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Common Pool Resources in Semi-arid India

Problems and potentials

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COMMON POOL RESOURCES IN SEMI-ARID INDIA: PROBLEMS AND POTENTIALS

GLOSSARY

Acronyms

AKRSP(I)	Aga Khan Rural Support Programme (India), Ahmedabad
AP	Andhra Pradesh
CBO	Community Based Organisation
CFM	Community Forest Management
CPR	Common Pool Resource
CRIDA	Central Research Institute for Dryland Agriculture, Hyderabad
CWS	Centre for World Solidarity, Hyderabad
DFID	Department for International Development, United Kingdom
DFO	Divisional Forest Officer
FD	Forest Department
GCCS	*Girijan* Corporation Co-operative Societies
JFM	Joint Forest Management
MFP	Minor Forest Products
NGO	Non-Governmental Organisation
NRI	Natural Resources Institute, Chatham, United Kingdom
NTFP	Non-Timber Forest Products
PF	Protected Forest
PPR	Private Property Resource
PRI	*Panchayati Raj* Institution
RF	Reserved Forest
Rs	Rupees (Indian currency, 67 Rs = 1 £)
SAT	Semi-Arid Tropics
SPRAD	Silvi-pasture Research and Development
SRL	Sustainable Rural Livelihoods
VASU	*Vaba Samrakshana Udyamam* (part of the JFM programme in Andhra Pradesh)
VLO	Village-Level Organisation
VSS	*Vana Samrakshna Samiti* (Forest Protection Committee)
WUA	Water User Associations

Local terms

chowkidar	watchman
crore	ten million
gram nidhi	village fund
gram panchayat	elected village council
gram sabha	village assembly
gramdan	Collective gifting/donation of all land in the village to the village assembly or *Gramsabha* for common management
kutcha	make-shift, earthen
lakh	one hundred thousand
pucca	solid, proper, paved
sarpanch	elected leader of the *panchayat*
zamindar	big landlord

1 INTRODUCTION

This report is an output of a research project funded by DFID's Natural Resources Systems Programme[1]. The project has been managed by the Natural Resources Institute of the University of Greenwich, which is based in Chatham, UK. In India the collaborators have been the Central Research Institute for Dryland Agriculture, based in Hyderabad; the Aga Khan Rural Support Programme, based in Ahmedabad, Gujarat; and the Centre for World Solidarity, Hyderabad. Specific inputs have been provided by Dr John Kerr of Michigan State University, USA; and Mr Charles Batchelor of Water Resources Management Ltd, UK (see

[1] This document is an output from a project funded by the UK Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of DFID.

Annex 2). In writing this report we have drawn heavily on reports already completed for the project by AKRSP, CRIDA and CWS (see Annex 1 for details). We would like to thank all our colleagues in these five organisations for their contributions to our thinking and knowledge.

The project has been a relatively short first phase project[2], which aimed at developing an understanding of the current status, trends, dynamics, livelihood contributions and management systems of common pool resources in India. On the basis of that understanding, the project has proposed researchable issues that should be explored in more depth in order to develop and test new interventions to maximise the benefits of CPRs. The project also seeks: "...to influence decision-makers by providing them with the knowledge required to understand the dependence of poor communities on common pool resources in semi-arid India, and the policy implications of this dependence in view of pressures on CPRs and constraints to their sustainable and equitable management".

Common pool resources are not static but are characterised by large seasonal and year-to-year fluctuations in productivity, extent of exploitation, and role in poor peoples' livelihoods. In addition to these variations, certain overarching trends in the extent and status of CPRs can be observed in semi-arid India. Various socio-economic and political factors have led to the decline of CPRs in terms of extent, productivity and diversity. At the same time, large-scale watershed development initiatives have generated new forms of common property, particularly related to augmented water supply, and they require appropriate management regimes for sustained and equitable use.

Despite widespread difficulties, there are success stories in managing CPRs in semi-arid India. Understanding the underlying parameters of these cases can provide insights into the requirements for the sustainable and equitable management of CPRs.

We invite anyone reading this report to let us have their comments on any parts of its contents. Please email them to B.Adolph@gre.ac.uk

2 TERMINOLOGY AND METHODOLOGY

2.1 Terminology

Confusion is rife in this subject area. The abbreviation CPR is sometimes used to refer to ‘common pool resources’ and sometimes to ‘common property regimes’: occasionally, a hybrid of these two terms, i.e. common pool regimes, is used. In this report we have sought to be consistent and clear by following the convention adopted by some researchers of separating the resource from the property regime; and by only using the abbreviation CPR to refer to the resource. Common pool resources (CPRs) have two key characteristics, namely:

- It is difficult to physically exclude potential users from them; and
- Their consumption is rivalrous or subtractable: i.e., increased consumption by one agent implies that less is available for others.

Common property regimes can be defined as “institutional arrangements for the cooperative (shared, joint, collective) use, management and sometimes ownership of natural resources” (McKean and Ostrom, 1995). In these regimes, no member of the user group has the right to exclude others, but the group has the right to exclude non-members from the use of the resource. it is sometimes described as ‘collective privatisation’.

Membership of the user group is usually contingent on having a presence in a location close to the relevant CPR, with the members living and/or owning land in that location. In addition, membership

[2] The project began on 15/11/00 and finished on 30/9/01.

is often also conditional on some form of contribution by the member to the group, either in cash or in kind (e.g. labour, grain). Households satisfying the location criterion sometimes fail to satisfy the contribution criterion.

In this study, three categories of CPRs are analysed: forests, non-forest land-based resources, and water resources. This study is concerned with semi-arid India only. In this report we have adopted a broad definition of semi-arid, i.e: corresponding to bio-climatic regions where the length of the growth period is 90 to 150 days, and the mean average rainfall is between 400 and 1000 mm.

2.2 Research team composition

The team consisted of 19 people from a range of disciplines. The large team size was a result of the merge of the two concept notes. The team comprised eight scientists from CRIDA (including the director), four scientists from NRI (including the team leader), one staff member from each CWS and AKRSP(I), and two consultants (one from the UK, and one from the USA - see

Annex 2).

The team was dominated by natural scientists, with more than half of the team members and more than 65% of staff time inputs being technically orientated. Social development skills came mostly from NRI.

2.3 Research methodology

The project used a two-tiered approach in order to capture both the documented and undocumented knowledge of CPR status, livelihood contributions, and management systems. It consisted of three main components:

1. A literature and data review, undertaken by CRIDA
2. Stakeholder consultations and case studies from Andhra Pradesh, undertaken by CWS
3. Stakeholder consultations and case studies from Gujarat, undertaken by AKRSP(I).

A formal literature and data review was carried out by CRIDA (supported by NRI and MSU). This review relied on documented (but not necessary published) sources, such as project reports, journal articles, and land use statistics. In addition, before and during the validation workshop, CRIDA consulted those ACRPDA (All-India Co-ordinated Research Project on Dryland Agriculture) centres that have a mandate for crop and fodder research in semi-arid parts of India.

Parallel to this, the two NGOs (AKRSP(I) in Gujarat and CWS in Andhra Pradesh) consulted with grassroots organisations in the two states to capture their experiences with innovative management options. The grassroots organisations, supported by the two NGOs, carried out case studies of successful and unsuccessful CPR management systems, using a checklist that was devised during the project's inception workshop. It is well known that many recent trends and approaches have so far not been documented and could therefore only be included in the review through direct interactions with the organisations involved.

The interactions between CWS / AKRSP(I) and stakeholders took place by mail / telephone (sending out a checklist), through field visits, and through regional workshops in Hyderabad and Ahmedabad.

3 CURRENT STATUS, DYNAMICS AND TRENDS OF CPRS IN SA INDIA

3.1 Introduction: Overall trends and developments related to the status of CPRs

3.1.1 Status and trends

With the breakdown of traditional management systems (where these existed), and exacerbated by privatisation and encroachment, most land-based CPRs in semi-arid India have become severely degraded and have shrunk in area. It is easier to document the reduction in area than the changes in quality. However, even this is problematic, because illegal privatisation (encroachment) takes place unrecorded.

The lack of reliable and comprehensive data, combined with the large variations from village to village and district to district, make it difficult for us to summarise briefly the trends that have been taking place. Some data for each general category of CPR are given in the following sections. For further details we refer readers to the three other reports produced by our collaborators in this project, i.e. the Andhra Pradesh (by CWS) and Gujarat (by AKRSP) reports, and the CRIDA report (see Annex 1 for details). These are referred to in the text of this report as the ‘Andhra Pradesh report’, ‘Gujarat report’ and ‘CRIDA report’ respectively.

Although varied in extent, most villages have a large proportion of the common water bodies and common lands listed in Table 1.

Table 1 CPRs found in Andhra Pradesh study villages

Forest	Water	Village common lands
Reserve forest Village forest	Tanks (*cheruvulu*) Ponds (*kuntalu*) Common wells (*uuru bavulu*) Common bore wells Streams (*vvagulu*) Rivulets (*vankalu*)	Community pastures for grazing (*metha porambokulu*) Waste (*poramboku*) lands • *Vanka poramboku* • *Gutta poramboku* • *Cheruvu poramboku* Common lands used for • Dumping waste • Thrashing grounds • *Bendula doddi* • Watershed drainage

Source: Andhra Pradesh report

3.1.2 Dynamics

CPRs, such as pastures and forests, are usually used in an apparently unregulated fashion commonly described as open access (i.e. no effective owners or secured rights). Nevertheless, shifting groups (particular castes, villages or state agencies) may lay different claims to diverse resources (e.g. grazing, non-timber forest products, timber), and vie for access, control, and use. Where a common property regime existed in the past, the community concerned may be seeking to re-instate it.

The ongoing nature of local politics and attempts to modify power relations mean that State or NGO interventions enable existing conflicts to take place on new terrains; and provide supports that can facilitate new coalitions, new alliances, new contests and new resistances (Agrawal, 1994). Development agencies should take account of local politics when planning interventions, but often fail to do so adequately. Some groups may be excluded from the development process, such as keepers of small ruminants in JFM programmes, or may be marginalised as a result of it.

A village pastureland that appears to the outsider to be in a state of open access may not be: for example, one powerful caste group may prevent people from weaker groups from using the pasture at certain times (Jindal, 2000). When a development agency comes to the village with proposals to rehabilitate some of this land, stressing that there will be equal access to benefits for all households, those previously excluded may see this is an opportunity to improve their position relative to the more powerful group.

Power relations in villages may limit what development agencies can feasibly do to benefit the poor, and need to be taken into account when interventions are being planned, as is indicated in Table 2. Interventions whose benefits are targeted exclusively at the poor are liable to fail, and may result in physical violence and sometimes death. This is illustrated by the following example from one of the project's AP case studies.

Table 2 Distribution Strategies and their Political Feasibility

Strategy	Rural elite	Rural poor	Political feasibility
A	Gain	Lose	High
B	Gain	Gain	High
C	No change	Gain	Medium
D	Lose	Gain	Low

Source: Adapted from Chambers et al.*, 1989*

Box 1 Power Relations and CPR Management: the Case of Varli Village

A few years ago an NGO formed a group of SCs and STs in the village of Varli in Anantapur District, to protect and manage a tank. The tank was converted into a percolation tank, with good results; the trees on the tank foreshore grew into a dense and thick grove, and provided a good income; and the sale of fish became a major source of income. The SCs and STs were able to fine caste Hindus if they violated management rules for the tank and its associated resources. The success of the intervention, and its regular yield of income, seemed to generate jealousy among the caste Hindus. In December 1998 the most outspoken member of the tank committee was murdered near the tank. During the next 2-3 days all of the trees from the tank were cut and sold by non-SC/ST people from the village, who also invited people from neighbouring villages to join them. It appears that their goal was to destroy the community effort by the scheduled people, and if so they were successful. The police and other authorities failed to intervene. The gruesome murder silenced many enthusiastic villagers, and plundering common resources for individual benefit spread to some more villages.

Source: Andhra Pradesh report

Government policies. Another important factor that has substantially affected the status of CPRs is the policies and programmes adopted by the government. Various policies and programmes, such as land reforms, forest policy, waste land development programme, irrigation policy, and introduction of Panchayati raj system pursued by the successive governments in the post independence period have all contributed to the rapid decline of CPRs. The excessive exploitation of forests for commercial/ industrial purposes by the private contractors, which was allowed by the government through coupe system, has largely contributed to the fast depletion of forest resources. Land reform policies, without explicitly stating, have encouraged the privatisation of village common lands. The introduction of local self-governments and electoral politics has also contributed to the decline of traditional management systems, which were largely responsible for proper maintenance of CPRs.

3.2 Forest resources

3.2.1 Status and trends

Forest cover for India as a whole is about 10% of the land area (CRIDA report), and in many semi-arid regions it is less than this. Forest cover is being lost at the rate of 1.5 million ha per year (CRIDA report). It has been estimated that people illegally occupy 1.5 million ha of forest, for agriculture and other uses). JFM has resulted in improved forest status in both AP and Gujarat.

In AP, before the1970s there were many dense large forests, providing a good quantity and quality of timber and NTFPs. Since then, however, there has been a substantial decline in their quality, accompanied by a significant loss of bio-diversity (Andhra Pradesh report). The decline has been most marked in the village forests: the Reserve Forests have fared somewhat better.

Satellite images show that forest in Gujarat is much less than shown on survey data /FD data. In 1997 only 6.4% of the land was under forest cover, not 9.6% as per a survey done in 1990-91 (Gujarat report). Dense forest is found on only one third of the notified forest area, which gives some indication of the degree of degradation.

