides food to the plant without first having to be broken down by micro-organisms in the soil.

The making of the compost can be hastened by mixing in top-soil, which contains micro-organisms, vegetation and old manure, under a moist and airy atmosphere. To enrich compost the ash from domestic fires can be added as it contains valuable nutrients. To hasten this process even further, the mixture should be turned every two to three weeks. Processed this way, the compost should be ready for use within six to nine weeks.

By contrast, inorganic fertilisers consist of chemicals with little or no organic matter. Though chemical fertilisers supply nutrients that are readily available after application, they are expensive, often unavailable and generally do little to improve soil structure. Many farmers have difficulty calculating how much chemical fertilisers to apply, often leading to under or over-fertilisation, neither of which produce the desired results.

Over-use of fertiliser is now a major environmental concern as elements such as nitrogen and phosphate washed into water bodies can have unpleasant and dangerous effects both for humans and wildlife

Box 17: Role of earthworms in farming systems

Earthworms perform a key role in substituting conventional management with low input practice, by:

- decomposing organic matter
- generating nutrient rich casts
- opening channels in the soil
- improving soil fertility and structure.

Different earthworm species perform different functions.

Some species inhabit organic matter lying on the soil surface, where they eat fallen leaves and other litter. These species are used for vermi-composting, which is the process of using earthworms and micro-organisms to convert organic waste into compost. Other species live beneath the soil surface where they mix and aerate the soil as they make extensive horizontal burrows. Still other species burrow vertically into the soil creating channels for drainage, aeration and root growth.

Farming practices such as frequent tillage and the use of fertilisers and pesticides, have detrimental effects on earthworms.

Legumes as nutrient suppliers

Legumes, including beans, ground-nuts and peas, contain nitrogen-fixing bacteria in their root systems. Legumes are often grown in association with other crops in intercrop or crop rotation systems to provide nitrogen for other plants. For example, peas or beans are often grown with maize in a naturally beneficial system. Such multi-cropping practices reduce the need for chemical fertilisers. All food crops can benefit from being grown in rotation with leguminous plants, like beans and peas, which take nitrogen from the air and transfer it into the soil through nodules found on their roots. The legumes can be planted to help the soil recover after long periods under food crops. Nitrogen is replaced without using fertilisers for the same purpose.

Alternatives to pesticides

Farmers usually know of the plant species in their area that have insecticidal properties. There are about 1, 600 plant species known to possess pest-control properties, and encouraging farmers to use indigenous plant materials, rather than chemical pesticides will reduce costs and may be safer. Such plants with insect repelling properties include tobacco, pyrethrum, onion, garlic, chillies, the castor oil plant and the neem tree.

Integrated pest management (IPM)

The above systems, which completely eliminate the use of chemicals, may not be suitable under all conditions. It has been found that on a large scale, a judicious use of pesticide is often necessary. IPM draws upon a number of different pest management methods – combining some of the above methods with selective use of pesticides.

Box 18: Traditional and biological control of pests in Malaysia

Traditionally, farmers controlled paddy field diseases using only locally available materials. Some of the methods used include:

- **Pokok gorah:** a smooth, hard-skinned fruit which grows on the edge of kampung (villages) and river banks. Farmers stick branches with leaves in every corner of the paddy field, where it is believed that the 'heating' nature of the leaves prevents the worms from disturbing the paddy plants.
- **Skins of lemon, lime and pomelo:** fresh or dried, it is thrown into the paddy fields. The acidic content of the skins prevent disturbance of the paddy plants by paddy pests.
- **Kitchen ash:** villagers, especially those who work the paddy fields, keep the ashes from the kitchen for use as a poison against paddy worms. The ash is used only in paddy nurseries (*tapak semaian*) where, apart from killing worms or insects, it acts as a fertiliser for the plants as well as breaking down the soil.
- ***Pinang* leaves** are cut into half and only the tail-end of the leaves are used. The leaves are tied together with the yellow bamboo shaped like a T.
- **The stems of tobacco plants** are thrown into the paddy fields. It is believed that the foul smell drives away the worms that destroy the paddy plants.
- **Paddy husks** that have been burnt white or black and disgarded by rice mills are used by farmers to destroy paddy worms. The husks are sprinkled in the fields or other places attacked by pests. It is believed that the reaction from the husk destroys the paddy disease. Furthermore, the husks help to break down the soil and act as a fertiliser.

Box 19: Bio-control for soil fertility

A case study from Nepal

Nepalese hill farmers sustain soil fertility and increase crop yields using the leaves of a local tree called *asuro* (*Adhatoda vasica* or *Jusiticia adhatoda*) as green manure in paddy rice, potato and corn fields. The leaves are chopped and applied to the surface of fields or flooded paddies prior to planting, where they rapidly decompose. Farmers report that the application of *asuro* leaves to potato fields not only increases yields, but also controls termite infestations.

