

# Chapter -1

## Concept and Dimension

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After the independence, India has witnessed an unprecedented pace of development activities in the form of urbanization coupled with industrialization, expansion of roads and national highways, railways networks, transformation of traditional agricultural fields into modern agro-technology based agricultural production system etc. The outcome of all these development activities has been the loss of biodiversity, negative impact on human health and disruption in environmental balance.

While admitting that such developmental activities only could ensure higher economic growth, the Government of India put much emphasis on the vital need for conservation and management of the eco degraded and threatened environment. This has necessitated to uptake Rapid Environmental Impact Assessment(REIA), which is now being considered as a compulsory exercise for major developmental sectors to get clearance from the Government.

West Bengal used to be the leading industrial state prior to and after the independence of India, besides supply of electricity to the every households of village area it is essential to set up new power plans.

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### **1.1 The EIA Process in India**

From the environmental angle, EIA has become an administrative requirement. The role for EIA was formally recognized at the earth summit held at Rio conference in 1992. Principle 17 of the Rio declaration states that –“EIA as a national instrument shall be undertaken for the proposed activities that are likely to have significant adverse impact on the environment and are subject to a decision of a competent national authority”.

In India many of the developmental projects till as recently as the 1980s were implemented with very little or no environmental concerns. The environmental issues began receiving attention when a national committee on environmental planning and coordination was set up under the 4th five year plan (1969-1978). Till 1980, the subjects of environment and forests were the concern of the Department of Science and Technology and Ministry of Agriculture respectively. Later, the issues were informally attended by the Department of Environment which was established in 1980. This was then upgraded to the Ministry of Environment & Forest in 1985. In 1980, clearance of large projects by the central investment board sought proof of such clearance before financial sanction. Five year later, the Dept. of Environment and Forests released guidelines for Environmental Assessment of river valley projects. These guidelines require various studies such as impacts on forests and wild life in the submergence zone, water logging potential, upstream and downstream aquatic ecosystems and fisheries, water related diseases, climatic changes

and seismicity. A major legislative measures for the purpose of environmental clearance was in 1994 when specific notification was issued under section 3 and rule 5 of the environment protection Act, 1986, called the “Environment Impact Assessment Notification 1994”.The first step in seeking environmental clearance for a development project is to determine what statutory legislations apply to the particular project. The MOEF has brought out several notifications restricting the development of industries in specified ecologically sensitive areas. In addition, there are also draft rules framed for the siting of industries. Environmental clearance for development projects can be obtained either at the state level or at the central level depending on certain criteria concerning the characteristics of the project. However (regardless of where the final environmental clearance is obtained from), for most projects the consent must first be taken from the state pollution control board or pollution control committees in the case of union territories.

### **1.2 List of projects requiring environmental clearance from the central government**

1. Nuclear power and related projects such as heavy water plants, nuclear fuel complex, rare earths etc.
2. River Valley Projects including hydel power, major irrigation and their combination including flood control.
3. Ports, Harbours, Airports (except minor ports and harbours).
4. Petroleum Refineries including crude and product pipelines.

5. Chemical Fertilizers (Nitrogenous and Phosphate other than single superphosphate).
6. Pesticides (Technical).
7. Petrochemical complexes (Both Olefin and Aromatic) and Petrochemical intermediates such as DMT, Caprolactam, LAB etc. and production of basic plastics such as LLDPE, HDPE, PP, PVC.
8. Bulk drugs and pharmaceuticals.
9. Exploration for oil and gas and their production, transportation and storage.
10. Synthetic Rubber.
11. Asbestos and Asbestos products.
12. Hydrocyanic acid and its derivatives.
13. (a) Primary metallurgical industries (such as production of Iron and Steel, Aluminum, Copper, Zinc, Lead and Ferro Alloys).  
(b) Electric arc furnaces (Mini Steel Plants).
14. Chlor alkali industry.
15. Integrated paint complex including manufacture of resins and basic raw materials required in the manufacture of paints.
16. Viscose Staple fibre and filament yarn.
17. Storage batteries integrated with manufacture of oxides of lead and lead antimony alloys.
18. All tourism projects between 200m—500 metres of High Water Line and at locations with an elevation of more than 1000 metres with investment of more than Rs. 5 crores.