4.2.2 Dynamics

Deforestation has been due to many factors, including: legal and illegal felling of trees for timber; and growth in human and livestock populations, leading to increased demand for fuelwood and forage, respectively. The forests situated near large towns and plain areas have experienced greater degradation and loss of cover than those located in interior areas.

3.3 Non-forest land based CPRs

3.3.1 National status and trends

This category of CPRs includes several different types, but is typically associated with village pastures. Other types include: threshing grounds, places for dumping waste, areas for firewood collection, drainage channels, common grazing areas, recreational and religious functions, burial grounds (Andhra Pradesh report). In addition, farmers' fields (but not their private wastelands) are a very important seasonal CPR to which others have customary rights to graze their animals. The fields (i.e. the crop residues and weeds in them) appear to shift from a private property regime to an open access one during the post-harvest period.

Accurate information on the extent of grazing land is difficult to obtain: the area is systematically overestimated in official statistics, because village records are not updated (Gujarat report). Available studies give widely varying figures: one estimate (Velayuthum, 2000, cited in CRIDA report) is that the area of CPRs declined from 67 million ha in 1950/51 to 38 million in 1997 (not clear whether all India or SAT, or whether only grazing areas). Estimates from a range of field studies are given in the CRIDA report.

A number of factors contribute to the shrinkage in this resource, of which the most important are privatisation of land by the government and illegal encroachment for crop production. Nobody knows the extent of encroachment, but case studies summarised in the CRIDA report suggest that it is very large, ranging from 25-65% of the common land (CRIDA report)

There is little information available on the productivity of grazing lands in India. A study conducted by NWDB (1986) showed that grazing lands (wastelands) produce less than 20% of their biological productivity. Bentley (1984), meanwhile, estimated that over 80% of uncultivated lands produced less than 20% of their potential. Data for sites in Rajasthan that have been protected and rehabilitated show grass yields increasing by anything from a factor of two to a factor of eight (Conroy and Lobo, in press).

3.3.2 AP and Gujarat status and trends

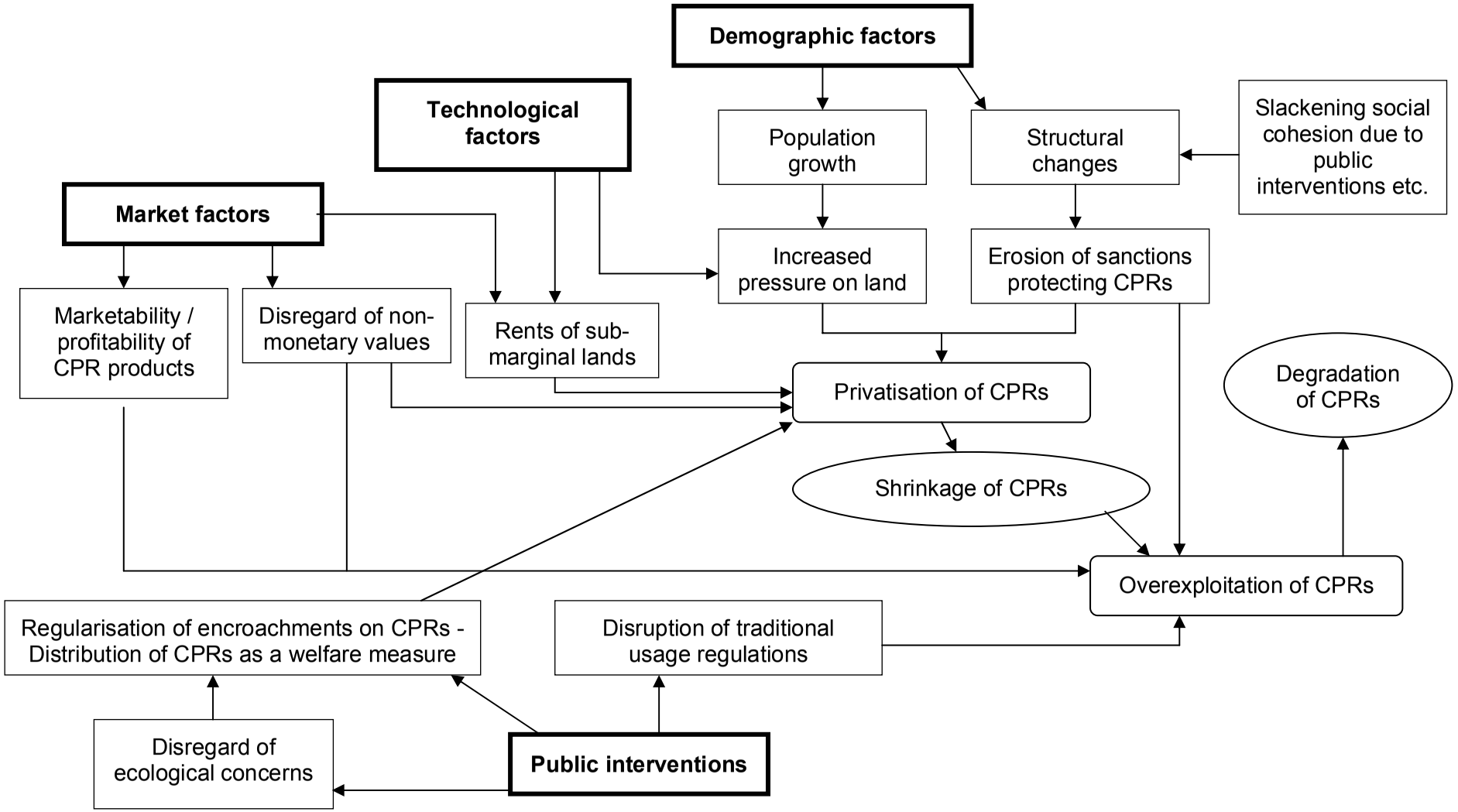
The area of these CPRs in AP has declined substantially (in some villages by 20 to 65 %). There are large differences within the state. In some areas, these CPRs have almost entirely disappeared; in others pressure on land is intense, leading to degradation; but in some parts of Rayalseema and Telangana there are still large tracts of grazing land (both private and CPR) (Andhra Pradesh report).

The quality of these resources has also declined, i.e. there is lower productivity and less biodiversity (Andhra Pradesh report). There has also been a change in vegetation species, to ones of poorer quality for livestock. The area of these lands is systematically overestimated in official statistics, because village records are not updated (Gujarat report).

3.3.3 Dynamics

There are several factors behind the degradation and shrinkage of land-based CPRs, as shown in Figure 1. The relative importance of each factor varies according to site-specific circumstances.

Figure 1 Process of depletion of common pool resources in semi-arid regions of India



Source: Jodha 1990

Encroachment in Gujarat has been on a large scale due to profitability of agriculture / cash crop production (Gujarat report). The government has been reluctant to remove encroachers, which has undermined NGO development efforts for grazing lands. Both rich and poor encroach in Gujarat and AP, but according to other evidence it is mostly the rich and powerful who drive the encroachment process (CRIDA report). These apparent contradictions are a result of the diversity of factors influencing encroachment, and their variability across SAT India. Whether or not encroachment benefits the rich or the poor depends on:

(a) the value of the land (the higher the value - including accessibility - , the more likely rich and powerful people will encroach),
(b) the relative pressure on the land (proportion / number of people depending on the resource for a living), and
(c) power relations in the community - the presence of strong self-help groups representing the interests of the poor can be a strong factor preventing rich people from encroaching CPRs.

Table 3 The Nature of Encroachment – Causes and effects

Encroachment by Whom	**Purpose**	**Other Causes**	**Affects whom**
Powerful people either economically or politically	1.Vested Interest 2. Status 3. Cultivation	1. Govt Mandate 2. Social Forestry 3.Political gains 4.Misuse of Power 5.Sarpanch 6. Govt. Officials	1. Rural Artisans 2. Women 3. Poor suffers
Industry	Mining	Land Value	Conflicts
Pastoral Community	Grazing	-	1.CPR/ha. 2.Pressure on CPR 3.Cattle 4.POP.Type
Religious Group	Temple	-	-
Intervention		-	Landless, marginal farmers

Source: Gujarat Report

Legal privatisation has been taking place, with the government distributing land to ST / SC and other poor groups. In AP, failure of the land ceiling act made the government go for the softer option of distributing common lands to the poor. In all the study villages, a substantial portion of common lands was distributed by the government to the weaker sections for housing as well as cultivation (Andhra Pradesh report). However, Patta lands were often unsuitable for cultivation, and had no productive use.

Quarrying, mining and related activities are an important driving force behind the degradation of CPRs in many areas. In Gujarat, CPLRs are used for stone quarrying, soil mining (put clay / sediments on private land), lime stone for cement plants (Gujarat report). The situation is similar in AP, where quarrying of sand and stones from riverbeds and CPR wastelands has increased tremendously as a result of the booming construction industry in the cities (Andhra Pradesh report). Generally quarrying rights to common pool land have to be negotiated with the Panchayat, but influential individuals and companies often quarry without permission from the communities affected. Royalties may be paid in some instances, e.g. for use of tank silt for brick making in Karnataka. As mining and brick making generates employment, the short-term benefits might be larger than those from sustainable CPR management by the community.

3.4 Water resources

3.4.1 Status and trends

In semi-arid India, there is huge diversity in the natural hydrological and hydro-geological systems that exist and in the approaches that have been adopted to develop and manage these systems in order to meet a wide range of human needs. This fundamental diversity, coupled with rapidly increasing demand for water, makes generalisations on the current status, dynamics and trends relating to water resources rather difficult. For example, statements relating to one geological situation will not necessarily be applicable to another one. It should be noted also that temporal and spatial scales are fundamentally important when considering water resources. For example, important dynamics that exist in localised areas during relatively short periods of time (e.g. during droughts) are often lost when considering larger temporal and spatial scales. Conversely, only considering localised and/or short-lived dynamics may result in the bigger picture being lost.

Key resources include rainfall and surface and ground water. While it can be useful sometimes to consider ground and surface water resources separately it is, of course, essential to recognise that surface and groundwater resources interact. Surface water in the form of ephemeral streams, rivers and tanks provides an important source of groundwater recharge and groundwater provides base flow to streams and rivers. Sources include traditional wells, or tubewells/ borewells that provide means of storing and accessing groundwater. Comparable sources above-ground include tanks, check dams and canals to store, and distribute surface water. All of these resources and sources are part of systems to utilise water for irrigation, for domestic supply or other purposes. Some of the major systems are tank irrigation, groundwater-based irrigation, watershed management (the integrated the use of land and water resources at a micro-watershed scale) and rural and urban water supply. It is usually difficult to differentiate between the use of water resources for different purposes and from different sources, because systems are complex and overlapping and reliable data is often lacking at appropriate scales.

Different approaches to developing and managing water resources have evolved in different parts of SA India. Some of these systems are traditional dating back hundreds or thousands of years, such as the tank-based irrigation systems in southern India. Others, such as the widespread utilisation of groundwater for smallholder irrigation, are much more recent phenomena of the last one or two decades. These resources and management systems almost always serve multiple functions, providing for a range of different uses. Tanks for example, provide water for livestock as well as irrigation (and in the past for drinking water), and are often also used for pisciculture. Many of these resources, sources and systems are CPRs themselves (for example, tanks store surface water for a number of farmers as well as other users) or are dependent upon CPRs (for example, the groundwater below a farmer's field - effectively a privatised resource - is dependent upon inflows from surrounding areas i.e. the aquifer is a CPR).

3.4.2 Dynamics

The major issues relating to the status (and trends) of these resources, and related sources and systems are:

- **Increased demand for water resources** that has resulted in demand outstripping supply in many areas during at least part of the year. This in turn has resulted in shortages of water for domestic and productive uses at the local level and the reallocation of water from agricultural to urban uses at the regional level. The trends are for increased competition for the limited resources that exist in semi-arid areas and for a worsening impact of drought on the livelihoods of the poor in particular and on the economy of these regions. The trend is aggravated by the relatively low cost of electricity and the charging of a flat rate per horsepower for pumps, resulting in a disincentive to judicious use of electricity. At the same time, irregular power supply and high voltage fluctuations are resulting in pumps being turned on continuously (in the hope that power will come eventually) and high break-down rates of electric engines.

- **Over-exploitation of groundwater** (Box 2) under effectively open access regimes has led to widespread declines in levels. Serious impacts include failure of drinking water supply systems (with especially severe impacts on the poor), and reduced inflows to tanks with consequences for tank-based irrigation systems.
- **Reduced tank water availability** has in many areas resulted in tanks not providing services such as water for livestock, a location for bathing and washing laundry etc. This reduced water availability is due to a number of factors including reduced inflow, lowering of the groundwater levels in the vicinity of the tanks, and siltation.
- In many places there are not large amounts of unutilised runoff that can be harvested through **measures to increase supply** such as rainwater harvesting, construction of new check dams, and de-siltation of tanks. Runoff figures often appear to be overestimated, and such supply-side measures will often have impacts on downstream users.
- **Deterioration in water quality** in many areas, primarily as a result of anthropogenic pollutants (e.g. untreated effluents) and natural pollutants (e.g. fluoride).