The *assuro* tree thrives both in prolonged drought or heavy annual rainfall, and tolerates infertile as well as alkaline soils. It has insecticidal, fungicidal and herbicidal properties in addition to its ability to add nutrients to the soil. *Asuro* leaves also kill mosquito larvae in standing water. Paddy rice treated with *asuro* at the rate of 10 tonnes of leaves per hectare outyielded rice treated with chemical fertilisers by almost 40 per cent.

Green manuring in India

Until recently, many Indian farmers relied on farmyard manure and compost as the main organic source of recycled nutrients on their farms. However, since these traditional organic sources have become both scarcer and more expensive, many farmers are increasingly focusing on growing leguminous green manure crops on their own land. Although these crops do not actually recycle any nutrients, they are rich in nitrogen, improve the soil structure and are cheap in monetary terms. A crop commonly used in India is *Sesbania aculeata.* Depending on circumstances, it produces between 8-25 tonnes of fresh organic matter per hectare while providing some 60-90kg of nitrogen (equivalent to 3-10 tonnes of farmyard manure). It grows on water-logged and alkaline soils and should be sown immediately after the onset of the rainy season.

Elimination of pesticides: a case study from Bangladesh

Summary: Through the non-application of chemical fertilisers on her family farm, Salima and her husband demonstrate the benefits to be gained from organic farming, in their particular case, through increases in their fish stocks as well as a much-improved rice harvest.

Background

Bangladesh relies heavily on rice as its major food source, but cannot grow enough to feed itself. Despite the dependence of the country's predominantly rural population on fish to supply more than 70 per cent of their annual consumption of animal protein, the average annual consumption of fish has declined in recent years. The main reasons for this are increased use of pesticides, reduced access to monsoon season flood plains by fish due to new roads and flood control embankments, and overfishing.

CARE-Bangladesh introduced integrated pest management (IPM) into ongoing rice projects in a bid to increase overall food production. Rice pests can normally be controlled by the rice field's own ecology, which comprises a complex population of potential pests as well as predators and parasites of these pests. The predator-prey relationship was enhanced for the farmer's benefit through non-chemical means. Fish were cultivated in the rice fields of small farmers and appeared to have a significant effect on the yield of rice. Much of the increase in rice production was due to better water management induced by the presence of fish.

Organic success

A typical example of a farm family that stocked fish was Salima's family from Manikgonj, 60kms from Dhaka. Salima sold her chicken to buy hatchlings which they stocked in the rice field. Salima and her husband did not apply any pesticide in the rice field, although they had always done so previously.

Some months later the paddy field was full of fish and the rice crop appeared to be better than before. At the time of harvest they collected 700 fish from the small plot and their yield of rice grew from 330kgs to 400kgs, an increase of 23 per cent. After the second season in the rice fields, the fish grew to a much larger size and were able to spawn onto the roots of a water hyacinth placed by Salima in a small, deep area of the paddy.

5. Further information

about section 5

This Section includes a select list of organisations involved with women, the environment and development issues, followed by a select bibliography.

Select list of organisations

Bangladesh

Women's Programme
Bangladesh Rural Development Board,
Palli, Bhaban 5,
Kawaran Bazar, Dhaka

Nijera Kori
10/9, Iqbal Road,
Mohammadpur, Dhaka 1207
Tel: 32 34 27 Fax: 880 2 813095

Proshika Mandbik Unnayan Kendra
5/2 Iqbal Road,
Mohammadpur, Dhaka 1207
Tel: 315068/315089 Fax: 813052

Ubinig
5/3 Barabo Mahanpur Ring Road,
Shyamoli, Dhaka 1207
Tel: 329620/318428/811465 Fax: 880-2-813065
Tlx: 632362 MASIS BJ

BRAC
66, Mohakhali Commercial Area,
Dhaka 12,
Tel: 601604/600161-4 Fax: 880-2-883542
Tlx: C/O 65612 ICDD BJ Attn. BRAC

Grameen Bank
2-G, Shyamoli, Dhaka 7
Tel: 326619/315281

Rangpur Dinajpur Rural Service
House No. 62, Road 7-!,
Dhanmondi, Dhaka 1209
Tel 310101-5, 317872/411416,
Tlx: 642428 Snht BJ. Attn. RDRS

Institute for Environmental and Development Studies (IEDS)/ Friends of the Earth
Bangladesh House No. 79 (1st floor),
Road No. 11-A,
Dhanmondi Residential Area, Dhaka
Activities: Seeks to promote awareness through environmental education, research and publications and training. Hopes to include a component on women and environment in future programmes.

