DRAFT GUIDELINES FOR MICROLEVEL PLANNING FOR INTEGRATED DEVELOPMENT OF WASTELANDS

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DECEMBER, 1989

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It is imperative that these wasted lands should be viewed together as a part of the ecosystem of any specific locality and managed well with the objective of improving the quality of life of the weaker segments of the society. This should be the broad perspective of the Wasteland Technology Mission.

1.1 AIMS OF WASTELAND DEVELOPMENT:

The aims of Wasteland Development (WLD) as outlined by the Technology Mission on Wastelands are as follows;

GOALS	1. To check land degradation 2. To put Wasteland to sustainable use 3. To increase biomass availability 4. Restore ecological balance
STRATEGY	1. People's participation at all stages - specially through panchayats 2. Integrated Landuse Planning on watershed basis 3. Preparation of village level action plans 4. Emphasis on conservation and natural regeneration 5. Fuelwood, fodder, timber production 6. Technology extension 7. Resolution of relevant policy issues

1. INTRODUCTION

The Indian civilization, in striking contrast to industrialized nations is biomass-based. The majority of our people depend for meeting the bulk of their needs on biomass, either gathered from natural vegetation or produced through dryland, low input agriculture. One of our endeavours on acheiving independence has been to transform this situation and intensity agricultural practices and industrialize. This effort will undoubtedly continue. It is clear, however, that only a minority of our people have been and in the foreseeable future will be involved in these modern sectors; with the majority continuing to depend on dryland agriculture, village grazing lands, forest and other public lands. These category of lands making up about 2/3 of our country's land surface has received very inadequate attention. At the same time it has been subjected to increasing pressures of our growing population. As a result the bulk of these lands today produce far below their potential. They may therefore rightly be called wasted lands. Such wasted lands come under variety of controls

(i) Privately owned farmland not appropriate for cultivation, e.g. on steep hill slopes, in regions of very low rainfall.

(ii) Public land owned by panchayats, temples, tribal councils etc. and subject to overuse in absence of good community management.

expanding settlements. Even the WL under private ownership are no better, either it has no vegetation cover or under cropping with extremely low productivity.

3) Biomass availability :

Villages are experiencing severe biomass scarcity. In the past biomass needs of the community namely fuel, fodder, small timber, leaf manure, fruits, bamboo and so on were obtained largely from the community lands. The total annual requirement of fuel biomass alone according to Report of the Working Group is 133.1 million tonnes. According to the State of Forest Report (1987) only 19 million tonnes is the recorded production of forests. There is a large shortfall which is only likely to grow with time. The supply situation with respect to fodder or timber or bamboo is no better. The role of community WL becomes crucial because the landless have to depend on it for procuring their survival needs of biomass and oven artisans have to depend on it for procuring raw material like bamboo. Landless or artisans cannot afford to purchase. The landed especially the larger holding farmers either have biomass on their own land or can afford to purchase it. The scarcity of biomass has led to : (i) increasing the drudgery of procuring fuelwood or fodder - walking longer distance and spending longer time for gathering fuel or grazing livestock, (ii) shift to inferior biomass, like low density fuels (leaves, herbs) and low quality timber, and (iii) loss of employment to artisans.

TARGET AREAS	1. Degraded forest areas 2. Degraded pastures and public wastelands 3. Private wastelands and farmlands

1.2. CURRENT STATUS OR SENARIO:

1) Status of wastelands :

The wastelands(WL) under community or revenue department control suffer from the tragedy of commons. There is hardly any tree cover and land around the habitats are subjected to excessive grazing. This leads to two problems :

i) The soil with no protective tree or grass cover will be exposed to excessive soil erosion. Comparative studies of wastelands with different tree vegetation types have shown that the silt + clay content would be lowest in the top soil layers and the soil nutrient status poorest for WL soils. The soils are in a degraded state with poor biomass productivity.

ii) Excessive grazing also leads to depletion of palatable species and such lands will be dominated by non-palatable species like Lantana camara, Eupatorium and Parthenium species. Thus the common grazing land will be lost.

2) Encroachment:

The community WL are also being continuously lost due to encroachment by powerful farmers, government agencies and

2.2 INCOMPATIBLE SPECIES SELECTION:

Species choice should be such that they meet the various local needs of biomass including that of artisans, they should conserve soil and moisture and improve the soil fertility. In such a case local tree species would have dominated and mixed cultures should have been preferred. By all accounts monocultures of exotic species seem to dominate all the revegetation programmes. It seems to be based on the logic that fuel is the only important need of the community and hence it is best to select only non-browsable tree species, to protect it from grazing. Thus the common species preferred in different parts of India are Eucalyptus sp. Acacia auriculiformis, Casuarina equisitifolia, Prosopis juliflora and Poplus sp. Studies have shown that mixed tree species forests protect the top soil from erosion and improve the soil nutrient status better than monoculture plantations.

2.3 NO INVOLVEMENT OF LOCAL COMMUNITIES:

Though the approach of the WLD programme was to achieve people's participation, one of the most important lacunae has been the lack of involvement of local community at all stages of planning and execution of WLD or social forestry. Involvement of women, who are the major sufferers of the degradation, is totally absent. Similarly the artisans and landless had no role to play. There are a few exceptions where local communities and especially women were involved for example; in case of hill resource user groups in Sivaliks of Haryana. Without the participation of

4) Grazing land :

Community WL are currently the common grazing lands. Any plan for improving the WL have to consider the grazing land requirement of the community in other words the fodder requirement. These grazing lands are playing a crucial role in the village ecosystems.

5) Loss of plant diversity :

Community lands were the treasure house of a large variety of tree and herbal diversity beneficial to man, birds and animals. This diversity has suffered the tragedy of commons and even sacred groves are not exception to this.

2. SHORT COMINGS OF CURRENT PROGRAMMES OF WASTELAND DEVELOPMENT (WLD)

An ambitious programme on wasteland development was launched to achieve afforestation and tree planting with people's participation during 1985. The objectives were noble but in the field several shortcomings could be noticed.

2.1 LOCAL BIOMASS NEEDS NOT CONSIDERED:

One of the aims of WLD or social forestry was to grow biomass to meet the local needs. According to all the available studies and our observations in several parts of India, neither systematic efforts were made to estimate the biomass needs of the community nor any attempts to meet the various needs. The primary aim seems to be to cover the land with trees, more often only the fuel needs of urban areas were kept in mind.

2.6 GUIDELINES OR METHODOLOGY LACKING:

WLD would involve several steps; survey of natural resources, resource use dynamics, understanding of people's perceptions, data analysis, preparation of plans, and so on. Guidelines are required for these and for species selection, estimation of biomass needs, involvement of community at various stages, sharing the benefits etc. This requires well defined guidelines, approaches and methodologies for the field staff. They also have to be trained in the systematic approach to use the guidelines. Guidelines as well as training of staff seem to be lacking.

If the guidelines are not clearly defined the programme would get distored. For example, if there is no rigid guideline that the biomass grown is exclusively for the local use and should not be sold outside without meeting the community needs first, what may happen is that the produce would be sold due to lack of understanding on the method of sharing the benefit locally. If there are no guidelines a contractor or the forest department may bring labour from outside the community and undertake tree planting.

Thus there is a need to clearly define the guidelines, methodologies and approaches suitable to local conditions to achieve the defined goals of WLD

the local community it will not be possible to protect the planted vegetation (tree or grasses), to control grazing, to share the benefits or even to undertake the revegetation programme itself.

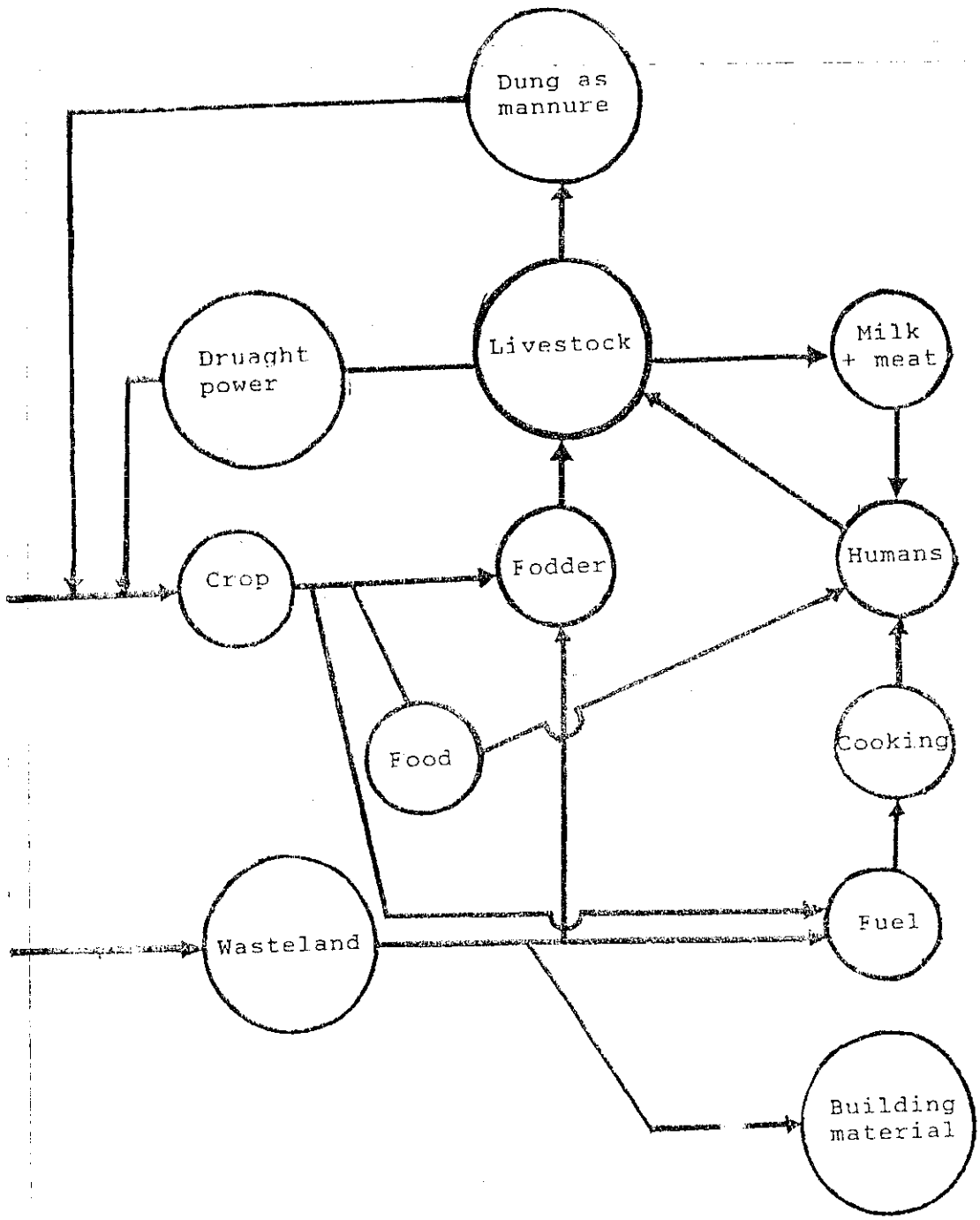
2.4 LINKAGES OF WL WITH OTHER COMPONENTS IN THE VILLAGE ECOSYSTEMS IGNORED:

Wastelands form a part of a watershed and WL are linked to several components of the village ecosystems. The watershed role of WL and the interlinkages in the ecosystems were not considered. For example, land capability classification and allotment of suitable land use based on it was not attempted or though the WL were currently used as grazing land, such lands were fenced and planted with monocultures without any consideration of grazing land requirement of the community.