Water resources issues are amongst the most important problems facing people living in and institutions responsible for development in India's semi-arid lands. India's water crisis is more pronounced in the western and peninsular areas (including not surprisingly the semi-arid areas), which are predicted to face acute water scarcity in the coming 25 years. The AP Water Conservation Mission report that per capita water availability has declined by 50% in the period 1947-2000 as a result of increasing population growth and poor management of resources.

3.5 Interactions

Important interactions include:

- positive impacts of improved management of CPR land resources (principally actions of watershed development and joint forest management projects to increase vegetation cover) through reduced siltation, improved groundwater recharge and base flows
- negative impacts due to increased water use by trees and other deep-rooting vegetation in areas where JFM and WD projects have promoted intensive planting
- protection of grazing lands and forests helps prevent siltation of surface water bodies and can contribute to groundwater recharge)
- CPRs often have beneficial effects on private lands, providing grass for livestock, leaf litter for soil fertility, water for irrigation, etc.
- Reduction / disappearance of non-forest lands often leads to additional pressures on the forests, resulting in forest degradation and negative effects on water balance, erosion, etc. (Andhra Pradesh report).
- negative (indirect) impacts of rural development projects (such as watershed development projects) through investment of income in new private bore wells and pump sets, leading to increased groundwater use.

Watershed development projects may actually contribute to increased competition between water use for irrigation and domestic use, because extending the irrigated area is often an explicit objective or an unintended outcome. Lobo & Palghadmal (1999) report how watershed programmes focusing on land-based activities such as soil and water conservation, can in turn have huge impacts on water use through investment of income in new wells and pumps (e.g. number of wells up by 85%, electric pumps up by 527%, and the area irrigated up by 500%). The improved resource, cash from subsidies, enhanced returns from dryland agriculture, more organised groups, and direct promotion of irrigation all provide powerful incentives to irrigate new land - and returns from irrigated cropping are very attractive compared to dryland farming.

4 LIVELIHOOD CONTRIBUTIONS OF CPRS

4.1 Introduction: Livelihood strategies and the role of CPRs

In the past CPRs have made a substantial contribution to the livelihoods of rural people, especially small and marginal farmers and landless labourers. This has particularly been the case in high risk and low productivity areas such as the arid and semi-arid regions (Andhra Pradesh report). In general terms, they have:

- widened the range of income-generating activities available to people in rural areas;
- provided inputs to agriculture;
- provided inputs to the home;
- provided environmental services;
- served as a safety net for people in drought years, in terms of income generation and/or food supply.

Income-generating activities Regular ones based on CPRs include the collection and sale of: firewood, leaves made into plates and cups, fruits, grass for fodder, grass for thatching, honey and fish. Grass and tree fodder may also be fed to small ruminants, which can be a significant source of income, especially for the poor.

Direct inputs to agriculture Wood from forests was used in making agricultural implements and bullock carts, and in fending off fields. Forage from forests and non-forest land-based CPRs is needed to feed livestock, some of which are an integral part of agricultural systems. Drinking water for livestock is another pre-requisite for their maintenance that often comes from CPRs, such as rivers, village ponds and tanks.

Direct inputs to the home Water and various fruits from CPRs are consumed by humans, while firewood is essential for cooking food. Wood and grass for thatching are used in house construction and maintenance, and wood is also used in furniture-making.

Environmental services Forests act as a sponge when it rains, regulating water flows - preventing flash floods and prolonging the period during which surface water is available. Where forests are on hillocks near to farmers' fields they also prevent stones and poor quality soil being washed off the hillock and deposited in farmers' fields; while supplying nutrients to the fields in the form of leaf litter.

A safety net for people in drought years Since forests are relatively resilient in the face of drought, many forest-based income-generating activities can continue when crop production has failed. In addition, some communities in forest areas used to fell trees in extreme drought years (but not in normal years) and sell the wood or firewood to generate income. Forests and other common lands may also be a source of emergency foods, such as weeds, tubers and mammals.

These common pool resources have contributed substantially to the poor people's employment, income and assets accumulation in several direct and indirect ways. They can reduce income disparities between the landless and near landless, on the one hand, and the land rich, on the other. The degree and nature of CPRs' contribution to the livelihoods varies tremendously from area to area, and social group to social group, depending upon the availability of quantity and quality of these resources and socio-cultural traditions of the communities.

4.1.1 CPRs as a coping mechanism

In most of semi-arid India CPRs used to play a major role in people's coping strategies in drought years, and in the event of other contingencies. However, the contribution made by CPRs and other coping mechanisms associated with them has declined in many areas, and in some cases has

disappeared altogether. This reflects the declines in the quantity and/or quality of water[3] and land-based common pool resources that were discussed in chapter 4. The degree to which CPR contributions have declined obviously varies from place to place. Nevertheless, the general changes taking place are illustrated by the situation in parts of Udaipur, a semi-arid district in Rajasthan (see Table 4), where:

- Forest products are no longer available for collection and sale;
- Availability of fodder has decreased;
- Numbers of livestock per household have decreased, hence people have less liquid assets to dispose of;
- the water table has declined drastically over the years, and in the recent drought this greatly reduced cultivation of the *rabi* (winter) crop.

This would not matter so much if other coping mechanisms had become available to replace the CPR-related ones. However, in this example only one or two have come into play for poorer people, namely migration for wage labour and remittances from children who have taken up work that is not significantly affected by drought, often in urban areas.

Table 4 The Declining Contribution of CPRs in Coping with Drought: The Case of Sagatdi Village, Udaipur District, Rajasthan

CPR-related Coping mechanisms	**Drought Year**		
	1972	**1987**	**1999/2000**
Drawing on common resources	Forest products (gums, fruits, etc.) available	Forest products (gums, fruits, etc.) available	Forest products **not** available
Drawing on common resources	Wood, charcoal sold to contractors		Wood, charcoal **not** available
Drawing on common resources	Fodder available	Fodder available	Fodder **not** available
	Water crisis not severe: some irrigation from wells, ponds	Water crisis not severe: some irrigation from wells, ponds	Water crisis severe: irrigation generally not possible, even from tubewells
Animal husbandry as risk-spreading practice	Yes. More animals, so more animal products available. No fodder purchased.		AH less effective at spreading risk. Animals are less and weaker due to fodder scarcity
Drawing upon liquid assets: livestock	Sale of livestock, especially goats	Less livestock to sell	Less livestock to sell

Source: Adapted from Conroy, Iyengar, Lobo et al., 2001.

4.2 Forest resources

4.2.1 Overview

For the people who live in the close proximity of forests, forest resources are an important source of livelihoods.

In Andhra Pradesh, a variety of resources available in the forests are used for both for domestic consumption as well as generation of additional incomes by marketing them (AP report). Important

[3] The water table has declined in many regions of semi-arid India. In Anantapur and other parts of south India, tanks used to be an important source of water for irrigation, but tanks have also declined in availability and use.

timber varieties like teak, billudu, papi, jittelaga, aare, vepa, sandra, neredu, pampareni, jana, gotika, different varieties of bamboo, ulindra, nemaliadugu are used for the construction of houses, making of agricultural implements, and household furniture. The minor forest products available from non-timber forest species like karaka, kunkudu, sheekai, sara, usiri, nannari, palagadda, musti billa, tamarind, mamidi, neredu, several varieties of grasses such as paraka and boda, several varieties of trees which yield gum, and several other varieties of fruit-bearing trees are used for domestic consumption (supplementing diet, firewood, fodder to the livestock and other domestic requirements) and also getting income by selling them in surrounding markets. These varieties are collected according to the seasonal availability so as to supplement the livelihood systems of the local communities.

In central Gujarat, where the mean annual rainfall is 600-1200 mm and the forests are dry mixed deciduous, the main NTFPs are bamboo, fuelwood, timru, mahua flowers and seeds, and gums (Tewari, 1998). In north Gujarat, where the rainfall is below 600 mm, there are dry scrub forests, and major NTFPs include Timru and honey.

Due to forest degradation, traditional forest users in AP have had to shift to other occupations. Less people are now depending on the forest, and the contribution to those still depending on it has reduced (Andhra Pradesh report). The situation is slightly better where villagers depend on reserve forest.

Despite forest degradation, forest resources still contribute significantly to the livelihoods of people living near the forest, especially in areas where JFM has been successfully implemented: e.g. in one village in Cuddapah District 90% of the families get 40% of family income from forest (Andhra Pradesh report).

Table 5 Comparative household incomes from Forest Produce in several districts of Andhra Pradesh

Dependency	Area	Approximate Incomes from forest usage (per annum)	Crop incomes from agriculture (per annum)
High	Adilabad, Visakhapatnam, East Godavari, Khammam, Karimnagar, Warangal, Srikakulam, Vizianagaram	Rs 4000-6000 NTFP Timber Beedi Leaf	Rs 8000-14000
Medium	Medak, Mahboobnagar, Chittoor, Cuddapah, Nellore, Kurnool, Nizamabad	Rs 2000-4000 NTFP, Grass, Beedi Leaf	Rs 8000-14000
Low	Krishna, Guntur, Prakasam, Anantpur, Rangareddy	Rs 2000 Grass Rs 2000-3000 Grass, Beedi Leaf	Rs 9000-12000 Rs 6000-9000[4]

Source: Satyasrinivas, JFM Network, as cited in AP report

Examples for incomes from forest produce and agricultural crops for households in AP with different degrees of forest dependency are give in Table 5. The relative and absolute contribution of forests to income are likely to depend on (a) the proportion of area under forest cover (e.g. coastal states with a share of the Eastern Ghats have larger forest areas), (b) the productivity of this forest in terms of biomass production and biodiversity, and (c) the income obtainable from agriculture, which determines the relative importance of forest resources. In addition, location specific factors such as proximity to non-NR based income opportunities play a role.

[4] It is not clear from the source to which areas / districts the two different amounts refer.

4.2.2 Forage

Forests (leaves and pods of trees and shrubs, and grass undergrowth) are an important source of forage for grazing and browsing livestock, especially as they provide forage even during the dry season. In some areas animals depend more on forests than on village grazing lands. It has been estimated that: 90 million cattle and buffaloes graze on forest land (CRIDA report). In AP 66% of small and marginal farmers would not be able to cultivate in the absence of forests, because they would not be able to feed their bullocks (ibid).

Many landless and SMFs would have less goats in the absence of forests in which grazing is permitted. Forests are important to goats because they prefer to browse on leaves and pods rather than graze on grasses. In AP the FD has been charging goat-keepers before allowing them to graze their animals in the forest.

4.2.3 Fuelwood

Under JFM fuelwood can only be collected in the form of dead wood or when the trees are pruned. The latter takes place only every couple of years, and requires FD permission.

4.2.4 NTFPs

Various types of NTFPs collected from forests in Andhra Pradesh were listed in section 4.2.1. The importance of NTFPs as a source of income in AP was illustrated by Table 5. In one village of Bharuch District, Gujarat, two products accounted for 97% of village income from the sale of seven NTFPs: these were tendu leaves for beedi making (72%) and Mahua doli (seeds) (25%). Further evidence of the contribution of NTFPs to household incomes comes from data showing that in Madhya Pradesh and Maharasthra, revenue from NTFPs is respectively 4 to 10 times the value of wood (CRIDA report).

Despite the importance of NTFP sales to some groups, the returns are generally low relative to the labour put in to collecting and harvesting them. This is partly due to the nature of the marketing system for NTFPs, a subject that is discussed in section 6.3.1.

4.2.5 Impact of JFM on livelihoods

Benefits. JFM generates employment (primarily for VLO/VSS members) through plantation and SWC measures, but only during the establishment phase in the first year or two. There is then a gap of a few years before the villagers start to receive major benefits from the harvesting of forest products.

In many villages in Gujarat and Rajasthan grass is the only major usufruct during the first few years. Income per hectare from sales of grass at three JFM sites in Sabarkantha District was in the range Rs 1840-2574 (Gujarat report). In terms of income per household this is a very small amount. Nevertheless, poorer people, especially women, tend to be most active in cutting and selling grass, and regard it as a very useful income-generating activity (Jain et al., 2000). The situation is somewhat better where many usufructs like timru leaves, amla, gum and other NTFPs are available. However, in such cases, a large proportion of the benefits are cornered by the contractors and agents appointed by the Forest Development Corporation.

Equity and exclusion. For some poorer households of a village, the situation may become worse with the beginning of JFM, namely those that have been relatively dependent for their livelihood on the land proposed for JFM. With the beginning of JFM, all village households become eligible for equal benefits. The initiation of JFM may also change the mix of benefits affecting the poorer households adversely. There is a need to suitably incorporate interests of such households and other losing households in the process of JFM.

Pastoralists also tend to be disadvantaged by JFM, either in their own village's forest, or in forests to which they have traditionally migrated: and they are often excluded from the benefits in their own

village. For example, in Manikonda village, in AP's Mahabubnagar District, the shepherds living here are not members of the VSS and have lost their right to graze their animals in the nearby forest: one had sold his animals, partly as a result of pressure from the VSS (SDC, 2001). Another example comes from Udaipur District, Rajasthan where in one village JFM resulted in migration of shepherds during the rainy season, who previously had not migrated: this placed a heavier burden on the women who stayed behind to manage the agricultural work (Vardhan, 2000). Tribals and others with goat herds have also been hit by the ban on grazing under JFM, both in AP and Rajasthan.

4.3 Non-forest land based CPRs

4.3.1 Overview

The main contribution of non-forest land-based CPRs to livelihoods is that they are an important source of forage for animals. As much as 30% of livestock forage in India as a whole comes from CPRs, both forests and non-forest CPRs (CRIDA report). In AP 91% of households depend on open grazing on CPRs for an average of 35% of the forage supply. Even 82% of large farmers use CPRs for grazing (CRIDA report).