International Union for Conservation of Nature & Natural Resources (IUCN) Office
35-B/1, Indira Road,
Dhaka 1215
Activities: Establishing a Natural Resources Information Centre, preparing a National Conservation Strategy; Programme for Environmental Awareness and Education.

Polli Unnayan Sangstha (POUSH)
43 New Eskaton Road,
Dhaka 1000

Department of Women's Affairs
37/3 Eskaton Garden Road,
Dhaka 1000

Department of Environment
House No 2, Road No 16 (New)
Dhanmondi R/A, Dhaka 1209

Gonashasthya Kendra
Nayarhat, Savar,
Dhaka

Gonakalyan Trust
Saturia,
Manikganj

Association for Development Agencies of Bangladesh
Lalmatia, Dhaka 1207
Envirocare
Mirpur Road
Dhanmondi R/A, Dhaka 1209

India

Centre for Women's Development Studies
25 Bhai Veer Singh Marg, New Delhi
Centre for Science and Environment
41, Tughlakabad Institutional area,
New Delhi 110 062
Activities: Researches and publishes on environment and development issues, with specific emphasis on the role of women. Actively involved in NGO coalition work and the issue of sustainable development. Produces factsheets on the state of India's environment as well as larger, in-depth reports on the same topic.

Chipko Movement
Chipko Information Centre,
P.O. Silyarea via Ghansali
Tehri Garwhal, Uttar Pradesh 249 155
Activities: The centre provides information on the effects of development on women and puts up peaceful resistance against further deforestation in the Himalayas.

Seva Mandir
Udaipur, Rajasthan 313 001

Society for Participatory Research in Asia (PRIA)
42, Tughlakabad Institutional Area
New Delhi 110062

Research Foundation for Science and Ecology
105 Rajpur Road,
Dehra Dun,
Uttar Pradesh
Activities: Aims to influence policy and legislative decisions, while providing information through its publications of environmental concerns in the area. The organisation is involved in two movements: one against teucalyptus cultivation on farmland, and the other to save water resources by stopping limestone mining.

Self Employed Women's Association (SEWA)
Sewa Reception Centre,
Opposite Victoria Garden,
Ahmedabad 380 017
Activities: Aims to influence policy and legislative decisions. Organises meetings, training, operational projects for self-employed women to unionise. Their projects include wasteland afforestation activities and tree planting activities by members of their many cooperatives.

Society for Promotion of Wastelands Development
Shriram Bharatiya Kala Kendra,
2nd Floor, 1, Copernicus Marg,
New Delhi 110 001

Research Centre for Women's Studies
SNDT Women's University,
Vithaldas Vidyavihar,
Santacruz (West), Bombay 400 049

Gandhi Peace Foundation (GPF)
223 Deen Dayal Upadhyaya Marg,
New Delhi 110 002
Activities: Promotes networking amongst rural NGOs and consideration of Gandhian perspectives on various national and international problems, including those of environmental degradation.

Indian Social Institute
10 Institutional Area,
Lodi Estate, New Delhi 110 003
Activities: Primary concerns include tribal rights, renewable natural resources and environmental concerns as they pertain to rural and tribal folk. Publishes material on forest dwellers and environmental degradation.

Lokayan
13 Alipur Road, New Delhi 110 054
Activities: Social activism and environmental work. Publishes a newsletter that monitors social and environmental issues. Also houses the Delhi Committee on Bhopal Gas Tragedy.

Social Action for rural & Tribal Inhabitants of India (SARTHI)
P O Godhar West,

Via Lunawada,
Taluka Santrampur,
Panchmahals 389 230, Gujarat

Development Alternatives
B-32 Tara Crescent,
Qutub Institutional Area,
New Delhi 110016

The Orissa Mahila Vikas Nigam
A G Square,
Bhubaneshwar 751 009, Orissa

Malaysia

Third World Network
87 Cantonment Road,
10250 Penang,
Malaysia

International Organisation Of Consumer Unions
PO Box. 1045,
10830 Penang, Malaysia

Friends of Women
47C Jalan SS 6/12,
47301 Petaling Jaya,
Selangor, Malaysia

Consumer Association of Penang (CAP)
87 Cantonment Road,
10250 Penang
Activities: Aims to influence policy and legislative decisions and carries out extensive research and publishes on a wide range of environmental issues concerning both local and international concerns. Has strong links with the Asia-Pacific People's Environment Network, the Third World Network and the World Rainforest Movement. Has organised ad hoc campaigns to support citizens' action. Produces two monthly newsletters Utusan Konsumer (English) and Utusan Pengguna (Bahasa Malaysia).