2.5 NO LOCAL INSTITUTIONAL ARRANGEMENTS WERE MADE:

The tree plantations were fenced and gaurded by watchmen. No attempt was made to develop any local institutions to protect the plantations or to share the benefits. Even the existing institutions were not used. Involvement of women, artisans and landless necessitates special organization structures insulated from the domination by large farmers and panchayat leaders.

Fig. 1 Village as an ecosystem



3. DEFINITION OF THE UNIT FOR PLANNING

Watershed is an ideal unit for study as well as for planning soil and water conservation measures and for planning revegetation. However more often a watershed may be spread over several thousand hectares and several villages falling in different administrative units. If one of the major aims is to involve people in a meaningful way, watershed may be too large for making group interaction and participation meaningful, apart from several administrative difficulties. Thus the approach should be (i) if a watershed is small, of a few hundred hectares extending over not more than 2 villages select watershed as a unit of planning (ii) if the watershed is large then restrict to sub-watershed extending to cover one village as a unit of planning. It could cover the wasteland, cropland, waterbodies, settlement (including humans and livestock) and if any forest. Ideally a village covering all these components could be considered as an ecosystem (Fig. 1). An ecosystem approach would enable us to recognise the interaction between different components.

If for example WL component is considered :

(i) It is linked to livestock as it provides fodder (or is the grazing land) to cattle and sheep (+ goat),

(ii) These livestock in turn provide - milk and meat for humans
- dung for use as manure to croplands
- dung as fuel for cooking
- draught power for agricultu

Thus livestock are linked to several components of the ecosystem.

forestry. Advance planning is necessary to achieve timely land preparation, planting, collection of seeds, raising nursery and planting of live fence and to accommodate all these operations.

4. Funding is going to be in a phased manner subjected to constraints and guidelines. Utilization of funds will have to be planned in such a way to maximise the benefit. Scheduling of requirement of funds will have to be planned in advance to get allocations from funding agencies.

5. Selection of appropriate land preparation technique and species for different patches of land requires land survey and land capability studies.

6. The needs have to be estimated and the programmes have to be tailored to the needs considering the constraints.

All this cannot be achieved without systematic planning. Steps involved in microlevel planning are given in Fig. 2. Planning here refers to microlevel planning at village level or at micro watershed levels.

5. PLANNING SURVEYS, DATA COLLECTION AND ANALYSIS OF RESULTS

The first step in microlevel planning would involve getting an understanding of the status, inventory and levels of use of resources and definition of the requirements and identification of contraints and problems. This could be carried out in two phases.

(iii) WL may be providing fuel twigs for cooking and leaves for manure purpose directly.

Livestock in the village community is converting the biomass productivity of WL into food (milk + meat) for humans and nutrients (dung) to crop production. WL even under degraded conditions is linked to other components like livestock, cropland and humans and is playing a critical role in village ecosystems. What is important here is to recoginse and keep in mind these interlinkages during planning. It is likely that currently the WL are not used in a sustainable way and the biological productivity may be low.

4 PLANNING WLD AND NATURAL RESOURCES MANAGEMENT

The first question that arises is why planning is necessary. Some of reasons why planning is required for WLD are as follows :

1) It would involve several institutions (government departments, local community, local institutions, educational institutions, experts and so on). Thus coordination has to be planned.

2) There is a gestation period involved, in other words to derive benefit the community has to wait for several years. This requires planning protection and management. Even sharing of diverse benefits has to be planned.

3) The programme implementation will be subjected to several constraints and time specific operations. For example labour scarcity due to clash of labour for agriculture and

PHASE I - RAPID RURAL APPRAISAL OF WASTELANDS:

This would involve a quick reconnaisance survey to identify the location, situation, status, problems, needs and perceptions of the community to get a feel of the region and situation and to prepare ground for detailed studies and may be even to prepare the first iteration of plan.

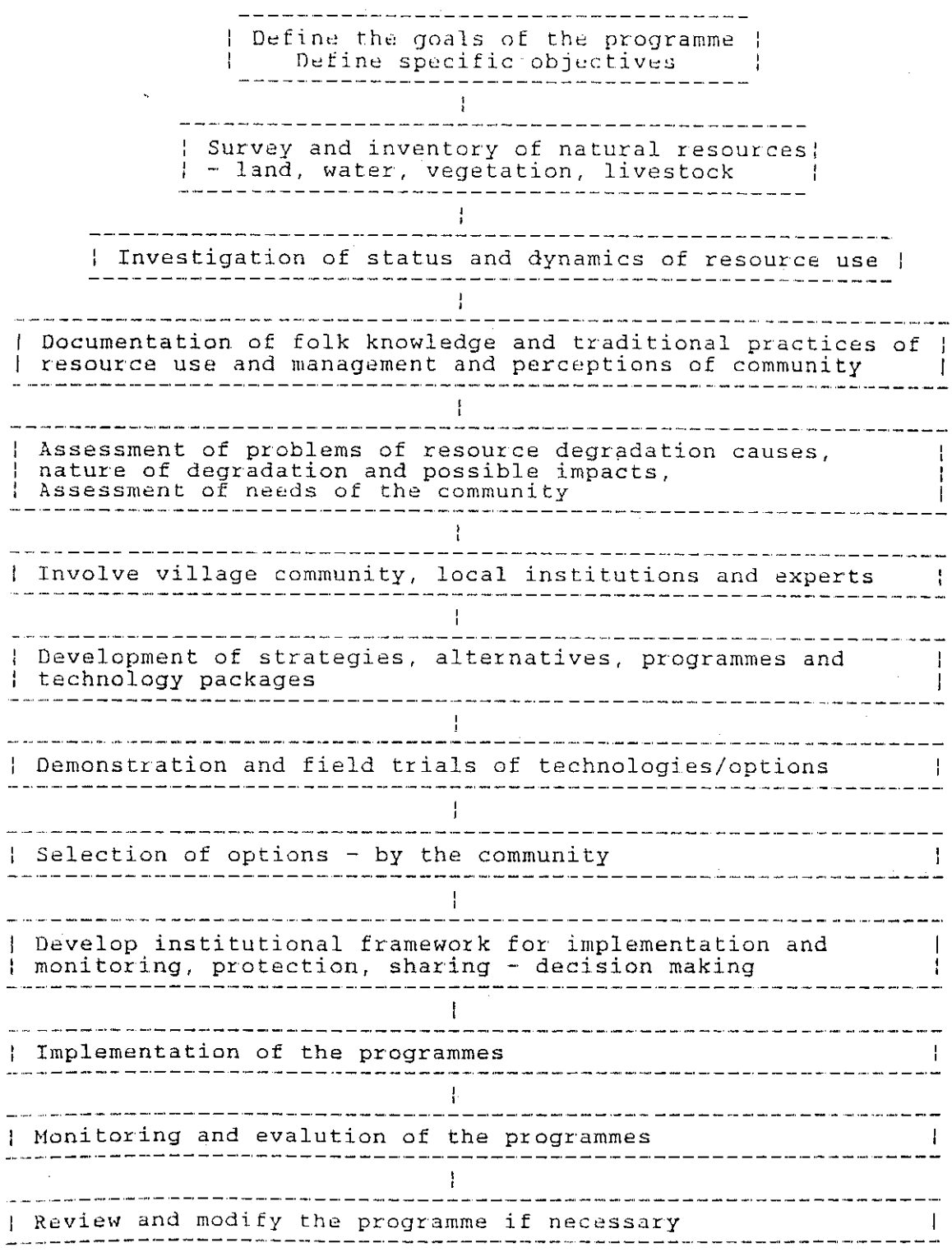
PHASE II - DETAILED STUDIES AND ANALYSIS:

Detailed quantitative study of the status, availability and requirements of resources and definition of problems and needs of the community.

Requirement of resources and time

There is a need to estimate the resources required for conducting the rapid appraisal study and for intensive survey. Assuming a watershed or a village ecosystem of about 100-300 households and a few hundred hectares of land the approximate requirement of time and personnel is given in Fig. 3.

Fig. 2. Steps in planning and implementation:



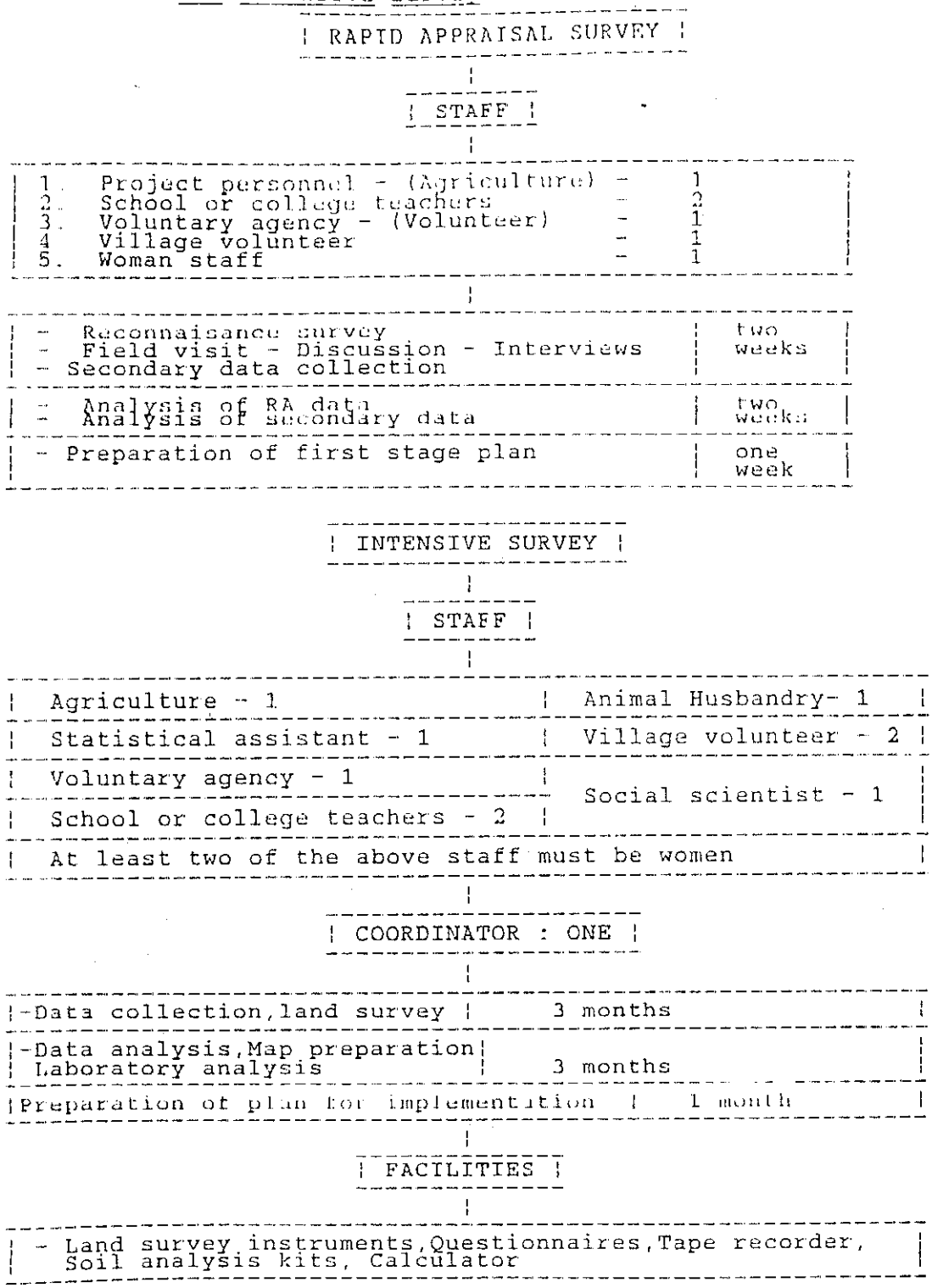
6. PHASE I: RAPID RURAL APPRAISAL (RRA)

RRA is a relatively new and quite different approach for conducting action-oriented research. RRA method requires less time and less resources (funds and personnel). It is a gradual learning process and at each stage the perceptions of community are considered. RRA requires an interdisciplinary approach as the field problems are complex.