Livestock-keepers can be grouped into three categories: Agro-pastoralists (farmers), labour-pastoralists, and pastoralists (landless livestock specialists). Poor people (often SCs) in this category usually only have small ruminants, whereas better off ones may have LRs or a mixed herd. Each category has a different degree of CPR dependence (see Table 6), and hence the size of the contribution of this type of CPR to their livelihoods varies.

Farmers obtain forage from a combination of: crop residues, private grazing land (not used for crop production), common grazing land and purchased fodder. Labour pastoralists who are involved in agricultural wage labour tend to have only 1-2 small ruminants: they either take them to the fields and tether them there while they work, or they stall-feed them and carry weeds and other forage home for them. They do not usually take them to graze on CPRs, because the opportunity cost is too high. Pastoralists, on the other hand, have little, if any, access to private grazing land, unless they pay for grazing rights. Thus, they tend to be more dependent on CPRs (including harvested fields), and those with large herds may migrate at certain times of the year to other areas where CPRs are available in good condition. For landless livestock-keepers, keeping animals enables them to obtain benefits from both common lands and farmers' fields.

Table 6 Contribution of Livestock and CPRs to Livelihoods

Livelihood system	**Dependence on CPRs**	**Contribution of livestock (and hence CPRs) to livelihood**	**Overall score** (Columns 2x3)
Agro-pastoralists (LRs, maybe SRs)	*	** draught power, manure, milk, liquid asset (SRs only)	**
Labour pastoralists (only keep SRs)	*	* liquid asset (SRs only), some milk	*
Pastoralists: landless livestock (SR) specialist	***	*** Sale of SRs is main source of income	*********
Pastoralists: landless (LR/mixed herd) livestock specialist)	***	*** Sale of livestock and their products is main source of income: -- milk and manure from LRs, + occasional LR -- Sale of SRs	*********

** Importance is shown on a scale of 1-3*

4.3.2 The specific contribution of CPRs to livestock feeding systems

Common pasturelands tend to be particularly important for grazing animals during the rainy season, when grazing in fields is not possible (except when the animals are tethered to the field bunds). This is illustrated by SC goat-keepers in Indrapura village, Rajasthan whose animals obtained about 88%, 75% and 63% of their feed from common lands during the months of August, September and October respectively (Conroy, 2002 - in press).

Contribution of private fields to livestock One village (Jogion-ka-Guda) case study from Rajasthan found that about 65% of grazing was on common lands and 35% on private land: of the latter, 20% was on private wasteland and 15% on cultivated fields (Saint, 2000).

The importance of cultivated fields for goats post-harvest is illustrated by SC goat-keepers in Indrapura village, Rajasthan, whose animals relied entirely on this source during the month of April and for 25% of their feed during three winter months (Conroy, 2002 - in press). However, this appears to have been only their own fields.

People have adjusted to the reduced size and productivity of grazing lands by: (a) maximising the complementarity between private and common grazing resources; (b) accepting inferior quality of grazing because of lack of alternatives; (c) increased frequency and unseasonal grazing, leading to reduction in seed formation, removal of plant roots, and use of inferior grasses and legumes (CRIDA report). These adaptations have had a negative effect on livestock productivity.

4.3.3 Landless livestock specialist

Since this group has little or no land, but is heavily dependent on livestock for a living, it is most affected by reductions in access to, or productivity of, non-forest CPRs (see above table).
In Gujarat there have been changes in the livelihoods of the shepherd caste, due to droughts and CPR land reduction, with some of them migrating to cities (Gujarat report). In other cases, there has been a shift to migration to far away places (100-500 km), which can have negative impacts on the family breakup.

Where there has been a serious decline in common grazing lands this may have had a major impact on the livelihoods of the poor. People will have adjusted their livelihoods to compensate for reduced dependence on CPRs, and are not necessarily worse off: that depends on the nature of the new livelihood that they are able to secure. Those likely to be most seriously affected are landless pastoralists, including shepherds.

Landless pastoralists are likely to be illiterate, so the alternatives available to them may be limited to manual labour. For example, Government resettlement schemes for pastoralists in Gujarat have lead to the breakdown of indigenous knowledge and livelihood systems, loss of cattle and to the pastoralists becoming landless labourers (Gujarat report).Furthermore, shepherds may prefer migrating with their animals to taking up seasonal migration for wage labour, perceiving it as a less attractive livelihood activity (SDC, 2001).

On the other hand, they may be able to move into an attractive alternative, such as irrigated farming. This is illustrated by the case of a shepherd in Pune District, Maharashtra, who sold his sheep when canal irrigation was introduced to the area and used the money to buy land in the command area of the canal irrigation system (Conroy, pers. comm.).

4.4 Water resources

Although often overlooked, it is important to recognise that access to **domestic water supplies** provides the most important contribution that water resources make to the livelihoods of the poor in India. As well as being essential to health (80% of rural diseases are water related), access to good quality domestic water supplies supports a wide range of productive activities at the household level

ranging from dairying and tea stalls to backyard horticulture . Importantly, the entry costs to some of these activities is low, enabling poor families to participate. van Wyk et al. (2001) showed how access to domestic water supplies was particularly important to the livelihoods of women in Gujarat, enabling a range of productive activities, partly due to large time-savings associated with easy access to water supplies, and improved social relations.

Domestic water supplies are severely impacted by declining groundwater levels in many parts of semi-arid India. Increasingly, water for drinking, other basic needs and small-scale economic activities vital to the poor, is vulnerable to groundwater drought and supplies are routinely (but drastically) reduced to less than 5-10 lpcd in summer. The time (and drudgery) spent collecting water in times of scarcity (or waiting for a tanker rather than being in the field), and impacts of health problems associated poor water supplies, has significant consequences for any other rural development issues or interventions, such as the management of livestock or CPR lands.

Access to **irrigation** also clearly provides a potential route out of poverty for farming families, and has important benefits through wage labour to landless people. For example, impacts include reduction of female migration due to employment opportunities through irrigated farming in parts of Gujarat / project areas (Gujarat report). Returns to irrigated crops are much greater than to dryland crops, and the number of crops per year can also be higher. Consequently, water for irrigation is a resource of over-riding importance in terms of productivity, profitability and security (Pound, 2000). Even one protective irrigation during the season has a major impact. For example, in NE Karnataka irrigated vegetable net revenues of around Rs 10000 per ha in rabi and Rs 18000 in summer have been reported, compared to returns of around Rs 5000 per ha for the most profitable rainfed crop (Batchelor et al., 2000). As well as providing hard cash, irrigation also improves household food security and fodder supplies.

In addition to contributions through domestic water supplies and irrigation, other important water-related contributions to livelihoods include:

- supporting **livestock** - inadequate water for livestock is frequently mentioned in case studies from Gujarat and Andhra Pradesh
- **fishing** in some areas is a major source of income for poor, for example in parts of AP.
- **Multiple uses of tanks**: fishing, duck rearing, silt mining, tree raising, etc. Yield and income from tank bed cultivation (although this is often illegal/ encroachment) and from bushes / trees in adjacent land (Andhra Pradesh report)

4.5 Interactions

- Dependency on multiple resources: See case study from Gujarat (Gujarat report). For tribal people, development of irrigation alone is not useful, because holdings are very small and people depend a lot on forest => need for multi-sectoral approach (Gujarat report)
- Other example: Pastoralists depend on pasture land, but also on water for livestock. Unless both is developed, their livelihood will not improve (Gujarat report)
- Example for compensation: Sukhomajri: Herders have a share of the rights to water in an irrigation pond that the pasture drained into. This gave them an incentive to reduce the grazing pressure to reduce erosion and subsequent siltation of the water source. However, often such obvious linkages between different types of CPR are not there (CRIDA report).

5 MANAGEMENT SYSTEMS OF CPRS

5.1 Introduction

Where pressure on a common pool resource is low, i.e. below the maximum sustainable yield, there may not be any need for a management system: an open access regime may be satisfactory. This situation probably existed for many of India's CPRs hundreds of years ago. However, as demand for

the products of the resource builds up, there comes a point where management is essential if maximum sustainable yields are not to be exceeded: if they are, the resource will become degraded and its productivity will suffer. Across India, demand has risen during the last century or more due to the growth of local human and/or livestock populations.

Sometimes the increased pressure on the resource comes from an externally imposed source. For example, the construction of India's railway network required a huge amount of wood for making sleepers; and once the network was functional this in turn facilitated access by outsiders to extract firewood for use in urban centres. When these sudden increases in demand for wood took place there were no effective management systems in place, so they resulted in widespread deforestation - for example, causing the disappearance of teak forests in parts of Gujarat (Jagawat, pers. comm.).

In some parts of India management systems were in place before Independence. Some were community-based (Jodha, 1990), while others (for example, in south Rajasthan) were enforced by princes and kings and their functionaries. Most of these disappeared after Independence, when the introduction of the panchayat system by the government undermined the authority and status of traditional leaders and village elders.

The trend towards the creation of a powerful state bureaucracy, and the provision of state services of various kinds, has been accompanied by the development of a dependency syndrome, in which people expect the government to sort things out and look after their needs (Gujarat report). Nevertheless, a few new community-based management systems (notably cases of forest management) have appeared in semi-arid India during the last few decades, either spontaneously or (more recently) with the support of NGOs or government agencies.

State agencies *have* intervened in natural resource management and CPRs in various ways, two of the most recent examples being the JFM and watershed management programmes. New, participatory systems receive a positive response in general, but sometimes contradict the "old order", particularly the caste system (e.g. with SCs and STs being favoured, receiving external support / training and claiming rights), giving rise to conflicts (Andhra Pradesh report). State programmes are also enmeshed with different claims for the same resources, and new exclusions from CPRs. The resulting situation sometimes appears haphazard and chaotic (ibid).

5.2 Privatisation and encroachment

5.2.1 Encroachment

Widespread encroachment by individuals on common lands has taken place, made easier where there is no effective management system in place, due to the fact that traditional management systems are not operating any more, but no new system is operational yet. It is a *de facto* open access situation (Gujarat report).

State governments have tended to do very little to discourage encroachment, and this is a major reason why village commons are not being developed (Gujarat report). The threat of encroachment can be a disincentive to community management, because people fear they will never get the benefits. Encroachment can be self-reinforcing, because every legalisation of encroachment is an incentive for more encroachment.

In Andhra Pradesh villagers have generally accepted encroachment as a fact of life. Those who encroached are also part of the village community, and people do not intend to re-claim land from them (Andhra Pradesh report). In AP, most of the CPR land has already either been encroached or legally distributed (CRIDA report).

5.2.2 Privatisation

There has also been legal privatisation of land by the state governments, particularly in Andhra Pradesh, in the context of land reform. However, land allotted, or intended to be allotted, to the landless has often not been that beneficial, because: (1) it was frequently of poor quality; and (2) it often ended up in the hands of others through corruption (see AKRSP report, section 3.1.1.3 on Legal Privatisation, for details).

Privatisation of common pool resources can take three forms. The most obvious is privatisation to individuals (pattas), as discussed in the last paragraph. A second is *corporate privatisation*, in which companies are given rights to use CPRs and harvest products from them: an example of this from the social forestry programmes of the 1980s is the use of CPRs by companies for establishing plantations of fast-growing tree species. This kind of privatisation is back on the agenda in Andhra Pradesh, in the form of a recent government order. The third is *collective privatisation*, in other words the promotion of common property regimes. However, this is not generally regarded as a form of privatisation, so we treat it in this report as something distinct.

Corporate privatisation can lead to higher productivity, but generally the benefits arising are not equitably distributed. A major issue is whether it is possible to design privatisation patterns that are compatible with equity.

5.3 Current management systems for CPRs and their development over time

5.3.1 Forests

Under British colonial rule forests were deemed to belong to the state (i.e. the Government of India), and forest departments (FDs) were established to manage them: this continues to be the case up to the present (Gadgil and Guha, 1992). Following independence the government made revenue generation based on timber production the principal objective of forest management. Then, in 1988 the government produced a new Forest Policy, which changed the management objectives, giving priority to ensuring environmental stability and the maintenance of ecological balance. The policy stated that, subject to this first objective, the domestic/subsistence requirements of poor local people for forest products should be given higher priority than revenue generation. However, it is widely believed that the Forest Service has reservations about the policy (Saxena, 1997), and its implementation has been "slow and lackadaisical" (Khare *et al*., 2000).

The FDs have not been able to manage most of India's forests effectively, partly because of inadequate resources to enforce protection, in the face of increasing pressures from growing human and livestock populations; and partly because of corruption, and connivance with timber contractors (primarily during the 1960s) and timber smugglers. The government's policy post-independence, combined with the corruption of the FDs, resulted in a generally antagonistic and distrustful relationship between the FDs and local people.

<u>Community forest management</u>

A few villages in Anantapur District of Andhra Pradesh have been protecting forest patches on revenue land near to the village for 15-40 years. When NGOs found out about these initiatives they decided to encourage other villages in Anantapur to do the same: APPS, MEOS and others are actively involved. There are now forest protection committees in 119 villages that are protecting revenue forest land covering 41,500 acres. The forest is generally on hilly and rocky land. This means that encroachment on the sites has been relatively limited, although in recent years many farmers have encroached so that they can grow groundnut there.

