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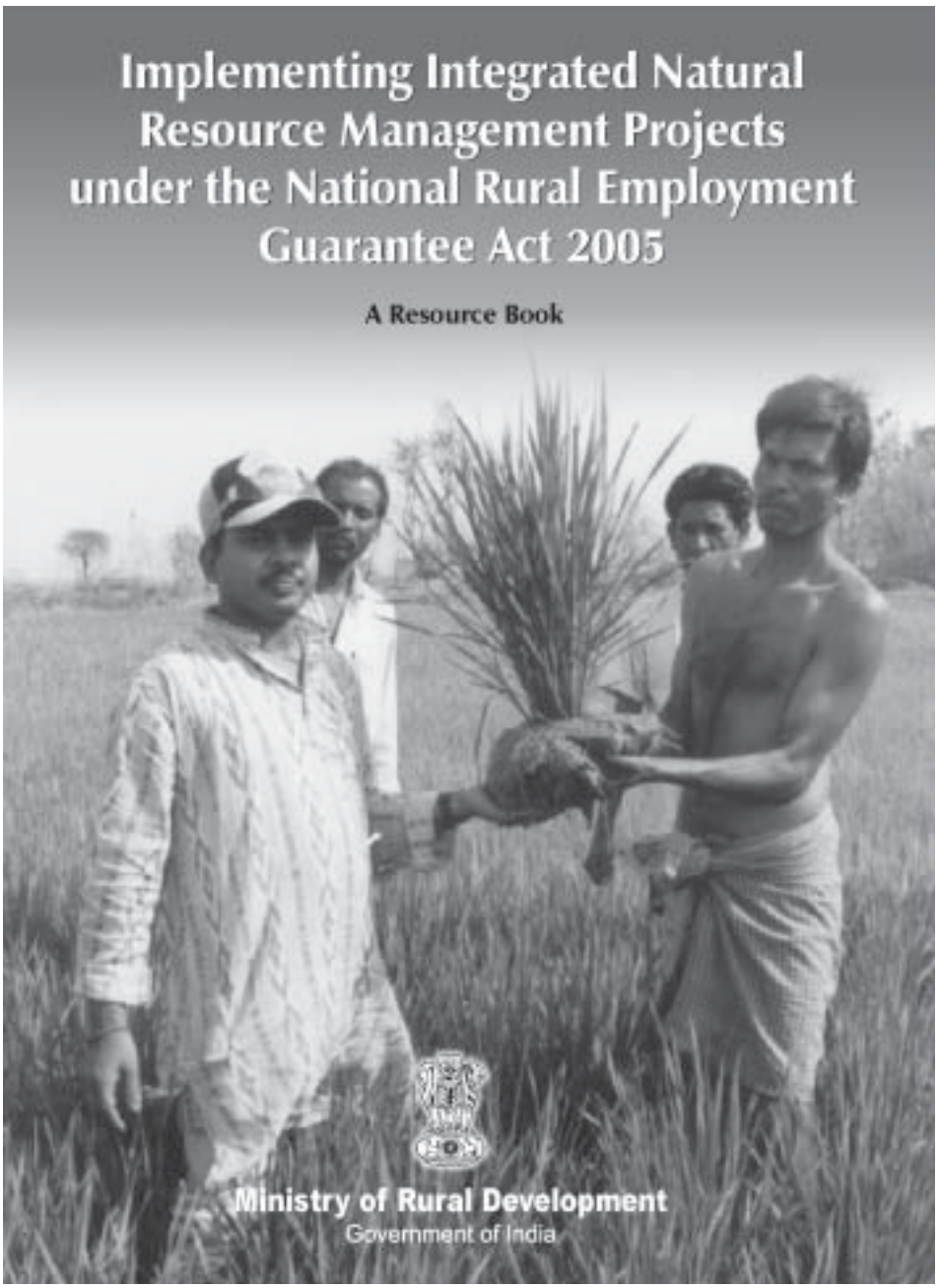
Implementing Integrated Natural Resource Management Projects under the National Rural Employment Guarantee Act 2005
A Resource Book
Ministry of Rural Development
Government of India

Foreword

The Government of India recently launched the National Rural Employment Guarantee ACT (NREGA). It guarantees one hundred days of wage employment every year to every rural household whose adult members volunteer to do unskilled manual work. The Act seeks to enhance the livelihood security of people in rural areas by generating wage employment through works that develop the infrastructure base of that area. The choice of works mentioned in the Act include all components of land and water resource development that help in addressing the causes of chronic poverty such as drought, deforestation and soil erosion.

Professional Assistance for Development Action (PRADAN) has been involved for more than 20 years in promoting livelihoods for the rural poor in some of the poorest areas of the country, primarily in the Central and Eastern hilly regions. It is not surprising that a majority of the districts shortlisted by the Ministry of Rural Development (MORD) for implementation of the NREGA also happens to be in the same region (the notified area of NREGA includes 56 of the 65 districts in the eastern plateau and hilly regions also called as the Agro-climatic Zone VII), because these districts have been selected on the basis of the intensity of endemic poverty in the villages. As has been PRADAN's experience in these areas, the major cause of extreme poverty in these areas is not the lack of livelihood resources but rather the lack of quality of these resources. Landlessness is not as rampant as in some other parts of the country, but there are millions of poor people here who are not food sufficient. Rainfall is quite high in these areas, yet water is not available for irrigation. High rainfall and a complex ecology make these regions potential engines of future growth as a wide variety of trees and crops can be grown and complex farming systems are feasible. But this requires an integrated approach to resource management. Following such an integrated approach, PRADAN has demonstrated ways to promote the development of natural resources leading to equitable and sustainable economic growth, ensuring household food security and eliminating mass poverty in the region. Such an approach requires participatory planning at the level of hamlets and villages, to develop production and management systems suitable to the resource endowment to meet people's needs and preferences. The technologies that PRADAN has evolved are simple, labour intensive and, therefore, suited to the requirements of NREGA in order to generate wage employment opportunities while creating livelihood assets.

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This handbook is the result of our efforts to share our experience in implementing INRM projects in the hilly undulating regions of the Agro Ecological Zone VII. This is the result of a joint initiative of the Ministry of Rural Development (MoRD), Government of India, and the United Nations Development Programme (UNDP) and PRADAN to document strategies that could be used for implementing programmes under NREGA.

We would like to express our deep gratitude to Ms Amita Sharma, Joint Secretary, Ministry of Rural Development, and in-charge of the NREGA; Dr. Neera Burra, Special Adviser (Poverty), UNDP, for being a great support in the process of preparing this handbook. We would also like to express our thanks to Word-by-Word Editorial Services, New Delhi, for going through the various versions of the manuscript and helping us bring out the handbook. Finally, we express our gratitude to the thousands of poor farmers, based on whose experiences PRADAN has been able to put together this document.

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Contents

CHAPTER 1

Introduction

The Government of India recently enacted the National Rural Employment Guarantee Act (NREGA) 2005.[1] **The NREGA guarantees one hundred days of wage employment every year to every rural household whose adult members are willing to do unskilled manual work.**

The Act seeks to enhance the livelihood security of people in rural areas by generating wage employment through works that develop the infrastructure base of that area. The choice of works mentioned in the Act include all components of land and water resource development that help in addressing the causes of chronic poverty such as drought, deforestation and soil erosion. This handbook is extremely relevant for the agencies/ individuals involved in implementing the programmes under this Act.

Professional Assistance for Development Action—PRADAN—is an NGO that has been working closely with the communities in Jharkhand, Bengal and Orissa in the field of Integrated Natural Resource Management (INRM) for the last 15 years. They have been successful in innovating and evolving a variety of appropriate technologies to deal with the undulating topography of these regions and enhancing the productivity of the land and water resources. This is being done with a deliberate purpose of generating livelihoods for the poor people.

PRADAN field workers guiding the villagers.

This handbook has emerged exclusively from the experience gained by the PRADAN teams in these states (all part of the Agro Climatic (AC) Zone VII). This handbook will be updated and refined over time as various implementers try out the process in different contexts and locations.

Purpose of the Handbook

The objectives of the handbook are to enable the implementers of the NREGA to:

- Identify opportunities with an INRM perspective for generating wage employment under NREGA in a given area.
- Enhance the technical understanding of the NREGA implementers on INRM measures.
- Plan and implement INRM measures with the help of the community.

[1] *The NREGA is a legal guarantee of 100 days of employment in a year to a rural household.*

The handbook is meant for the implementers of the NREGA at the district, block and panchayat levels. The book serves as a guide for the implementers in the field. It gives a detailed description of the various technological measures that can be implemented in the different types of lands. Measures, such as the 5% model, the staggered trench, 30 x 40 model, seepage tank and gully plugs, have already been successfully tried and tested in the various parts of AC Zone VII. The book also provides insights into the lives of farmers who have benefited by adopting these measures. The footnotes provide further explanations of technical and special terms.

The handbook has seven chapters

Chapter 1 delineates the purpose of the handbook.

Chapter 2 describes the NREGA, its purpose and features.

Chapter 3 portrays the Agro-climatic Zone VII along with its residents, their livelihoods and their problems/needs.

Chapter 4 explains the INRM approach and its importance for employment generation and sustainability.

Chapter 5 illustrates what to do at the field level. Various technologies are explained with illustrations and case studies.

Chapter 6 explains the steps in planning INRM.

Chapter 7 deliberates on the mobilization of funds to the community for the execution and implementation of the INRM measures.

CHAPTER 2

National Rural Employment Guarantee Act 2005

In this chapter

- The NREGA: its purpose and features
- The relevance of NREGA for INRM

The National Rural Employment Guarantee Act (NREGA) 2005 was passed by the Government of India to provide at least 100 days of guaranteed wage employment every year to every household whose adult members volunteer to do unskilled manual work.

Important Features of the Act

Entitlement

A household is entitled to 100 days of unskilled manual work in a year. Within the household entitlement, all adult members of a rural household have the right to demand employment.

Registration of Rural Households for Wage Employment

A household that wants work under this Act should submit names, age, sex and addresses of its adult members to the local Gram Panchayat for registration.

Job Card to Every Registered Household

- Upon registration, a job card, with photographs of adult members, will be issued by the Gram Panchayat. It will have the registration number of the household and will be valid for five years.
- The job card is a document that gives the applicant the right to such employment.

Application for Work

- To get employment, the registered adult must submit an application on plain paper to the Gram Panchayat or the Programme Officer (at the block level) and get a dated receipt of the application. The application should be submitted for at least 14 days of continuous work.
- Women will get priority to the extent that one-third of the persons given employment are women, who have asked for work.

Allotment for Work

- Within 15 days of submitting the application or from the date when employment is sought, employment should be provided by the Gram Panchayat.
- The Gram Panchayat will inform applicants within 15 days, by means of a letter, where and when to report for work. A public notice of this will be displayed on the walls of the Gram Panchayat office.

Payment of Unemployment Allowance

- If the eligible applicant does not get employment within 15 days of the demand for work or the date from which s/he sought work, s/he shall be provided unemployment allowance. There will be no unemployment allowance if a person does not appear for the work allotted.

Minimum Entitlement of Labourers

- The statutory minimum wage applicable to agricultural workers in the State shall be paid.
- Wages are to be paid not later than a fortnight after the date on which work was done.
- Work will be provided within 5 km of the applicant's residence. If employment is provided beyond a 5 km radius of the applicant's residence, then s/he is entitled to 10% additional wages towards transport and living expenses.
- If a worker is injured while working on the site, free medical treatment will be given by the State government.

Creation of Durable Assets

The focus of the works is on (in terms of priority)

- Water conservation and water harvesting
- Drought proofing, including afforestation and tree plantation
- Irrigation canals including micro and minor irrigation works
- Irrigation facilities for land owned by households belonging to SC/ST or to land of beneficiaries under the Indira Awas Yojana
- Renovation of traditional water bodies, including desilting of tanks
- Land development
- Rural connectivity to provide all-weather roads
- Any other work, which may be notified by the Central government in consultation with State governments

Implementation of the Act

- The Gram Sabha will identify the works to be taken up. The panchayats have the principal responsibility for planning, implementing and monitoring.
- All agencies implementing NREGA will be accountable to the public for their work. Social Audit and Right to Information will apply to each aspect of implementation.
- A local vigilance and monitoring committee will be set up.
- The Act will be notified in 200 districts identified by the Central government in the first phase. It will cover the whole country within five years.

Relevance of NREGA in Promoting Natural Resource Management

Natural resources (land, water, forest, etc.) are pretty basic to the livelihoods of the rural poor.

Providing water line for agriculture land.

The lack of investment and poor husbandry are gradually reducing the production potential of these resources.

Policy makers must make use of this opportunity to deploy government investments under various poverty alleviation schemes to develop these lands and generate sustainable livelihoods for the poor communities, primarily depending on them.

It is, thus, possible to use the funds under the NREGA for natural resource management activities with a view to generating wage employment for the poor as well as strengthening their livelihood resource base.

On an average, 150 to 200 persondays of employment can be generated for developing every hectare of such land. The techniques and measures used for rainwater harvesting and land husbandry are along the lines of the works proposed under NREGA.

Potential beneficiaries include both the landless wage earners and owners of the resources themselves. In addition to wage-earning opportunities, the landless benefit from non-farm activities that flourish following the development of natural resources. Asset creation and increase in productivity will definitely help the population relying on natural resources to cross the poverty line.

CHAPTER 3

The Agro-climatic Zone VII

In this chapter

The Agro-climatic Zone VII:

- its territory
- its features (area profile, physiography, geology, etc.)
- its natural resources (soil, water, forest, climate, etc.)
- its people and their livelihoods (agriculture, forest, livestock, etc.)
- its problems and needs

The significance of Natural Resource Management (NRM) for the development of the region

Background

During the Eighth Five Year Plan, the Planning Commission divided the entire country into 15 agro-climatic regions, each with similar resource endowments and constraints, for the purpose of agricultural planning.This planning aims at the scientific management of regional resources to meet the demand for food, fibre, fodder and fuel wood without adversely affecting the natural resources and environment. This is expected to lead specific strategy formulation in different zones for faster agricultural development and to bring about sustainable development through diversified agriculture. The Eastern Plateau and Hills Region is the seventh such agro-climatic zone.

Location

Agro-climatic Zone VII covers the undulating and hilly (UH) regions of eastern India. It includes Jharkhand and Chhattisgarh, the south-western districts of West Bengal, non-coastal Orissa, and a few districts each in eastern Madhya Pradesh and eastern Maharashtra (see map, page 8). The zone covers 65 districts in 6 States. **Table 3.1** gives some characteristics of the zone in each state.

Geography

The topography of this region is undulating and the soil is shallow. The UH regions of this zone have limited ground water. The terrain, however, receives good rainfall and is criss-crossed by many seasonal and perennial streams carrying off a huge runoff[1]. Thus, there are multiple options for harvesting the high runoff from the region in a decentralized manner. These options have largely remained untapped. At present, wells, tanks and rivers are the major sources for irrigation. There is virtually no scope for large and medium irrigation projects due to the undulating nature of the terrain.