6.1 FEATURES OF RRA

1. Phase I has to be completed in 1 or 2 months.
2. It should involve an iterdisciplinary team which includes women and local volunteers.
3. Minimum resource (funds and personnel) should be involved.
4. No measurement or quantification is neccessary, expect what is already available in records.
5. No statistical sampling or analysis is involved.
6. The methods would involve visual observation in the field, group discussion, interview of key informants and collection of secondary data.

Fig. 3. Requirement of personnel and time for rapid appraisal and intensive survey



6.2.1. Data from secondary sources :

For the identified or selected village or watershed or cluster the first step should be to gather all the information available with secondary sources.

i) All the maps available should be obtained namely NRSA maps, revenue maps, topo sheets, cadastral maps, soil survey maps and so on.

Sources	NRSA	National Bureau of Soil Surveys and Land Use Planning
	Land survey	Revenue Department
	Forest Dept.	Survey of India

ii) Socio-economic, Land use, Weather data :

All the relevant information available from secondary sources has to be collected. Details are given in Table 2.

TABLE 2 : Socio-economic and Weather data.

A. Rainfall - Source - From nearest rain gauge

Months	year t'	year t-1	year t-2	year t-3	year t-4	year t-5
Jan						
Feb						
Mar						
Apr						
May						
June						
July						
Aug						
Sep						
Oct						
Nov						
Dec						

6.2 OBSERVATIONS AND METHODOLOGIES FOR RRA

A summary of the information to be collected and methods is given in Table 1 and are discussed here.

TABLE 1

	Details of data	Method	
Basic data	- NRSA maps, Revenue maps - Socio-economic data: -population -occupations -artisans - Rainfall, Institutions present	-Secondary sources -BDO, Revenue office -Schools	Project staff
Map preparation	- Rapid map preparation-hand sketch - Marking of land available on the map	-Field visit and observation	Project staff
Land characte-ristics	- Visible extent of erosion - vegetation features on the land - soil colour, topography	-Field visit and observation	Project staff
Water situation	- Location of water sources - Seasonal availability of water	-Field visit -Group discussion	Project staff
Peoples' perceptions	- Land availability (encroachment) - Envrionmental problems (ranking) - Status of Wastelands - Biomass - availability, sources - extent of scarcity - export or import - requirement for artisans - Labour availability-seasonality - Grazing land and pressure - Options available for biomass generation and use of wastelands - Solutions - reducing soil erosion - controlling runoff - allocation of land to different uses.	-Group discussion in the village -Discussion with key informants -Use 1 or 2 page schedule -Avoid quantification	Voluntary agency

6.2.2 Preparation of field maps :

Often the maps obtained from the secondary sources may be old, a part of WL may have been encroached, may not contain several information (location of pond or bund or stream,), WL owned by farmers may not be shown in the maps, a bund might have breached and so on. Visit the village or the watershed, go to the highest point taking one or two local persons to guide you and prepare a rough hand drawn sketch showing the patches of cropland, irrigated and dry land, hills, forests or plantations, irrigation tanks, settlement, roads, grazing land, streams, wells etc.

Based on the field maps locate the WL, marginal croplands and water bodies. These can be marked on the revenue map or NRSA wasteland map obtained from the department.

6.2.3. Status of wasteland :

To get an idea of the vegetation type, soil status, water availability, topography select a high point in the largest patch of the WL from the rough hand drawn field map. Walk through it till the lower end. If there are several patches of WL or community land, select only 2 or 3 larger patches.

Walk through two or three of them and smaller patches could be avoided. Every twenty long steps (20 meters) observe for the information listed in Table 3 and also draw a rough sketch of the cross section of the WL patch showing the relative altitude and presence or absence of vegetation (tree or shrub or grass).

B. Institutions present – Source – BDO Panchayat

Co-operative society		Government office	
Schools		Farmers, youth, women's association	
Temple committee		Voluntary agency	

C. Socio-economic data – Source – Census report | Agri. Dept. | Animal Husbandry

	No.		No.	Livestock Animals	pop. No
Population – Male – Female Households (No.)		Occupation patterns – Farmers – Agri. Labour – Artisans –		– Bullocks – cows – Buffouloe – Sheep – Goats	

D. Land use pattern – Source – Agri. dept. | Census report | Revenue dept.

	Area	
– Geographic area – Forest – Plantation – Crops – Kharif – Summer – Wasteland		
Total		

6.2.4 People's perceptions :

AIM : To guide preliminary plan preparation or to prepare plan for detailed studies a knowledge of the perceptions or opinions of the community on the status of their environment, major problems, resource availability and possible solutions is necessary.

METHODS : 1. Interview individually few representative persons using an open ended questionnaire; for instance, 2 farmers, 2 landless, 1 fisherman, 1 potter, 1 basket weaver and 2 women. Select them randomly and talk to them individually. This gives an idea of differences in perceptions of different categories in the community.

2. Group discussions : Go to the panchayat or middle of the village, collect a few people randomly or by prior arrangement discuss with them on the village level problems and solutions using an open ended questionnaire.

3. Interview specialists: They could include a person controlling release of water in the tank, firewood traders, dairy society secretary, community grazing person, women working in forest nurseries etc. Aim would be to get detailed information on selected specific issues like water availability or tree species suitable to that area. Use a semi-structured questionnaire. A model set of questions or issues is listed in Table 4 and 5.

Table 1: Observations on vegetation and soil in the radius of 2 m at every 20 m point

	Every 20 meters	Tree present or not	Which tree species	Dominant shrub weed	Slope - steep - moderate - levelled % of slope	Any water body	Soil type	Level of erosion - gully - sheet - top soil present	Remarks
Wasteland 1									
Wasteland 2									

...Continued...

7 BIOMASS AVAILABILITY

A Cooking fuel

- In your opinion what is the extent of scarcity of cooking fuel
  - No
  - 25 %
  - 50 %
  - 75 %

	- Type of fuel used for cooking (rank them)	- Tree twigs - Crop residue		
	- List the major locations of gathering fuel (rank them)	- Wasteland - Forest - Road side		
	- How far is the dominant source (kms)			
	- Extent of selling of fuel outside - No. of families depending			
B	FODDER - Do you export crop fodder	Yes/No		
	- Do you import fodder	Yes/No		
	- Is the grazing land adequate	Yes/No		
	- How far is the major grazing patch (kms)			
8	BIOMASS FOR ARTISANS - Extent of biomass available - Bamboo for basket weaver	- Locally - Purchased - Partly		
	- Was it available in the past			
	- Can it be grown in the VC (Repeat for different raw materials)			
9	NOMADIC SHEPHERDS - Are there shepherds	Y/N		
	- How many families			
	- Which months they migrate			
	- Why they migrate			
	- Can their problem be solved			

Perceptions of the people

Information	Examples of perceptions	Group discussion	Representative household
			Farmers / Landless / Artisans / Forest
1. - Major problems of their community or environment or village (rank them)	- Grazing land - 1 - Drinking water-2 - Fuelwood - 1 - Soil erosion - 2		
2. - Is there community wasteland in your village - Any idea on how much land is available (approximate area units)	Yes/No		
3. - Is there any wasteland under private ownership (permanent fallow) - Any idea of area availability			
4. - How much or what % of community WL is available for improvement			
5. - What is the status of WL Soil erosion	- Severe (Gully) - Moderate		
- Grass availability for grazing	- Very poor - Moderate - Excellent		
- Is it fit for - raising trees	Yes/No		
- fodder plantation	Yes/No		
- cropping	Yes/No		
6. - Water availability for nursery	- No water available		
- Any suggestion for obtaining water for nursery	- Bund for stream - well		

Table 5: Suggestions for biomass production

	Examples or opinion	Group discussion	Representative household
			Farmers / Landless / Artisans / Women
- Options for biomass production	- Grow on VL - on bunds - private lands		
- Which biomass needs are to be met from VL (rank them)	- Fodder - Bamboo - Fuel - Fruits - Timber - Manure - Mulch		
- Do they want to grow only for local requirement or for export also	- Local only - Local + export		
- Is the available VL adequate If no - what suggestion they have			
- Any suggestion on location of nursery	- Near tank		
- List the tree or grass species of their choice for each end use and why they prefer (features)	- Fuel - Casuarina -good burning - Eucalyptus -good coppicing - Fodder- Ficus -lot of leaves - Manure- Pongamia -multi benefit -rich in Nitrogen - Basketry - Bamboo		
- Suggestions for sharing the produce from the VL	- Equitable distribution - Selling		
- Any traditional system or technology for soil and water conservation			
- Any past history or traditions or practice for - protecting forest - controlling grazing - sharing benefits			
- Do they know that efficient technologies are available for conserving wood used in cooking			

Continued

10 LABOUR AVAILABILITY

- Does the village import labour for peak agricultural operation — Y N
- Extent — - Large scal
  - Marginal

- Availability of local labour for afforestation or soil preparation	- No - Yes - Partly		
- Will there be clash for labour for agriculture and tree planting	- Y'S - Partly		
- Is it good to import labour for afforestation in the village	- Y'N - No other option		
- Any suggestion for overcoming the labour scarcity			
11 GRAZING PRESSURE - If the current grazing land is fenced and planted with trees where will the livestock graze			
- Any suggestion			
- Is grazing land a must			
- If yes, what % of the current grazing land has to be reserved			
- Can the tree, grass bamboo plantations be protected from grazing			
- Any suggestion for managing the grazing activity			

6.3 ANALYSIS OF RAPID APPRAISAL (RA) DATA

No detailed statistical analysis is required and is possible from RA data. The aim would be to : (i) identify the extent of WL, water, labour and other resources available, (ii) understand the status of WL, water, vegetation etc., (iii) identify the major problems as perceived by the community, and (iv) list the possible solutions and approaches. The information obtained is mainly qualitative. Based on RA the following two could be achieved :

A. Identification of parameters and issues to be studied in detail for preparing detailed plan at microlevel.

B. It would be possible to prepare a rough plan to be taken to community for their comments if intensive study is not planned for some reason.

Some examples of analysis of information :

1) Land area and Land features :

- Prepare a rough plan of the locations of WL, streams, roads etc based on the field sketch and revenue maps.
- Based on secondary data and community's opinion calculate the land area available for development - community and private.
- Based on field observations define the major features of the land for planning - slope, erosion level, soil quality, water availability and so on.

... Continued ...

- Would they like to have the improved stoves/biogas system			
- Any suggestion for institutional set up for managing VI - Structure, composition - Functions - Powers, - Responsibilities			

A detailed methodology and model questions for obtaining information on the perceptions and opinion of the local community is given in the section 7.14 of the intensive survey. The questionnaire given in Section 7.14 could be used during RRA phase also.

Ask them detailed questions on their perceptions of

- resource availability (water, fodder, land etc)
- resource shortage (extent like percentage)
- options for augumenting the resource supply
- suggestions for organising and managing the system.

6.4 SHORTCOMINGS OF RRA

RRA has several advantages and would be a useful initial step. But it is no substitute for detailed - intensive - quantitative surveys for microlevel planning. In certain situations where it is not possible to carryout intensive studies and time is short RRA method could be adopted. Some of the short comings of RRA are :

(i) The quantitative details required for planning are missing like exact land area available, contour lines and dung yields.