The precise institutional arrangements vary from village to village. Usually, NGOs form a village society (PPS) in each village, involving all households, and a management committee may be formed. Each household contributes a small amount of money (or in kind) each month. Specific user groups

may also be formed (involving SCs, STs or other resource-poor households) to deal with training, product marketing etc. In a minority of cases a watchman is employed by the community to protect the forest, but usually protection is based on social fencing involving the whole community. Restrictions are placed on cutting of trees and encroachment; and fire protection arrangements are developed – fire is the main threat to the forests. Grazing is not usually restricted, except when and where seed dibbling is undertaken.

Grass and thatch are the main products harvested in the first few years. Other products may include medicinal plants, custard apple, honey, gums and beedi leaves. As a result of these initiatives, illicit tree felling has largely been stopped and forest fires are being prevented or controlled more effectively. Benefits for poor people include: less seasonal migration, additional income from forest produce, more work due to increased area under irrigation. The NGOs involved argue that a forest rehabilitation programme based on natural regeneration is superior to one based on tree planting, in both financial and ecological terms. This informal programme is discussed further in Box 3.

Box 3 Community Forest Management in Andhra Pradesh

There are 119 villages involved in protecting 41,500 acres of forest on revenue land in Anantapur District as of January 2001, which compares with 6,000 acres in 1993.
The low cost and participatory nature of this approach, together with the fact that it is based on an indigenous model, have been important factors in its increasing take-up. The approach taken relies primarily on:

- natural regeneration and seed dibbling, rather than tree planting; and
- social fencing rather than physical fencing;
- thorough discussion with villagers prior to implementation;
- representation of different social groups in the village.

Another important consideration is ensuring that the villagers have secure rights to the protected patches and their products. Many villages have hesitated to take up forest protection, because of doubts over whether they would have usufruct rights to the products (Khasim Peera, pers.comm). One tree species commonly found in these forests is custard apple, whose fruit is marketed. The Revenue Department often auctions the harvesting rights to custard apple to the highest bidder, who may be from outside the village.

The NGOs have played an important role in creating and sustaining a supportive enabling environment for community management. They have successfully lobbied the District Collector and other government officials to: (a) give usufruct rights to the villages (so far 78); and (b) to enter the protected areas in the prohibitory order book, to prevent further encroachment. They have also campaigned effectively against a recent government order that would have made it possible for private companies to replace natural forest on revenue land with plantations.

Clusters of 5-8 villages have been formed, which meet every six months or so to discuss common issues; and a district-level parliament was recently formed. The prospects for further widespread adoption of this model of forest protection appear to be good. The existing villages have a demonstration effect, and the number of villages involved is growing each year. In Anantapur, the current District Collector is giving this informal programme his full support, and it has been estimated that about 700 villages in the district have suitable hills or hillocks nearby (Khasim Peera, pers.comm). In addition, APPS, the umbrella NGO that is playing a lead role in Anantapur, has been promoting the replication of this kind of work in four other districts – Chittoor, Cuddapah, Kurnool and Nellore.

5.3.2 Land-based CPRs

Overexploitation resulted from institutional arrangements that were inadequate to encourage people to protect and develop these lands (Singh 1997). Historically, management of common lands followed at

least three different patterns (Gadgil and Guha 1992). In some places they were accessible to all, with insufficient pressure on resources to lead to severe degradation until the last several decades. In others, management was enforced by powerful landowners such as *zamindars*, who acted as "gatekeepers" to make sure that the common lands were not overexploited (Gadgil and Guha 1992; Bentley 1984). While this system was good for the condition of the land, it was inequitable, with benefits dominated by the landlords. In a third kind of situation, democratic village-level institutions resulted in sophisticated, equitable ways of sharing both rights and responsibilities for managing common lands (Agarwal and Narain, 1989). Although this latter situation is sometimes presented as the historical norm in rural India, there is little evidence that it prevailed beyond a minority of villages.

Today there is *generally* no effective management system in place on village pasturelands. Whatever the situation was around the time if Independence, uncontrolled grazing is now the norm, i.e. it appears that there are commonly no restrictions on who can take how many animals to graze on the pasturelands when. In addition, in the past a few herdsmen collected the animals of the village and grazed them on CPRs. The system is breaking down because of: (a) declining contribution of CPRs; and (b) social change (herding is considered a low status occupation, traditionally done by members of the lower castes).

In parts of the Telangana and Rayalseema regions of Andhra Pradesh, formal and informal arrangements are in place to regulate access. Rights to pastures and other common lands can be auctioned (by the Panchayat or Revenue Department) to a third party, who then collects fees from grazers (Andhra Pradesh report). The efficacy and equity aspects of these arrangements need to be studied.

Grazing land protection. There are a few exceptions to the common picture described above, where active management of common pasturelands has been attempted. These come from Gujarat and Rajasthan. Government programmes are referred to in section 5.4. Only NGO experiences are discussed here.

When silvi-pasture rehabilitation and development (SPRAD) has been undertaken the approach taken by both government agencies and NGOs has normally involved enclosure of the area and long-term exclusion of all ruminants (Bhise, Vardhan and Suess, 2000; Conroy, 2000). The standard technological package has been to construct a boundary wall, and to plant trees and sow grasses within the protected area. Forage is only obtained from the enclosed areas through cut-and-carry, and has to be stall-fed. Lopping of trees tends to be prohibited, even when they have reached a suitable size for lopping. Thus, the principal (sometimes only) kind of forage harvested from the protected sites is grass.

Pastureland protection initiated by NGOs has required very intensive inputs in developing the necessary social capital for effective management. One NGO, Seva Mandir, has supported pastureland development in 50 villages in Udaipur District during the last 15 years. Community protection and management is still being sustained in about two-thirds of these villages (Bhise, pers. comm.).

Discussion. The Gujarat experience suggests that, even with high external inputs / lots of support from an NGO, effective community management of pastures may not be sustainable. The Rajasthan experience, on the other hand, while confirming that it is difficult, shows it can be done under certain circumstances. However, the difficulties and the lack of scaling-up are partly due to the external policy environment, notably the reluctance of state governments to take action against encroachers (Gujarat report).

5.3.3 Water resources

The switch from surface water to groundwater abstraction has been accompanied by a shift to what are effectively open access regimes. Surface water bodies for irrigation (at least the tanks - not

necessarily the resource due to upstream impacts) can be controlled, boundaries defined, free riding not easy. Groundwater management (principally abstraction and recharge) is much more difficult (see Table 7). Electricity supplies often worsen the situation rather than providing some form of control. Flat rate for electricity (by pump capacity) and frequent power cuts lead to wastefulness / overuse (people leave pump on until power comes back).

Surface water resources, especially the tanks of southern India, have a history of more active management, but the effectiveness of traditional institutions has been declining. In the past, communities used to manage the channels and repair work; and there was more emphasis on conservation, not just utilisation (Andhra Pradesh report).

Community management of ground water and surface water utilisation (with or without NGO support)

In southern India traditional management system of surface water (particularly tank) resource management have largely broken down, but no effective new system has taken their place. There are, however, many recent cases of the effective restoration of tanks and their management, with the support of NGOs (InterCooperation, undated).

Groundwater management: collective action by users to manage demand has only been attempted in a few cases. It is difficult, because the community has no physical control and monitoring is difficult (since wells are on private land): influence can only be brought to bear through social / peer pressure. It would involve, for example, users agreeing to restrictions on additional or deeper tubewells, and on crops having high water requirements (e.g. sugarcane). An interesting example comes from the work of Tarun Bharat Singh (TBS), an NGO working in Rajasthan's Alwar District. TBS constructed about 350 water-harvesting structures on the Arvari rivulet, a tributary of the Yamuna; and subsequently formed an informal organisation with the people of the 70 villages affected, called the "Arvari Parlaiment". The Parliament has resolved, among other things, not to allow any tube-wells in the 70 villages. SOPPECOM, an NGO working in Pune District, Maharashtra, has also been working on the creation of village institutions to regulate water use.

Surface water management: collective action by users to manage demand. One of the Gujarat case studies describes an interesting arrangement. Women impose a rule of not drawing water from the village pond for irrigation if the water level is below 2 feet, in order to make sure a minimum amount of water is available for drinking and other domestic purposes (Gujarat report).

Table 7 Management interaction matrix for water resources

Type of management/ system	Resource characteristics	Objectives	Management interventions	Profile of benefits	Outcome
Tank Irrigation	• Renewed approx. annually • Seasonal – catchment area • Perception – public • Excludability – high	• Income and food from agricultural production • Drinking water, livestock, fisheries et.	• Maintenance of tank bunds, head works, channels etc. • Amount and timings of allocations	• Rapid • Local • Tangible • To people incurring cost	• Successful membership/ user groups
Groundwater based irrigation	• Renewed annually-decades • Seasonality–aquifer • Perception–private • Excludability – low	• Income and food • Drinking water inc. livestock esp. droughts	• More efficient use of irrigation water • Recharge measures • Reduced abstraction levels	• Quick in hard rock areas • Scale variable • Less visible • Likely to accrue over wide area	• Few successful examples based on local institutions • Need involvement of administrative/ govt. at appropriate scale
Watershed management	• Mixed as above, also land, crop, livestock, forests etc.	• Irrigation for food and income • Dryland production • Drinking water • Livestock etc	• Soil and water conservation • Forestry • Check dams etc.	• Delayed • Remote • Hard to identify • Downstream? • Land owners?	• Lack perception of interdependence • Hard to establish sustainable local management without subsidies
Rural and urban water supply	• Mixed surface and ground water • Perception- public • Excludability – low	• Health • Well-being • Productive activities	• Development of safe sources • Infrastructure O&M	Dependent on infrastructure but could be: • Rapid • Local • Highly visible • Especially poor	• Sectoral approach is effectively unable to secure resources

Source: CRIDA Report

5.4 Government-promoted shared management systems

5.4.1 Joint Forest Management

JFM was conceived of as a win/win arrangement between the forest department and communities. The FDs would have the assistance of local people in enforcing protection of the forest, while the protecting communities would earn priority or exclusive rights to forest products.

Status of JFM in Focus States. There are large numbers of forest protection committees in both states. In Gujarat; by 31 March 1999, 63,577 ha of forest were being managed under the JFM programme, 706 village level organisations had been formed and 92 VLOs were registered (Gujarat report).

In Andhra Pradesh there are: 6616 VSSs; 1,660,000 ha under JFM, and 546000 ha treated. The VSSs have a total of 1,300,000 members, out of whom 600,000 are women and 550,000 are SC/ST (Andhra Pradesh report).

There are many controversial issues associated with JFM, and a burgeoning literature on them. These are summarised very briefly below.

Gender. Women are generally under-represented or only symbolically represented on FPCs, even though they are the main forest users. Therefore, women sometimes even lose out from JFM (lose access to forest, but have no benefits) (Gujarat report). In some VLOs only one household member (a male) is taken, while in others it is both husband and wife (ibid).

JFM Management Unit. In the past forests were used by many villagers as a CPR for rotational grazing etc. Now JFM gives usufruct rights to one particular revenue village, and this leads to inter-village conflicts (Gujarat report).

Exclusion and conflict: inter-village. Exclusion of traditional users is quite common: the case studies from Andhra Pradesh contain examples of, restrictions on hunting, grazing and shifting cultivation after JFM was initiated. The FD uses new management systems to control shifting cultivation and non-tribals now compete with tribals over forest resources (Andhra Pradesh report).

Shepherds and tribal goat-keepers are often negatively affected by restrictions on grazing in the forest, and may not be members of the group. They sometimes opt out of being a member of the VSS because their concerns and priorities are not addressed.

Equity and conflict within villages. Rules and regulations for JFM tend to be determined by the FD and better-off people; landless, poor and women are often excluded, or do not make their voice heard, so rules suit only the better-off . This happens because of:

- the low status of the poorer groups;
- Their inability to attend meetings (e.g. meetings in the daytime, when poor go for wage work, or poor migrate and cannot participate in meetings);
- Their exclusion from membership of the FPC.

Exclusion from membership occurs because poor households are sometimes unable to make the contributions required of a member, such as voluntary labour for patrolling. This is often because they are too busy going for wage labour, sometimes migrating.

NGOs and JFM. NGOs are sometimes also involved in JFM. There is a certain degree of competition between NGOs and FD for JFM in Gujarat: the FD manages 78% of VLOs, the rest are managed by NGOs. Problems arise if NGO appears to be more successful than FD (Gujarat report). There are different arrangements for sharing of benefits between NGOs and FD, which discriminate against NGOs.

Multi-purpose groups The rewards from forest management are limited during the first few years. NGOs (such as AKRSP, Sadguru and Viksat in Gujarat) have found that community interest can be sustained more effectively if the group is involved in a number of different activities over the course of a year (Gujarat report). Forestry-related groups have diversified into water, agriculture, soil and water conservation, and pasture management.

Initiating a large range of group activities requires a lot of inputs from support organisations, such as NGOs or government departments. NGOs are often in a position to work in a range of different subject matter areas, because they generally have multidisciplinary staff and are often supported by donors that favour an integrated approach. For government agencies it is much more difficult to work with multi-purpose groups, because government departments are specialised and have very little flexibility to get involved in activities beyond their mandate. It is therefore difficult to upscale multi-purpose groups within the existing government structure. The main pathway for the establishment of such groups remains through donor-funded projects and programmes, such as the World Bank funded "Andhra Pradesh District Poverty Inititatives Project" that works through multi-purpose self-help groups (see http://www-wds.worldbank.org/servlet/WDSServlet?pcont=details&eid=000094946_99111305444943).