[1] *Runoff is term used to describe the water from rain, snowmelt or irrigation that flows over the land surface and is not absorbed into the ground, instead flowing into streams or other surface waters or land depressions.*

Table 3.1: Selected characteristics of areas in the Agro-climatic Zone VII					
State	**Jharkhand**	**Chhatisgarh & MP**	**Maharashtra**	**Orissa**	**West Bengal**
Districts	22	16+3	4	19	1
Population in millions (1991)	21.85	24.02	4.66	16.5	2.21
Population density (persons/ sq km)	277	219	133	142	354
Urban population %	21.34	15.8	18.1	12.8	30.7
SC	11.85	10.78	16.09	14.3	16.15
ST	27.67	37.66	20.65	37.54	13.78
Female literacy	20.8	21.04	38.1	21.5	45.4
Rainfall	1354	1325	1271	1362	1295
Climate	Moist sub-humid to sub-humid	Moist sub-humid to dry sub-humid	Dry sub-humid	Moist to dry sub-humid	Humid subtropical
Soil type	Red sandy/ loamy, red and yellow	Medium to deep black, red and yellow	Medium to deep sandy loam to clayey soils	Medium to deep black, red sandy, red and yellow	Red loamy
Area (sq km)	78,740	109,880	35,110	116,150	6,243
Net sown area (NSA) (% of total)	22.57	50.6	29.36	36.38	61.4
Forest (% of total)	28.85	19.96	50.27	37.52	16
Net irrigated area (% of NSA)	10.47	21.89	29.58	37	37.7
Fertilizer consumption (kg/ha)	54.9	26.08	43.26	7.89	50

Source: ARPU Working Paper No. 10, August 1998

Temperature and Rainfall

The average temperature in this region ranges between 19.7 °C in winter and 32 °C in summer, while the average annual rainfall ranges between 1,271 mm and 1,436 mm. Around 80% of the rainfall occurs between June and September. Generally, the monsoon starts in mid-June. Every alternate year there is a dry spell, either just after the onset of monsoon or in mid-September. This causes crop failure even in the years when the total rainfall is sufficient. The high yet erratic rainfall sets the eastern UH regions apart from the other UH regions in the country such as the Deccan and western India.

Soil

The soil in this region is mostly nutrient-poor, red sandy, or red and yellow. The combination of an undulating and hilly terrain and high rainfall produces wide variation in soils, slope, water availability, soil depths, etc. even within the boundaries of the smallest village. Though there are variations across the upper, middle and lower reaches, the overall pattern repeats itself village after village—dry uplands[2] with shallow soils, dry midlands[3] *with deeper soils,* and *wet lowlands[4] with deep soils*. In fact, the local terms for land classification incorporate these variations—*tand* (upland), *baid* (medium upland), *kanali* (medium lowland) and *bohal* (lowland) in Bengali and similar terms in other vernaculars. This makes Natural Resource Management (NRM) a complex process in this region.

Population and Poverty

The Agro-climatic Zone VII is characterized by low population density, low urban population, high percentage of SC/ST population, low levels of literacy and high levels of poverty.

Of the total population in AC Zone VII, 75–80% is rural. Scheduled Tribes comprise 20–35% of the rural population in most districts. In many blocks, they form the majority. Most people own land, and landlessness is significant only among the Scheduled Castes. Agriculture is a key source of livelihood, supplemented by gatherings from forests and wage earnings from migration.

High rainfall and a complex ecology make these regions potential engines of future growth. However, the people are almost uniformly poor and among the most food-insecure in the country at present. In some districts, two-thirds of the population is officially classified as below

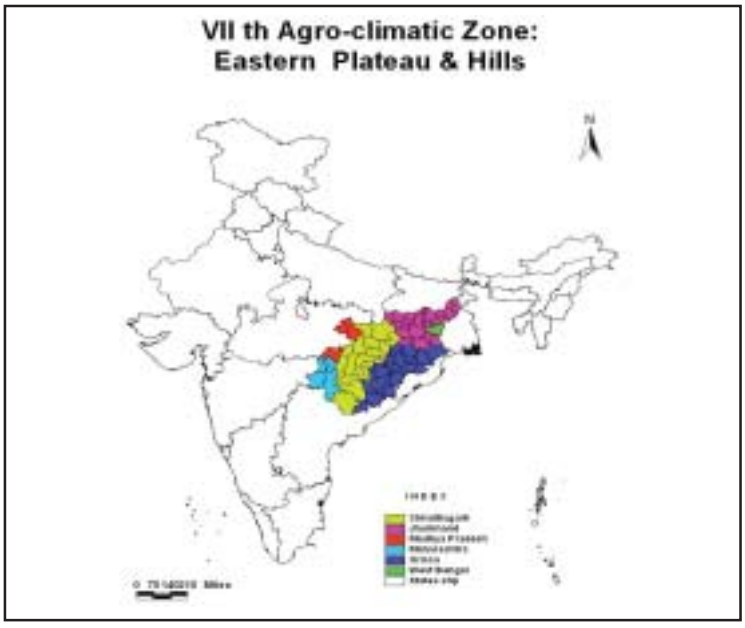

Figure 3.1 The Agro-climatic Zone VII.

[2] *Lands in the upper reaches of a slope*
[3] *Land in the middle reaches of a slope*
[4] *Land in the lower reaches of a slope*

the poverty line[5] (BPL) and almost no district has less than 40% BPL. A majority of the 100 poorest districts in the country fall in this region.

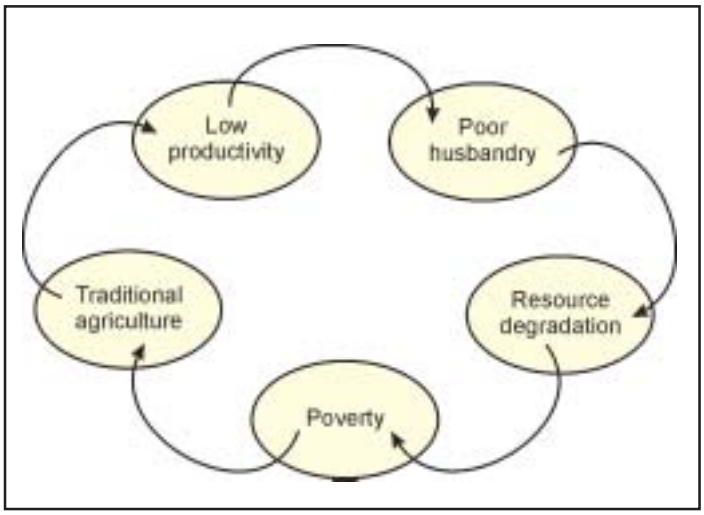

Figure 3.2 Vicious cycle of poverty.

Livelihood Pattern in AC Zone VII

- Agriculture, forest and wage earning (either locally or through migration) are the primary sources of livelihood in this zone.
- There also exist a number of artisan castes/groups who depend either on providing services to the community or on small-scale processing and marketing.
- A small percentage of the tribal population (primitive tribes) living in this zone still depends on shifting cultivation, forest gathering and hunting. Many tribals are caught in a debt trap because of the precariousness of their food security situation.

In this zone, people's livelihoods vary according to the location of their settlements in different parts of the river basins. For example, the livelihoods of people living in the upper reaches of the basins are substantially different fromthe livelihoods of people in the low-lying parts.

Steep hilly areas in the upper catchments of rivers form 25% of this region. People are poor and live in small, scattered settlements located near forests. They mainly depend on forest-based livelihoods such as the sale of fuel wood and non-timber forest produce (for consumption or sale). Agriculture is limited and provides food security for three to six months only. Small stocks of poultry, pigs and goats help to meet contingencies. In addition, wage earning, either locally or through seasonal migration, forms a major method of supplementing people's meagre incomes.

Partially hilly areas located in the middle part of river basins form 60% of this region. Compared to people in the steep, hilly areas, people in these parts depend more on agriculture and less on forests. Rain-fed paddy is the main crop. In addition, people also cultivate some vegetables. Some farmers own bullocks and use manure for maintaining soil fertility. Food security extends to nine months. Agriculture is mainly of the subsistence type as there is irregular access to the market. Around 50% of households in such areas depends on wage earning.

Flat, low-lying areas located in the lower parts of river basins form 15% of this region. Communities living in these parts are mixed, extend into the lower plains and have relatively little access to forests. Landholdings are smaller but more intensively cultivated and people own more bullocks. Agriculture forms the backbone of the economy. Double cropping[6] is common.

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[5] *The estimated minimum level of income needed to secure the necessities of life*

[6] *The practice of consecutively producing two crops of either like or unlike commodities on the same land within the same year. An example of double cropping might be to harvest a wheat crop by early summer and then plant corn or soybean on that acreage for harvest in the fall.*

A third crop is grown in areas where irrigation is available. There is a greater reliance on paddy and year-round vegetable cultivation. Most people have year-round food security during normal years. People are more market-oriented as they have access to them all through the year. Many fields have bunds[7] as the terrain is generally flatter and there is better information about water management techniques. In general, farming is carried out for a longer period and productivity per hectare is higher . Migration to distant towns is less prevalent with greater availability of locally available wage work.

Pattern of Land Holding

Most people have lands except the Scheduled Castes and primitive tribal community. The average landholding per family is around 1ha. Roughly 50% of the cultivators are marginal farmers, 30% are small farmers, and the rest are big farmers. Problems of land tenure mainly arise in relation to 'encroached' forest land.

Agriculture

- The total cultivated area in this zone is 14.372 million hectares of which 2.57 mha (18%) is irrigated.
- Agriculture is predominantly rain-fed and monocropped. Although official estimates claim that 18% of the net sown area is irrigated, in reality many irrigation schemes are either defunct or irrigate much less land than what they were designed for. As a result, less than 25% of the gross cropped area is double cropped.
- Paddy is the major crop, accounting for 60% (about 75% of *kharif*[8]) of crop coverage, with a productivity of 1–1.5 t/ha.

All indices of agricultural development, such as fertilizer consumption, farm credit, spread of high-yielding crop varieties, seed replacement, etc., are far below the national average.

- Other crops include maize, a variety of millets, sorghum, wheat, barley, pulses and oil seeds.
- Food grains occupy about 80% of the cropped area and the average yield of food grains is 1.4 t/ha in rain-fed conditions and 1.8 t/ha under irrigated conditions.
- Major *kharif* crops include paddy, maize, millets, arhar, niger and groundnut.
- Wheat, oil seeds (rapeseed, mustard, linseed, groundnut, pigeon pea, and niger), pulses (lentil and gram) and vegetables are the major *rabi*[9] crops.
- Horticulture is under-developed and only 5% of the cultivated area is under horticultural products such as fruits, vegetables, and spices.
- Productivity of all the crops is in the range of one-third to one-fifth the national average (itself depressed by data from the large UH regions) and often as low as one-tenth the potential.
- Poor crop and resource husbandry continue mainly due to the low returns and high risk in agriculture.

Forests cover around 30% of the geographical area of this region.

[7] *An embankment or causeway* [8] *Summer crops, sown during April-July and harvested by October*
[9] *Winter crops, sown during October-February and harvested by June*

Livestock Raising

In this region, raising livestock is viewed as an important component of the agricultural production system rather than a livelihood by itself. For example, cattle and buffaloes provide draught power and manure, and are used in threshing operations. Other livestock, such as goats and chicken, provide a cash reserve in times of distress.

Roughly 80% of the households in this region own livestock (mainly cattle and excluding poultry). Livestock is mostly of the local breed. Traditional grazing areas include common lands and wastelands, while forests are used during the monsoon months. Farmlands covered with stubble and grass (after harvesting is over) become the main grazing areas in the remaining part of the year.

Forest-based Livelihoods

Forests supply timber, fodder, fuel wood and a large number of non-timber forest products (NTFPs[10]). Almost all households living in forest belts depend upon the collection of NTFPs for consumption and sale. In economic terms, mahua and tendu leaf are the two most important NTFPs. The annual income from forest ranges between Rs 2,000 and Rs 5,000 per household and includes income from collection and processing activities (e.g., basket-making, rope-making, de-seeding, etc.). In addition, they use the forest to graze their animals, to meet their household fuel need and to get timber for their house construction.

Wage Labour

Most households depend on wage labour to eke out a living. Dependence on wage labour is much higher in villages away from forests, (for over half the year) when food from their own lands is not available. Wage work is done both within the village and in neighbouring towns. Within the village, people mostly engage in agricultural work. Outside the villages, people work in brick kilns and as unskilled construction labour. Women's participation in wage work is equal to that of men. However, agricultural wages paid to women are almost always lower than those paid to men. Landless SCs are often the poorest and most dependent on wages.

Relevance of Natural Resource Management for This Region

As explained, the Agro-climatic Zone VII is characterized by subsistence agriculture; declining availability and control over common property resources and forest resources; deficit-induced indebtedness leading to the loss of control over private resources; and dependence on low-return seasonal labour migration. The downward spiral of low productivity leads to poor husbandry, which further reduces productivity resulting in widespread resource degradation and impoverishment of the people.

An integrated approach to NRM, focussing on the efficient management of soil, water and vegetation resources, becomes extremely important in this situation. INRM not only helps to optimize and increase the productivity of land and water resources, but also ensures household food security and eliminates mass poverty in the region.

[10] *Products available from the forest other than wood used for construction and furniture purposes. NTFPs include fuel wood, fodder, leaves, grasses, seeds, creepers, herbs, medicinal plants, fruits and other edibles such as mushrooms, honey and lac.*

CHAPTER 4

The INRM Approach

In this chapter

- INRM, its definition and approach
- The importance of INRM for employment generation and sustainability
- The challenges in INRM
- The scope of INRM in the AC Zone VII

What is INRM?

INRM is normally understood as the careful management of land, water, forest and biological resources to achieve and sustain potential agricultural productivity. The following boxes capture two standard definitions.

"Integrated natural resource management (INRM) is a way to ensure that the uses of natural resources are ecologically sustainable. It is 'integrated' because it attempts to manage all the activities that could affect natural resources, taking natural processes into account as well. It combines managing uses of natural resources with conservation. To do this it cuts across artificial distinctions such as government agency responsibilities, government or property boundaries, industry sectors and scientific disciplines. In defining management areas it gives priority to natural over human boundaries, for example using river catchments or **bioregions** as the primary basis for planning and management." Department of Environment and Heritage, Government of Australia.

The current definition of INRM, as displayed in the website www.inrm.cgiar.org: "INRM is an approach to research that aims at improving livelihoods, agro-ecosystem resilience, agricultural productivity and environmental services. In other words, it aims to augment social, physical, human, natural and financial capital. It does this by helping solve complex real-world problems affecting natural resources in agro-ecosystems. Its efficiency in dealing with these problems comes from its ability to:

- Empower relevant stakeholders
- Resolve conflicting interests of stakeholders
- Foster adaptive management capacity
- Focus on key causal elements (and thereby deal with complexity)
- Integrate levels of analysis
- Merge disciplinary perspectives
- Make use of a wide range of available technologies
- Guide research on component technologies
- Generate policy, technological and institutional alternatives."

INRM recognizes the links between natural resources (soil, water, vegetation) within a natural boundary called watershed. Action in one part affects the others. For example, deforestation in the upper catchment areas increases soil erosion, reduces moisture conservation, and increases runoff in the lower valleys. The movement of rainwater across time and space is a key factor in this concept.