(ii) Preparing the action plans based on perceptions and opinions may not be correct as generally communities will be more worried about short term problems and short term solutions, which may not be compatible with long term objectives.

(iii) The time available would be too short to get a better feel of the situation for the project staff.

(iv) Lot of personal bias of the staff may enter the decision making or planning.

(v) In addition the respondants may tend to exagerate certain problems or issues.

2) Biomass availability, sources and requirement :

- List the major types of biomass used for different end uses.
- Which are the sources, what is the extent of dependence on outside the village (like imports).
- Extent of shortage of different types of biomass (like % of requirement)

  Ex : - Tonnes of firewood
  - Number of bamboo shoots

- Estimate the land required to produce the requirement by consulting community and experts.

3) Biomass production :

- What are the priorities of the community for use of WL: fuel, fodder, oil seeds, etc.
- For the given land what should be the share of different purposes or end uses.
- Which are the tree and grass species suggested by different communities : women, potters, basket weavers.
- Estimate the resource required : plastic bags, seeds, labour, fence material etc.
- Prepare a rough plan giving the area, type of biomass to be produced, species combination, labour required etc.

4) Organization and management of system :

- Based on the suggestions made by different sections of the community develop an ouline of the composition, functioning and powers of the organization or institutions proposed.

These plans could be presented to the community to obtain their suggestions and further modify the programme.

OUTLINE FOR DATA COLLECTION

	Data	Tool or technique	Institution
Socio-economic data	-Human, cattle population -Occupation pattern (artisans,etc)	Questionnaire - survey	local school
Preparation of map	-Contour map -Land area available -location of water bodies	Contour Survey	Project staff
Soil study	-Soil texture:sand:silt:clay -Organic matter and nitrogen content -Soil depth	Laboratory analysis	Local college
Land ownership distribution	-Ownership data -Land encroachment	Revenue department	Project staff
Water resources	-Location of water bodies -Water availability -seasonality -for nursery etc. -Extent of irrigation -No. of open wells, bore wells, etc.	-Field survey -Govt. dept.	Project staff
Vegetation	-Location of trees, dominant tree species -Area under plantations -Grass and shrub coverage of lands -Tree species use for different purposes	-Field survey -Survey of key informants	Voluntary agency
Biomass	-Existing consumption levels: fuel, fodder, timber, manure, thatch, etc. -Use by artisans-Bamboo, etc. -Sources of biomass -Contributions -Trees -Crops -Shrubs -Biomass requirements -Subsistance -Commercial -Extent of export	Survey - Questionnaire	Local School or college
Perceptions	-Uses of wasteland -Species choice -On institutional requirment -Management of resources	Survey - Questionnaire	Voluntary agency

7. PHASE II: INTENSIVE STUDIES

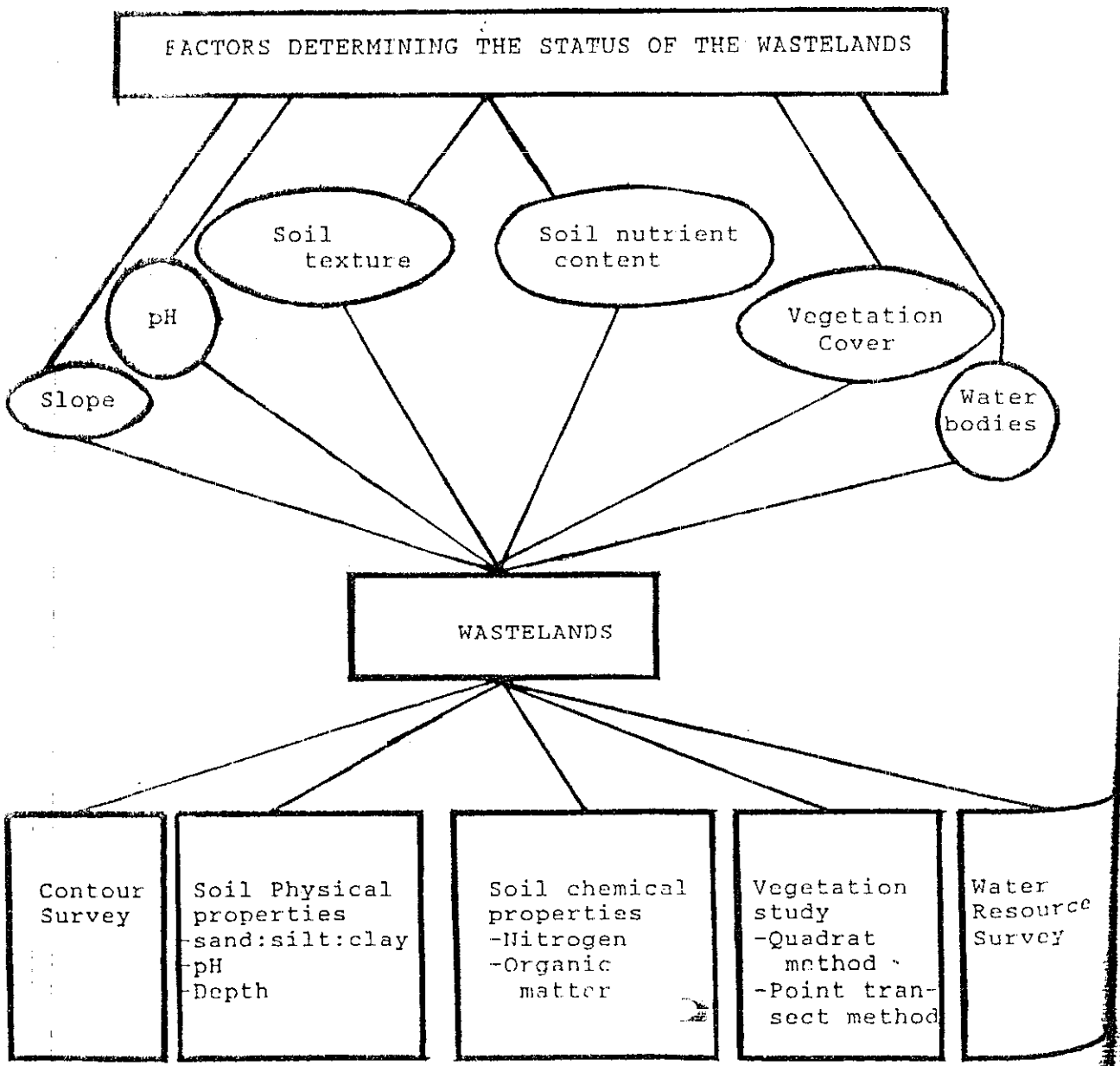
Unlike the Rapid Appraisal phase aim of the intensive phase is to generate quantitative data on all aspects of availability, utilization levels, shortages (or requirements) and status of resources (land, biomass, water etc.) to enable detailed planning for sustainable development. The information obtained from rapid appraisal would assist to focus the detailed study and to select appropriate method for the survey or study.

7.1 FEATURES OF INTENSIVE STUDIES

1) Quantitative estimates of most parameters will be attempted.
2) Statistical sampling and analytical techniques would be adopted.
3) Involvement of local educational institutions would be essential.
4) Instruments (land survey), field kits (for soil analysis), drawing board, calculators etc. will be required.
5) Methods to be included are;
   i. Contour survey of the landscape,
   ii. Laboratory analysis of soil samples,
   iii. Survey using questionnaires,
   iv. Measurement of quantities, area, volumes, etc.
   v. Discussions at group and individual level,
   vi. Field observation.

In planning for sustainable use of natural resources or WLD knowledge of soil topography, physical and chemical properties is essential. One of the basic objectives any where would be to conserve soil and moisture and to put soil to appropriate sustainable use. To develop plans to achieve these goals the data required and methodologies are listed in Fig 4.

FIG. 4. LAND FACTORS DETERMINING THE STATUS OF WASTELANDS



Agriculture and animal husbandry practices	-Labour use - seasonal -Biomass use - manure, fodder -Crop residue - quantity - enduse -Livestock - grazing practices - dung availability	Survey Questionnaire	Local College + Voluntary agency
Traditional knowledge	-Tree species choice/selection for different locations, enduses -Land capability -Harvest and sharing of resources -Soil and water conservation	Group discussion	Voluntary agency
Local Institutions	-Existing, membership, structure functions of institution -Mechanisms of settling disputes	Group discussion	Voluntary agency

In the following pages an outline of the aims, sampling, method of observation, survey or measurement, data to be recorded is given for different parameters. The questionnaires or the model questions will have to be modified to suit local conditions. In addition new questions or alternate methods may have to be adopted in different areas.

7.2. STATUS AND EXTENT OF WL AND LAND CAPABILITY SURVEY:

The information provided by NRSA maps, the All India Soil and Land Use Survey Reports and aerial photographs have limited use for microlevel planning required for WLD. NRSA maps of wastelands (1:50,000) cannot be used for detailed land use planning or for planning soil and water conservation measures at the ground level as these maps show no contours and in addition there are errors of as much as 0.5 to 1 Km in comparison with the cadastral maps. Maps and information available will have to be substantially augumented by intensive field studies.

3) SOIL PHYSICAL CHARACTERISTICS:

Parameter	Method
Texture: sand:silt:clay	Sieve analysis
Depth of soil	Digging a soil profile
pH	pH meter

4) SOIL NUTRIENT STATUS:

Detailed analysis of all nutrients, Nitrogen, Phosphorus, Potassium, Calcium, Iron, Manganese, etc. is difficult and also not necessary. Thus to get an idea of the soil status only Nitrogen and organic matter content of the soil could be estimated.

Nitrogen: Micro-Kjeldahl method

Organic matter: Walkley and Black's Rapid Titration Method.

5) VEGETATION STATUS

AIM: To understand the extent of tree vegetation cover in the WL patches. To get an idea of the shrub, weed and grass growth. Here a method for studying the vegetation in wasteland patches is suggested. For croplands, road sides, stream banks, the methods for study are considered later.

1) PREPARATION OF CONTOUR MAP:

AIM: Contour map is very essential for planning soil and water conservation practices. The aim is to prepare a contour map of the WL patches.

METHOD: It is possible to prepare maps using two methods. The common method is to use the land surveying instrument (Tilting level). A simpler method which doesn't require any instrument is the tube level method for marking contour points. Depending on the availability of the instrument the method to be adopted could be decided.

2) SOIL EROSION:

AIM: The aim is to understand the level or severity of soil erosion.

METHOD: It is very difficult to make measurements. Thus what is feasible is to make note of the status of soil surface based on observation:- Sheet erosion - moderate erosion,
- Gully formation - severe erosion,
- Rocky surface - No top soil,
- No erosion - top soil intact.

7.3. TREE DIVERSITY OF THE VILLAGE ECOSYSTEM:

AIM: To understand the tree resource diversity in different locations (excluding wastelands) like crop lands, road sides, stream bank. This gives an idea of the past traditions or practices of tree planting also.

METHOD:

Method 1: By project staff	Method 2:By local students
Sample:Select randomly i) 4 cropland patches of 25m x 25m (including bunds) ii) 4 stretches of 50m length of roads iii) 4 stretches of 50m length of stream -Data given in the proforma has to be recorded	Sample:select all the students of 6+7 standard or 8+9 standard from that village. -Students from farming families could select their own farms and other students could select the roads, stream banks and wastelands. -Size of sample mentioned for Method 1 for streams and roads is adequate. -Let the students record the following observations.

PROFORMA

Patch _____ Student _____ patch _____

Tree species	No.	Uses	Tree species	No.	Uses

METHOD 1: Using the map select randomly 3 quadrats of 25m x 25m from the wasteland patch.