Capacity development and sustainability It is important that attention is given to developing the capacity of the VSSs to manage the forest on their own. This is an area in which FDs tend to be weak, and where NGOs have played a valuable role. The development of clusters or federations of VSSs is also important as a forum for effectively articulating the concerns and interests of the villagers to the FD and other government agencies. Federations can also oplay a role in inter-village conflict management. In Gujarat AKRSP and other NGOs have been developing federations of VLOs at Mandal / Taluka / state level (Gujarat report).

FD/community interface. There are some problems in the relationship between FDs and local communities regarding (a) bureaucratic hassles and (b) the dominance of the FDs. Policy and practice issues relating to JFM are discussed further in section 6.3.

5.4.2 Non-forest land-based CPRs

During the last 15 years or so there have been many initiatives to rehabilitate Rajasthan's common pasture lands, including the World Bank-supported Integrated Watershed Development Programme, and the state government's watershed development programme and joint forest management programme.

The sustainability of these initiatives has been a problem. Kerr and Pender (1996) found that in the World Bank-supported IWDP project in southern Rajasthan, developed common lands were actively managed for up to three years while a *chowkidar*, hired by the project, ensured protection. However, in all 16 villages sampled, where the *chowkidar'*s term had expired management arrangements had broken down almost immediately. The sustainability of initiatives taken by the FD has been threatened by various types of conflicts affecting the villages involved (Pandey and Thakur, 2000).

Watershed projects often aim at reviving the productivity of common grazing lands through bio-physical measures (SWC etc.), and by developing institutions for managing these lands. However, the institutional development has been weak and there are few success stories. The interests of the poor are often not reflected (CRIDA report).

5.4.3 Management of water resources

Groundwater management. The new watershed guidelines ask for the formation of user groups. However, this is often difficult, because the benefits of groundwater recharge are difficult to assess and measure, and beneficiaries are difficult to define. Generally WSM does not include any regulation over water demand, it only regulates the supply (CRIDA report).

Management of water for irrigation Gujarat has many canal irrigation schemes, but in AP most surface water irrigation in semi-arid areas (i.e. not in coastal Andhra) is from traditional irrigation tanks.

In Gujarat there are many examples of CBOs (lift irrigation societies, canal irrigation societies etc.) managing irrigation schemes under a common property regime. These seem to work well if the purpose, benefits and boundaries are clear and exclusion is possible (Gujarat report). Water user societies are able to meet the cost of distributing water, maintaining the system, etc. The most successful groups collect money both for running costs and to save for investment, e.g. replacement of machinery - but as a result, the rates will be much higher than in government subsidised programmes. Good societies collect water rates in advance. They have a system of incentives for members who adhere to the rules and disincentives or sanctions for those who break them.

In Andhra Pradesh, under the government's irrigation policy, peoples' participation in management of irrigation systems has become compulsory: it is achieved through the creation of Water User Associations (Andhra Pradesh report). However, only the farmers in the command area can be members. This affects around 15% of tanks in AP (only tanks with a command area of more than 100 acres).

A DFID funded research project (Water, Households and Rural Livelihoods: Promoting access of the poor to sustainable water supplies for domestic and productive uses in areas of water scarcity) looks into innovative institutional and operational strategies to for integrated water resources management - see http://www.nri.org/WSS-IWRM/. The project is operating in Andhra Pradesh and is currently attempting to link the control of water use to watershed management projects.

5.5 Community Management of CPRs – When does it work?

The Gujarat and Andhra Pradesh reports identified several forms of community management of CPRs that have been moderately successful. These include: community management of forest on revenue land in AP; management of rehabilitated tanks in AP; and canal irrigation management in Gujarat. Shared management of forests (between communities and the state) under JFM programmes has also been fairly successful. Yet there are other CPRs and situations where effective community management has been conspicuous by its absence, notably village pastures and groundwater.

In this section we discuss the circumstances under which community management is most likely to be effective. Perhaps the most important factor is that the community or user group must be able to obtain a good return on its investment (labour, capital etc.). Related to that is the degree of security and clarity regarding their rights to the resource. The characteristics of the resource and of the management or user group are also important: so is the external environment, particularly the attitudes and policies of state agencies. These points are discussed further in the following sub-sections and in section 6.

5.5.1 Secure rights to CPR products

One way to strengthen the motivation of communities to manage land-based resources is to ensure that their usufruct rights to the resource are clear and secure. This point applies to all of the land-based CPRs. In the case of JFM some people might argue that the community's rights are clear and secure. However, factors like delay in approval letters, delay in registration of the VLOs, non-signing of agreements, going back on promises, and provision of withdrawal without compensation create of uncertainties in the minds of local people (Gujarat report). Similarly, risk of encroachment reduces security of benefits for those using and managing CPRs.

Secure rights are closely linked to the institutional arrangements in place and their effectiveness in controlling access to CPRs. Legal rights alone are not enough, if there is no effective enforcement of

these rights. CPR management groups promoted and supported by government organisations or NGOs can be in a more secure position, because they can call in outside mitigators in case of conflicts or violation of restrictions. Ideally such support empowers communities to eventually protect their rights independently, but it can also lead to dependencies and breaking down of protection systems once the support is withdrawn.

5.5.2 Nature of the resource

Important factors here are how well defined the boundaries of the resource are, and how visible the benefits of managing the resource are. The influence of resource characteristics is clearly illustrated by comparing surface irrigation schemes with groundwater recharge schemes. The characteristics are much more favourable for the former, as can be seen from Table 8, and this is one of the reasons why community management of irrigation schemes has been successful. Another important characteristic of the resource is its condition: once the status of a resource has declined below a certain level (e.g. root stock destruction in forests), it may be difficult to restore its management and productivity even with the involvement of strong CBOs (Andhra Pradesh report).

Table 8 A Comparison of the Characteristics of Surface Irrigation and Recharge Schemes

Surface Irrigation Schemes	Groundwater recharge schemes
• Benefit is predictable and certain, hence incentive for farmers to develop and manage project • Benefit is immediate • Benefit of water supply can be controlled, boundaries are defined, hence free riders can be punished • Impact of variations in rainfall can be known – systems for equitable distribution evolved. • Common source – requires ongoing management for water distribution interaction within group.	• Uncertain & unpredictable benefit for individual farmer, hence no incentive to form group • Benefit may not be immediate or defined by hydrogeological conditions • Benefit cannot be controlled or stopped. Non-defined boundaries allow free riders to draw benefit without contributing to the development or management of source • Impact of rainfall variation unpredictable and invisible. • Use by penalised source i.e. wells

Source: Gujarat report.

5.5.3 Nature of and favourable conditions for management system

The Andhra Pradesh and Gujarat case studies show that good management systems are important and are characterised by:

- a set of clear rules and norms,
- transparency over decision-making and the use of funds,
- an effective monitoring system,
- conflict mitigation or management mechanisms.

Effective and transparent management is therefore closely linked to the institutional arrangements. These are discussed further in section 5.6. Community management is also more likely to be successful where barriers are weak and drivers are strong (Gujarat report). In the case of land-based CPRs, barriers include: feudal control and encroachment; conflicts within the community and lack of consensus in favour of community management; and the existence of high returns on agriculture, which increases people's motivation to privatise the resource. Drivers include: the presence of a high proportion of landless and marginal farmers (as this implies high dependence on CPRs), high

importance of animal husbandry (which also implies a high dependence on CPRs), and expected high returns from protection (e.g. protection of high productivity forests).

5.5.4 Costs, benefits and sustainability of community-based CPR management

Community-based CPR management is only likely to be feasible where the benefit:cost ratio is favourable for communities. This ratio can be, and is, influenced by government agencies making funds available to local communities: prime examples of this are the JFM and watershed development programmes. However, this in turn raises the question of whether government funds *should* be used for this purpose. Information on costs and benefits of community-based CPR management is lacking, so discussion of these issues here is largely based on qualitative information and general principles.

External support can, in principle, be justified on the basis of (a) poverty alleviation or (b) environmental improvement, which may in turn enhance rural livelihoods. Regarding the former, it can be argued that people have already adjusted their livelihoods to compensate for reduced dependence on CPRs, so there is no point in investing in programmes to enhance CPR productivity and management. The counter-argument to this is that people may be poorer now than they were before, and might welcome the chance to increase the contribution of CPRs to their livelihoods again.

The benefit/cost ratio will vary depending on:
(a) the nature of the resource (e.g. forests v. pasturelands v. water resources):
(b) the current biophysical condition of the resource (e.g. little root stock v. substantial root stock in degraded forest area); and
(c) social and institutional factors (e.g. to what extent has the resource been encroached on; is there a strong community consensus in favour of CPR management?).

Costs include: (a) investment in relatively tangible things like soil and water conservation structures, tree planting and boundary walls: and (b) intangible ones (mainly transaction costs), such as village management meetings and patrolling the site. Where common lands have become relatively unproductive, the "costs" of participating in CPR management may exceed the benefits. This outcome is particularly likely where people have alternative sources of income, as participating in a CPR management institution will involve opportunity costs, i.e. it might interfere with other things they are doing to make a living.

It is our impression that, generally speaking, the benefit:cost ratios for managing different CPRs can be ranked from the community's point of view as shown in Table 9. In estimating benefits we have also tried to take account of how secure the community's rights are to these benefits. These rankings are quite subjective, however, and they may vary with local conditions. We hope that they will stimulate further discussion and thinking. They are based: (a) partly on the numbers of cases of community management that we are aware of for each CPR; and (b) partly upon the information given in the table. Thus, JFM (with tens of thousands of VSSs) receives a high ranking and groundwater demand management (two known cases) receives the lowest.

Maximising the benefits from forests Despite the fact that we have ranked forests second we believe that from an economic point of view, in which state inputs are counted as costs, the benefit/cost ratio is not very favourable, particularly for seriously degraded areas where the potential for natural regeneration is limited. Hence it would be desirable to determine how costs can be minimised and/or benefits increased.

Table 9 Costs and Benefits to Community of Managing Different Common Pool resources

Resource	B/C ratio: Rank	Comments on costs	Comments on benefits	
			Size	Security
Surface water CPR (e.g.tank, canal irrigation system)	First	Rehabilitation of long-neglected infrastructure high, as can new infrastructure. The high capital costs tend to deter communities from acting on their own.	The economic benefits of irrigation in semi-arid areas are very high - but environmental impact can be negative. Benefits to fishermen and -women can be high, esp. relative to costs.	Irrigation benefits can only be availed by farmers in the command area, so they are secure, except for tailenders.
Forest on forest land (JFM)	Second	Costs to FD (but not community) will be higher (or benefits less) on land with little root stock intact, since tree planting costs will increase. Low survival rate may limit biomass benefits of tree planting. Encroachment raises transaction costs. Patrolling is a significant transaction cost. (Same for forest on revenue land.)	Limited biomass benefits during first few years (e.g. grass). Wage labour from FD/NGO is major benefit – paradoxically higher where resource is poor.	Villagers may perceive their rights to timber/bamboo to be uncertain and potentially contested with FD. Sharing arrangements may be unclear, & future of JFM uncertain.
Forest on revenue land	Third	In case of natural regeneration the costs are very low – no tree planting and no physical boundary. Intermediate option, involving S&WC, would increase costs, but also benefits.	Limited biomass benefits during first few years (e.g. grass) and thereafter	Villagers may perceive certain usufruct rights (e.g. custard apple) as uncertain
Village pastures: enclosure and rehabilitation	Fourth	Encroachment raises transaction costs. Patrolling is a significant transaction cost	Limited biomass benefits in short-term – mainly grass. Wage labour from NGO is major benefit. Securing of community rights to resource (prevention of further encroachment) seen as major benefit.	Village involvement may be limited to 5 year lease from panchayat. Rights beyond then (including to timber and bamboo) are uncertain and may be contested with/by panchayat.
Groundwater recharge through tanks, check dams etc.	Fifth	Detection of rule-breaking may be difficult	GW-related benefits can be large or small, depending on aquifer characteristics.	GW Benefits unclear and uncertain for individual farmer, and some may go to 'free riders'. Percent of benefits going to community depends on boundaries of aquifer. However, there are also surface water benefits
Management of groundwater abstraction	Sixth	Substantial monitoring and enforcement costs		Benefits unclear and uncertain for individual farmer

Source: own

A substantial proportion of the benefits to the community initially is in the form of wage labour, particularly on heavily degraded sites (Vardhan, 2000). When that benefit is no longer available communities may lose some of their initial interest and motivation. The Gujarat report noted that there is a need to increase share of non-timber usufructs of JFM in the total benefits, in order to increase the livelihood contributions of forests during the first few years.

Community forest management, where communities have initiated protection themselves, and have not been given wage labour by the FD, is rare in semi-arid regions, and is found predominantly in higher rainfall areas in eastern India, notably Orissa and Jharkand[5]. This might, at least in part, be due to relatively low returns in semi-arid regions: degraded forests in eastern India are more productive than degraded forests in semi-arid areas, by virtue of their species composition and other edaphic factors (Vardhan, 2000)

One of the reasons why benefits to the community are low during the first few years is that where FDs have had a major say in species selection they have given priority to timber species, whose gestation period under these conditions is typically 15-20 years (ibid). Plant and tree species that would yield benefits more quickly tend to be neglected: these include bushes, shrubs, medicinal plants and grasses (ibid). Furthermore, the management and silviculture rules governing JFM are still geared to production of timber rather than other tree and forest products: so there may not be any provision in the micro plan for lopping or pruning of the trees (ibid.). Consequently, corresponding changes in FD practices are required to ensure that intermediate benefits to communities are increased.