Uncontrolled, unplanned and unscientific use of natural resources results in their decline. Activities that deplete natural resources include the following:

- Cultivation on slopes without adequate precautions
- Inadequate bunding of cultivated plots
- Irrational cropping without replenishing soil fertility
- Severe deforestation exposing the hills
- Barren and compact commons due to overgrazing
- Intentional fire in forests
- Shifting cultivation
- Unscientific mining
- Lack of people's involvement in managing natural resources

The consequences are soil erosion, siltation of water bodies, less infiltration and the fast disposal of runoff causing floods and droughts resulting in low productivity and the poor health of people and cattle. Therefore, managing natural resources calls for their rational utilization to optimize production and minimize risk. This involves:

- Proper land use for protecting it from all forms of erosion
- Enhanced productivity while maintaining soil fertility
- Water harvesting and conservation for effective use (domestic, irrigation, etc.)
- Safe disposal of runoff

INRM combines *managing the use* of natural resources along with their *conservation and sustenance*.

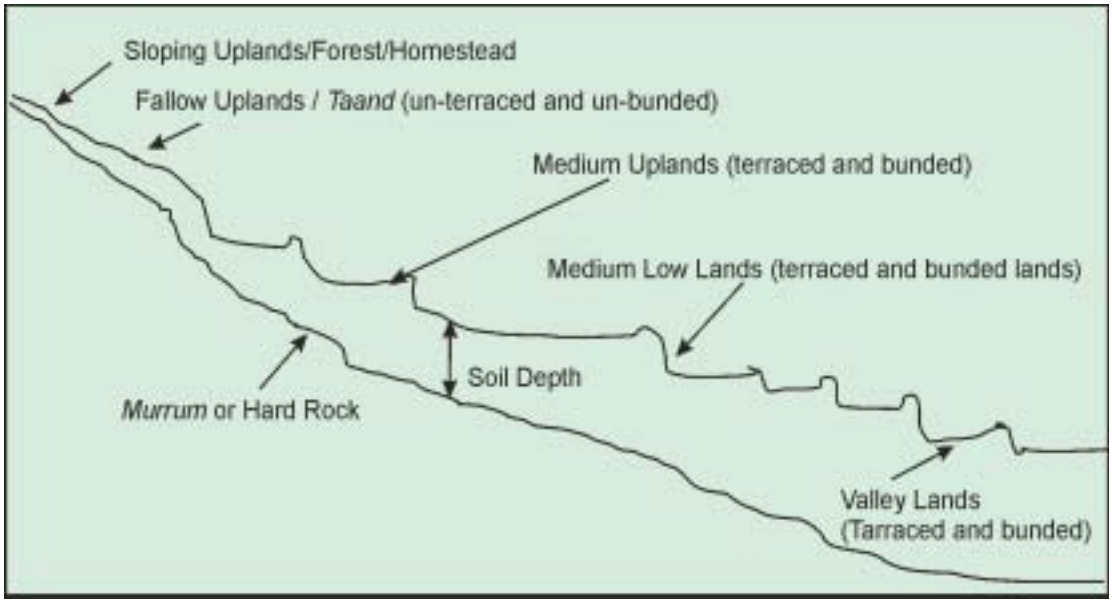

Figure 4.1 Typical Terrain in the AC Zone VII (not to scale)

Table 4.1: Characteristics, present utilization and problems in various land types in the AC Zone VII

Land type	Characteristics	Present utilization	Problems
Upland	Highest slope, very thin topsoil. *Morrum*/rocky substrate (often exposed) very low moisture status. Generally not terraced or bunded.	Used for cultivating paddy through direct seeding wherever there is a bit of topsoil. Most part remains fallow. Homestead is used for maize/vegetable cultivation private/ government forest.	High erosion due to high slopes and low or no vegetative cover. Low water-retention capacity Extremely low production.
Medium upland	Moderate slopes. Soils are sandy to sandy-loam. Shallow top soil with low organic matter. Low moisture-holding capacity. Generally bunded and terraced.	Increasingly brought under transplanted short- duration paddy due to population pressure.	Low moisture-retention capacity Low productivity. Lands are not husbanded well: Shallow and poorly maintained field bunds, unplugged rat holes, little or no manure is applied. Paddy crop in these lands is highly vulnerable to rain failure.
Medium lowland and lowland	Most productive lands: core of the farming system. Soil is rich in organic matter. Suitable for intensive year-round cultivation. Water surplus during monsoon: sourced from direct rainfall, surface runoff and seepage from upper catchments. Surplus water has to be drained out to ease farming operations in the lower valleys during monsoon.	Long-duration paddy during monsoon.	Land use below potential. Single paddy crop is grown during the monsoons due to the absence of irrigation sources. Waterlogging and crop damage during heavy rain.

The creation of a self-sustaining system requires the involvement of the community[1] in the planning and implementation of resource development programmes and management of these resources. Again, they need explicit rights to fairly share all accountability and benefits from these resources. Hence, participatory planning at the hamlet level is emphasized to meet people's priorities. Only this can bring sustainable development of natural resources.

In short, INRM involves the development of natural resources taking into account the relationship between them as per the needs and priorities of the people.

Land Types in the AC Zone VII

A typical terrain in the AC Zone VII is shown in Figure 4.1. Table 4.1 depicts the characteristics, uses and problems of the different types of land.

If undertaken, proper land treatment and scientific cropping practices will help to conserve and enrich the soil, increase moisture content and carrying capacity of the soil, thus ensuring a higher return for poor families. For maximum impact, a small farmer needs to treat a contiguous area (covering all land types) with a variety of activities suitable for different land types. The following section deals with different land treatments suitable for uplands, medium lands and lowlands.

Strategies of INRM in the AC Zone VII

The following strategies would help improve returns from land and water resources.

Strengthening Homesteads

- Homesteads are very fertile due to the presence of organic material and are also the easiest to protect. Yet, these lands are very poorly managed.
- Intensive cultivation of homesteads (*baari*)[2] to create year-round income-earning opportunities is one of the strategies.
- Every family in the AC Zone VII has 200 to 400 sq m of homestead land.
- By developing dug wells[3] shared by several families, homesteads could be irrigated and used for the intensive cultivation of vegetables, fruits and flowers.
- This would especially benefit women and offer them an alternative to leaving home in search of wage labour.

Developing Uplands

- Developing uplands (*taand/goda/dhipa*)[4] is the second strand of the strategy.
- Land treatment to harvest rainwater to improve soil moisture locally is the first step towards enhancing the productivity or carrying capacity of these lands.
- Gullies[5] should be plugged and stabilized to prevent any further degradation.
- Agro-forestry[6], with a combination of trees and grasses, is more suited to such lands rather than paddy or other field crops.
- Tree varieties could be chosen for light timber, fuel wood, tussar silk and horticulture.

Husbandry of Medium Uplands

- The third element of the strategy is to improve the management of medium uplands (*baid*).
- To enhance and stabilize productivity, these lands need to be treated for water harvesting and the recycling of biomass to ensure good organic content in the soil.

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[1] *All adults dependent on the concerned natural resources for their lives and livelihoods.* [2] *A house, especially a farmhouse, and outbuildings.* [3] *A well that is usually excavated by hand.* [4] *Uplands in different areas—***Taand** *in Jharkhand,* **Goda** *in Bengal and* **Dhipa** *also in Jharkhand.* [5] *A water-worn ravine.* [6] *Agriculture incorporating the cultivation of trees.*

- The promotion of on-farm water resource development (5% model) and green manuring (through field bund plantation or cultivation of sun hemp) would be the required interventions in these types of lands.
- Besides these, alternatives to paddy, such as maize, pigeon pea, and maize mixed with pigeon pea, can be cultivated profitably.

Crop yields can be dramatically increased with these interventions and with the following simple changes in cultivation practices:

- ✓ Selection of healthy seeds
- ✓ Better nurseries
- ✓ Timely transplanting
- ✓ Application of potash
- ✓ Production and use of vermi-compost

Managing Medium Lowlands and Lowlands

- Improving the management of medium lowlands (*kanali*) and lowlands (*bohal*) is the fourth element of the strategy.
- These provide huge opportunities to harvest both surface runoff and sub-surface flow and recycling of water for localized irrigation to support intensive agriculture.
- The most suitable infrastructure here is a chain of farm ponds (over 6 to 8% land area, 2 to 3 m depth) constructed in the valleys along the drainage line. As these ponds can retain water for long duration (up to 10 months), they provide excellent opportunity to promote composite fish farming besides providing irrigation.
- Once this is done, the lowlands would not only produce three crops a year but would also provide life-saving irrigation to adjoining *baid* lands with low-cost water-lifting devices during late-monsoon failure, which is very common in this region.

The preceding treatment measures generate substantial wage employment opportunities in the short run. In addition, these measures improve the production and productivity of natural resources in a sustainable manner in the long run, bringing significant reduction in poverty.

In regions with complete control over water, such as medium lowlands and valleys, the alternative technique of rice farming, namely, System for Rice Intensification (SRI)[7], can bring about a truly remarkable increase in productivity and sustainability.

Once agriculture is stabilized and intensified, intensive livestock rearing will become feasible as a subsidiary livelihood that is complementary too. The infrastructure on private land for collecting rainwater will provide scope for rearing fish, and farm residues will support cattle rearing.

Enhanced productivity of land and lower risk in farming would:

- ➢ Reduce the need for distress migration[8]
- ➢ Bring greater stability to the household
- ➢ Provide better husbandry of resources and crops
- ➢ Bring higher private investments in land development
- ➢ Open up opportunities for subsidiary home-based economic activities for landless and marginal farmers

[7] A methodology for increasing the productivity of rice by changing the management of plants, soil, water and nutrients, such as early transplantation and alternating flooding and drying of the rice field. These practices contribute to both healthier soil and plants supported by greater root growth and the nurturing of soil microbial abundance and diversity. It is based on a number of agro ecological principles with good scientific foundations. *[8] Migration out of no other choice to ensure food security.*

CHAPTER 5

INRM Technologies

In this chapter

- The options/technologies for addressing the problems of different types of lands with construction guides, illustrations and cases
- The cost (of labour and material separately) and employment potential of each technology

INRM technologies are of two types:

1 **Structural measures**[1]: These involve the construction of different earthen or rocky structures to hold back the runoff and thereby conserve soil and water.

2 **Vegetative measures**[2]: These involve appropriate land-use practices to conserve different types of land and maximize agricultural production in the interest of the community.

Whereas structural measures address the concern of soil erosion and moisture conservation immediately after their construction, vegetative measures, after full growth, conserve soil and water. However, vegetative measures are the most effective for soil conservation, and help improve the soil quality too. Figure 5.1 provides different structural measures in the upland.

Various measures, according to different land types (uplands, medium lands and lowlands) are described in the following paragraphs. In each land type, the land treatment is described first followed by a description of the proposed land-use. For each structural measure, its purpose and location, the process of construction, the estimated cost (labour and the material separately) and the time of construction is provided. Similarly, each subsection on proposed land use describes the different options of vegetation, rationale for selection, key considerations for the selection of species, estimated cost, rate of return and schedule.

[1] *Land-use measures that address immediate issues by creating different earthen or rocky structures*

[2] *Land-use measures that help to conserve and improve soil quality by using different kinds of vegetation cover and crop cultivation to sustain the productivity of the soil*

UPLAND TREATMENTS

The purpose of upland treatments (shown in Figure 5.1) is to

- check soil erosion
- diversify land use to reduce vulnerabilities
- enhance the income of poor families while conserving the land
- enhance percolation to improve the soil-moisture regime and reduce runoff

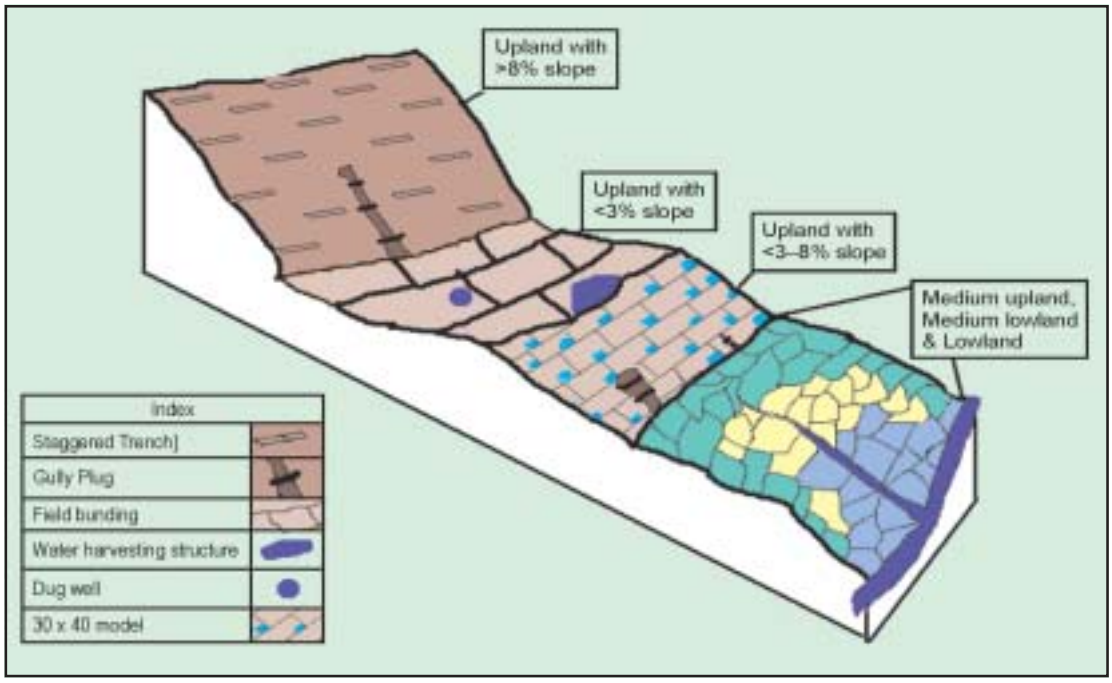


Figure 5.1 Upland treatments - Structural measures.

***Note**: The slope can be measured by using a pipe level[3] or dumpy level[4]. The vertical displacement (in metres) between two points that are 100 m apart on the ground along the slope is the per cent slope of the land.*

Slope	Structural measure
>8%	Staggered trench
3–8%	30 x 40 model
1–3%	Field bunding, water harvesting structures, dug well

[3] *Pipe levels consist of two 2 m long staffs and a transparent and flexible 14 m long tube, the ends of the tube being firmly fixed to the staffs. They are used for measuring differences in elevation*

[4] *An engineering level to measure the elevation difference between two points on the ground*

The following activities have been experimented successfully in the uplands of the Agro-climatic Zone VIII.

1. Staggered Trench

What is a staggered trench?

A staggered trench is a model of in-situ water conservation in which pits are excavated across the slope of the land that is not terraced or bunded to collect runoff during spells of rain to allow gradual percolation into the soil mass. It is a low-cost method of soil and water conservation to substitute the conventional measures such as contour bunding/trenching in greater than 8% slopes.

How is it constructed?

A staggered trench comprises shorter trenches (6ft long) along the contour with 6ft space between them at suitable intervals to impound the expected runoff from above. (See figure 5.2)

To construct:

- Locate the trenches directly below one another in alternate rows.
- Place the excavated soil from the trench behind the trench in the form of a bund.
- Have plantations in the space between the trenches and the bunds. The bunds may be planted with grasses.

The trench and the bund together act as a barrier to the runoff, and check soil erosion. Again, the accumulated water in the trench and behind the bund percolates down the soil to enhance soil moisture that increases biomass production from the otherwise unproductive lands. (See Figure 5.3)

A view of several staggered trenches across a slope.

What are the dimensions?