- Record the following observations in the quadrats.

Quadrats	Tree Species	No.	Girth at 132cms above ground	Basal area	End uses	Dominant ground vegetation
Quadrat 1						
Quadrat 2						

METHOD 2: - Lay a representative 1 km transect line in the wasteland.

- At every 20 m along the line in a radius of 2 m observe and record the following;

Points	Tree species	No.	Girth at 132 cms above ground	Basal area	Shrub species	Gully	Stream
1. 2.	1. 2. 3.						

7.5 WATER RESOURCE AND NURSERY:

AIM: 1. To estimate the water resource available in the village.

2. To get an idea of the availability of water for nursery and watering of revegetation programme.

-Location of all the water bodies in the village and WL will be covered during contour survey and map preparation.

-Area under irrigation will be determined in socio-economic questionnaire.

-Information on sources of irrigation will be recorded here.

METHOD: -The following data could be collected through a group discussion in the village and from revenue records.

PROFROMA

1. Village _____

2. No. of open wells for drinking _____ for irrigation _____

3. No. of bore wells - Irrigation _____

- Drinking water _____

4. Irrigation tank - command area _____

5. How many farmers would be willing to take up Kissan nurseries _____

6. Will it be possible to mannually irrigate the seedlings planted in the W L _____

7. How to involve women and landless labourers (LL) in raising nurseries _____

7.4 SOCIO ECONOMIC DATA:

AIM: To collect data on demographic, land and cattle parameters.

SAMPLE: A census survey is suggested.

METHOD: Adopt survey method using a questionnaire.

HOUSEHOLD QUESTIONNAIRE

1. Name of the Head of Household _____ Village _____

2. Main occupation of the family _____

3. Size of family and skills

Each member	Sex	Age	Skill	Occupation

4. Land

Particulars	Area
Total crop land	
Total uncultivated land	
Cropping pattern	
Kharif - 1.	
2.	
3.	
Summer - 1.	
2.	
Plantation(like coconut)	
1.	
2.	
Tree plantation	
- Species	
Area under irrigation	
Source 1	
2	
3	

5. Livestock

Animals	No.
-Bullocks	
-Milking cows	
-Non-milking cows	
-Cattle calves	
-Buffaloes	
-He buffaloes	
-Buffalo calves	
-Sheep	
-Goats	

METHOD 2: Human effort for grazing cattle

- Select about 30 students of 6 and 7 or 8 and 9 standard.
- Ask them to record human effort for grazing in their families during two week ends.
- Provide the questionnaire.

Proforma if livestock are taken seperately for grazing.

Student Name	Day or date	Time of taking out	Time of returning	Who took the animals M	W	C	Location

7.7 LIVESTOCK DUNG AVAILABILITY:

AIM: To estimate the dung resource available to study biogas and manure potential.

SAMPLE: Select randomly
- 5 cows
- 5 bullocks
- 5 buffaloes
- 5 calves

METHOD: Inform the household earlier and go and weigh the daily stall collection normally early in the morning, after that livestock are taken for grazing or work.

Repeat for a minimum of two days.

7.6 LIVESTOCK GRAZING PRACTICES

AIM: To understand the practices of grazing, locations of grazing and human effort for grazing.

METHOD 1: Grazing practices and locations of grazing

1. Identify a few knowledgeble elderly persons.
2. Use the semi-structured questionnaire and discuss and gather qualitative responses.
3. Also observe the grazing locations by visiting them.

PROFORMA

1. Do you take the livestock for grazing and guide them OR the livestock are simply left free with no supervision.	
2. If taken for grazing, whether - All village animals are taken together, or - Livestock are taken seperately by each family. - Is leaf fodder lopped from trees.	
3. Do you take cattle and sheep + goat for grazing - Seperately, - Together, - Why.	
4. Name all the locations of grazing grounds - rank them Cattle : 1. 2. Sheep + Goat 1. 2. Together 1.	

METHOD: 1. Select about 20 landless and representatives of artisans for survey.

2. Collect data using a questionnaire and concentrate on the months when revegetation or contour bunding operations have to be carried out.

3. Ask men and women seperately.

PROFORMA

Season	Months	How many days were you employed (1/2 or 1/3 month)	Where		Nature		How many days can you work on WL if offered
			Inside the village	Outside the village	Agri	Non-Agri	
Summer	March April May						
Pre-Monsoon							
Monsoon							
Post-Monsoon							

SCHOOL STUDENTS: Select the students of 6 +7 or 8+9 standard for monitoring the dung yields in their own families and provide them with spring balances. Select students to cover the earlier mentioned sample size.

PROFORMA

Household name	Animal	Day	Dung yield Kg	
			Night collection	Day Collection
		1. 2.		

7.8 LABOUR AVAILABILITY:

AIM: 1. To understand the extent of labour availability for revegation or soil and water conservation programmes.

2. Study the levels of employment especially of landless.

ISSUE: - It will be difficult to directly estimate the extent of surplus or deficit of labour. Its estimation will involve enarmous effort.

- Keeping WLD in mind it is suggested to understand the labour availability for revegetation and land modification work.
- Thus the landless labourers and artisans have to be contacted.

7.10. BIOMASS REQUIREMENT OF ARTISANS:

AIM: To estimate the biomass requirement of artisans for employment generation.

SAMPLE: Census survey- cover all the existing and potential artisans.

METHOD: Survey using questionnaire.

PROFORMA

Name of the artisan_____	Name of the artisan_____
Occupation _____	Occupation _____
No. of persons working in the family _____	No. of persons working in the family _____
No. of days employed annually/monthly _____	No. of days employed annually/monthly _____
Type of biomass used _____	Type of biomass used _____
Qty. required per day _____	Qty. required per day _____
Qty. required/year _____	Qty. required/year _____

Record data on quantity of biomass used in local units like number of bamboo shoots, cart loads, head loads.

7.9. CURRENT LEVELS OF USE OF FUEL AND FODDER

	FIREWOOD	FODDER
Aim	-To estimate per capita/day fuel use -Community level aggregates -type of fuel used -Source of fuelwood used	-To estimate per animal per day and per year stall feeding of fodder -village aggregates
Sample	Stratified Random sample -5 small farmers (<2 ha) -5 large farmers (>2 ha) -5 landless	Stratified Random Sample -5 cows -5 Buffaloes -5 bullocks
By whom	-Select 15 students belonging to above categories and provide spring balance	- Select 15 students who own cattle and provide spring balance.
Method	Daily displacement method -Weigh a bundle of wood -ask the housewife to use it in the next 24 hours -After 24 hours measure the remaining wood -Repeat for 2 to 3 days -Record the size of family and type of wood used	Daily displacement method -Weigh a bundle of straw/ leaf fodder -let the farmer feed it to the selected animal for the next 24 hours as is the usual practice -After 24 hours measure the remaining straw -Repeat for 2 to 3 days Record the fodder type used

PROFORMA - FUEL

	Day 1	Day 2
Size of family		
Type of wood		
Weight of wood - Initial - Final		
Source of wood		

PROFORMA - FODDER

	Day 1	Day 2
Animal type		

Weight of fodder - Initial - Final		
Type of fodder Time		

7.12 TIMBER REQUIREMENT

AIM : To estimate the annual timber used in the village

METHODS : Obtain data from either carpenters or village panchayat on the number of houses built in the last two years.

- Select these houses for survey.

PROFORMA

- Name		
- Number of rooms in the house		
- Total cft of timber used or Total cost of purchased timber OR No. of tree trunks used		
- Timber species used	1. 2.	
- Source of timber	Own	
	Purchased locally	
	Purchased from outside	

7.13 COMMERCIAL AND EXPORT NEEDS OF BIOMASS

AIM : 1. To estimate the extent of biomass fuel, fodder, etc exported.

2. To estimate biomass needs for industrial and commerical purposes, like brick lime and tile manufacture.

7.11. LEAF MANURE USE AND CROP RESIDUE YIELD:

AIM: To estimate the leaf manure use (direct, mulch, as animal bedding) and productivity of crop residue with its end use.

SAMPLE: About 10 farmers - 5 small
- 5 large

METHOD: Survey using a questionnaire.

Farmers name _____ Village_____

Crop	Variety	Area	Leaf manure quantity	Source of leaf manure	Tree species	Crop residue yield	Enduses of residue

Record the leaf manure quantity used and the yield of crop residue in local units like baskets, cartloads, headloads, bundles and later convert them to tonnes by sample measurements.

7.14 PERCEPTIONS OF THE COMMUNITY AND PAST TRADITIONS:

AIM : To understand the traditional knowledge and practices of several aspects of revegetation, soil and water conservation, protection and sharing of community resources.

METHODS : The information to be collected on these aspects is going to be qualitative.

- The method suggested is group discussion using an open ended questionnaire.
- All the categories of households have to be selected

for example :
1. Farmers
2. Landless families
3. Basket and mat weavers
4. Potters
5. Shepherds
6. Women

1) Tree species choice for different end uses and locations

Women			Basket Weavers		
	Tree species choice	Reasons		Tree species choice	Reasons
END USES - Fuel - Fodder - Timber - Manure			END USES - Basket weaving - Roofing - Fuel - Fodder		
LOCATION - WL - Bunds - Road sides			LOCATION - WL - Bunds		

Similarly prepare proforma for other categories of households end uses and locations.

METHODS : EXPORT - FUEL : Select all the households involved traditionally in selling headloads of firewood.

FODDER : Select 10 large and 10 small farmers for survey using a questionnaire.

PROFORMA

FUEL				FODDER	
Household	No. of days spent on exporting headloads per month		No. of headloads sold per day	Farmers name	Export of fodder last year cart/ tractor load
	Summer	Rainy			

METHOD - COMMERCIAL - Brick making, lime burning etc

- Sample : Select all the households involved in brick and lime burning and interview them.

PROFORMA

BRICKS	LIME
1. Brick maker	1. Name of lime producer
2. No.of bricks made during the year	2. Qty of lime produced : Units Qty
3. Fuel used : Own / Purchased - Local / Imported	3. Fuel : Source : Own / Purchased - Local / Imported
4. Qty used : Units(local) Qty	4. Qty used : Units Qty

3) Any past traditions of management of community resource

(only outlines are given and these have to be elaborated)

	Group discussion in the Village
1. Protection of trees in common lands from - Theft - Fires - Overuse or misuse	
2. Punishment practices for theft, fires or misuse - by whom - mode of	
3. How to share the produce ? - method of harvesting - method of distribution in the community	
4. How the local disputes were settled - on land, water, trees, houses ?	
5. What was the procedure for using community water source ?	
6. Any grazing management practices in the past ?	
7. Were there any local committees or institutions for the above in the past ? - Structure and composition - Functions, powers, authority	

2) Land capability and possible uses for the WL

Suggessions of different communities for possible uses of community resources - WL, water, grazing land etc and their capability.

Suggestions for use of community resources

	Examples of uses	Opinion and Suggestions: Farmers / Women / Artisans / President of local panchayat
WL	- Biomass forest - Cropland - Natural regener-ation - Fodder plantation	
Grazing land	- Biomass forest - Fodder plantation - Managed grazing - Status quo	
Road sides	- Fruit trees - Shade trees - Flowering trees	
Stream water	- Construct a bund and collect water for afforest-ation - Divert it to irrigation	

Similarly prepare proforma for other land category and end uses and different communities.

Survey of the perceptions of the people on a new management system:

QUESTIONNAIRE

Note : - Opinions of different categories (women, artisans, landless, panchayats etc) is proposed to be elicited on an alternate management system.