Education and Research Association for Consumers (ERA Consumer)
11 Lorong Kilat, Grand Silibin Park,
30100 Ipoh, Perak
Activities: Has begun developing a programme of activities that address women and environment questions. Recently produced a book Our Common Future; Making it Happen (1991) on action that women and men can take as individuals and organisations towards a more environmentally viable community.

Environmental Protection Society Malaysia (EPSM)
71 Jalan SS2/53,
47300 Petaling Jaya
Activities: Aims to protect and improve the Malaysian environment through education, monitoring and disseminating information on pollution and research. Has launched various environmental campaigns and organises 'envirowalks' to heighten environmental awareness.

Institute for Community Education (ICE)
PO Box 8,
96007 Sibu,
Sarawak
Activities: Grassroots activism and awareness-raising. Produces a newsletter, Panchar Penemu which highlights the struggles of tribal peoples of Sarawak in the face of heavy logging and commercial agricultural activities.

National Council of Women's Organisations (NCWO)
157 Jalan Tun Razak,
50440 Kuala Lumpur
Activities: A national network of women's NGO organisations. In response to the government National Policy on Women, NCWO has set up several commissions for implementing various aspects of the policy, including a component on women and environment.

Sahabat Alam Malaysia
43 Salween Road,

10050 Penang
Activities: Campaigns for environmental protection and conservation of natural resources in Malaysia. Assists different marginalised groups and lobbies their concerns on environmental degradation. Monitors pollution and other environmental concerns in their bimonthly newsletter, Suara Sam and a journal, Environmental Digest.

SUSDEN Malaysia
c/o Management Institute for Social Change (MINSOC),
B-2114,
1st Floor, Jalan Merpati,
25300 Kuantan,
Pahang Darul Makmur
Activities: Provides a forum for the exchange of ideas, to motivate and promote the practice of environmental conservation and sustainable development as a way of life and as part of the value system in the community.

Women's Crisis Centre
School of Social Sciences,
University Sains Malaysia,
Penang 11800

Asia Pacific Resource and Research Centre for Women
ARROW,
Room 608, 6th Floor APDc Building,
Persiaran Duta,
54080 Kuala Lumpur

Gender Studies Association of South East Asia
c/o The Population Studies Unit,
Faculty of Economics and Administration,
Lembah Pantai,
59100 Kuala Lumpur

Maldives

Environmental Research Unit
Ministry of Planning Human Resources and Environment,
Ghazee Building,
Male

Marine Research Section
Ministry of Fisheries and Agriculture,
Ghazee Building,
Male

Volunteers for Environment, Social Harmony and Improvement (VESHI)
Kinbi,
Machchan Golhi,
Buruzu Magu,
Male

Society for Health Education
Kothanmaage,
Maafannu,
Male

Pakistan

Aga Khan Rural Support Programme (AKRSP)
Baber Road, Gilgit,
Northern Areas
Activities: The Aga Khan Rural Support Programme is a non- profit, private company established by the Aga Khan Foundation to help improve the quality of the lives village people in Northern Pakistan. Activities include a village organisation and collective saving programme with a view towards prompting cooperative endeavour. Encourages accumulation of capital, provides productive physical infrastructure, credit facilities, marketing of products, training programmes for workers and special women's programmes.

Applied Socio-Economic Research (ASR)
Flat #8, 2nd Floor, Sheraz Plaza,
Main Market, Gulberg,
Lahore
Activities: Research and the publication of books, reports and papers. Acts as a documentation and resource centre with a special emphasis on women and environment. Audio-visual programmes include two video films on the environment. ASR also gives training on the variety of issues, including women and environment.

Aurat Foundation
Head Office,
4-A LDA Garden View Apartments,
Lawrence Road,
Lahore
Activities: An NGO set up to encourage the dissemination of information for women, so as to promote a more humane environment for the participation of women in society. It also provides information in the fields of health, environment, consumer protection, education, training and skill development, law, employment and finance.

International Union for Conservation of Nature and Natural
Resources (IUCN) Office,
1 Bath Island Road,
Karachi 0402
Activities: Projects include the preparation of the National Conservation Strategy, design of courses for training trainers involved in the Women in Development sector of rural development projects, sustainable forestry programme, creation of a Journalists' Resource Centre for Environment. Other projects include an Environmental Awareness and Education Programme consisting of adult literacy projects, health and family planning extension schemes, the formal education system, and media.