The dimension of a trench would be as follows:

Length	=	6 ft
Width	=	2 ft (top and bottom width are almost same)
Depth	=	1 ft
Total capacity	=	(6 x 2 x 1) cft = 12 cft

Expected runoff in a trench from a normal rainfall (Figure 5.1)

= Length of the catchment x Width of the catchment x Depth of runoff

= 12 x 6 x 2 = 12 cft

(See Figure 5.4)

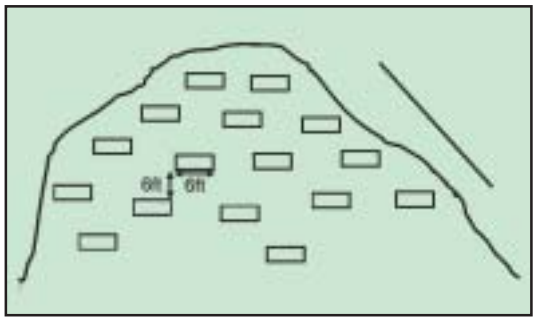


Figure 5.2 Staggered trenches along a slope.

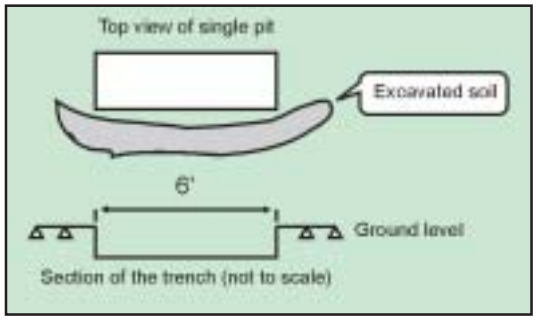


Figure 5.3 View of a trench and a bund.

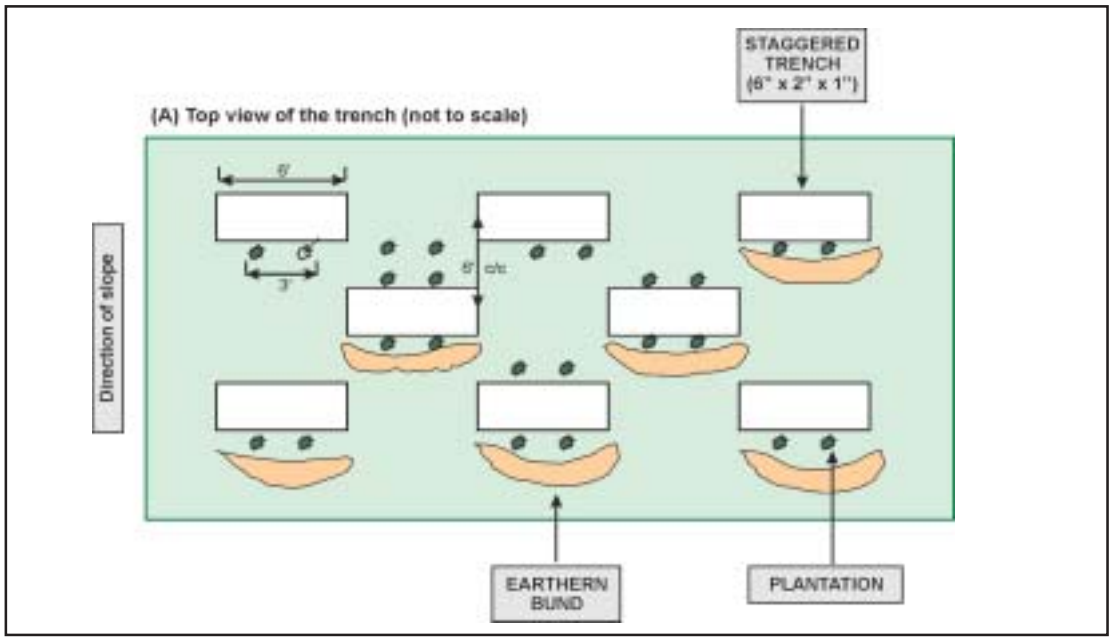


Figure 5.4 Top view of the trench (not to scale).

When is it constructed?

It is preferable to begin the construction of a staggered trench in the month of September when the soil is not too hard and labour is available after paddy transplantation. It is better to complete the work before people get occupied with harvesting paddy so that the treatment of lands under paddy cultivation (medium upland, medium lowland and lowland) can begin after harvesting and end before the onset of monsoon. The labour force is, thus, engaged effectively.

What is the cost?

The cost of construction of trenches per hectare of land is Rs 10,600/- at Rs. 62 for 100-cft earthwork not including the cost of plantation.

How many wagedays are generated?

A hectare of land will roughly generate 171 wagedays of employment with100% of this being the labour component.

What are the advantages?

In the eastern plateau and hilly regions, the percentage of barren land along the slopes that is not bunded or terraced is quite large. Due to the slope, both soil and nutrients erode very fast making agriculture on these lands uneconomical. People with land of this type can adopt staggered trends to grow plants that can meet their fuel, fodder, fibre and timber needs. Also this technique can be adopted on common land and government land. However, the technique is viable only when the land has at least 1-foot deep soil that can be excavated manually.

A trench is big enough to store the expected runoff volume. The bunds behind the trenches provide for additional storage in case the runoff exceeds the average.

Note: The treatment of any land with staggered trenches should start from the ridgeline. If for some reason the treatment cannot be started from the ridgeline a diversion channel has to be constructed, to prevent the entry of runoff from above into the treated patch and to dispose it off safely.

Case Study

This activity was implemented in a patch of 13 hectares named Cherrang Tungri in village Nawagarh. The patch is situated at the ridge of the Shaldaha Watershed of Jhalda-1 Block of Purulia. Treating the patch was important to check soil erosion.

Sabai grass was planted immediately after the excavation of the staggered trenches. In the rainy season it was wonderful to see, from the top, all the trenches filled with water. The grass had a vigorous vegetative growth. The retention of moisture encouraged other grass species to cover the patch and, thus, soil erosion was reduced to a great extent.

Within a year, the scenario changed completely. Farmers experienced improved moisture status in the medium upland (around 10 ha) below the treated patch. They could transplant the patch with paddy seedlings and found their crop unaffected by a 35-day long dry spell. They even opted for a pulse crop after they harvested the paddy in January.

2. 30 x 40 Model

What is the 30 x 40 model?

The 30 x 40 model is a method of in-situ soil and water conservation. It involves dividing uplands into small plots of 30 x 40 ft (30 ft along the slope and 40 ft across the slope), digging pits at the lowest point in each plot and bunding the plot using the soil dug out of the pits.

How is it constructed?

- Divide and mark the selected area into 30 x 40 ft, starting from the ridgeline, with the help of a measuring tape, rope and lime. The size of the plots may be altered upto ± 10% to fit the boundary and ownership.
- Identify the lowest point in each plot.
- Dig a 3-ft deep pit that is 7 x 7 ft at the top. The pit should have a sloping wall such that the bottom of the pit is 5 X 5 ft.
- Bund the plot with the excavated soil from the pit. The bund across the slope should be 1 ft high with a top width of 1 ft and bottom width of 2 ft.
- Use the rest of the excavated earth to construct the field bund at the side, along the slope.

Fields showing the 30x40 model treatment.

What are the dimensions?

Length of the plot = 40 ft
Width of the plot = 30 ft

Pit

Length of the pit = 7 ft
Width of the pit = 7 ft
Depth of the pit = 3 ft

When is it constructed?

If the land is fallow, the work can be started in the month of August so that after the rains, the soil becomes loose enough to be excavated. If the plot is under the *kharif* crop, the work can be started in October or just after harvesting of the *kharif* crop. The work should be completed before the soil gets too hard in the summer months.

What is the cost?

The cost per hectare is approximately Rs 5,600, when the cost of earthwork as Rs 62 per 100 cft and excluding the cost of plantation.

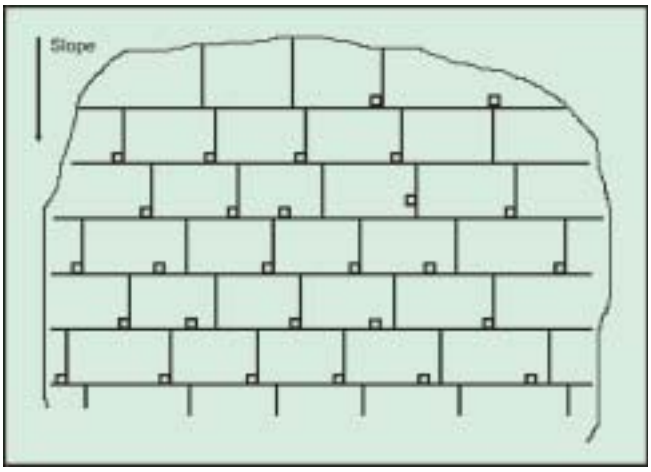


Figure 5.5 Division of an upland into 30 x 40 ft plots.

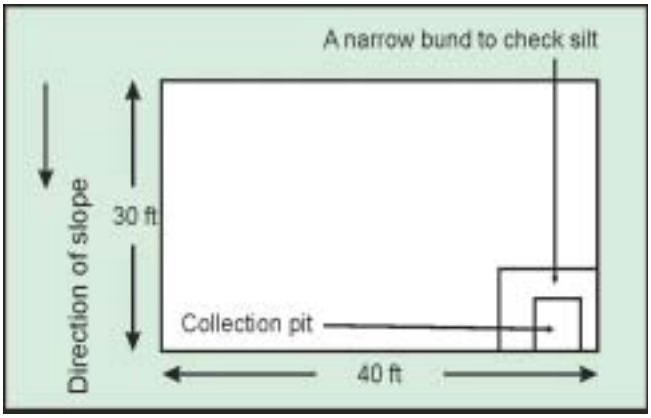


Figure 5.6 Demarcation of a pit in the 30 x 40 model.

How many wagedays are generated?

A hectare of land generates 90 wagedays of employment, the labour component of which is 100%. The work involves dividing the uplands that are not bunded or terraced with 3–8% slope into small plots of 30 ft x 40 ft (30 ft along the slope and 40 ft across the slope). A pit is dug at the lowest point of each such plot and the excavated earth from the pit is used to make two of its bunds especially to strengthen the bund that lies across the slope.

What are the advantages?

Following this treatment, people can use the patch to grow their preferred species of plants. The bunds may be planted with grass. This treatment too starts from the ridgeline.

This treatment mainly

- breaks the velocity of the runoff to stop soil erosion (as the water gets arrested before reaching the eroding velocity)
- harvests the runoff to percolate through the soil slowly, thus improving the soil moisture condition and hastening the growth of vegetation.

Note: *In case it is not possible to treat the area from the ridge, a diversion channel should be constructed above the patch to be treated, to safely dispose the runoff that otherwise would have entered the patch.*

Case Study

Under Amagara WS, in the Barabazar Block of Purulia district, a patch of upland with 10% slope, strewn with stones and very little topsoil, was treated with the 30 x 40 model. The total land measured 3 hectares and was owned by seven beneficiaries. After treating the land with the 30 x 40 model, *Terminalia arjuna* was planted at a spacing of 7' x 7' for rearing tasar silkworms as an income-generation activity. Arhar (pigeon pea) was also cultivated as an inter crop in the first two years. Within two years, a piece of fallow land, unfit even for grazing, looked visibly different. Erosion was totally checked, there was grass cover, and even the growth of the arjuna plants was stunning—the plants grew up to 10 feet in two years. From the third year onwards, the beneficiaries were able to start tasar rearing, which was a completely new activity. The activity appealed to them as most of the rearing work took place in the months of September and October when there is very little work in agriculture in this paddy-dependent area. In the third year, they earned Rs 12,000 and in the fourth year, though there was shortage of leaves, they earned Rs 13,000. In the fourth year, when some of the beneficiaries were not willing to rear tasar, four landless families joined the rearing activity.

3. Field levelling and Bunding

What is field levelling and bunding?

It is a treatment to level out slopy lands. This increases soil and moisture conservation. A bund is an earthern embankment made arround an agricultural plot to conserve soil and moisture.

How is it constructed?

- After the selection of the patch for levelling and bunding, plan the plot boundaries and drainage system considering the ownership and topsoil depth. The topsoil depth has to be kept in mind, for deciding the width of the plots along the slope. After cutting the earth from the upstream side of the plot for field bunding, at least a 6 inches topsoil has to be ensured for crop cultivation. In case of a thin topsoil, plots will be of smaller width.
- Mark the boundaries on the ground, along which bunds have to be laid, with a rope and lime powder. Make the bunds and fill up the depressions of each plot by removing a thin layer of topsoil from the adjacent upper slopes and mounds. While removing the topsoil care should be taken not to expose the hard strata that is not suitable for cultivation. In extreme cases, the topsoil may be kept separately and replaced once the final level of the plot is attained.
- The top width of the bund ranges from 0.5–1.5 ft depending on its height. The side slope is 1:1. The height of the bund

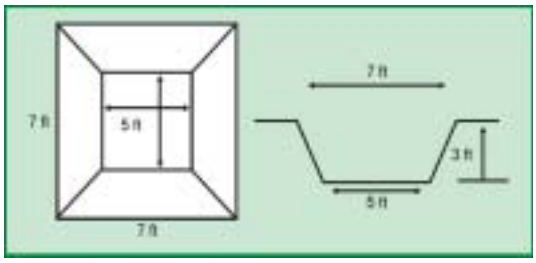


Figure 5.7 A standard pit design.

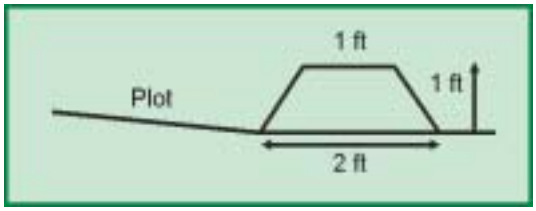


Figure 5.8 Design of the bunds.

will be such that the plot holds enough runoff to maximize moisture conservation without causing inundation. It should at least be of 1ft high.

To drain the excess runoff from the field, construct a small spillway[5] on the lower field bund with local stones. The top of the spillway should be at least 6 inches below the top of the bund. The small bunds should be protected by establishing grasses and the big ones by providing stone pitching with local material. The exact site of the spillway is to be fixed after discussion with the landowners of the surrounding plots.

The following table shows the width of the spillway (in centimetres) for a given area of plot size (in square feet).

Table 5.1: **Optimum spillway widths for plots of varied sizes.**

Plot area (sq ft)	Spillway width (cm)
5000	24
6000	29
7000	33
8000	38
9000	43
10000	48

When is it done?

If the land is fallow, this work can be started in the month of August after the onset of the monsoon. If the land is under the *kharif* crop, work can be started just after harvesting the crop. Work should be completed before the soil gets too hard in the summer months.

What is the cost?

The total cost of the measure approximately to Rs 13,000 per hectare. In this treatment, the labour component comprises 100% of the cost, assuming that the stones for pitching and spillway are locally available.

How many wagedays are generated?

One hectare of field levelling and bunding generates nearly 210 wagedays of employment.

What are the advantages?

Field levelling and bunding make a plot suitable for agriculture by

- The uniform distribution of soil moisture
- The retention of soil and manure
- The better drainage and the use of irrigation water, where available

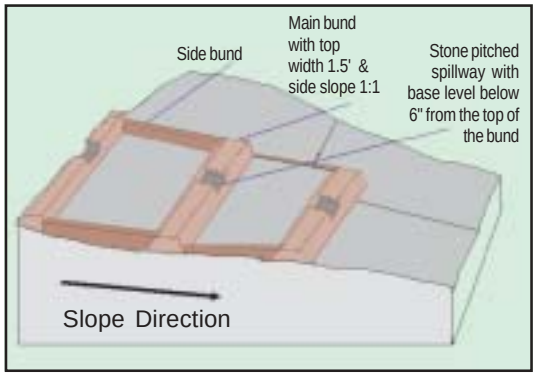


Figure 5.9 Design of a field bund.