19. Thermal Power Plants.
20. Mining projects \*(major minerals)\* with leases more than 5 hectares.
21. Highway Projects (except projects relating to improvement work including widening and strengthening of roads with marginal land acquisition along the existing alignments provided it does not pass through ecologically sensitive areas such as National Parks, Sanctuaries, Tiger Reserves, Reserve Forests)
22. Tarred Roads in the Himalayas and or Forest areas.
23. Distilleries.
24. Raw Skins and Hides
25. Pulp, paper and newsprint.
26. Dyes.
27. Cement.
28. Foundries (individual)

### **1.3 Draw back in the Indian system**

1. Even though some of the industrial set ups do not require EIA as per the statutory norms, they might involve certain technological processes which could be harmful to the environment, as a result of which such enlisted industries could have potential impacts on the environment and on public health.
2. Exempting industries from the EIA requirements based on the investment value of specific projects is not acceptable. There are no specific studies conducted till now which demonstrate that

environmental impacts are always inconsequential for projects under a given value. It is a well established fact that the small scale industries are contributing more pollution with respect to the major industry.

### ***Agro Ecosystem Analysis***

In recent years there has been growing demand for a more multidisciplinary and holistic content to agricultural research and development. Farming systems research and integrated rural development are two responses to this demand but, in common with other multidisciplinary approaches, they face the problem of trying to encompass a breadth of expertise while at the same time generating a common agreement on worthwhile practical action. The procedure of agro-ecosystem analysis which is described and illustrated here combines a rigorous framework with sufficient flexibility to encourage genuine interdisciplinary interaction. It has been designed and tested in Thailand over the past few years. The procedure uses a systems analysis approach in a workshop environment. The participants begin by defining the objectives of the analysis and the relevant systems, their boundaries and hierarchic arrangement. This is followed by pattern analysis, the system being analyzed by all the participating disciplines in terms of space, time, flows and decisions. Those patterns are important in determining the important system properties of agro-ecosystems, viz. productivity, stability, sustainability and equitability. The outcome of the analyses is a set of agreed key questions for future research or alternatively a set of tentative guidelines for development.

Agro-ecosystem analysis is an effective decision making tool for critically examining the roles, responsibilities, constraints, capacity building requirements, opportunities, costs and corresponding benefits, etc. and then drawing of the intervention plan for agricultural development. Such analysis takes into account the detailed description of activities undertaken by men and women in any given sector of agriculture (like crop production, dairy, fisheries, sericulture, etc.). These information they need to be matched with planning in appropriate interventions to bridge gap, if any and their implementation mode considering the gender characteristics. While planning for extension of any agro-technology, the development agents need to continuously ask themselves within the sector of agriculture, who does what and what interventions are needed to increase the efficiency of the most usual performer of the tasks. Based on such information, development interventions are to be planned and disseminated.

### **Agro-Ecosystem**

An agro-ecosystem (or agricultural-socio-economic-ecological system) is an ecological system partially modified by human to meet his present and future demands for agricultural produce. Example: Rice field.

### **Features of an Agro-ecosystem**

1. Well defined boundaries
  - Bund made up of soil
  - External linkage limited for irrigation

2. Dominating to human introduced component
  - Rice, dominating in number and area
  - Reduction in natural and biological components
3. Sustenance of ecological processes
  - Competition between rice crop and weeds
  - Herbivorous of rice by pests
  - Predation of pests by natural enemy
4. Human intervention alters ecological forces
  - Cultivation and harvesting of rice crop
  - Subsidies in the form of inputs
  - Control of water and pests
  - Co-operation and competition between people in management

### **Properties of an Agro-ecosystem**

Four interconnected properties distinguish one agro-ecosystem from another.

#### **A. Productivity**

It refers to the output per unit of input. It is measured as yield or net income per unit area. Input refers to land, labour, capital, technology, etc.