Another area in which it may be possible to increase benefits is the harvesting of fruits and seeds, such as those from custard apple (Seetaphal) and Ratanjot respectively. This is sometimes done in an unregulated fashion, on a 'first come, first served' basis, which results in the fruit being harvested prematurely at well below its full size (N.C. Jain, pers.comm.). If the harvesting was carried out in a regulated way the size of the harvest, and hence the total income (where sales are involved), could be greatly increased.

Non-forest land-based CPRs. With encroachment and privatisation the best lands tend to go first, making the remaining land that much less productive. Thus, non-forest common lands tend not to generate high returns, the main benefit (apart from wage labour) being grass. It has been suggested, therefore, that other higher value crops should be grown on them, such as horticultural and medicinal crops (Gujarat report). However, this would require a well-developed community based production and marketing systems for such crops and only communities with strong CBOs might be in a position to pursue this.

The legal situation of a CPR needs to be clarified before any investments are being made, because, as pointed out earlier, any investment increases the value of the resource and thus the risk of encroachment. Therefore it is often seen as desirable to remove existing encroachers on a chosen site, before commencing rehabilitation work, both for political and financial reasons. The latter concerns the additional costs of boundary walls made longer by having to go round encroached patches.

The case for government support. Government support can be justified on the following grounds: First, there is the fact that existing management systems are either non-existent or working poorly to solve various societal objectives, and (with a few exceptions) attractive solutions are not emerging endogenously.

In recent decades, environmental conditions have been worsening and the contribution of CPRs to the livelihoods of some of the poorest people in rural areas has been declining.

[5] It has been suggested that the presence of Sal (*Shorea robusta*) in eastern India, a fast-growing species that coppices well, is one reason for the large number of CFM groups there. While that may be true, a large proportion of the forests managed by CFM groups contain little if any Sal, so there must be other factors at work.

Second, improved management of CPRs may have off-site benefits in which local users have no interest in investing. These might include reduced siltation, reduced flooding, and groundwater recharge. In most of semi-arid India such off-site effects are fairly localised.

The most common endogenous solution to the management of non-forest land-based CPRs is privatisation. As discussed above, relatively wealthy and powerful people often dominate this process at the expense of the poor. In some places, such as Andhra Pradesh, the government has responded by allocating additional land to the landless, but often such land is of such poor quality as to be barely cultivable.

Government support to address these problems can take a variety of forms, including policy changes, institutional reform, and financial backing. Some possible policy and institutional changes are discussed in this report, including: raising villagers' share of ususfruct rights in JFM; experimenting with alternative arrangements for managing common lands; tackling the problems of unspecified rights to groundwater, and underpriced electricity for extracting groundwater.

Government support for groundwater recharge (through the construction of check dams, percolation tanks, and in-situ soil and moisture conservation) has a long history in India and can be technically effective. This has justified huge investments of both GoI and donor resources in watershed management programmes. However, groundwater recharge does not per se solve the problem of water shortage for drinking water and other purposes - it generally leads to an increase in the area under irrigation and can even aggravate the competition between water users (see Batchelor et al. 2000).

Financial assistance is justifiable if it can be linked to attainment of desired outcomes: too many natural resource management projects and programmes have failed to yield lasting outcomes. That is why we have looked at the attractiveness to communities of managing different types of CPRs, as this will have a major influence on the sustainability or otherwise of the benefits.

Government financial investments in CPRs, regardless of how well they are justified on other grounds, may be fruitless if it is impossible to develop workable management arrangements. Thus, it is important that the state and national governments learn lessons from experiences to date, and support experimentation in alternative arrangements, such as leasing common lands to a group within the village.

5.6 Who should manage? Roles of CBOs and PRIs

Since Panchayats are, at least in principle, democratically elected, some people argue that they should have the primary responsibility for managing CPRs. Until now, however, Panchayats have not played much of a role in managing CPRs (Andhra Pradesh report; Gujarat report), and that is one of the reasons why some CPRs, notably village pastures, have become so degraded (Jodha, 1985).

It has been argued that the primary reason for their non-involvement is that they do not want to enforce unpopular measures such as CPR user obligations, as they are afraid this would lose them votes (ibid.). This highlights their political nature, which some say could be detrimental to CPR management. For example, one political party might make an election promise to fell the trees from a protected forest and distribute the revenue to the voters – a potentially vote-winning stand.

A particular problem is the relationship between Panchayats and villages. One the one hand, the former have legal rights of various kinds to natural resources, whereas the latter tend not to; while on the other hand the latter sometimes effectively manage CPRs whereas the former do not. In a one village panchayat this might not be a problem, but in some states (or districts), such as Rajasthan, there tend to be several villages in each Panchayat. In this situation the panchayat does not necessarily act in the interests of a particular village as far as NRM is concerned. In fact, it is not likely to do so,

because it would be politically advantageous for the panchayat members to do whatever will win them the maximum number of votes.

This is illustrated by the experience of a village in Bhilwara District, Rajasthan. The village had been protecting and managing an area of pastureland for 3-4 years, and the panchayat (in which there were 12 villages) decided to open up this pastureland to livestock from all 12 villages. The site, which had been regenerating, quickly became degraded again, and the community's efforts were undermined.

There is a strong case, therefore, for giving management and usufructuary rights for village pastures, forests and small water resources to villages (or hamlets) - for decentralisation beyond the panchayats. However, there may still need to be clear and effective relationships developed between the village and the panchayat. Experiences and issues relating to specific CPRs are elaborated below.

5.6.1 Forests

Under Gujarat's JFM resolution the managing body can be a panchayat, but so far not a single village Panchayat has taken up JFM (Gujarat report).

Under the provisions of the Panchayat Act, the village Panchayats and Gram Sabhas have been vested with the ownership rights on Minor Forest Produce.

5.6.2 Non-forest land-based resources

Vesting control/ownership of these resources in the hands of Panchayats has lead to greater encroachment problems (Gujarat report). There is a need for decentralisation beyond the panchayat (Gujarat report). In Rajasthan, villages can obtain a lease from the Panchayat for developing and managing pasturelands, which is usually for five years. Although the lease can be renewed after the first five years, the community cannot be sure that it will be. There is a need to give villages longer-term security, particularly since some products, such as fruits, may become available until 8-10 years after protection began.

Under 73rd constitutional amendment, watershed management has been included under issues to be handled by panchayats (CRIDA report).

5.6.3 Drinking water

Drinking water supply is a function traditionally of, and legally managed by, the village panchayat. However, the failure of these institutions and the state has led to the search for new alternatives.

5.6.4 Relationships between CBOs and Panchayats

In the long run, with the increasing devolution of powers to the Panchayat, the alternative community management institutions involved in natural resource management (e.g. pastureland management, drinking water supply, NTFPs) should have a clear relationship with the Panchayat. It is essential to ensure that the panchayat plays a supportive role, and that the arrangements guard against the possibility of unscrupulous politicians cashing in on the efforts of villagers involved in community management. The CBOs must have secure, attractive and long-term rights to the resources they are managing, otherwise there may not be enough of an incentive for them to play an active role.

6 KEY CONSTRAINTS AND RECOMMENDATIONS FOR ADDRESSING THEM: POLICY, PRACTICE AND RESEARCHABLE ISSUES

6.1 Introduction

The major constraints on the effective management of CPRs can be grouped under the following broad headings: policy constraints, cultural constraints (including peoples' attitudes), resource constraints, technical constraints and institutional constraints. In this chapter we focus primarily on policy constraints, and identifying areas where research could help to address technical and institutional constraints or improve understanding of them. Many of the constraints are common to different CPRs, so we begin by considering these.

6.2 Crosscutting issues

6.2.1 Policy and practice issues

No coherent policy framework for CPRs A key constraint to proper management of CPRs in both of the focus states (and probably in the rest of the country) has been the lack of a coherent public policy framework for CPRs and their use. Various public policies and programmes pursued by both the state and central governments during the post-independence period have substantially affected the status of CPRs, generally in a negative way. Government policies and programmes that have contributed for the rapid decline of CPRs include: land reforms, forest policy, wasteland development programme, irrigation policy, and introduction of Panchayati raj system (AP report).

Are CPRs irrelevant? Some people believe that there is no justification for the state to rehabilitate CPRs, arguing that:

1. their contribution to people's livelihoods has declined sharply, and people have adjusted their livelihoods and coping strategies accordingly;
2. most land-based CPRs are seriously degraded, so the costs of restoring them to their former levels of productivity would be very high;
3. there is little evidence that CPRs can be effectively managed by communities, so rehabilitation investments would be wasted.

There is some truth in each of these points, so they deserve to be taken seriously. There is a need to consider them on their merits, and to move away from the common situation in which individuals or organisations take up positions on the sole basis of their political or philosophical convictions. Generalisations need to be replaced with specifics. Each of these points needs to be considered on a case by case, area by area or sector by sector basis. For example, it might be true that points 2 and 3 apply to village pastureland in most of AP, but not to pastureland used by homogeneous tribal communities in south Rajasthan.

While CPR rehabilitation and management on its own might not be economically viable, linking CPR development initiatives to other NR management programmes can have a synergetic effect. The DFID funded APRLP (Andhra Pradesh Rural Livelihoods Project) is currently trying to incorporate CPR management into their "watershed-plus" activities.

Privatisation and the exclusion of certain groups. Most of the above-mentioned policy interventions have encouraged the privatisation of CPRs, in a broad sense. Land reforms in AP tended to convert common lands into private land; while state governments have tended to turn a blind eye to illegal privatisation through encroachment. Some state interventions (e.g. the newly created VSSs and WUAs for forest and water management respectively) have excluded important stakeholders from the membership of the associated CBO, either in practice or officially. In the case of formal WUAs created by the government, only command area farmers are recognised as members: other groups, such as fisherfolk, washers and cattle herders are excluded by law (InterCooperation, undated). Women are excluded too, because membership is conditional upon having land titles.

Table 10 Privatisation of common pool land resources and its (potential) impact on the poor

Type of privatisation	Intended beneficiaries	De-facto beneficiaries	Problems associated
Land reforms and land ceiling (re-distribution of land and legalisation of encroachment on common land)	Landless, small farmers	Encroachers are often medium to large farmers.	Women are excluded, as they normally do not hold land titles and can access land only through their male family members
Tolerating illegal encroachment	No specific beneficiaries envisaged	Existing encroachers of all wealth categories	Non-action against encroachers undermines community management efforts for CPRs
State initiatives for CPR management (JFM, WUA, etc.)	De-facto users of CPRs, poor people	A sub-group of the de-facto users	Important stakeholders are excluded, because (a) their claims over the resource are not recognised (e.g. washer caste's rights over water) or because (b) they do not meet the formal requirements to join the association (e.g. women not having land titles over the irrigated land they cultivate). Therefore such initiatives often have a negative impact on the livelihoods of the actual users, who are unable to participate in management decisions.

Poverty and CPRs The above point relates to a broader one concerning the relationship between CPRs, poverty and the poor. Whereas degraded CPRs are generally more important to poorer groups than to better-off ones, the benefits of rehabilitated CPRs sometimes accrue disproportionately to the better off. Development agencies need to design and implement their interventions with the poor in mind; and to monitor them carefully to see whether they are having the desired impact, taking corrective action where necessary.

Equity Privatisation of CPRs has been justified on the ground of increasing productivity and efficiency of these resources. In the process the question of equity has been sidelined. How to build equity and sustainability while maintaining efficiency is a crucial question, which needs to be addressed.

Lack of co-ordination between different government departments in charge of CPR issues Since there are interactions between different CPRs, and between CPRs and farmland, development of one CPR alone is not enough. The livelihoods approach (which has been promoted by DFID, Oxfam and other agencies) offers the opportunity to work in a more integrated way.

Investments and returns by external agencies In order to increase the productivity of some CPRs there would need to be large investments in them: for example, in desilting and repairing tanks that have been neglected for decades. It is important to determine whether such investments are justified economically, but the necessary information is somewhat lacking at present (see next section). Furthermore, it would be unwise for external agencies to make such investments unless they were reasonably confident that the *postulated* benefits flowing from them would materialise and be sustained. It is necessary, therefore, to take account of the prospects for *sustainability* when drawing up investment plans, and to understand what influences sustainability.

Sustainability and the neglect of institutional capacity This issue is common to a range of state interventions, including watershed development and JFM. For example, a recent evaluation of the watershed development programme in AP found that in the majority of watersheds studied (17 out of 27) the users had not been organised into groups (WASSAN, 2001). Even where groups had been formed, their roles and responsibilities were not clear in most cases (ibid.). Where management groups have been formed, experience[6] has shown that they are liable to become defunct within a few years unless they are soundly constituted, and carefully nurtured initially. When financial or other support ends, their involvement may end too. In addition, the returns must be sufficient to justify the time they invest in managing the resource (see below).

Financial aspects of sustainability: investments and returns by users Users would be foolish to invest time or other resources in managing a CPR if doing so was not giving, or going to give, them a good return. Where there are clear and secure returns, or where the operating and maintenance costs are low, people are prepared to make the investment. This is illustrated by fishing communities in parts of AP, who are contributing in cash and kind to the maintenance of tanks; or by villagers in Rajasthan who voluntarily protect village pasturelands and repair the boundary wall each year.