Note: Field bunding is generally done in uplands, having less than 3% slope, to be used for intensive agriculture. The upstream side and the mounds of the plot are cut to fill its downstream side, depressions and bunds to almost make a level field.

4. Water Harvesting Tanks

What is a water harvesting tank (WHT)?

A water harvesting tank is a model of in-situ water conservation in which the area of natural depression can be converted into a water body. These tanks also work as infiltration tanks and increase the moisture content of the soil downstream.

[5] A channel for an overflow of water, as from a reservoir.

Case Study

Lob Singh Sardar of Vikhari Cheliamma village of Barabazar block in Purulia district is a very poor farmer, with a food security of only six months. In 1999, he owned just one acre of land, a portion of which was not bunded or terraced. The Barabazar Panchayat Samiti held planning meeting for implementing the watershed development programme in the village, at which Lob Singh was present. During the option-generation exercise, he opted for land levelling of 0.3 acres of his land. In 2000, his land was levelled at the cost of Rs 2,000. In the same year, Lob Singh harvested 5 quintals of paddy from the piece of levelled land that was earlier unproductive. To Lob Singh this was a huge benefit as it increased his food sufficiency for another four months.

How is it constructed?

- Select the site for constructing the WHT. Mark the area on which excavated earth has to be placed to construct the bund. Excavation is done from the proposed storage area, at least 1ft away from the embankment area.
- For smaller tanks, construct the earthen embankment with 1.5:1 side slopes and 3-ft top width by excavating soil from the storage area. The top of the bund is kept 1.5-ft higher than the maximum water level in the pond. For very porous soils, a central core wall of clay may be constructed to prevent seepage through or under the dam. In bigger tanks, protect the embankment with stone pitching on the upstream side and grass on the downstream side.
- Make the embankment straight when constructing in a valley and extend it upwards on either side when constructing around a natural depression.
- Leave a surplus escape on one side of the tank to pass on the surplus runoff. This is constructed at a point on the embankment where the overflow can be safely taken over the stone pitching without having a masonry structure.

What are the dimensions?

The dimensions vary with the terrain, the slope of the land and the amount of rainfall.

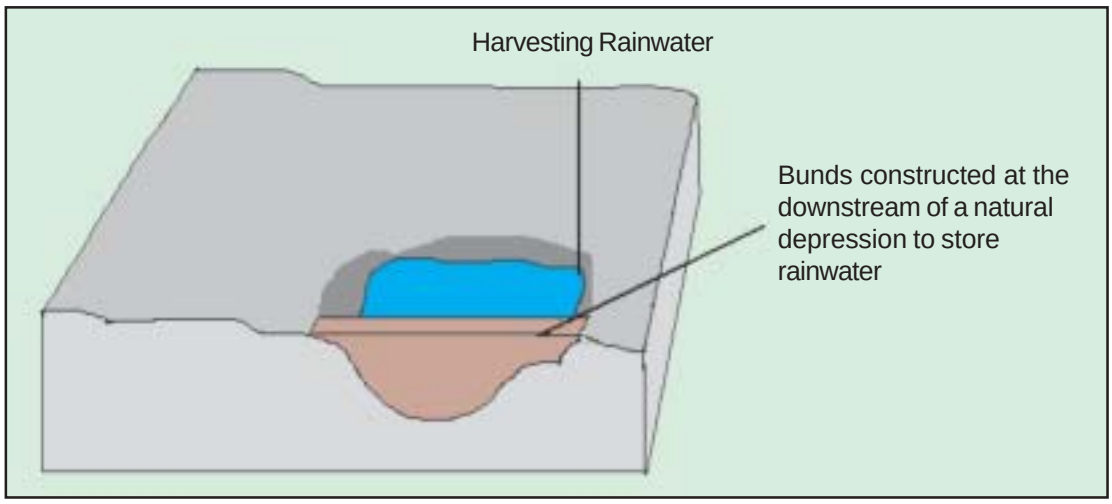


Figure 5.10 A water harvesting tank.

Case Study

Saramani Naik of Baliaposi village in Patna Block of Keonjhar district constructed a 50 ft x 50 ft x 10ft water harvesting tank on the upland. He utilized the harvested water to irrigate the tomato crop in the adjacent plot of 15 decimals during *kharif*. In addition, he used the bund for cultivating sem, pigeon pea and bottle gourd and reared fish in the tank. That year, the family sold 35 kg of sem, 40 kg of pigeon pea, 200 kg of bottle gourd, 100 kg of tomato and 8 kg of fish. The family earned a net benefit of Rs 3,000 in the *kharif* season. The family is looking forward to increasing the land under vegetable cultivation in the coming years.

When is it constructed?

This work can be started in the month of August and should be completed before the soil gets too hard in the summer months.

What is the cost?

The cost of construction depends on the size of the tank. For a tank, 100 ft long, 50 ft wide and 6 ft high, the cost of construction is Rs 18,600. Again the labour component is 100%, assuming that local stones are used for pitching.

How many wagedays are generated?

The construction of one such water body generates 300 wagedays of employment.

What are the advantages?

These tanks are constructed by excavating the depression or valley and constructing an earthen bund of 5 ft–15 ft high on the lower side of the valley to hold, divert and use the runoff from forests, uplands and medium lands for agricultural production. These improve the soil moisture regime, recharge groundwater and provide both protective irrigation to *kharif* crops and assured irrigation to *rabi* crops. They can be used for fishery and for providing drinking water to cattle too.

Note: *WHTs should be located near the agricultural land of the families to be benefited. A good site is the one that ensures maximum storage with least cost of construction. Narrow valleys or depressions with steep side slopes and gentle floor slopes are potential sites. To reduce evaporation losses, a large submergence with a shallow water depth should be avoided.*

5. Dug Well

What is a dug well?

A dug well is an irrigation structure 10 ft–15 ft in diameter and 30 ft–50 ft deep. It catches the sub- surface seepage and the water is lifted manually or by machine to irrigate fields.

How is it constructed?

Dug wells are constructed on the upland, especially homestead lands, where agro-horticulture or vegetable cultivation is planned. It can also be constructed in the low/valley lands to tap the sub-surface water.

Dug wells are normally stone-lined and circular and constructed at the lower-most location of plot.

What are the dimensions?

For irrigation, the diameter of a dug well is normally 20 ft and the depth will vary from 30 to 50 ft.

When is it constructed?

It is constructed before the monsoons, in the months of April and May.

What is the cost?

The cost of construction of a dug well with 15 ft diameter and 30 ft depth is approximately Rs 46,000. If wells are constructed using locally

Case Study

Rajesh Mahato of Kenduadih village of Jhalda I Block in Purulia district was a poor farmer who had a food security of nine months. In 2001, he constructed a well on his homestead land with the help of a government subsidy. His homestead land measured 33 decimals. In 2001, the construction cost was Rs 30,000. Following the construction, he started cultivating potato, sunflower and brinjal on the land. Brinjal has been the most lucrative for him. Last year (in 2005) he sold brinjal worth Rs 12,000 in Jhalda market. In winter, he earned another Rs 12,000 by selling cucumber from the same field. Now Rajesh Mahato is considered a well-to-do farmer in his village.

available material, the cost of construction can be reduced. For constructing this structure, the labour component is 57% and the material cost is 43%.

How many wagedays are generated?

The construction of one such dug well generates around 250 wagedays of employment.

What are the advantages?

When a farmer has only uplands where s/he wants to grow vegetables, the construction of a dug well can be a suitable option. Experience shows that such a well can irrigate about 0.40 hectares of uplands in winter. These wells are used for domestic purposes too.

Note: Being costlier than other structures discussed earlier, precautions have to be taken to select the beneficiary and site. Before digging the well, one should ascertain that there is less chance of a underground hard rock strata within the well construction zone by looking at the adjacent areas.

6. Gully Plug

What are gully plugs?

Gully plugs are small check dams made up of loose rocks in a series across the gully. A gully plug is one of the erosion control measures in non-agricultural land.

How is it constructed?

- A gully plug is constructed in series along a gully to change a sloping bed to a series of flat beds. The vertical interval between two such structures is equal to its height. The height of the structure is generally kept less than 1 m.
- After clearing the site for constructing a gully plug, excavate the bed to a depth of at least 1ft.
- Pack large local stones carefully from that level upward upto 2 ft–3 ft above the bed level. The structure is slightly (1:3) sloped on either side and embedded on both the sides of the gully. Engaging a village mason (experienced in constructing dug wells) helps in packing stones.
- Curve the top surface to provide enough space for the maximum runoff from the catchment above the structure to pass without damaging the banks. Stone pitching is done both on upstream and downstream sides of the structure to prevent scouring by the flowing water. These structures are made in gullies that are less than 2 m depth and 5 m width.

When is it constructed?

Gully plugs are construced before the monsoons and immediately after the paddy harvest.

What is the cost?

Each such structure costs around Rs 5000–8000, and 100% of it is the labour component.

How many wagedays are generated?

Constructing a gully plug roughly generates 200 wagedays of employment.

What are the advantages?

A gully plug serves two purposes: (a) it collects soil and water for proper growth of the vegetative cover and (b) it reduces the runoff velocity to stop soil erosion.

Note: *These are structures intended only to provide necessary protection until the vegetation becomes well established in the catchment area. They need annual maintenance by the farmers whose farm/lands are located besides the gully.*

Vegetative Measures for Uplands with Greater than 8% Slope

- Where the slope is more than 8% a permanent vegetative cover is required to check soil erosion.
- Plant timber plants at 6 ft x 6 ft intervals on the entire patch, following treatment with staggered trench.
- One plant will be placed between the trench and the excavated soil and the next one will be placed between two trenches.
- The entire uncovered area can be brought under grass plantation.
- Increased soil moisture due to the staggered trenches will facilitate the growth of the plants. Trees and grasses will not require further irrigation.

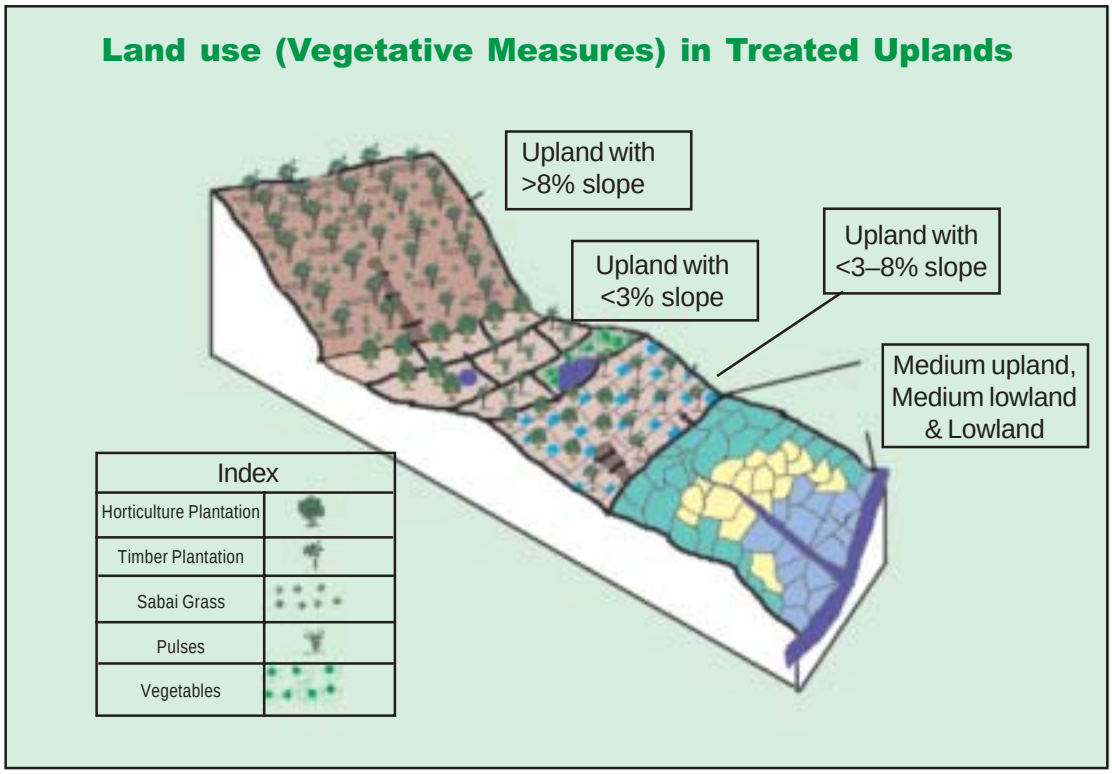


Figure 5.11 Vegetative measures in the uplands.

- Dig pits of 1ft x 1ft x 1ft size for the plantation.
- Select timber species based on the type of soil and depth of topsoil. Keep in mind the need of the villagers. Generally, Gamhar, Sisum and Acacia species have been successfully planted in this zone, which along with supplying fuel wood have a good timber value.
- Carefully select the grass species so that it gives some economic return to the land holders. Sabai grass is preferred by the community in some areas. Besides checking soil erosion, it is used for rope-making.

When is it constructed?

The pit digging should be completed in April so that the pits absorb adequate summer heat to kill insect eggs and other pathogens, which may cause harm to plants. Plantation work is to be done in July after the onset of monsoon.

What is the estimated cost?

The cost of planting timber species is approximately Rs 22,000 per ha. This is includes the cost of fencing. Sabai cutivation costs Rs 2,700 per ha.

What are the estimated returns?

From one ha of land under timber plantation, the return will be approximately 1.5 lakh rupees after 15 years. Sabai cultivation gives a return of Rs 10000/- per year upto the fourth year after which replanting is required.

What is the material cost and labour component?

If seedlings are purchased and considered as material cost, the labour component will be 66% of the total cost. For Sabai plantation too, the percentage of labour is the same when the seedlings are purchased.

How many wagedays are generated?

One hactare of timber plantation and sabai plantation generates 175 and 30 wagedays of employment, respectively.

Vegetative Measures for Uplands with Less than 8% Slope

- Timber or horticulture plantations are successful in uplands with slopes less than 8%.
- If the patch is near habitation, horticulture plantation can be done since it needs intensive and regular care.
- Timber species are planted in the same manner as explained earlier. It is better to have a mixed plantation of species having different gestation periods, to get periodic yields.
- Grass can be grown on the field bunds to maximize income and stabilize the bunds.

Slope	Landuse plan (vegetative measures)	Conditions to be considered
>8%	Timber/fodder plantation, sabai grass	The selection of the timber species will depend on topsoil depth also. If the topsoil depth is <6", Acacia species may be grown. Otherwise Gamhar, Sisum, etc. can be planted. The selection of a patch for horticulture will also depend on its distance from the habitation as it requires intensive and regular care.
3-8%	Timber/fodder plantation, horticulture plantation such as mango, cashew	
<3%	Horticulture plantation such as cashew, mango, vegetable cultivation, pulses	

- ☐ Grass species should be selected according to the need of the villagers. Fodder grasses, such as Dinanath and Stylo, can be grown here.
- ☐ Select the horticulture species based on the market, the distance of the patch from the homestead, the investment capacity (labour and capital) of the farmer and the availability of irrigation facility.
- ☐ Discuss with the community and finalize the species. For irrigated uplands, mango and lemon plantations are potential options whereas cashew may be an option for unirrigated uplands.
- ☐ The spacing of the plantation varies according to the selected species. A horticulture patch should be surrounded with some straight growing timber species, such as gamhar, teak, etc., to increase the return as well as to create a wind barrier for the fruit crops.
- ☐ Intercropping with pulses and other vegetables optimizes the return from the land. Intercropping with pulse crop increases the soil fertility andenhances the growth of fruit plants.