Organgi Pilot Project (OPP)
Sector 1-D, 26 Daulat House,
Orangi Town,
Karachi 41
Activities: Has conducted research and extension work focusing on the problems of low-income squatters. Developed a low-cost sanitation system managed and maintained by local women, and has promoted urban regeneration, targeting women as central to the success of any waste and water management activity.

Shirkat Gah
1 Bath Island Road,
Karachi 75530
Activities: A women's collective that works to encourage, support and promote the participation of women in national development. Shirkat Gah has also been working in collaboration with IUCN for the protection of environment in Pakistan.

World Wide Fund for Nature (WWF) Pakistan
1 Bath Island Road,
Karachi 402
Activities: Strategies on environment and development programmes. Works in close collaboration with women's organisations.

Sri Lanka

Envi Foundation Limited
6, Boyd Place,
Colombo 3,
Sri Lanka

Centre for Women's Research (CENWOR)
121/1 Ascot Avenue, Thimbirigasyaya,
Colombo 5
Activities: Research and publications on women and development issues.

International Union for Conservation of Nature and Natural Resources (IUCN) Office
7 Vajira Lane,
Colombo 5
Activities: Preparation of management plan for Knuckles Reserve. Preparation of management plan for Sinharaja Reserve, incorporating an

environmental component into forestry development.

Marga Institute
PO Box. 601,
61, Ispathana Mawatha
Colombo 5
Activities: Research-based organisation that seeks to influence policy making and social process relating to economic growth and social equity. One of their research projects in the rural agricultural sector is to examine the specific nature of the link between women's functions, customs and rituals in rural society and the environment.

Sri Lanka Environmental Federation/ Sri Lanka Development Confederation
215, G-2/5 Park Road,
Colombo 5
Activities: A citizens' action group that works to coordinate environmental NGOs in Sri Lanka, and carries out research on various development issues. It highlights the state of the environment in Sri Lanka and assists in formulating legislation.

Sri Lank Environment Congress (SLEC)
17/1 Barnes Avenue,
Mt. Lavinia
Activities: Started as a public interest law firm, then formed as an umbrella organisation for non-governmental organisations throughout the country. It produces two publications; Mhikiatha, a monthly magazine and an environmental quarterly, Biophere. SLEC's basic aim is to provide a forum for discussion amongst environmental NGOs.

The Environmental Foundation Ltd (EFL)
29 Siripa Road,
Colombo 5
Activities: An environmental public-interest organisation which monitors and promotes environmental protection largely through legal means. EFL has a number of major environmental projects and works with women's groups to help create public awareness. EFL publishes a quarterly newsletter in English called Biosphere *and a Sinhala newsletter,* Surekera.

Sarvodaya Women's Movement
32 Rawatawatte Road,
Moratuwa
Activities: Organises communication programmes, training programmes, and village/district level projects on natural resource management and coordination with government and non-government agencies at national and field level.

Kantha Shakthi
Thimbirigasyaya Road,
Colombo 5
Activities: awareness creation on women's role in agriculture, the safe use of pesticides and safe handling of household chemicals.

Women's Environment Centre
Ruk Rakaganno,
03 Campbell Terrace,
Colombo 10
Activities: Produces a newsletter for women on issues of environment and development. Also organises workshops and tree planting programmes.

Select list of institutions working with water harvesting systems

Bangladesh

Caritas Bangladesh
2 Outer Cir Road,
Shantibagh,
Dhaka 1217

Rangpur-Dinajpur Rural Service (RDRS)
House 62, Road 7A,
Dhanbondi,
Dhaka 1209

India

Society for Promotion of Wasteland Development (SPWD)
1, Copernicus Marg,
New Delhi 110 001

Development Alternatives (DA)
B-32 TARA Crescent,
Qutab Institutional Area,
New Delhi 110 016

Madras Institute of Development Studies
Gandhinagar, Adyar,
Madras,
Tamil Nadu 600 020

Institute of Rural Management
Anand
Gujarat

Sadguru Water Development Foundation (SWDF)
PO Box 71,
Near RTO Naka,
Dahod Taluka,
Dist. Panchmahal,
Gujarat

Gram Gaurav Pratisthan
PO Box 1202,
67, Hadapsar Industrial Estate,
Dist. Pune,
Maharashtra 411 013

Tarun Bharat Sangh
Village Bhikampura,
Thanagazi Tehsil,
Dist. Alwar,
Rajasthan

Agha Khan Rural Support Programme
Choice-Premises,
Swastika Cross Road,
Navrangpura, Ahmedabad,
Gujarat 300 009

Malaysia

Asia Pacific People's Environment Network (APPEN)
43, Salween Road,
10050 Penang

Centre for Environemt, Technology and Development (CETDEM)
71, Jalan SS2/53,
Petaling Jaya,
47300 Selangor