Productivity can be measured for land, labour, capital and technology.

- Land: output/ha or profit per hectare
- Labour: output/man hour
- Capital: return/unit of capital invested
- Technology: output/unit of technological intervention



Levels of measurement can be plant, crop, field, farm, village, region etc. Productivity may remain constant or increase, or decrease, with similarly measured productivity of different agro-ecosystem. Productivity varies with changes in space, time, flow and decision patterns.

### **B. Stability**

Stability refers to the degree to which production remains constant in spite of normal small-scale environmental fluctuation. Environment includes physical, biological, social and economic factors. Fluctuations may be due to natural (rainfall, temperature, etc.) or artificial (market fluctuations, subsidies) factors. Coefficient of variation of productivity helps to measure stability. Time series of productivity measurements and trend lines are also used to measure stability. Stability may remain constant, increase or decrease with similarly measured stability of different agro-ecosystems. Stability will also show variation with changes in space, time, flow and decision patterns.

### **C. Sustainability**

Sustainability is the ability of a system to maintain the productivity when subject to stress or perturbations in the surrounding environment. Stress refers to times-continuous but relatively small and predictable disturbance. It has a cumulative effect in the productivity. Example: water logging, salinity, indebtedness, etc. Perturbations refer to relatively large and unpredictable but less frequent disturbances which have an immediate impact such as drought, flood or pest attack. Example: Flood, drought, new pest price fall etc. Qualitative measurement is normally used.

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Quantitative measurements are difficult. With shock or stress, the productivity of an agro-ecosystem may remain the same or go down but return soon to original level or go down and settle at a lower level or become very low.

#### **D. Equitability**

Equitability is the measure of how evenly the production of the agro-ecosystem is distributed among people or beneficiaries. The production is measured in terms of total yield or net income for the concerned agro ecosystem. Production may be uniformly distributed with everyone obtaining an equal share (high), or with some receiving more than other (low). Equitability may show variation due to changes in space, time, flow and decision patterns.

#### **Agro-Ecosystem Analysis (AESA)**

AESA is a methodology for zoning and analyzing agricultural systems in order to plan and prioritize agro-forestry research, development, and extension activities. It uses a system approach to gather bio-physical and socio-economic information and to identify key issues or problems within the eco-system that may be used for planning and implementing research, development, and extension programs. Experience has shown that important issues identified cover a range of sectors including agriculture, forestry, livestock, land and water use, infrastructure, community services, social, economic and marketing. It is preferable to use AESA at the operational levels, i.e., district and development zone, where issues identified can be addressed by district planning systems.

AESA is a bottom up approach in analyzing location specific problems and remedies concerning development of agriculture based on analysis of properties of system (Productivity, Stability, Sustainability and Equitability) along with pattern analysis of Space, Time, Flows, and Decisions. It is a technique of understanding the situation of certain agro-socio-economic-ecological complex in a comprehensive manner.

Effective AESA may be done by resorting to Participatory Learning Exercises viz. Participatory Rural Appraisal (PRA)/ Participatory Learning and Action (PLA). It may be defined as “an approach and method of learning about rural life and conditions prevailed therein by way of sharing with the rural people.” It goes beyond of just learning to even analyse, plan and action. Through these exercises community members can investigate, analyse and evaluate the resources, their utilization patterns in respect of Space and Time. Constraints and opportunities of the agro-ecosystem and making formal and timely Decision regarding the development may also be accomplished by these exercises.

An important premise of AESA is that the identification of a limited number of key issues within an agro-ecosystem will have a significant impact on improving the performance of agriculture and forestry production systems. Thus, it is necessary to better understand zone characteristics and key issues from which solutions can be identified.