What is the cost?

The cost of a mango orchard is around Rs 31,000 per ha. This includes the cost of fencing.

What is the expected return?

In the fifth year, the return from a mango orchard is roughly Rs 13,000 per ha. The return is expected to reach Rs 1,00,000 per ha in the tenth year.

When is it constructed?

In case of plantation, the pit digging is to be completed in April to expose the pit to the summer heat for the next 45 days so that any insect eggs and pathogens are destroyed. Planting should be done after the onset of the monsoon that is, in the middle of July.

What is the material cost and labour component?

When the saplings are purchased and considered as material cost the labour component for mango plantation is 63% of the total cost.

How many wagedays are generated?

One ha of mango plantation generates 221 wagedays of employment.

The purpose of treating medium uplands is:

- Soil and moisture conservation
- The protection of crops against frequent dry spells during monsoons

Photograph showing mango orchards in an upland.

A sabai grass plantation.

5% Model

What is the 5% model?

This is a model of in-situ rainwater harvesting suitable for medium uplands, in which every plot has its own water body, the area of which equals 5% of the total area of the plot. The pit is able to hold rainwater that otherwise flows out of the plot as runoff. The water held in the pits irrigates the plots during water scarcity.

How is it constructed?

- Measure the length and width of each individual plot.
- Demarcate 5% area of the plot in the following manner. Mark an area of one-fifth of the length and one-fourth of the width at the upper right corner of the plot to dig the pit. Suppose, a plot is 150 ft long and 100 ft wide. The pit area then needs to be 30 ft x 25 ft or 750 sq ft.
- The pit is dug to the following dimensions. Depth: 5 ft–7 ft depending upon the type of the soil and wall slope 1:1.
- Use the excavated earth to strengthen the field bunds.
- Make a small 4-inch high bund around the pit to keep some standing water in the field.

What are the dimensions?

The length is one-fifth of the length of the plot and the width is one-fourth of the width of the plot. For odd-shaped plots the implementers should use their own judgement for giving the layout of the pit. The area needs to be about 5% of the total plot.

When is it constructed?

The best time to construct a 5% model is between December and June.

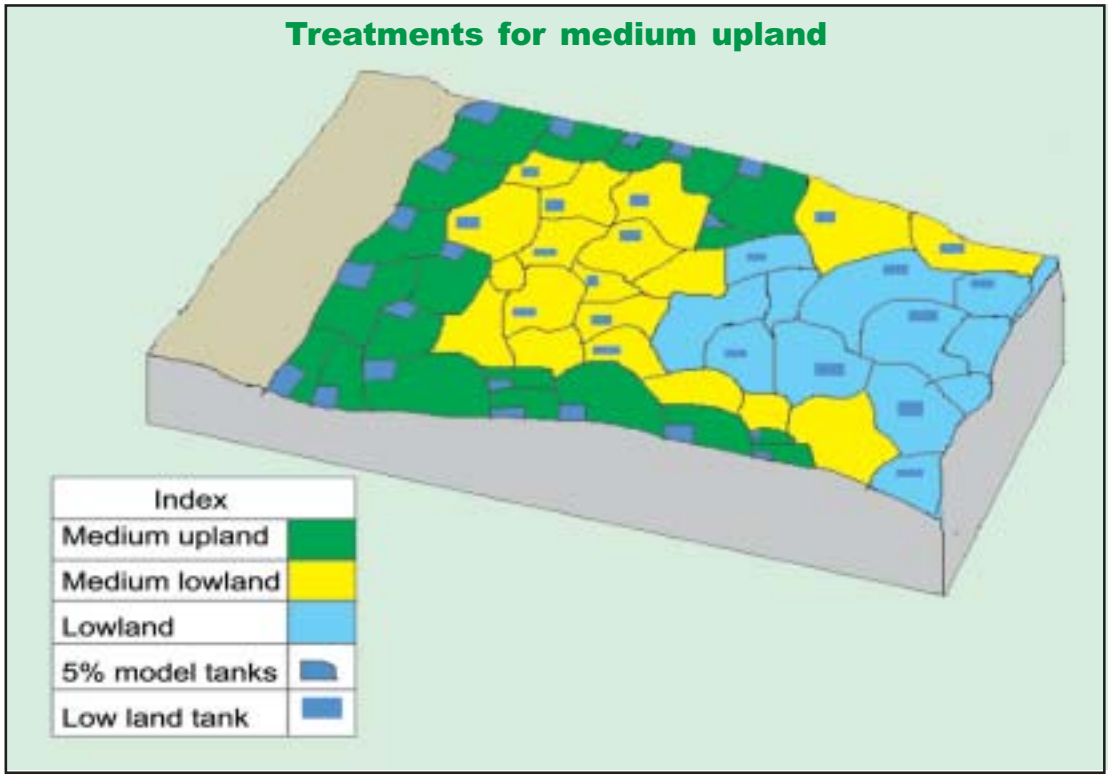


Figure 5.12 Treatments in medium upland, medium lowland and lowland.

What is the cost?

The cost of treatment is around Rs 25,000 per ha and the labour component is 100%.

How many wagedays are generated?

Nearly 400 wagedays of work are generated for treating 1 ha of land with the 5% model.

What are the advantages?

This model not only saves the crop in the plot but also increases percolation to augment water availability downstream. Additionally, this treatment increases the farmer's access to water as it provides is a storage structure in each of the plots. So the farmer can exercise individual choice to best utilize it.

The 5% model has been successfully experimented in Agro-climatic Zone VII for the above two purposes. The core idea of the 5% model of in-situ rainwater harvesting is that every plot should have its own water body to hold the runoff that otherwise was flowing out of the plot.

A 5% tank on a medium upland.

Sabai plantation in a slopy upland.

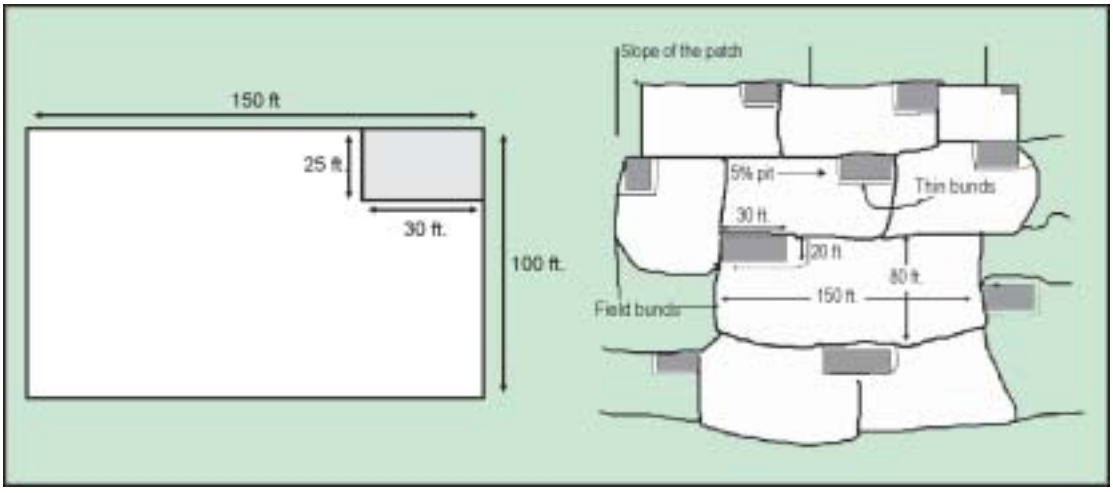


Figure 5.13 Demarcation of a 5% area and the location of a pit.

Note: *This treatment is suitable for a patch of minimum 4 ha with unidirectional slope where the crop fails due to regular water stress. The patch should have good soil cover with moderate porosity.*
The norm for allocating 5% area is not sacrosanct. One needs to consider land qualities and farmers' preferences and other crop plans. A bigger pit is required to store more water. While laying out the pits in successive plots along the slope, one needs to make sure that the pits are rather staggered and not in a straight line.

Case Study

Nepal Chandra Baskey and his brother of Bagmundi Block of Purulia district own 167 decimals of land. Their house occupies 23 decimals and the rest is medium upland. Before treatment, they used to grow upland paddy on a 25 decimal plot, reaping a harvest of 2.1 quintals if the rains were good. Failing a good monsoon, they used to get about 1 quintal of paddy. On 40 decimals they used to grow maize from which the harvest was 1 quintal of corn. The remaining 79 decimals was lying fallow, where they grew tomatoes, which sometimes failed.

Nepal Chandra's lands were treated with the 5% model. By spending approximately Rs15,000, a lemon orchard with 275 plants was planted on 70 decimals of his land. This year, with the water from the tank, he was able to grow tomatoes in 20 decimals to earn a profit of Rs 6,500, potatoes in 21 decimals which yielded 6.5 quintals (approximately Rs 2,600), sem in 5 decimals that earned Rs. 350 and paddy in 18 decimals of land that yielded 1q of paddy. Additionally, Nepal Chandra earned Rs 1,000 from the lemon crop. The potential for lemon was much higher but they could not find the market for selling the lemon. Each plant had on an average 50 lemons. Though the tank occupied 7 decimals of lands, the earning from the remaining land was much more than what he used to earn from the whole plot. This is remarkable considering that there was a drought-like situation in the locality.

Potential Landuse of Treated Medium Land

The medium lands are mostly used for growing paddy in this region. The 5% model pits on these lands protect the crop against dry spells and help to stabilize the paddy production in the land. Paddy production can be further increased if the System for Rice Intensification (SRI) method is adopted. In this method, paddy fields have to be dried and soaked alternately and the 5% pits prove to be of immense use.

Treatment in Medium Lowland and Lowland

The purpose of treating these lands is to:

- Tap the sub-surface flow of water to protect the *kharif* crop
- Recycle the harvested water to irrigate a second crop

The lowland tank is a structural measure in the treatment of medium lowlands and lowlands.

Lowland tank

What is a lowland tank?

A lowland tank is a small structure (about 1000 to 1500 sq feet) with an average depth of 6 to

Excavation of tanks with 1:1 slope.

10 feet cut out in a corner of an individual field on medium lowland and lowland. It acts as a harvesting structure during the monsoons and also helps to recycle sub-surface flow locally in the post-monsoon months. Lowland tanks are made in a series so that the initial monsoon rains are better harvested and the sub-surface flow canbe arrested and recycled better in the post-monsoon months.

How is it constructed?

The design and steps of excavating a farm pond is same as the construction of a 5% pit.

A lowland tank

Transforming Lives through INRM

Dinabandhu Majhi, a resident of Ponra village, Purulia district, West Bengal, heads a family of seven, which includes his wife Saraswati and five children. He owns 4 acres of upland of which only 0.66 acres was paddy land and the rest was mostly unproductive.

The paddy yield was miserable—only 3.5 quintals in a year with sufficient rains. An occasional crop of tomato and maize during the Kharif season fetched him an additional Rs 3,600. For his sustenance, Dinabandhu depended on goat trading, fishing from the adjacent river, wage labour and lac cultivation. Despite all his efforts, he was barely able to make both ends meet.

During an INRM intervention in his village, Dinabandhu together with his family decided to use 3 acres of his unused upland for grafted mango plantation (400 saplings of the Amrapalli variety). The intervention provided for a well to support the entire plantation of 15 acres. Dinabandhu also constructed two 5% pits in his upland paddy land. Assured irrigation helped him take up a crop of pumpkin and *arhar* (pigeon pea) in the horticulture patch and rear fish in the 5% pits.

Subsequently, Dinabandhu's earnings changed dramatically. His unproductive asset became the most prized asset. He earned Rs 4,120 from his crop of pumpkin and *arhar* in the very first year. Water from the 5% pits doubled the paddy production. Well irrigation helped him cultivate vegetables, such as bottlegourd and tomato, in his paddy land. The wages earned during the project period helped him take another 1 acre of land on lease. Dinabandhu plans to purchase this land in the near future.

Three years after planting the mango saplings, he has sold 3.5 quintals of mango for Rs 3,360. Another consignment of 1 quintal has been sent to Singapore, the expected earnings from which is at least Rs 6,000. This yield from the mango plants will keep on increasing every year. In the 10th year the expected income is Rs 75,000 at 40 kg of fruits per plant.

In their own words, both Dinabandhu and Saraswati say, "Our lives have completely changed. Over and above sufficient income there is leisure time, which previously was simply unimaginable. There is no need to go in search of employment.

What are the dimensions?
The dimensions are 50 ft in length, 30 ft in width and about 10 ft in depth.

When is it constructed?
This work can be started after the paddy harvest and completed before the onset of monsoon. So the best time to construct these tanks is between December and May.

What is the cost?
The cost of construction is aproximately Rs 5,500 for a 1000 sq ft tank with 7-ft depth.

How many wagedays are generated?
The labour component is 100% and the work demands 89 wagedays.

What are the advantages?
In the *kharif* season, these lands can be used for paddy cultivation. With water security, the yield can be increased by at least 1.5 times the present yield. Farmers can even grow summer vegetables in a portion of these lands alongside the tanks.

Compatibility of INRM measures with the NREGA

The comprehensive land and water resource development of a typical village[6] in this region, encompassing all the above activities, approximately requires an investment of Rs 12,000 per ha (at a minimum daily wage rate of Rs 62). Of the total investment nearly 80% is towards labour and 20% for material. Whereas the provision under NREGA is that the cost of the material, component of projects, including the wages of the skilled and semi-skilled workers, shall not exceed 40% of the total project costs. So such activities go well with the objectives of NREGA.

[6] *The assumption is that a typical village in this region has more than 70% of upland and medium upland*

CHAPTER 6

Steps in INRM Planning

In this chapter

The step-by-step implementation of INRM by the Gram Sabha by:

- Community organization
- The participatory planning of interventions at the hamlet level
- The finalization of the action plan at the village level, and budget preparation
- The phasing of the activities and the implementation plans

The Steps and Their Purpose at a Glance

Steps	Purpose
Village selection	The Gram Sabha chooses the target villages, based on the poverty status.
Concept seeding	The Gram Sabha helps villagers understand the objectives and features of the programme.
Programme execution committee (PEC) formation	The Gram Sabha forms a village-level programme management and implementation unit named PEC. The Gram Sabha also appoints an NREGA Assistant to work under PEC.
Formation of hamlet-level association	The Gram Sabha helps form an operating unit at the hamlet level, which provides a platform to share, discuss, plan and implement the programme.
Baseline data collection	To get an idea about the village profile.
Resource mapping	To get an overview of the available resources.
Ownership mapping	To get an understanding of the land ownership in the village.
Problem identification	To define and analyse the problems for each patch of land.