Pakistan

Al-Muhahid Welfare Council
Musakhel District,
Mianwali,
Punjab

Rural Development Foundation
16 Street 35,
F-6/1 (PO Box 1170),
Islamabad

Sindh Rural Workers Cooperative Organisation (SRWCO)
263-C, Block 2,
Near Tariq Hotel, Tariq Road,
P.E.C.H.S.,
Karachi 29

Sri Lanka

MARGA Institute
P.O. Box 601,
61 Isipathana Mawatha,
Colombo 5

A select bibliography

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Learning from rural women

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Contact: Commonwealth Science Council, Commonwealth Secretariat, Marlborough House, Pall Mall, London SW1Y 5HX, UK

Davis-Case, D. 1989. *Community Forestry. Participatory Assessment, Monitoring & Evaluation. Forest, Trees and People, Community Forestry Note 2.* Food and Agriculture Organisation of the \United Nations, Rome, Italy.
This book outlines the concepts, approaches and techniques that need to be an integral part of a truly participatory development strategy. It includes a section outlining 23 different tools for participatory analysis and communication
Contact: Community Forestry Officer, Room 823bis, Policy and Planning Service, Forestry Department, FAO, Via delle Terme di Caracalla, Rome 00100, Italy

Feuerstein, M.T. 1986. *Partners in Evaluation. Evaluating Development and Community Programmes with Participants.* Macmillan Publishers.
This guide is designed to be used in the field by busy practitioners with little or no formal training in evaluation methods. The methods, principles and examples it contains can be used in many different types of programmes, but they are particularly appropriate to development and community programmes.
Contact: TALC, Box 49, St Albans, Herts AL1 4AX, UK

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This book, produced in three separate volumes, is aimed at educators and community workers in the field. Based on the approach by Paulo Freire, it gives practical advice on how to use participatory analysis and participatory education for the development of self-reliant communities
Contact: Mambo Press, PO Box 779, Gweru, Zimbabwe

McCracken, J.A, Pretty, J.N. & Conway, G.R. 1988. *An Introduction to Rapid Rural Appraisal for Agricultural Development.* Sustainable Agricultural Programme, IIED, London. £ 4.00 (free to Third World individuals and institutions).
An overview of the Rapid Rural Appraisal approach and some of its techniques. This publication is not designed as a field guide but provides examples of where the techniques have proved useful. Strong emphasis on diagramming.
Contact: Sustainable Agriculture Programme, IIED, 3 Endsleigh Street, London WC1H ODD, UK

McCracken, J.A. et al. 1991. 'Diagrams for Shared Learning and Analysis. Participatory Rural Appraisal Handbooks: No. 2' *IIED,* London and FAO, Rome (in press)
This handbook conveys a range of diagrams : maps, transacts, seasonal and daily calendars, historical and predictive diagramming, cartoons, flow diagrams, decision trees, pie diagrams and venn diagrams.
Contact: Sustainable Agriculture Programme, International Institute for Environment and Development, 3 Endsleigh Street, London WC1H ODD, UK

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Contact: Sustainable Agriculture Programme, International Institute for Environment and Development, 3 Endsleigh Street, London WC1H ODD, UK

McCracken, J.A. et al. 1991. 'Annotated Bibliography: Participatory Rural Appraisal Handbooks: No. 4' *IIED,* London and FAO, Rome (in press)
This bibliography includes approximately 250 references to publications on general participatory research and development approaches; case studies of RRA and related approaches, including non-agricultural applications; and documents on specific techniques.
Contact: Sustainable Agriculture Programme, International Institute for Environment and Development, 3 Endsleigh Street, London WC1H ODD, UK

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This manual is aimed at readers with no special knowledge of social research methods or statistics. In particular it is designed to help those working in remote rural area, with little money or technical back-up. Guidelines are provided on, for example the fieldwork team, choosing the sample, and presenting the findings.
Contact: Oxfam, 272 Bankbury Road, Oxford OX2 7DZ, UK

Participatory Rural Appraisal Handbook, 1990. National Environmental Secretariat, Kenya, Clark University, USA, Egerton University, Kenya and the Center for International Development and Environment of the World Resources Institute.
This handbook explains the use of participatory rural appraisal (PRA) for developing community-based resource management plans. It uses case study material of RRAs conducted in Kenya. This handbook has also been summarised as a booklet: MWAGIRU, W., THOMAS-SLAYTER, B.P. AND FORD, R. 1989. *An Introduction to Participatory Rural Appraisal for Rural Resources Management.* Clark University, USA and National Environment Secretariat, Kenya.
For both these publications contact: The Director, National Environment Secretariat, Ministry of Environment and Natural Resources, PO Box 67839. Nairobi, Kenya
OR
The Director, Program for International Development, Clark University, Worcester, Massachussetts 01610, USA

Pretty, J.N. et al. 1991. *Semi-structured Interviewing. Participatory Rural Appraisal Handbooks No. 1,* IIED, London and FAO, Rome.
This handbook provides guidelines on how to select informants, how to prepare to interview, appropriate styles of questioning, how to avoid errors and biases.