PART I

1. Currently is there any management system or committee in your village ?
2. What is its structure and composition ?
3. What are the functions of the committee ?
4. Has it ensured protection of community resources ?
5. Has it ensured equitable distribution of the benefits ?
6. If not, why it has failed ?

PART II

Assuming the community will suggest a new management system, the following questions are framed.

1. What is the suggestion for the proposed organisation
   - a cooperative society
   - a new management committee
   - only through panchayats with some modification
   - others

4. Opinion on management of WLD

AIM : To obtain suggestions and opinion of different communities regarding decision making, development, protection and sharing of benefits of WL.

- What should be the institutional structure for managing the WL.
- This is a very critical aspect for ensuring implementation of WLD programme.

METHODS:- Interview using an open ended questionnaire.

- Whom to interview
  - Women
  - Artisans
  - Farmers
  - Landless
  - Panchayat
    - members
    - president

- Interview each category separately in groups to get their independant views.
- Before starting the discussion explain the purpose of asking them. The main aim of WLD is to meet their community needs of biomass. For the sucessful management; from identification of land to planting to sharing benefits the participation of village community is a necessity. In such case the community itself should suggest the structure, functioning and powers of the institutions required.

5. Role and functions of the proposed committee, government agencies and panchayats.

Decision regarding	Role of		
	Proposed committee	Panchayat	Govt. agencies
1. Species choice			
2. Identification and demarcation of land			
3. Fencing decision			
4. Land preparation, planting, watering, nursery			
5. Community forest protection from - Theft - Fire - Misuse			
6. Punishment in case of theft or fire or misuse - by whom - mode of punishment			

.....Continued.

2. What should be the composition of the proposed organization (committee)

Members	No.	Members	No.	
- Landless		- Women		
- Farmers		- From panchyat		
- Artisans		- Forest dept.		
- Agril. dept.		- Others		

3. Who should become the head of the committee ?

   - From among landless or women or from panchyat,
   - Should he or she be elected.

4. Who should become the secretary of the organization?

   - Govt. representative
   - village community person,
   - Panchayat secretary

8. ANALYSIS OF DATA FROM INTENSIVE STUDY

Data collected during the intensive studies have to be analysed in such a way that it should guide us to generate solutions to the defined problems; technical, social, institutional. Some of the major results of data analysis would be as follows:

8.1. MAJOR FINDINGS OR RESULTS:

1. Contour map of the WL (Wasteland).
2. Soil status and land capability classification.
3. Extent of land actually available for revegetation or grazing management.
4. Extent of water availability for revegetation or fodder plantations - in different seasons.
5. Demographic and socio-economic data,
   - population (human and cattle), occupation pattern, land use pattern.
6. Vegetation (tree, grass and shrub) features in different land categories.
7. Local tree diversity and enduse of different species.

.....Continued.

7. Distribution of produce (benefit) - What should be the share of different communities - artisans - landless - farmers - Basis for distribution - per household basis - per capita basis - per animal basis - sale within the village - free distribution - distribution in exchange for labour - graded subsidy - Should the sale of produce outside the village be permitted			
8. WATCHMAN - Should a watchman be appointed full time - How to meet his salary bill			
9. FUNDING FOR REVEGETATION - Who should fund the revegetation - What should be the contribution of panchayat - Can village community contribute labour			

Based on the analysis define the needs of the community and problems associated with natural resourcces to enable planning for sustainable development.

8.2 OUTLINES OF EXPECTED OUTCOME:

Analysis of data, observations, perceptions, local knowledge, and technological options should lead to preparation of plans for WLD.

1. SOIL AND WATER CONSERVATION MEASURES ON WATERSHED BASIS

- Allocation of land based on land capability: trees, grass.
- Land correction measures,
- Check bunds,
- Contour trenchs,
- Farm ponds,
- Resource requirements: Labour, funds etc.

2. BIOMASS CONSERVTION PROGRAMME:

- Technologies for different activities.
- Resource requirements: funds, trained personnel, material.
- Technology dissemination strategy.

3. PLAN FOR BIOMASS PRODUCTION

- Estimation and definition of needs: fuel, fodder, bamboo, timber, oilseeds, leaf manure fruits etc.
- Incorporate needs into a plan.

8. Quantities of biomass used (or required) in the community for different purposes,

   - Fuel - Fodder - Timber - Leaf manure
   - Basket making - Mat making - Bricks - lime

9. Sources of biomass for different purposes

   - crop residue, trees, shrubs, coconut plantions, forest, WL.

10. Magnitudes of import and export of biomass

    - Fuel, timber, bamboo, fodder, etc.

11. Labour availability locally for revegetation or soil and water conservation.

12. Livestock grazing practices - location and human effort for grazing.

13. Community's perceptions and suggestions on:

    - problems of their environment,
    - Possible end uses of community resource;

      -W L,
      -Water,
      -Grazing Land.

    - Management of the community resource.

      Method of sharing benefits or produce.

    - Institutional or organizational structure.
    - Tree species for different locations and end uses.

14. Past traditions and practices of resource use and management as guide to future.

8.3. AVAILABILITY OF INFORMATION

One major lacuna is the availability of information on various technologies, practices and procedures on the above programmes in local languages. Thus it is assumed that the following material would be made available to the field staff in local languages.

1. Introduction to India's agroecosystems.
2. Handbook on soil and water management practices on a watershed basis.
3. Manual on biomass conservation technologies.
4. Manual on revegetation techniques
   (Nursery techniques, land preparation, species-mix, planting, after care, fencing, harvesting procedures).
5. Education material;
   - Training manuals for teachers, adult educators.
   - Audio-visual aids - for adults,
     - for children.
6. Manuals on how to involve the community;
   - Approach to women's participation.
   - Case studies of sucessful involvements of local community in WLD.

- Species - mix or choice.
- Fencing material and technology.
- Resource requirements: phased funding, labour (seasonwise), seeds, plastic bags etc.
- Methods of harvesting the produce.
- Source of water for revegetation.

4. PROGRAMMES FOR EDUCATION OR CREATION OF AWARNESS:

Programmes for : - Students, women, landless, artisans.
- Training teachers and adult educators.

5. PROPOSED INSTITUTIONS FOR PEOPLE'S PARTICIPATION:

- Structure, composition of proposed institutions.
- Role, functions and powers.
- How to ensure participation of women, landless and artisans.
- Role of local panchayat.

6. ROLE OF PROPOSED INSTITUTIONS:

- Protection of vegetation, incentive and punishment procedures.
- Management of grazing land.
- Species-mix: role of local community.
- Procedures for sharing the produce.
- Co-ordination with government departments.
- Mangament of funds.

requirements of the village community. Thus there is a need to reduce the land requirement for growing fuel biomass by reducing the requirement of biomass itself by increasing the efficiency of biomass use.

2) CONSERVATION IS CHEAPER THAN PRODUCTION:

Studies have shown that conservation is always cheaper than production. According to a study conducted by ASTRA, the investment required for producing 1 t of biomass fuel is 45% higher than the investment required to conserve 1 t of biomass fuel through the fuel efficient stove programme.

3) GESTATION PERIOD IS SHORTER:

It would take at least 4-5 years to raise an energy plantation to produce wood for cooking. The biomass conservation programme could be implemented in a very short time (of say a few months) and the reduction in fuel use would be immediate as in the case of fuel efficient cook stove or biogas programmes.

4) LEADS TO REDUCTION IN PRESSURE ON FORESTS OR VILLAGE TREES:

Adoption of efficient or alternative technologies leading to reduction in biomass requirement would result in reduction of pressure on the village tree resource or nearby forest. This is necessary as the existing biomass sources are often overexploited and are already in a degraded state.

9. BIOMASS CONSERVATION OPTIONS

Biomass conservation options have been considered in some detail here as in many manuals or monographs this aspect is not generally considered.

Biomass is used for various purposes in rural areas. Biomass use as fuel is one of the dominant end uses of biomass in any village. Biomass is increasingly becoming scarce in rural areas. The reasons are many; (i) felling of village trees to meet the urban demand, (ii) loss of village common lands and the resulting loss of tree, shrub and grass biomass resource, (iii) increasing demand due to population growth (iv) less efficient use and (v) deforestation. Studies have shown that rual women spend several hours each day to gather fuelwood for domestic use. The prices of fuelwood has increased so much that poor can't afford to buy it in the market. This situation has led to the awareness on the need to use biomass efficiently and to find alternative technologies to conserve fuelwood.

9.1. NEED FOR CONSERVATION:

1) SHORTAGE OF COMMON LANDS:

Common lands (or C and D class land or gomal land or protected forest or temple or panchayat land) are being enchroached both by the farmers as well as Government departments. Thus in most villages (probably excluding the forest dominated districts) either there is no common land or the common land available would be inadequate to grow all the biomass

A. COMMUNITY BIOGAS OPTION:

The approach would be to go in for centralized biogas production at community level. Here all the dung available in the village could be collected each day and biogas could be produced centrally. The community biogas potential could be estimated by using the following data;

i. Mean dung yield of cows, bullocks, buffaloes and calves

ii. Cattle population of the community

iii. Human Population

iv. Biogas yield potential of 0.04 m^3 (35-40 litres) per Kg of dung

v. Biogas requirement of about 0.3 m^3 (300 litrs) per person for cooking per day.

In majority of the village situations the dung resource available may not be adequate to meet the cooking energy requirement of all the households. Even if it is not possible to meet the requirement of all the households it will still be worthwhile to consider the community biogas option because;

(i) all the dung resource available or the full biogas potential could be utilised, and

(ii) the economics is highly favourable i.e. the investment required per capita would be low compared to the family biogas plant option.

9.2. ACTIVITIES USING BIOMASS AS FUEL:

Some of the dominant activities using biomass as fuel are listed below.

1. Cooking
2. Heating bath water
3. Pottery
4. Lime production
5. Brick production

9.3 TECHNOLOGICAL OPTIONS FOR BIOMASS FUEL CONSERVATION:

There are two types of technological options for conservation of biomass fuel.

1. Alternative sources of energy

   Examples: - Biogas
   - Solar water heaters
   - Pressed soil blocks

2. Efficient devices

   Examples: - Fuel efficient cook stoves
   - Fuel efficient bath stoves
   - Fuel efficient kilns

1. BIOGAS

Biogas is a renewable source of energy based on cattle dung. Adoption of biogas technology would lead to substitution of wood by biogas. There are two options for using the biogas potential;

A. Community biogas plant option,

B. Family size biogas plant option.

C. FUEL CONSERVATION POTENTIAL:

The biomass fuel conservation potential could be worked out by considering the number of households and the population covered by the biogas technology.

Biomass conserved

= (Fuelwood use/capita/day) * (No. of persons switching to biogas) * 365 days

2. FUEL EFFICIENT STOVES:

The thermal efficiency of traditional stoves is low. Realising this a number of fuel efficient stoves have been developed. These stoves are being disseminated in the field. A study in Tumkur district in Karnataka has shown that a 30% reduction in fuel consumption could be achieved using ASTRA stove in the field. However it is necessary that the stoves are built properly (according to design specifications) and the housewife is given adequate information on the operation and maintenance of the stove. All the households who are not going in for biogas technology could be provided with fuel efficient stoves.

FUEL CONSERVATION POTENTIAL:

The biomass fuel conservation potential could be estimated by the following equation.

Quantity of biomass fuel conserved

$$= (\text{No. of persons to be covered by the stoves}) * (\text{Fuel/capita/day}) * \frac{30}{100} * 365 \text{ days}$$

One approach could be to price the dung as well as the biogas in such a way that maximum quantity of dung available could be used for biogas generation. However, one disadvantage is that the rural poor who do not own cattle or do not have adequate cattle will be left out as they may also not have the purchasing power to purchase biogas. With the adoption of community biogas option even for a part the village population the demand for biomass and the pressure on village tree resource would be reduced.