Steps	Purpose
Option generation	To generate a number of alternatives for each patch to deal with the problems.
Activity plan and proposed land-use map	To scrutinize the options generated that are economically viable and socially acceptable.
Budget preparation	To prepare the overall budget by consolidating all the plans.
Approval from the Gram Sabha	To get a formal approval of the plan and budget.
Sanction from the government	To get the plan and budget sanctioned from the Panchayat / Block

Village Selection

The Gram Sabha will prioritize villages according to their poverty status as determined by the certain criteria detailed in Table 6.1.

Concept Seeding [1]

This step involves the intensive interaction among the Gram Sabha members to help the villagers understand the objectives, features, budget and benefits of the programme. During concept seeding, the villagers interact with the Gram Sabha members.

A hamlet-level association (HLA) is an operating unit at the hamlet level, which provides a platform to share, discuss, plan and implement the programme.

Gram Sabha

The purpose of the Gram Sabha is to form a platform to integrate and approve the village-level plan, that, in turn, is formed by merging the hamlet-level plans.

Roles and Responsibilities of the Gram Sabha members

- Reviewing the detailed patch-wise plan and giving approval
- Reviewing performances against plan

Table 6.1 Criteria of village selection and sources of such information

S. No.	Criteria	Source of information
1	ST & SC population	Census book
2	BPL percentage	District Information Centre
3	Remoteness	Block revenue map
4	Application for EGA wage employment	Concerned Block Officer
5	List of backward villages	Concerned Block Officer

[1] *A three-step interactive process involving a pre-meeting interaction to finalize details of the village-level meeting, a village-level meeting to introduce the programme at the village level, and intensive hamlet-level interactions to promote clarity about the programme and increase villagers' involvement in the same.*

- Providing a platform for collective decision-making
- Resolving inter-hamlet conflicts
- Dissemenating information to hamlets through hamlet representatives

Membership

All male and female members (over 18 years of age) of the village are members of this forum.

Frequency of Meeting

- At least once in two months
- During the peak work period (December to June), the frequency of meetings should be once a month

Records to be Maintained

The NREGA Assistant, appointed by the Gram Sabha, will maintain the following records: Meeting register with proceedings of the Gram Sabha meetings, baseline and patch-wise data, and the other necessary NREGA records.

Requirements

Register, cover file (to keep all the documents such as resource map, ownership and activity maps, baseline data and wealth ranking data), one stamp pad, one pen.

In case there is a single hamlet in a village, the HLA and village-level association (VLA) can be merged.

Gram Sabha meeting

This stage is an extension of the concept seeding stage, in which the members of the Gram Sabha:

- Share details of the programme, its objectives, features and benefits.
- Obtain villagers' feedback on the programme.
- Finalize the date and time of the hamlet-level meeting with the representatives.

Request the representatives to ensure full participation of all family members, especially women and the marginalized sections. Give them the responsibility of arranging a meeting place. The meeting place should be centrally located and away from disturbances.

Expected Output

1. Decision-makers of the village have a clear understanding of the NREGA.
2. Villagers share the responsibility of organizing subsequent hamlet meetings (date, time and venue).
3. The selection of an NREGA Assistant and the setting up of a PEC (Programme Execution Committee) to implement NREGA.

Time Required

One personday.

Selection of an NREGA Assistant

The NREGA Assistant is selected at the Gram Sabha meeting. A person who has studied at least up to Class X is desirable. S/he has to maintain the Secretariat of the PEC.

Programme Execution Committee (PEC)

Its purpose is to form a village-level programme management and implementation unit.

Roles and Responsibilities

- Reviewing the detailed patch-wise plan
- Getting the plans approved from the Gram Sabha
- Managing finance

A hamlet-level meeting.

- Programme execution
- Programme monitoring
- Resolving conflicts
- Information dissemination
- Maintaining links with government departments, facilitating agency and panchayat bodies

Membership

The PEC is formed of representatives from all HLAs. Every HLA will select two to three persons from the hamlet to represent it in the PEC. Of these representatives, at least one must be male and one female.

Frequency of Meeting

- At least twice in a month.
- During the peak work period (December to June), the frequency of meetings should be once a week.

Records to be Maintained

- Meeting register
- Muster roll
- Utilization certificates
- Cash book
- Ledger
- Vouchers
- Stock register

Requirements

Measuring tapes (equal to the number of hamlets), one stamp pad, cash box, pen, formats of utilization certificate

Process of Formation

- Inform the hamlet representatives of all hamlets (in a village) to call a general body meeting of the villagers (over 18 years old) on a pre-fixed date and at a set time. The Panchayat performs this function and the Sarpanch (or his representative) attends the meeting.
- Provide a quick update of programme activities undertaken so far. This helps the hamlet representatives to initiate a discussion on resource management and

utilization planning. Also, they can talk about patch-wise planning.

- Explain the need and importance of a PEC for the proper implementation and management of INRM activities in the village.
- Ask each individual hamlet to select their representative for the PEC by popular choice.
- Formalize the body by writing down the names of PEC members in the meeting register.
- Work out the roles and responsibilities of PEC members. Decide on the minimum norms such as meeting frequency, appointment of an accountant to maintain the accounts and records, etc.

Hamlet Meetings

A hamlet (normally of about 50 families) is the operational unit of the programme. Planning and implementation at the hamlet level is more effective because the community is much more cohesive at that level compared to the village level. Wherever there is a large hamlet, divide it into manageable, homogeneous units.

In a hamlet meeting, the details of the NREGA is explained to the hamlet members. The meeting also serves the purpose of building hamlet-level ownership.

Separate focussed group discussions with women and the marginalized sections, such as the landless, are organized to get their views on the programme and the programme's possible impact on their lives.

If and when overall consent for the programme is obtained from all sections, hamlet members are asked to select some volunteers who assume a leadership role in the programme. The selected volunteers give their consent and their names are recorded.

Criteria for the Selection of Hamlet Volunteers/Representatives

- They should represent the whole hamlet.
- The community should have confidence in them and trust them.
- They should have time to devote for development work.
- They should be able to influence the villagers.
- They are between 18 and 40 years of age.

Expected Output of the Hamlet Meetings

1. Understanding of the Employment Guarantee Act. The villagers, especially women and the marginalized, have a clear understanding of the employment Guarantee Act.
2. The hamlet-level representatives are selected.
3. Enhanced understanding of INRM.

Time Required

One personday

If needed, the Gram Sabha may organize an exposure visit of hamlet members to areas of good practices. This can serve as an effective way of changing people's misconceptions, beliefs and attitudes.

Hamlet-level Association (HLA)

Purpose

The Gram Sabha forms an HLA and a PEC as operating units at the hamlet level to provide a platform to share, discuss, plan and implement the programme.

Roles and Responsibilities

- Planning of hamlet-level activities
- Implementing INRM activities
- Reviewing performance against plans
- Managing stock
- Providing a collective platform for joint ac-

tion by hamlet residents

- Decision-making at the hamlet level
- Resolving hamlet-level conflicts

Membership

All men and women (over 18 years of age) of the hamlet are members of this forum.

Frequency of Meeting

- At least once in a month.
- During the peak work period (December to June), the frequency of meetings should be once a week.

Records to be Maintained

- Meeting register containing baseline data, patch-wise data, and proceedings of all hamlet-level meetings
- Cash book

Requirements

Cash box, stamp pad, pen, register, cover file (to keep documents such as resource map, ownership map, activity map, activity plan, sanctioned budget, copy of muster roll and copy of stock details).

Expected Output of the Meeting

Hamlet-level association formed.

Time Required

Five to six hours.

Process of Planning

This section describes the steps involved in developing a village-level resource management plan. It spells out the purpose of different planning exercises, the processes involved and the formats used. The entire process of planning is participatory and can only be carried out with the active and intensive involvement of the villagers themselves.

Preparation of a Resource Management Plan

The PEC helps in the development of a resource management plan. This involves planning a set of activities that will augment the carrying capacity of A resources and help villagers utilize these resources optimally to get maximum incremental benefit from them.

The following is the output expected from the planning exercise.

Name of the Patch:	Patch characteristics: Slope% : Type of soil: Topsoil depth (mt): Erosion status:

The following steps help in collecting the above data.

1. Baseline Data Collection

The purpose of this exercise is to get an idea of the village profile before initiating the project. Comparison with the data collected after intervention helps to evaluate the overall impact of the intervention on the village in terms of:

Table 6.2 Table for baseline data collection

S. No.	Name of the owner	Category	Land holding (in Ha)	Crops grown			Irrigation (in Ha)			Problems	Option generated	Remarks
				Kharif	Rabi	Summer	Kharif	Rabi	Summer			
1.												
2.												

- enhanced production of cereals, oil seeds, pulses, vegetables, horticulture, fisheries and fodder
- qualitative and quantitative change in the livestock
- increase in the irrigated area
- increase in the harvesting of runoff
- change in the groundwater table
- change in the income and expenditure pattern of families

Baseline data collection involves the collection of data on people, infrastructure and facilities, and natural resources. It includes a combination of *village-level data* and *data from individual households,* and is collected with the help of hamlet representatives.

Process Involved

- The members of the PEC organize hamlet-level meetings before undertaking the process of data collection. They explain the need and importance of such data collection in the meeting and clarify doubts and issues.
- The PEC selects two or three volunteers from each hamlet and trains them to collect data.
- The members find out when villagers will be able to give time for group discussions and individual interaction that is required for such data collection.
- The members collect data at the convenience of the villagers.
- They triangulate/crosscheck the data gathered.

The PEC can use this as an opportunity to recruit people into the Act. People can be encouraged to register themselves and place their demand for employment.

Table 6.3 **Schedule of treatment activities to be carried out in the year**

Month	Labour availability			Nature of activities
	Male	Female	Total	
January				30 x 40 model
February				Pit cutting of plantation; 30 x 40 model
March				5% model, water harvesting structures
April				Seepage tanks, dug wells, 5% models, water harvesting structures
May				Seepage tanks, dug wells, 5% models, water harvesting structures
June				
July				Plantation
August				Plantation
September				
October				
November				
December				

Labour Availability

The data helps to bring out the availability of labour in the area in different months and seasons. The data is used to plan and execute the implementation of various activities. For example, if one hamlet has planned to dig 50 small water-harvesting structures (40 ft x 40 ft x 8 ft) within three months, they need roughly 72 workers every day (assuming that one person cuts 100 cft of earth in eight hours) for three months. If the hamlet knows about labour availability in the area, it can plan the work accordingly.

Natural Resources

- **Livestock data**

The data provides information on the number of livestock/ dominating livestock in the village. The data on livestock population per family also acts as a baseline and helps the PEC members to evaluate the impact of the programme at the end of the project period.

- ***Major Livestock Diseases***

The data helps to focus on the major diseases that livestock are prone to and their severity in a particular month. Since livestock is an important resource for the families (especially for the poorest who use it as a buffer), the data is important to plan and implement preventive measures such as vaccination camps for livestock. (See table 6.4)

Table 6.4 **Lifestock diseases data**

Month	**Major livestock diseases**
January	
February	
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	

Table 6.5 **Crop production data**

S. No.	Crop	Area in hectares	Production in quintals
1	Cereal		
2	Vegetables		
3	Horticulture		
4	Pulses		
5	Oil seeds		
6	Fishery		
7	Fodder		

Table 6.6 **Livestock data**

S.No.	Hamlet	Caste	Jersey Cow	Local	Cow *(Desi)*	Ox	Buffalo	Total
1.								

- Irrigated area in hectares
- The amount of runoff arrested through existing water bodies in hectare-feet

Table 6.7 **Water bodies data**

Name of the water body	Length (ft)	Breadth (ft)	Effective depth (ft)

- The depth of the groundwater table in summer (through a sample survey of existing dug wells) in feet
- Area under plantation in hectares

Time Required

Seven to eight persondays of volunteers (for a village of approximately100 households). Time may vary as per the number of households.

2. Resource Mapping[2]

Resource mapping involves the plotting of different land types, water bodies, ridgelines, drainage line and the direction of water flow on a revenue map of the village.

Things required

Coloured sketch pen, plain paper, scissors, brown tape, three copies of the village revenue map, pencil, eraser, stamp pad

Process Involved

Arrangements for the resource-mapping exercise:

- The date and time for the resource-mapping exercise is fixed by the PEC members. Cadastral maps of the target villages from the village head, panchayat member/ pradhan, etc., are procured
- The different sheets of the village revenue map are photocopied.
- The different sheets are joined to prepare a village map.

Resource mapping process

- The purpose of the mapping exercise is shared by PEC members.
- The village boundary, drainage lines and ridgelines on the village map are delineated with the help of the villagers.
- Different types of lands (lowland, medium lowland, medium upland, upland, forest, common grazing land) are denoted in different colours, for example, green for lowland. An index for the different colours used is provided on the lower right-hand corner of the map itself.
- The local patches in the map are identified by members. These clusters of plots are circled with a coloured pen. Within the circle, the code numbers of the farmers who have lands in that cluster are written. This helps to know who owns lands where. Simultaneously, the patch name and numbers are noted on a piece of paper.
- The area of each patch of land and the total area of the village on the revenue map are calculated using a transparent inch graph sheet.

[2] *This is a process of recording the pattern of land ownership in a village.*

Field visit

- The PEC members undertake a field visit along with hamlet representatives for the physical verification of the ridgelines, drainage lines and various types of land. They make the necessary corrections in the map, in case of inconsistencies.
- They finalize the resource map in consultation with the hamlet representatives. Since this map will be used for several years, it is advisable to laminate it.

Expected Output

All the resources (mainly the type of lands and water bodies) will be shown on the revenue map of the village.

Expected Time

Three person days for resourcing.

3. Ownership Mapping

This is a process of recording the pattern of land ownership in a village. This is undertaken after the resource map has been made, and helps to identify the patches that are mostly owned by poor families. Ownership mapping involves two steps:

1. Collection of ownership data
2. Collection of data on present land use

Ownership data is collected using the following format.

Name of the Patch

Table 6.8 **Ownership data**

S.No.	Name of the owner	Category	Land (ha)

Time Required

Four hours.

4. Problem Identification

The process of analysing and delineating the problems for each patch of land is called problem identification. This is required for generating alternative options to overcome the problems.

Process Involved

- Ask the hamlet-level representative to arrange a date and time for interaction with the land owners. Ask them to inform the owners of each patch.
- The PEC members should visit each patch of land in the presence of all the owners to identify/verify the existing problems in each patch.
- Note the typical features of each patch such as the type of soil, the depth of soil, water-holding capacity, slope, vegetation and irrigation.

Expected Output

The area of the patch, current land use and problems are identified.

5. Option Generation

Option generation involves creating a number of alternatives for each patch to overcome the problems.

Process Involved

- The members visit each patch with all the owners. After identifying the problems and understanding the present use of the land, they help the owners to brainstorm about possible alternatives to deal with the problems in a better way. (see ch. 5, INRM technologies for information on the type of options available for each patch of land.)

- For each alternative, the members calculate the cost and benefit involved during the visit itself. They help select the best option available in consultation with the owners.

Expected Output

Multiple options for treating problems in each land type will be generated.

Time Involved

Problem identification and option generation takes approximately two hours for a single patch of land.

Tips for Problem Identification and Option Generation

- The patch-wise problem identification and option generation should be done simultaneously. This is because landowners are available during the field visit and it is easier to relate a problem/s with the option/s generated. It also saves time.
- Carrying a measuring tape and calculator during the field visit saves time.

6. Preparation of an Activity Plan and Proposed Land-use Map

Different options are scrutinized with the villagers; options that are most cost effective and acceptable to the community are selected. These selected options form the basis of the final action plan.