Contact: Sustainable Agriculture Programme, International Institute for Environment and Development, 3 Endsleigh Street, London WC1H ODD, UK

Rojas, M. (FAO). 1989. *Women in Community Forestry. A field guide for project design and implementation.* Food and Agriculture Organization of the United Nations, Rome.
This guide focuses on practical ways to include women in project design and implementation and is meant to be a tool to facilitate discussion, offer options and promote action on behalf of women and forestry.

Rugh, J. 1986. *Self-Evaluation of Rural Community Development Projects.* A World Neighbours Publication, Oklahoma, USA.
The basic purpose of this manual is to help those involved in running rural community development projects to learn how to do more effective and appropriate evaluation themselves. It discusses the questions : why evaluate, evaluation for whom, evaluation by whom levels of evaluation, when to evaluate, what to evaluate and how to evaluate.
Contact: World Neighbours Development Communications, 5116 North Portland Avenue, Oklahoma City, OK 73112, USA

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This manual provides methods, guidelines and examples for integrating women into agricultural and natural resource development projects. It includes lists and question sheets to identify gender issues that should be addressed by those involved in project assistance. The manual also presents case studies describing efforts to incorporate women in development activities.
Contact: Dissemination Manager, Office of Women in Development, US Agency for International , Development, Washington DC 20523-0041 USA

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This manual deals with the topics of the role of trainer in participatory training, designing a training programme, small groups, learning-training methods, and evaluation and follow-up.
Contact: Society for Participatory Research in Asia, 42 Tughlakabad Institutional Area, New Delhi 110 062

Vella, J. 1989. *Learning To Teach. Training of Trainers for Community Development.* SCF and OEF International.
This manual is designed to be used in training of trainers workshops and includes guidelines on, for example, adult to adult communication, using pictures and sociodrama.
Contact: OEF International, 1815 H St, NW, 11th Floor, Washington DC 20006, USA

Wasonga, L.M. and Zwart, G. 1984. *A Manual for Extension Workers in Arid and Semi-Arid Zones. For Promotion and Management of Women's Group Projects.* Ministry of Finance and Planning, Kenya, and Food and Agriculture Organisation of the United Nations, Rome.
The purpose of this manual is to provide workers with guidelines to assist them when working with women's groups who have organized themselves to undertake income generating activities. The manual contains case studies of projects in arid and semi-arid lands of Kenya.
Contact: Ministry of Finance and Planning, PO Box 30005, Nairobi, Kenya

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Some key concepts on sustainable management of resources

Some of the terms used in this manual are those typically used in the context of environment and development. Since some definitions may vary, depending upon the specific context, a list of the more frequently used terms along with definitions, follows:

COMMON PROPERTY RESOURCES are resources in a community has shared usage rights. Resources in this category could include community pastures, community forests, common dumping and threshing grounds, watershed drainages, village ponds, and rivers, as well as their banks and beds.

CONSERVING BIOLOGICAL DIVERSITY: The diversity of many of the countries in the Asia region is reflected in the differences of their living organisms. The region has one of the highest rates of diversity and existence of unique species in the world. This is, however, seriously threatened by development activities.

DEFORESTATION is the loss of trees by their dying or by human removal. Shifting cultivation or slash and burn methods are as much a danger as overlogging

DESERTIFICATION is the process whereby lands bordering deserts are reduced to desert-like conditions. It usually refers to the degradation of arid and semi-arid lands. Desertification can occur both naturally and through human activities or by the two acting together. It often results in a reduction in the amount and variety of plant and animal species, reduced soil fertility and a reduction in available water, and an increase in soil erosion.

ENVIRONMENTAL DEGRADATION is a reduction in either the usefulness of a natural resource, or in its capacity to be self-sutaining.

ENVIRONMENT AND HEALTH: In many Asian countries, infectious diseases associated with poor environmental conditions are widely prevalent.

NATURAL RESOURCES is everything we use from nature, and includes land, water, fisheries, forests, agricultural crops, animals and minerals.