B. FAMILY SIZE BIOGAS PLANTS:

Using the earlier mentioned data at family level it would be possible to identify all the households who have adequate dung potential to go in for a family size biogas plant. It is necessary to find out how many of the households with biogas potential would be ready to adopt the technology if credit or subsidy is provided. It is likely that majority of the households may not agree to adopt the family size biogas option even if credit is available due to several reasons, namely; (i) the cost per biogas plant is still high, (ii) the land required for a biogas plant may not be available, (iii) these families may have their own source of fuelwood, and (iv) they may be obtaining fuelwood at zero cash cost.

Biomass Conserved

= (No. of bricks substituted by pressed soil blocks) * 0.3 Kg of wood/brick

However, there is a need to undertake demonstration of the pressed soil block technology in the regions selected to educate the community.

9.4 ALLOCATION OF FUNDS FOR BIOMASS CONSERVATION OPTIONS:

By considering the technologies mentioned above, it would be possible to reduce the demand for biomass fuel considerably. As mentioned earlier the cost of conserving 1 t of biomass is much lower than producing 1 t. Thus the funds required for implementing various biomass conservation technologies should be estimated and included in any proposal of afforestation or revegetation or biomass production programmes in rural areas.

10. REDEFINE THE BIOMASS REQUIREMENT

10.1. CURRENT AVAILABILITY OF BIOMASS:

Village community is currently obtaining the fuel biomass from various sources available locally and these will have to be estimated before arriving at the actual requirement. It has to be recognised that there are difficulties in estimating the tree or shrub biomass available for use as fuel or fodder or timber. Biomass available from crop land could be estimated and grassland productivity estimate could be obtained from literature. Some

3. FUEL EFFICIENT BATH STOVES:

Studies have shown that biomass fuel use for heating bath water accounts for about 20-25% of the biomass fuel used for cooking. Thus by switching to efficient alternatives a signifiant reduction in biomass fuel use is possible.

For example in Karnataka ASTRA, Indian Institute of Science has developed fuel efficient bath stoves. All the households in the community could be switched to fuel efficient bath stoves. A 30% reduction in fuel use is possible.

Biomass fuel conserved

$$= \text{(Tonnes of fuel used for heating bath water/year in the community)} * \frac{30}{100}$$

4. SOLAR WATER HEATERS:

Though a possibility exists adequate information regarding the cost, life, maintenance aspects, etc. of solarwater heaters for rural applications is not available.

5. PRESSED MUD BLOCK TECHNOLOGY:

This technology involves compaction of soil in a mannualy operated machine to obtain mud blocks. There is no need to burn or fire the machine made mud blocks. To that extent firewood would be saved. This technology has already been demonstrated in several villages of Tumkur and Bangalore districts. Pressed mud block technology is suitable for the red soil zones of Karnataka. The machines for making the mud blocks are commercially abailable.

11. LAND REQUIRED AND AVAILABLE

After estimating the actual quantities of different types of biomass required it is necessary to estimate the land required to grow the biomass. Often it may turn out that the land available is inadequate to grow the requirement. To estimate the land required, productivity of the proposed forest or grassland or fodder plantation for the given soil and water condition is necessary. However one of the major lacunae in forestry research is the lack of studies in different regions on the performance of different tree species especially local species in monocultures as well as polycultures. In the absence of data some approximations on productivity could be obtained by discussing with local forestry experts.

If the land available is inadequate to grow the required biomass as a captive forest other options of growing trees or grass along bunds, road sides, along water bodies and near houses needs to be explored. According to a study in a village in Tumkur district 3% of dryland and 10% of irrigated land is covered by bunds. Even if adequaate WL is available it is desirable to undertake planting of tree or grass species along bunds, road sides and stream banks. There is a need to educate the farmers to bring the marginal cropland owned by them, under tree or grass cover. This should be based on land capability survey.

rough estimates of fuelwood from trees could be attempted after getting data on number of trees in the village ecosystem. The quality of fuel currently used and the quality preferred has to be considered here. Women may prefer to shift from the low quality fuel currently used in the village. Further the subsistance and commercial requirement has to be estimated. Obviously subsistance requirement should get priority in land allocation.

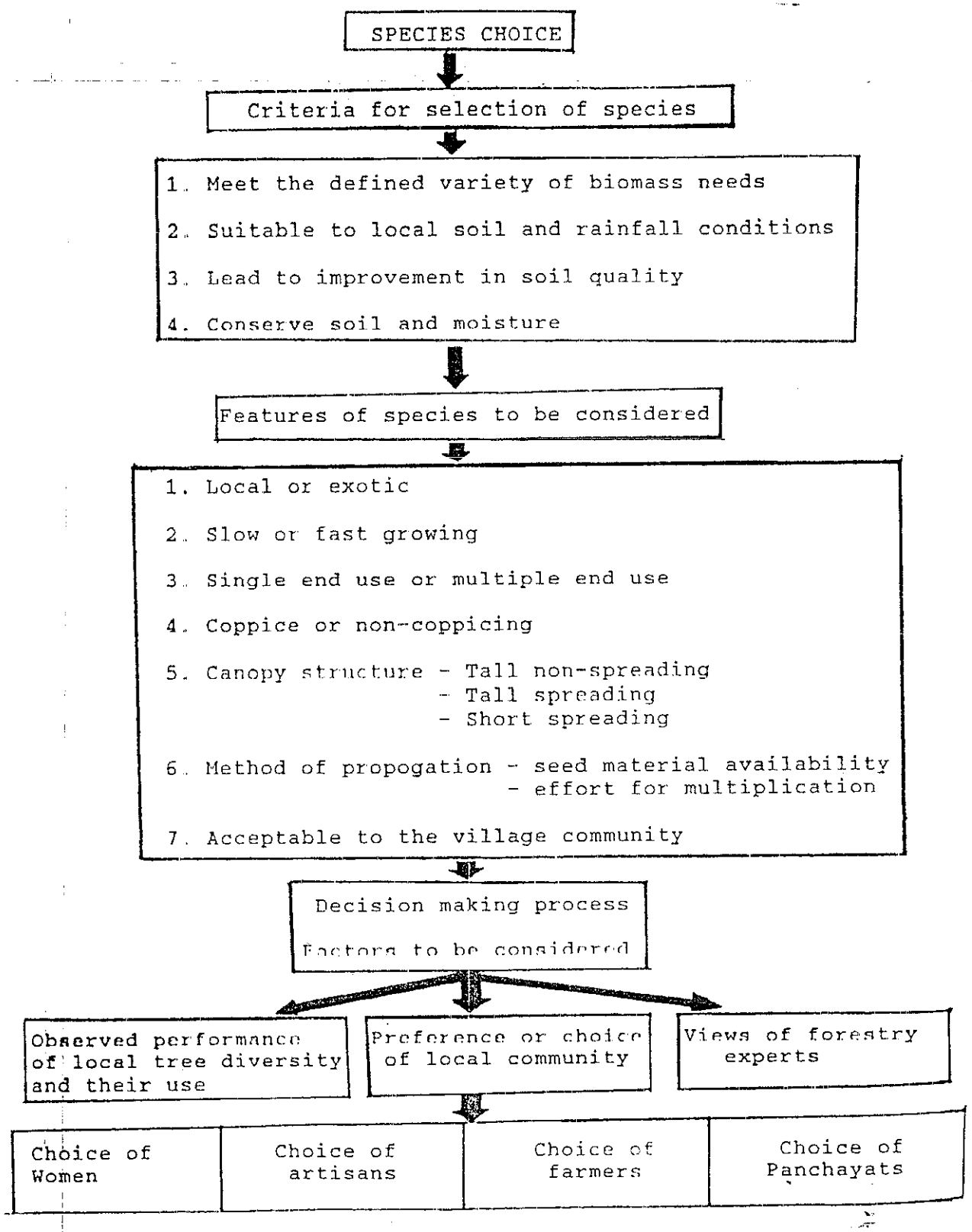
10.2. FUEL BIOMASS TO BE GROWN:

The current biomass use as fuel and potential for conservation by adopting alternative and efficient technologies could be estimated. The actual fuel biomass required could be estimated as follows;

Fuel biomass to be grown	=	(Current consumption)	–	(Estimated conser- vation potential)	–	(Current availability)

However there is a need to demonstrate and field test the biomass conserving technologies and only after they are found acceptable and beneficial they have to disseminated.

FIG. 5 CRITERIA FOR SPECIES CHOICE



12. SPECIES CHOICE OR SELECTION

Selection of tree or grass species for revegetation is an important step in WLD. The factors and features to be considered and the approach for decision making is given in Fig. 5. Who should make the dicision on choice of species for different enduses and locations? In several programmes normally the forest department officials take the decisions. If the aim is to meet the community needs of biomass, the choice of the community should be the dominant factor. Next question is who in the community should be consulted?

12.1. INVOLVEMENT OF DIFFERENT COMMUNITIES:

WOMEN: It has been realised now that women are more closely associated with natural resources and they will be the real beneficiaries or sufferers of changes in the status of natural resources. If only men are consulted women's requirement is unlikely to be included. In rural areas mainly women extract resources like fuel wood, green grass, tree leaves for manure purpose and herbal plants. Women also fetch water, tend cattle and so on. Thus women's opinion must be given greater weightage than that of men whose main interest may be commercial. A group meeting of women could be organized by the woman staff for selecting the tree species.

12.2. OBSERVED PERFORMANCE OF THE SPECIES:

Data on the local diversity and dominance of the tree species under different soil and moisture conditions would give an indication of the performance of different species. For a given need say fuel or fodder there may be 10 species. The question that arises is, which of these 10 species and in what proportion or combination should they be selected. Experience of the local elderly persons would be very valuable in understanding the performance of tree species in that village.

13. PROGRAMME FOR CREATING AWARNESS:

The main aim would be to create awaness in the local community and motivate them to participate in WLD or natural resource management. Without active participation of the local community such programmes cannot take root or get distorted. Involvement of commuity should not mean domination by the panchayat leaders or influential farmers. Women, artisans, landless and school students should be involved and seperate programmes have to be organized for each community. The approach is given in Fig. 6.

To organize these awarness programmes there is a need to train teachers for school programmes, lady adult educators or volunteers for women programmes. These programmes have to be organized before and after the intensive survey.

ARTISANS: Normal tendency is to ignore the biomass needs of artisans like basket weavers, mat weavers and potters. One of the important aims of WLD should be to generate employment opportunities. Given the fact that there is a severe scarcity of biomass for the artisans due to several factors, there is a need to make special provision for growing their biomass needs. Group meetings should be held seperately with each artisan community for eliciting their choice.

PANCHAYAT: The tendency of members of local panchayat or its head would be to favour growing tree species with commercial value. They may prefer exporting the produce to urban market. Thus care should be taken in involving the panchayat or its president in decision making. The ideal approach would be to elicit the choice of artisans, women and landless and present it to the panchayat or the commitee in charge of forestry for their information and approval.

FORESTRY EXPERTS: For revegetation of WL selection of tree or grass species should mainly be made by the local community; women, artisans, landless and farmers in that order. However the technical opinion of the forestry experts familiar with the region needs to be considered. They may suggest some new promising species. The ideal approach would be to take the experts to the village and involve them during discussions with various communities. But it is necessary to make sure that experts do not dominate the decision making process.

14. TECHNIQUES OF REVEGETATION AND SOIL AND WATER CONSERVATION:

Manuals describing the soil and water conservation practices, fencing, silviculture practices, harvest procedures, seed collection etc. are not easily available for different regions especially in local languages. Techniques for tackling problem soils like saline soils, highly eroded and degraded soils also should be included in the manual. Discussion on the technical aspects is beyond the scope of this report. In fact there is an urgent need to prepare manuals describing the above for different regions.