Process Involved in Preparing a General Plan

- After the patch-wise problem identification and the option generation is over, the members ask the hamlet-level representative to call a meeting of the hamlet association. Representatives of all hamlets in the same village are invited to the meeting.
- The members initiate the meeting by asking the hamlet representative to share the maps (resource and ownership).
- The members mention that the purpose of the meeting is to prioritize the options generated in all patches.
- Special emphasis is given to the women members. Some of them are asked to articulate the process undertaken so far and describe the maps in their local language.
- The members discuss the options generated and select the best option for each patch of land.
- The best options together form the Action Plan. The members prioritize and sequence the proposed activities (from upland to lowland) and form a timeline.
- The PEC records the Action Plan and timeline in the minutes book of the VLA. Ensure at least 80% attendance in this meeting.

A Case

In the planning meeting with women at Bankura, the women of Barokuli hamlet shared their pain in having to lift water from the dug well—the only drinking water source in the hamlet—which does not have a pulley. They also spoke about the problems of drying paddy grains and bathing publicly in the village pond. In the planning exercise, a discussion was facilitated to generate options to overcome the problems. The women came up with three options—a pulley for the dug well, a community threshing floor for drying paddy, and a dressing room at the side of the village pond.

7. Plan for Landless and Women

A separate plan is made in order to ensure the inclusion of the most downtrodden section of society in the process of development. This ensures that the pro-poor focus of the programme is retained. This plan is prepared concurrently with the general plan.

Process Involved

- During the entire planning process, the members conduct meetings with the landless, women and other backward sections of the people.
- The PEC helps them identify their present skills, resources and problems in these meetings.
- They help them to brainstorm about the possible alternatives to combat their problems, using their present resources and skills.
- The PEC prioritizes and finalizes these options at the hamlet-level option-generation meeting. This is used to prepare a separate action plan for the landless and women.

8. Obtaining Approval

This involves obtaining a final approval of the hamlet-level plans from the Gram Sabha.

Process Involved

- After the activity plans of all the hamlets in a village have been finalized, the respective hamlet representatives share these hamlet plans at the Gram Sabha meeting.
- The members discuss the plan, provide necessary clarifications and help sort out disagreements. The hamlet representatives are asked to make the necessary changes in the plan on the basis of the given inputs.
- Finally, the Gram Sabha's approval of the plan is formalized by recording the members' signatures or impressions of the left thumb in the meeting register.

9. Obtaining Sanction

This involves the submission of the approved plan of the village to the government authorities at the district and getting money for implementing the proposed village-level plan.

Implementation

- After obtaining the approval of the Gram Sabha, the PEC will integrate the hamlet-level activity plans into a village-level approved plan document.

CHAPTER 7

Financing and Implementation

In this chapter

- The mobilization of funds to the community, for the execution of the planned activities, and to the implementing agency, for capacity building of target community and overheads
- Capacity building of community to keep accounts
- Capacity building of selected members from the community to supervise implementation
- The details of implementation through the hamlet-level committee and the programme execution committee
- Monitoring for quality and the timely execution of planned activities

Overview of the Implementation Mechanism and the Fund Flow

The PEC consolidates the hamlet-level activity plan and presents this to the VLA. If and when the plan is approved by the VLA, the PEC submits it to the Panchayat for necessary sanctioning and fund releases. The Panchayat releases the money as per the NREGA guidelines. As per the guidelines, the account will be held by the Panchayat President and Secretary

The major proposal being made here is that the process of planning and implementation be done in a manner that builds ownership and participation of the hamlet-level members. The proposal is that the PEC regularly indents for funds from the Panchayat for the works. The funds are duly transferred to the PEC. The PEC opens a bank account to channelize the Panchayat funds given for the INRM activity. In its first meeting, the PEC members select three persons from amongst themselves to become signatories of the PEC bank account. Any two of the above three can operate the account. One person from the Panchayat can also be one of the signatories.

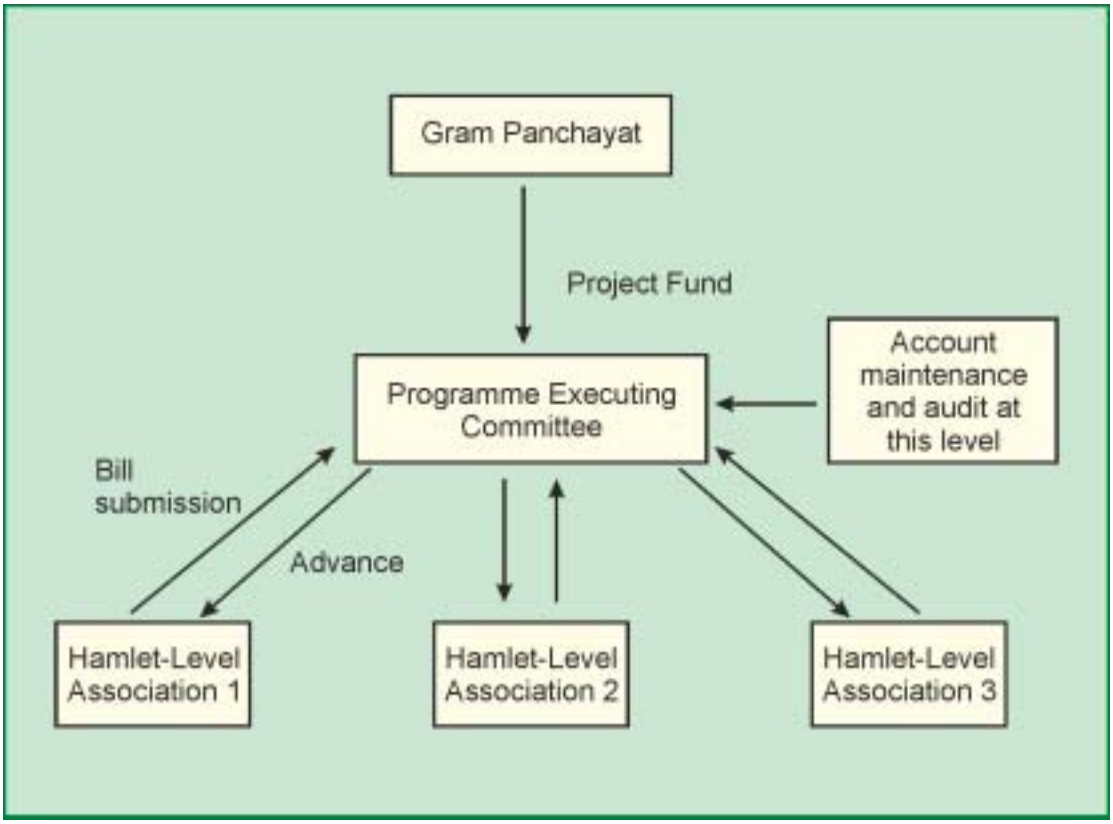
Once the Panchayat sanctions the plan, the PEC submits a half- yearly indent. The indent is prepared by consolidating the work plans of all the HLAs (in a village) for the ensuing six months. Accordingly, money is released to the PEC's bank account.

At the hamlet level, the HLA engages in a process of weekly planning. The HLA decides on the work that needs to be undertaken the following week, the money required for it, and

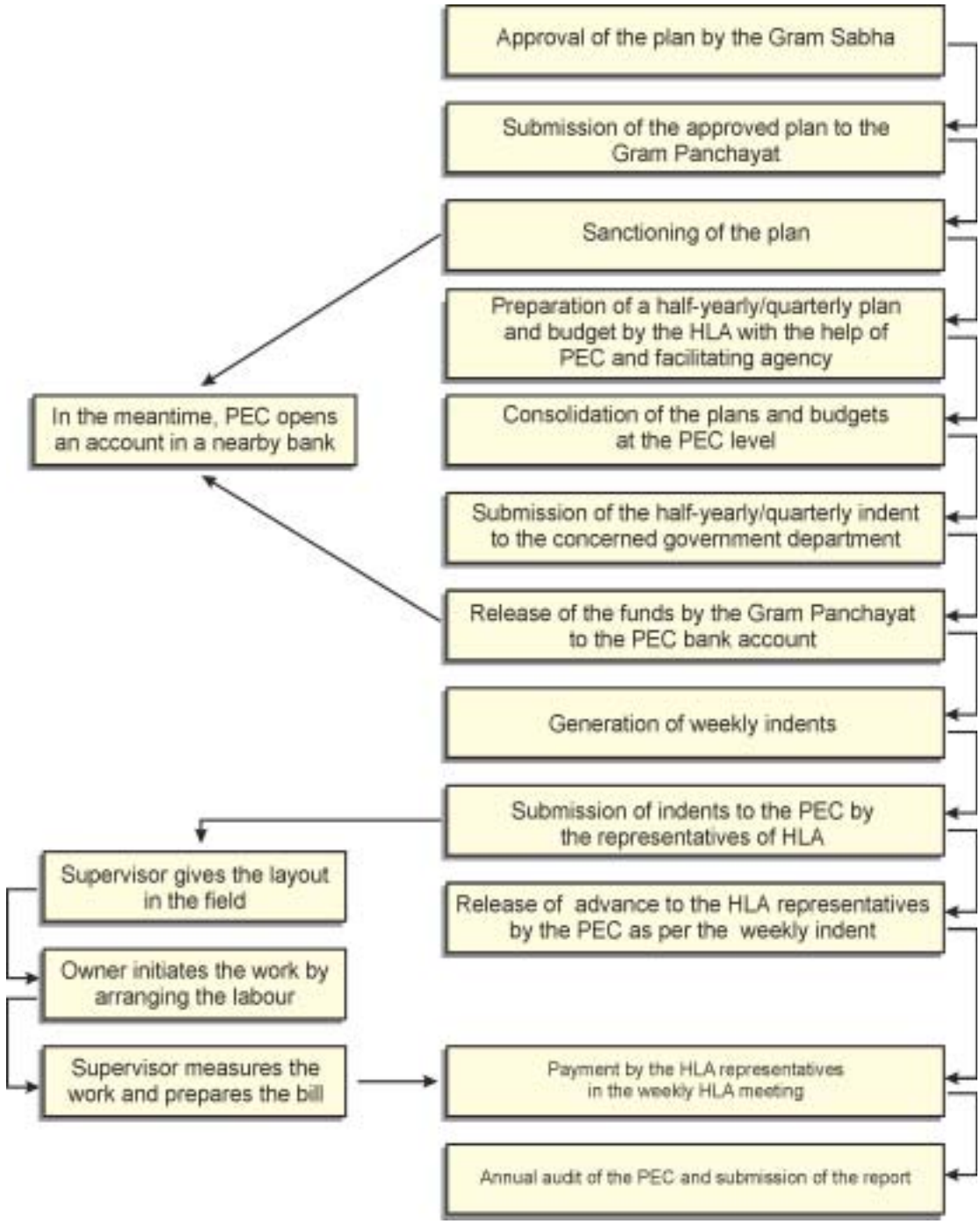
the person who will supervise the work. The PEC consolidates the weekly indent of different hamlets, withdraws money from the bank and gives it as an advance to the hamlet representatives. Supervisors appointed by the HLAs look after the work, take measurements, prepare the muster role and maintain the minutes book and cash book.

The hamlet-level committee (HLC) meets weekly for the purpose of payment for the work done or for advances. It reviews the work progress in the previous week, plans for the following week, and estimates the money required. Bills against the advances and expenditures are collected in the meeting.

In its weekly meeting, the PEC reviews the previous week's progress in various hamlets, collects bills against advances and expenditures, maintains accounts and makes further advance payments to the respective HLAs based upon their weekly plan and outstanding balances. The PEC accounts are subject to an annual audit. The PEC also purchases some stock items such as planting materials and, fertilisers and provides them to the HLC. The PEC accountant maintains the accounts and records such as the minutes book, cash book, ledger, vouchers and stock register. S/he also checks the measurements and bills submitted by the HLA.



Steps in Fund Flow and Implementation



Format of Indent from HLA to PEC

Name of Hamlet: **Indent Period: From** **To**

Works to be undertaken in the coming week	Expected expenditure
Total	

Unsettled advance: **Amount required:**

Signature of the hamlet committee members

Functionaries for the Implementing Programme

NREGA Assistant at the PEC Level

The PEC employs an Assistant to maintain its accounts and to check the measurements and bills submitted by the HLA. The accountant should be between 18 and 40 years of age, have at least passed Class 12, be good at calculation, possess interest in development work, and be honest and accepted by the villagers. S/he should take it up as a full-time activity. It is preferable to have the Assistantt from the village itself.

Supervisor of HLA

The HLA appoints a supervisor to maintain its accounts and records, take measurements and prepare bills. S/he should be between 18 and 40 years of age, have passed at least Class 10, be good at calculations, possess interest in development work, and be honest and accepted by the villagers. The candidate should also be familiar with the terrain, revenue maps and local agricultural practices. It is preferable to have a supervisor from the village itself.

Selection of Functionaries

The proper selection of functionaries is crucial to the implementation of the programme. PEC members select their NRGEA Assistant while the HLA members select their supervisor. After candidates (for the post of accountant/ supervisor) have been shortlisted on the basis of the given criteria, appropriate tests are conducted and the best candidates are selected.

Training of Functionaries

A series of training programmes are conducted at various levels for capacity-building of the above functionaries.

Bookkeeping Training for NREGA Assistant

***Topics* to be covered**

- Concept of double-entry bookkeeping
- Writing cash book, ledger, stock book and vouchers
- Writing the minutes of the PEC meeting
- Making trial balance
- Fund-flow mechanism

Tools: Lecture, practice, mock exercises

Duration of the training: 3 days

No. of participants: 10–20

Trainer: Facilitating agency

Bookkeeping Training for Supervisors of HLA/ PEC Accountant

***Topics* to be covered:**

- Fund-flow mechanism
- Preparing indents
- Maintaining the advance book and cash book
- Making the muster roll
- Writing hamlet-level minutes

Tools: Lecture, practice, mock exercises

Duration of the training: 2 days

No. of participants: 10–20

Trainer: Facilitating agency

On-field Training on the Measurement of Earthwork for Accountants and Supervisors

***Topics* to be covered:**

- Land area measurement
- Layout of field bunding, 30 x 40, 5%, farm pond
- Earthwork and measurement of the above structures
- Layout and pit digging of plantations

The format of the voucher, minutes book, ledger, cash book, etc. Other records maintained by HLA/PEC.

Payment and Accountability of PEC Accountant/HLA Supervisor

The PEC accountant is a full-time employee. S/he is paid a stipend every month. The accountant is accountable to the PEC members for his/her performance. The HLA supervisor is paid on a piecemeal basis, according to the work completed. Table 7.1 provides the payment rates for different works done. The supervisor is paid by the hamlet-level association in its regular meetings. The supervisor is accountable to the HLA and reports to it.

Format of Advance Book to be Maintained by the HLA Supervisor

Date taken	Advance submitted	Bill	Balance	Signature of HLC representatives	Signature of accountant

Table 7.1 **Rates of payment for different activities undertaken by supervisors**

S.No.	Item	Payment
1	Supervising earthwork	Wage of one skilled person for supervising 40 persondays (4000 cft earthwork)
2	Field layout of 30 x 40 with plantation pits, staggered trench (including contour survey)	Wage of 2 skilled persons for one hectare of treatment area
3	Maintaining HLC records	Rs 80 per month
4	Masonry work	Wage of one skilled person for supervising 40 persondays
5	Any other engagement	Rs 70 per day or Rs 40 for half day