NATURAL RESOURCES CONSERVATION describes the preservation of some, and the careful use of other natural resources, to ensure that the existing natural systems are not run down beyond their ability to recover

POLLUTION results from the release of harmful substances into the environment. It is usually classified according to the polluting element – air (emissions), water (effluents) and land (dumps and disposals). The cause can be natural but is usually a result of human activity.

RESOURCE MANAGEMENT is the way in which resources are used to meet human needs. For instance, the way in which a forest area is used by a local community to provide wood for construction and fuel, fodder for

animals, food and medicines for consumption and raw materials for cottage industries.

SHIFTING CULTIVATION slash & burn agriculture concerns farming different plots of land in rotation. A patch of land is cultivation until the soil loses its fertility or is covered by weeds. New sites for planting are usually cleared by burning natural vegetation.

SALINISATION is the contamination of soil by excessive quantities of dissolved salts. This is a common problem not only in coastal regions but also where extensive irrigation is used.

SUSTAINABLE DEVELOPMENT is development without destruction. In the words of the World Commission on Environment and Development it is ' meets the needs of the present without compromising the ability of future generations to meet their own needs'.

TRADITIONAL SYSTEMS of resource management are systems developed by societies, often over many generations, which contribute to sustainable use of natural resources.

The following terms relate specifically to concepts and basic techniques referred to in relation to the conservation strategies discussed in Section 4 of this manual:

BIOGAS is a mixture of 60 per cent methane and 40 per cent carbon dioxide, and is produced by anaerobic bacteria through the fermentation of organic matter inside an airtight digester. Benefits include the removal of offensive smelling waste, a supply of organic compost, and the production of a gas that can be used for cooking.

BUNDING is a well tested and simple measure to minimise topsoil loss. The earthen bund is provided with an outlet for excess water to escape, which also enhances groundwater recharge. The outlet is located where the slope is steepest or the flow of water is highest. Legumes and grasses can be sown on these bunds to make them stronger while also providing a good source of forage.

CHECKDAMS are barriers built across the flow of water in a stream in order to reduce the damage caused by high-energy water flow as well as to store part of the excess flow that occurs during the monsoon. The advantage of these structures is that they store surface water for use both during and after the monsoon, and aid in groundwater recharge of the area.

COVER CROPS are grown to provide vegetative cover for the land during a season when it would otherwise be bare. An example of this is the growing of green fodder during summer months following wheat harvesting. Cover crops protect the soil against erosion and the loss of nutrients

CROP ROTATION/MIXED CROPPING involves the growing of several crops, singly or in combination, in a regular sequence rather than growing the same crop in a field year after year. When a crop such as wheat, barley or paddy is continually grown on the same plot, the plants feed on the same the soil, depleting it of nutrients. The introduction of a deep-rooted crop allows a period of rest for the depleted layer of soil.

COMPOSTING entails the decomposition of the organic content of waste under controlled conditions, either through anaerobic or aerobic bacteria, to produce manure. Anaerobic decomposition, takes place in the absence of oxygen and is a low-cost but lengthy process, whereas aerobic decomposition is much more rapid.

GREEN MANURE CROPS are grown soley to be ploughed back into the soil. Usually, a green manure crop is fairly deep-rooted and its growth, followed by its ploughing results in a movement of plant nutrients from the deeper layers up to the topsoil.

GROWING GRASSES AND LEGUMES IN FALLOWS helps to reduce soil erosion, while ploughing the legume back into the land greatly improves the structure and nitrogen content of the soil.

LEGUMES, such as gram and soybeans, have the capacity to fix atmospheric nitrogen in the soil (50 to 100kg per hectare per year). Mixed cropping of cereal and legumes therefore ensures maintenance of soil fertility.

MULCHING is the spreading of crop residue or other vegetation over open field surfaces. Mulching minimises splash effect of rain drops, controls weeds on the crop land, and reduces water evaporation.

PROPER CROP AND LAND MANAGEMENT ensures crop cover for a maximum possible period, and helps to prevent soil erosion by wind and by splash of rain drops. Contour ploughing on sloping lands also helps to reduce soil erosion.

STONE DYKES are stone walls built in rocky terrain where the slope of the land does not have enough soil depth to allow digging.

USE OF ANIMAL MANURES, PLANT RESIDUES AND FERTILISERS represents a return of some of the nutrients that have been removed from it. A large share of the nutrients absorbed by the growing plant are permanently lost to the soil due to consumption by human beings and animals.

Vegetative barriers are constructed by planting *Chrysopogon* or Vetiver along the contours of a slope. They help reduce soil erosion by slowing down the erosive velocity of fast-flowing water.

VERMI-COMPOSTING is the recycling of organic waste using selective tropical species of earthworms under semi-natural conditions. It is a economical and fast method of composting

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