15. NEED FOR TRAINING PROGRAMMES:

The rapid appraisal surveys, intensive studies, data analysis, plan preparation, implementation and monitoring are specialized jobs. There is a need to conduct seperate training programmes for personnel at different levels. Teaching manuals and field manuals have to be developed for conducting field studies (rapid and intensive), data analysis and plan preparation, awarness and education programmes, programme implementation, monitoring and above all on how to involve local communities especially women, landless and artisans in WLD. One of the problems would be to find resource persons especially women resource persons for conducting the training programmes.

FIG. 6. AN APPROACH TO CREATING AWARNESS

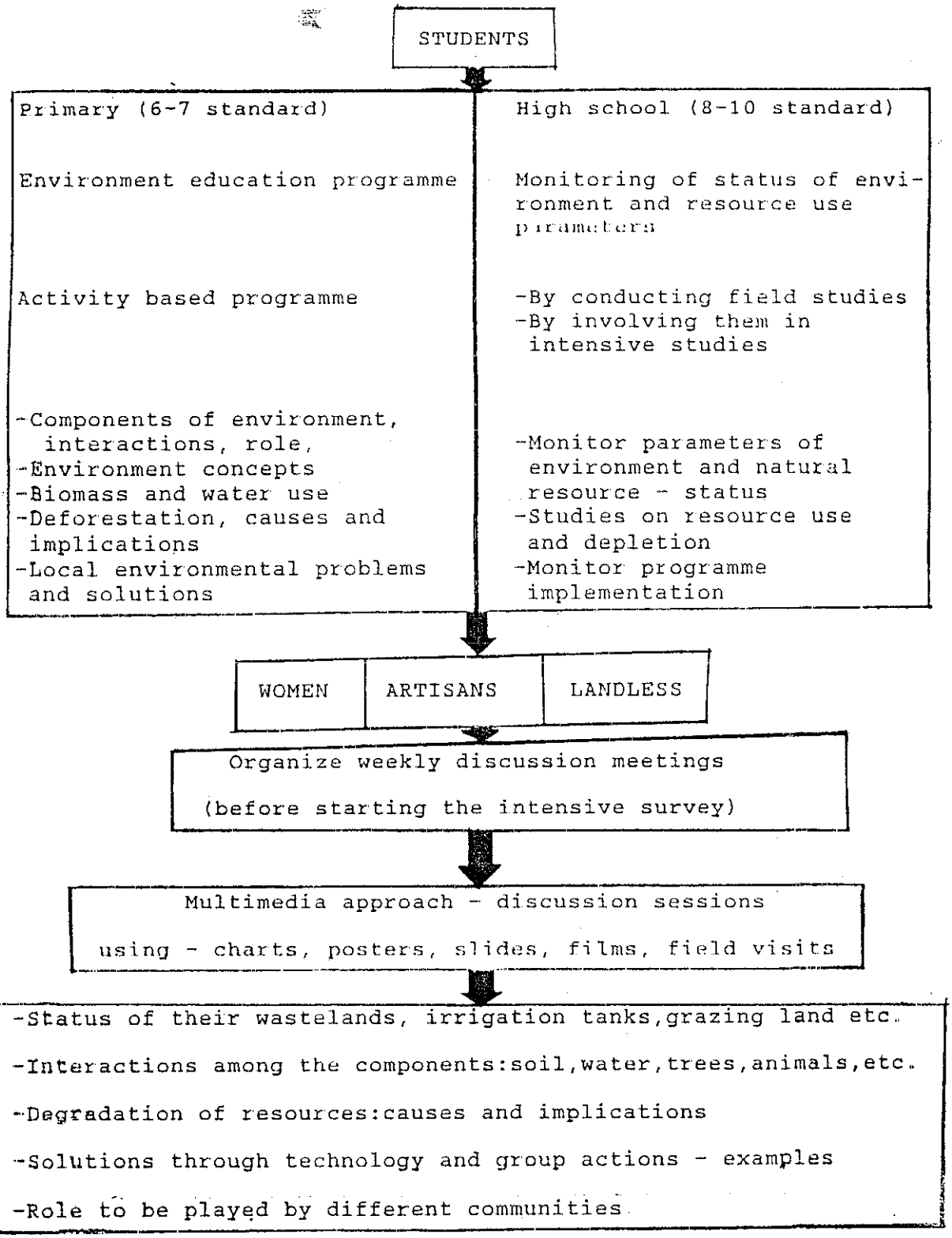
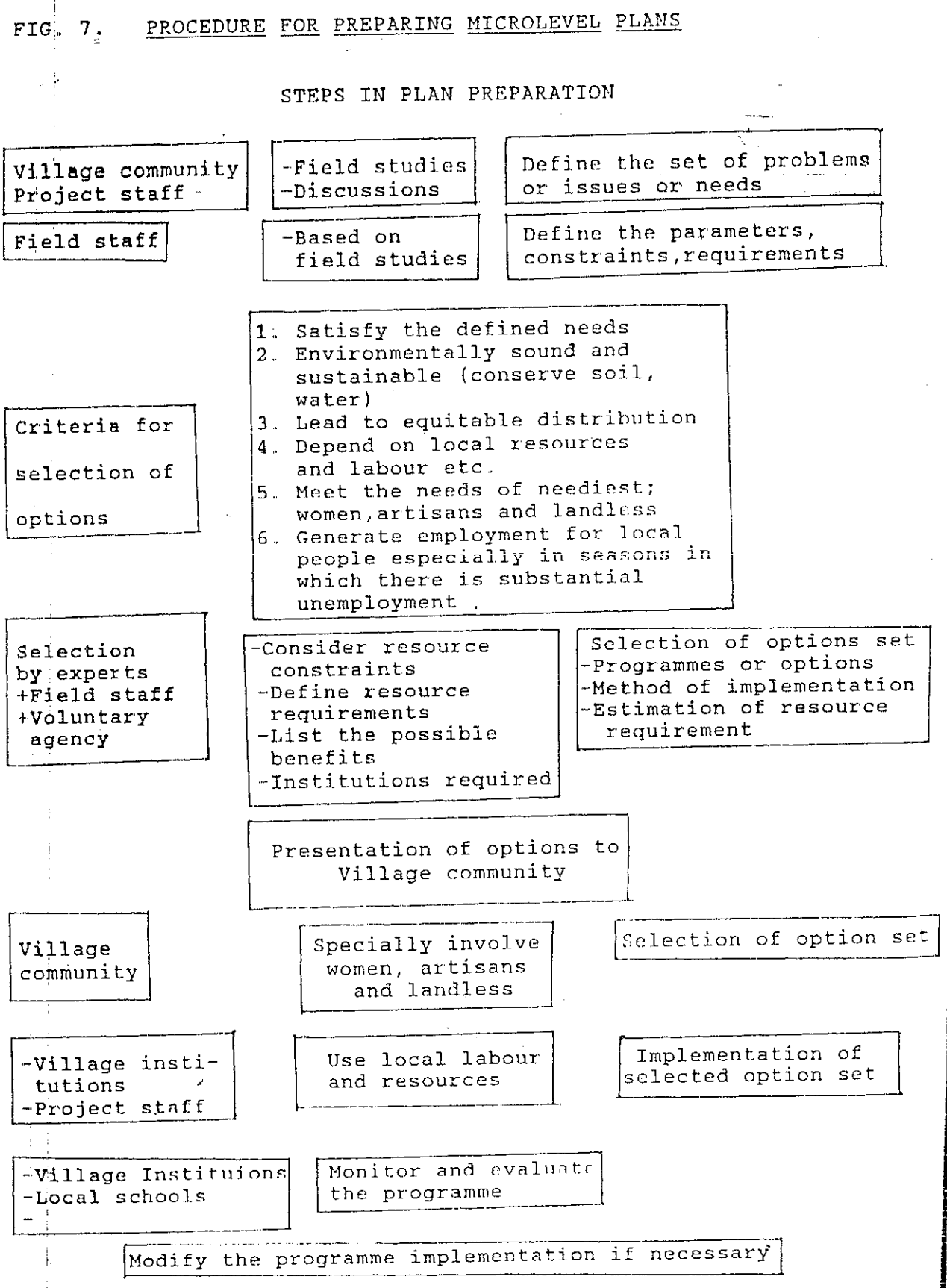


FIG. 7. PROCEDURE FOR PREPARING MICROLEVEL PLANS



1.	District level coordinators	-	National level	- One week
2.	District level specialists	-	State level	- 3 days
3.	Field officers	-	District level	- One week
4.	Village level workers / field workers	-	Block level	- 3 days
5.	Voluntary agency personnel	-	District level	- 3 days
6.	School teachers	-	District level	- One week
7.	Field investigators: Survey and data collection	-	District level	- 3 days

16. PREPARATION OF MICROLEVEL PLANS

This is a highly specialized task involving experts, field officers and village community. This phase starts after analysing the data and defining resource levels, requirements and problems. Technological, social and institutional solutions have to be identified. The procedure to be followed is presented in Fig. 7. To find acceptance in the field the local community must be involved at various stages. The suggested solutions should also be accompanied by institutional support required to implement the programme.

17. SCHEDULING OF REQUIREMENT OF RESOURCES:

Resources required for implementing the selected options needs to be estimated. It is necessary to estimate the resource required seperately for different programmes. The contribution of local community in the form of labour or provision of fence material etc. has to be included.

Table 6. SCHEDULING OF RESOURCE REQUIREMENT

Programme 1: NURSERY

Months	Tree species	No. of seedlings to be raised	Material		Labour man/woman days	Transportation requirements carts, tractor	
			Plastic bags	Manure			

Programme 2. CONSTRUCTION OF FUEL EFFICIENT STOVES

Months	Procurement of components			Training builders	No. of builders required	Funds	No. of stov to be buil
	Chimney pipe	Grates	Firebox lid				

Programme 3. CONTOUR TRENCHING

Months	Implements required	Labour required		Funds	Area to b covered
		Men	Women		

Programme 4. TEACHERS TRAINING PROGRAMME

Month	How many teachers	Material required	Funds required	

Similarly prepare resource requirements and time schedule for all the other programmes.

The scheduling of requirement of labour has to be carefully worked out in consultation with local community such that as far as possible only local labour is used. Scheduling of collection of seed material has to be planned one year ahead keeping the seasonality of the availability of tree seeds and their viability. Similarly live fence has to be planted at least one year in advance to be effective. These examples show the need for preparation of a time schedule of different activities and requirements of resources. A set of examples are given in Table 6.

18. ASPECTS NOT COVERED IN THE GUIDELINES:

1. The draft guideline does not attempt to provide any set of solutions to the problems of WL. The solutions would have to emerge from the field studies as well as from the discussions with the community. For example the community WL in a given village may have to be left for natural regeneration or for managed (or controlled) grazing and not necessarily for planting trees, depending on the decision of the community.

2. The draft also doesn't consider broader policy issues like improving agricultural productivity or improving the breed of cattle or reserve forest management or marketing of milk or legal aspects of land.

3. Technical aspects of biomass production or conservation of biomass or soil and water conservation are not covered. For example details of how to draw contours and how to estimate the volume of farm ponds, statistical analytical techniques, method of propagation, choice of fence material and legal aspects of local institutions and land ownership are not connsidered here. Such issues will have to be covered seperately.

The present draft aims only at providing an outline of the approach to be adopted, the steps to be followed and examples of methods to be adopted to achieve the goals of wasteland development or management of natural resources. The approaches and methods may have to be suitably modified depending on the local situations.