AESA has the following attributes:

- a. Can be conducted at provincial, district, or development zone levels
- b. Uses multidisciplinary teams

- c. Uses available secondary data
- d. Follows a systems approach

### **Principles of Participatory Learning Exercises**

- Role reversal from an expert to a learner for gaining better insight of the local agro-socio-economic-ecological complex
- Optimal ignorance by not trying to learn more than what is needed
- Avoiding biases in terms of space, time and persons
- Sharing of ideas
- Sufficient provision for improving the quality of gathered information by cross checking/ triangulation
- Using one's own best judgment than following a rigid set of steps and rules

### **Types of Agro-Ecosystem Analysis**

#### **A. Space Analysis**

It may be defined as a type of explanatory analysis of a particular area to observe and record minute details of that area. It deals with

- i) Mapping: Rural people have great ability to represent their surroundings by drawing maps and visually depicting the micro-details of their natural resources. Thus, mapping provides bird's eye view of the agro-ecosystem of a location. Types of mapping are as follows:
  - a) Social map: It depicts the detail description of a social set-up including roads, households, village institutions, settlement

pattern, economic and well-being distribution, important social features, etc.

- b) Resource map: It provides a detail picture of manmade and natural resources of the specific agro-ecosystem inclusive of land type, soil type, land use pattern, water resources, abiotic and biotic resources.
  - c) Hydrological map: It delineates drainage facilities and direction, water table (seasonal), water regimes, water resources utilization pattern and other important related features.
  - d) Technology map: It represents different agricultural technologies with their adoption and non-adoption phenomenon.
- ii) Transect walk/ biodiversity study: A transect walk is a type of explanatory walk which is undertaken by facilitators' team along with the villagers to observe and record detail of diversity of a particular agro-ecosystem. It provides the information about the main land use zones and features under each land types viz. land use pattern, soil type, plantation, vegetation, crop sequences, water resources, livestock, fisheries, problems and opportunities.

### **B. Time Analysis**

Time analysis is the chronological study of any geographical area or social system regarding its historical attributes, qualitative and quantitative developments over time. It is one type of systematic analysis of past by which one can easily be aware of changes and developments of lifestyle,

crop husbandry, livestock resources, socio-economic status, social infrastructure, etc. It also helps to understand the local decision making process, its evolving nature, along with 'break through' or 'turning points'. Components of time analysis are:

- i) Timeline: It reveals the historical events and major perceived changes following linear pathway in an area.
- ii) Time trend: It shows both the qualitative and quantitative changes in an agro-ecosystem over specific period of time.

While time series analysis moves vertically, time trend move both vertically and horizontally.

- iii) Seasonality diagram: Seasonal variations have both the implicit and explicit characters of any process. A seasonality diagram thus is a participatory mapping on the fluctuations of variations or undulations of different system characters viz. production, demand, supply, disease pest attacks, etc.

### **C. Flow Analysis**

It is the influence of village activities, opportunities, etc. over a time. It helps to study the linkages or networking of village resources, institutions, etc. with its surroundings, seasonality of resources, events or constraints and crop profiles in terms of the crop under detail study. Components of flow analysis are:

- i) Mobility map (flow): This shows the spatial mobility for different sections of community with respect to different activities patterns or

group mobility of rural people. Mobility map of rural people based on socio-economic aspects, gender, age, groups and other criteria can indicate the nature of work.

- ii) Venn diagram: A visual method to reprint the role of individuals/institutions and the degree of their importance in decision making. In such diagrams, circles of different sizes represent an individual or institution, whose size shows the degree of importance and the overlapping of circles indicate their webbing/ linkage in decision making.
- iii) Crop profile: It is a schematic and non-descriptive study of crops according to their production practices. It shows a sequential flow of different agricultural operations. A crop profile also depicts cost based studies, spill-over effect from previous crop to follow up crop.

**D. Decision Analysis:**

It is done for the understanding the choices under different conditions as well as for identification of the critical decisions of the spheres of the influence of the decision-makers. It deals with

- i) Ranking and scoring: It helps to understand local preferences on certain objects (crop, varieties, etc.) and the reasons behind those preferences-the criteria of preference may vary from group to group and women may have different criteria in certain objects than that of men. Ranking methods include preference ranking, pair-wise ranking, direct matrix ranking and wealth ranking.