Social aspects of sustainability Conflicts within CPR management groups, and between those groups and neighbouring villages and hamlets are common, and can undermine management initiatives. There is a strong case, therefore, for giving priority to villages where the prospects for avoiding conflicts or for managing them effectively are good. Relevant criteria include villages: with a homogeneous community; that are smallish or medium in size and remote; in which there are no political or factional conflicts; and where their claim to the resource is relatively undisputed by other villages or communities. This also reduces the transaction costs for development agencies regarding the time they spend assisting in conflict management.

Flexibility Development agencies, particularly (but not only) state ones, tend to be rather rigid in the way they implement their programmes. For example, FDs have tended to insist on having only single revenue villages (as opposed to hamlets or multi-village arrangements) as the management unit in JFM programmes. Such uniformity of approach is inconsistent with the diverse social arrangements and relationships that exist in rural India. (In Anantapur District, for example, rural communities evolved different arrangements for effective utilisation of tanks without hurting anyone's interests).

Formulating procedures and programmes Scaling up effective participatory approaches to CPR management requires not only policy changes, but formulation of necessary procedures and programmes. Clear guiding principles, operational mechanisms and administrative instruments are needed to operationalise policies effectively (presentation on "Scaling up of participatory management approaches for CPRs" by Dr N K Sanghi, MANAGE, during the project's validation workshop on 14 April 2001).

6.2.2 Research issues

Maximising net benefits There is a major gap in knowledge and information regarding: the costs and benefits of rehabilitating CPRs; and the costs of community and co-management of these resources. A programme of research is needed to fill this knowledge gap, so that policy-makers and programme implementers have a sound basis for prioritising investments and ensuring that public funds are spent effectively and wisely. The programme should include research into ways of increasing benefits and reducing costs.

Encroachment. While encroachment processes have generally been understood, there is a lack of location-specific information on: (a) who encroaches (rich, poor or both); (b) under what circumstances; and (c) how useful the encroached land is too them. This needs further analysis to get

[6] For example, from JFM (Kapoor, Ghose and Upadhayaya, 1996) and watershed programmes (Kerr and Pender, 1996) in Rajasthan.

a better understanding of the implications of policies opposing or supporting encroachment. Because encroachment processes are location specific, it would be useful to link such research to development projects and programs that work with communities on improving CPR management.

6.3 Forest resources

6.3.1 Policy and practice issues

NTFP Marketing There is a need to improve marketing systems for NTFPs, including processing rights for collectors (e.g. leaf plate-making). In Gujarat, the rights for collection and marketing of many important NTFPs are auctioned by the State Forest Corporation to private agencies, who exploit the villagers in various ways (e.g. they take bribes, and pay only in kind, not cash). As a result, returns to collectors are poor (Gujarat report). Where federations of VSSs or VLOs exist we recommend that they be given rights for collection and sale of such NTFPs.

Forest Development Corporations should rely primarily on price as the instrument to regulate purchases of NTFPs from tribals: they should provide a floor price, so as to ensure a minimum level of income to tribals and other collectors (Tewari, 1998).

JFM: The balance of powers and rights between the FD and communities. In JFM the FD is too dominant relative to the communities. While FDs have the power to veto communities' decisions, and to dissolve the VSS if they believe it has acted improperly, the communities have no corresponding rights, powers and sanctions in relation to the FD's actions. For example, a community has to obtain approval from the FD for each bamboo harvest; but if the FD causes damage to the bamboo by delaying the approval there is nothing the community can do about it. State governments, including those of AP and Gujarat, should make FDs accountable to the communities and reduce the powers of the FDs over them.

JFM: Exclusion of certain groups of livestock-keepers. This is a high priority issue that needs to be addressed with urgency. The factors giving rise to the exclusion from VSSs (or non-participation) of shepherds and other poor small ruminants keepers should be investigated, and necessary actions taken to prevent this happening in the future. There also appears to be "a need to evolve a grazing policy under the JFM programme" (NAEB, 2000).

Various other issues relating to JFM are discussed in the following Box.

Box 4 Further Recommendations for Improving the Efficacy and Benefits of JFM

Various issues have been raised in the case studies on JFM in Gujarat. These issues point towards fulfillment of certain conditions in order to make the JFM achieve its objectives. These conditions appear to be as follows.

First, People should have significant stakes in JFM. This is possible only if JFM is oriented towards meeting the needs of the people. The planning has to be people-based and participatory. More importance to timber production and neglect of regular usufructs has undermined the contributions to the livelihood of people as well as intensified conflicts at various levels. The VLOs need to be given more and more autonomy in decision-making. There is also a need to involve all sections of the people in a village, more so the relatively weaker sections.

Second, there should be clarity of rights and responsibilities, and uncertainty and ambiguity should be minimised. It requires cooperation among all stakeholders including the Forest Department and the NGOs. There has to be an environment of trust. Factors like delay in approval letters, delay in registration of the VLOs, non-signing of agreements, going back on promises, and provision of withdrawal without compensation contribute to creation of uncertainty.

Third, there is a need to create awareness and build capacities of all stakeholders, more so in case of the VLOs. This requires training in leadership and management on one hand and handling greater responsibilities on the other. The VLOs need to operate efficiently and transparently. Giving more responsibilities like collection and marketing rights of different NTFPs to the VLOs or their federations would also contribute to their capacity building.

Fourth, The elements of equity and economic soundness have to be brought to the forefront. The people who bear the costs or losses due to JFM need to be properly compensated. Similarly, the distribution of benefits needs to be in proportion to the contributions in various ways. There is a need for economic, ecological and environmental accounting to ensure proper use of resources. All expenses, irrespective of who makes them, need to be accounted before sharing of profits rather than just felling expenses.

Fifth, There is a need for the VLOs to federate properly at various higher levels (talukas/districts/state) into the organisations that have legal support. The federal structure of cooperatives may be suitable for this purpose.

Source: Gujarat Report, AKRSP.

6.3.2 Research issues

Comprehensive data and knowledge about NTFP production, collection and marketing trends is often lacking at the state level, and these gaps need to be filled. The study done by Tewari means that there is a reasonably good level of knowledge and understanding of the situation in Gujarat (Tewari, 1998): similar systematic studies should be carried out in other states.

If these studies support the initial findings that NTFP contribute significantly to the livelihoods of poor people, in particular those of tribal origin, NTFP production needs to be given similar or greater priority to timber production in JFM. This will require research into, and development of, suitable management plans and silvicultural practices.

Economic and financial aspects of JFM and CFM need to be studied systematically to improve understanding of the conditions leading to the maximisation of net benefits, so that government funds are used efficiently. This should include:

- a comparison of the economics of JFM and CFM (see section 5.5.4), including the impact of soil and water conservation measures;
- identification of ways to increase the returns from CFM/JFM in semi-arid regions, e.g. by regulating the harvesting of fruits (such as custard apple) and seeds, so that they have reached their full size before being harvested;
- the social arrangements required to enable the achievement of maximum sustainable yields of NTFPs.

With regard to community management of forest on revenue land, the scope for assigning usufructuary rights **to the poor** (as opposed to whole community, or an outsider), including its political feasibility, is an issue that needs to be investigated.. Such a system could be feasible in situations where CBOs have been able to mobilise the whole community to safeguard the interests of the poor. In relation to water resources, there are a number of example in Anantapur district of Andhra Pradesh where usufruct rights for tanks and other water bodies (for fishing and duck rearing) have been assigned to a group of poor by CBOs.

6.4 Non-forest Land based CPRs

6.4.1 Policy and practice issues

Community management of village pastures Where there is a strong interest among a particular community in managing these lands, Panchayats should lease out the lands to them for their management and use, as happens in Rajasthan.

Encroachment Where there is evidence that investment in rehabilitating common pasture lands for community management is justified socially and economically, state governments should give strong backing to the removal of encroachers.

Fodder There is a contradiction of policies, which needs to be rectified, between: the promotion of high production livestock breeds, on the one hand; and the lack of policies to address fodder shortage in dry regions, on the other. **Each state government should develop a co-ordinated policy for fodder production**.

6.4.2 Research issues

Maximising net benefits Land-based CPRs (apart from some forests) serve primarily as sources of fuel and forage, neither of which is a high value product. There is a need to explore the potential to use CPRs for producing higher-value crops, such as horticultural or medicinal ones, to increase the benefits to communities and make CPR management more attractive.

Post-harvest fields are a common pool resource that has been neglected in the literature, and about which there do not seem to have been any systematic studies. Their use for grazing appears to the casual observer to be done on an 'open access' basis, but that may not always be the case. Sometimes there is an agreement between the farmer and one or more pastoralists: and it could be that there is sometimes a common property regime. Since they are a major CPR they warrant an in-depth study. Issues that need to be covered include:

- which property regimes are most common, and under what circumstances are they found?
- do users need to pay (in broader sense) anything, and are the terms of use changing?
- is the resource increasing or decreasing?
- what is the impact of irrigation on availability of crop land for grazing?

Sustainable grazing systems There is a need for research into socially acceptable, economically viable and environmentally sound grazing / feeding systems (daytime penning, rotational grazing, etc.)

Conditions and characteristics of effective community management It would be very helpful if a study were undertaken, comparing and contrasting three sets of villages in similar socio-economic and agro-ecological conditions. The three sets would be: (a) ones which have been effectively involved in a programme of pastureland development and management on common lands; (b) ones that became involved, but in which management broke down; and (c) ones that have not been involved, despite having the option of doing so. Finding out the differences and the reasons for this could provide valuable information for development agencies working on, or thinking of working on, silvipasture development on common lands.

6.5 Water resources

6.5.1 Policy and practice issues

Managing demand. The over-riding need is to shift effort in all sectors from increasing supply to managing demand. This needs to be done in an adaptive way rather than seeking to apply universal solutions.

Water resource management. There is a need for:

- long-term management rather than quick fixes at all levels - i.e. at the local level and at the regional and basin levels;
- more effective local management of water resources, especially those that aim to protect access to water for domestic uses;
- support and documentation of initiatives emerging at the grassroots;
- representation of all users, and especially women, in irrigation societies and water user associations;
- effective planning and management arrangements at a basin level;
- improving the effectiveness of laws, regulatory systems and use of democratic structures.
- Mechanisms for water sharing/upstream-downstream compensation.

There is a strong demand for change (i.e. fairer and more rational allocation of water), but many, especially elites, benefit from the existing regime. Action is required to tackle corrupt practices.

Groundwater use is very difficult to manage, particular under a legal framework that gives rights to water to landowners: monitoring abstraction is problematic. Electricity pricing with progressively steeper tariffs is a potentially important tool for restricting the amount of water that a well-owner pumps. The flat rates for electricity and frequent power failures both work as disincentives for farmers to make better use of their irrigation water by pumping only when water is really required.

Irrigation. Small and marginal farmers can be beneficiaries from irrigation, if they have the opportunity to buy water or to share a borewell with another farmer. Landless people benefit indirectly from irrigation through an increase in the availability of wage work (often coupled with an increase in wage rates). However, the increasing number of borewells for irrigation purposes reduces the amount of water available to human beings and livestock, and it is usually the poor who suffer most from this, as they cannot afford to buy water.

6.5.2 Research issues

The few existing cases (Tarun Bharat Singh, SOPPECOM) of community-based demand management need to be thoroughly analysed, and lessons learned. Similar pilot initiatives should be launched and carefully studied in other dryland states, including AP and Gujarat. Research is needed into these and other institutional requirements for controlling groundwater extraction.

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Annex 2 Composition of research team (IN DESCENDING ORDER BY TIME ALLOCATION PER ORGANISATION)

Organisation of origin	Name of staff	Disciplinary background	(De-facto) Role in the project	No of days input
CRIDA	1. H P Singh	Soil science	Facilitation of process, incl. ICAR approval, representation	15
	2. M Osman	Agroforestry	Team leader for CRIDA, review of forest status and trends	55
	3. S Dixit	Agricultural Extension	Review of livelihood contributions, in-charge of CRIDA report production and editing	55
	4. A K Mishra	Grazing land management	Review of non-forest land based CPRs	55
	5. P K Mishra	Water conservation	Review of water resources	55
	6. K Ramachandran	GIS	SAT definition, maps on SAT India	55
	7. Rama Rao	Agricultural Economics	Review of economic aspects of CPR management	55
	8. G Korwar	Agronomy	Reading of CRIDA report	40
NRI	9. Barbara Adolph	Social development, esp. CBOs	Overall project leader, responsible for project methodology, project co-ordination and project management, production of FTR	65
	10. John Butterworth	Soil and water conservation	Inputs related to water as CPR	20
	11. Czech Conroy	Natural Resource Economics	Inputs related to general issues & forest management	30
	12. Mike Morris	Social development / livelihoods	Inputs related to livelihood systems	20
AKRSP(I)	13. Ashok Gupta	Agricultural development / community based NR management	In-charge of Gujarat stakeholder consultations, case studies, regional workshop and regional report	60
CWS	14. Shaik Anwar	Agricultural development / community based NR management	In-charge of Andhra Pradesh stakeholder consultations, case studies, regional workshop and regional report	60
MSU	15. John Kerr	Natural Resource Economics	Backstopping on non-forest land based CPRs issues, peer review of project reports	10
WRMLtd	16. Charles Batchelor	Water resources management	Backstopping on water resources management issues, peer review of project reports	8
Total person days				648