### **Intervention Points**

Based on the pattern analysis and the identified problems and opportunities the key issues are to be identified, which need further investigation. Examples: The introduction of a new cultivation technique, strengthening an existing village institution, etc. The intervention activities needed for each of the issues should have to be made explicit.

### **Assessment**

Assessment of the intervention points needs to be carried out to produce a list of priorities for action. An intervention points is assessed on its importance as follows.

- i) Potential impacts on the system properties of the village agro-ecosystem (positive, neutral or negative)
- ii) Cost of implementation (high, medium, low)
- iii) The time it takes before we get benefits (long, medium, short)
- iv) The feasibility, both technical and social (high, medium, low)

Based on the obtained score, prioritization is carried out.

### **Implementation, Evaluation and Reconsideration:**

The implementation, evaluation and reconsideration stage follows after the prioritization of intervention points. The steps involved in it are as follows:

1. Identification of the level in which the intervention should be implemented first
2. Arrangement of facilities for implementation



3. Execution of the plan of action prepared in a participatory manner
4. Monitoring the implementation process and identify the degree of change brought on system properties
5. Carrying out a before-after evaluation and see the results.
6. Reconsideration the decision based on the consequences.

### **Trade-off in Agro-Ecosystem Analysis**

Developmental interventions designed to improve one or more of the system properties may create negative, unexpected effects on other properties. For example, green revolution technologies on rice have improved the productivity. But the over dependence of chemical inputs had effected the sustainability of the production system. Further, it also created two distinct classes of farmers: those adopted improved technology and got high returns and those not adopted improved technology and remained as poor, thus affecting the equitable distribution of production in the same agro-ecosystem.

### **Participatory Rural Appraisal (PRA)**

During the 1980s, PRA was firstly developed in India and Kenya, mainly supported by NGOs operating at grass-roots level.

The word “appraisal” in PRA has a much broader connotation than its dictionary meanings as “estimation of the value of asset/goods” or “an act of estimation/assessment of nature, quality and importance of asset”. Participatory Rural Appraisal (PRA) is a further evolutionary stage of the RRA approach. In it, emphasis is placed on empowering local people to

assume an active role in analyzing problems and drawing up plans, with outsiders mainly acting as “facilitators”. This enables them to assume responsibility for implementing the activities based on them.

PRA is a way of enabling local (rural and urban) people to analyze their living conditions, to share the outcomes and to plan their activities. It is a “handing over the stick to the insider” in methods and action. The outsider’s role is that of a catalyzer, a facilitator and convenor of processes within a community, which is prepared to alter their situation.

➤ **Uses of PRA:**

As noted above, PRA is not really about discrete studies in the way that RRA is. Instead, it offers an approach to project planning and implementation that integrally involves the community throughout the length of the process. The village will first use PRA to assess their needs and to customize the project interventions to their priority concerns and the peculiar circumstances of their community. As the project advances, they will monitor their own progress and engage in rolling planning in which new activities and strategies are planned as previous ones take off. Over the course of this process, it is expected that communities will build their skills in analysis and planning so that there will be sustained benefits that outlive the project’s interventions.

➤ **Advantages of PRA:**

- a. **Empowerment.** Knowledge is power. Knowledge arises from the process and results of the research that, through participation, come to be shared with and owned by local people. Thus the professional

monopoly of information, used for planning and management decisions, is broken. New local confidence is generated, or reinforced, regarding the validity of their knowledge."External" knowledge can be locally assimilated.

- b. Respect.** The PRA process transforms the researchers into learners and listeners, respecting local intellectual and analytical capabilities.
- c. Localization.** The extensive and creative use of local materials and representations encourages visual sharing and avoids imposing external representational conventions.
- d. Enjoyment.** PRA, well done, is and should be fun. The emphasis is no longer on "rapid" but on the process.
- e. Inclusiveness.** Enhanced sensitivity, through attention to process; include marginal and vulnerable groups, women, children, aged, and destitute.

In addition to these, PRA has the following unique features,

1. **Iterative:** goals and objectives are modified as the team realizes what is or is not relevant. The newly generated information helps to set the agenda for the later stages of the analysis. This involves the "learning-as-you-go" principle.
2. **Innovative:** techniques are developed for particular situations depending on the skills and knowledge available.
3. **Interactive:** the team and disciplines combine together in a way that fosters innovation and inter-disciplinarity. A system perspective helps make communication easy.

4. **Informal:** focuses on partly structured and informal interviews and discussions.
  5. **In the community:** learning takes place largely in the field, or immediately after, or in the intensive workshops. Community's perspectives are used to help define differences in field conditions.
- **Disadvantages/pitfalls/Dangers /Drawbacks of PRA:**
- a. The term PRA itself can cause difficulties. PRA need not be rural, and sometimes is not even participatory, and is frequently used as a trendy label for standard RRA techniques.
  - b. There are also risks of:
    - i. **"Hijacking"**. When this occurs, the PRA agenda is externally driven, and used to create legitimacy for projects, agencies and NGOs.
    - ii. **Formalism**. The "PRA hit team" arrives in a local community to "do a PRA". This abrupt and exploitative approach is all too common in project based PRAs where there is a deadline to meet, or in scheduled training courses.
    - iii. **Disappointment**. Local expectations can easily be raised. If nothing tangible emerges, local communities may come to see the process as a transient external development phenomenon.
    - iv. **Threats**. The empowerment implications of PRA, and the power of its social analysis, can create threats to local vested interests. This may result in lack of rapport within the community.

➤ **Some Principles Essential in Carrying Out of PRA:**

Different practitioners would find different principles but generally they include the following:

- 1. Offsetting biases:** by being relaxed and not rushing, listening, not lecturing, probing instead of passing on to the next topic, being unimposing instead of important, being gender sensitive, and seeking out the poorer people and their concerns.
- 2. Using optimal ignorance:** this refers to the importance of knowing what it is not worth knowing. It avoids unnecessary details and irrelevant data. It does not measure more precisely than is needed. It optimizes trade-off between quality, relevance, accuracy and timeliness.
- 3. Triangulation:** using more than one, and often three sources of information to cross-check answers.
- 4. Learning from and with rural people:** directly, on the site, and face-to-face, gaining from indigenous physical, technical and social knowledge.
- 5. Learning rapidly and progressively:** with conscious exploration, flexible use of methods, opportunism, improvisation, iteration, and cross-checking, not following a blueprint program but adapting through a learning process.

➤ **Multi-disciplinary Team**

The scientific team conducting PRA must have fairly broad base, meaning thereby inclusion of scientists of all important disciplines relevant to the area of study. It is also important to have female scientists in the team so

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that rural women could be effectively involved in the appraisal exercise. The team should identify among themselves one member who should work as Team Leader/Facilitator. Another member should be identified to work as Process Recorder or Content Recorder. While interacting with the villagers he/she should not jump directly to the objective of the study but first develop rapport with them. The responsibility of rapport building may be assigned to one member of the team who could work as Environment Controller.

### **Participatory tools and techniques**

Participatory Rural Appraisal techniques are typically used in the field to gather qualitative data, often to complement quantitative data derived from traffic counts and origin and destination data.

#### **A. Space related methods :**

##### **i. Social Map**

Social mapping is the most popular method in PRA. For many, in fact, it is synonymous with PRA itself. Quite a potent method, it seeks to explore the spatial dimensions of people's realities. The focus here is on the depiction of habitation patterns and the nature of housing and social infrastructure: roads, drainage systems, schools, drinking-water facilities, etc. Social map is different from other regular maps as it is made by local people and not by experts. For another, it is not drawn to scale. It depicts what the local people believe to be relevant and important for them. Thus it reflects their perceptions of the social dimensions of their reality with a high degree of authenticity. In spite of there being many overlaps, a social map is

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different from a resource map. The latter depicts the natural resources-land, water sources, flora and fauna, etc. In certain cases, though, a map could be a rich combination of the two (called as Village map). This is quite often so in the case of areas having a dispersed settlement pattern.

**Objective**

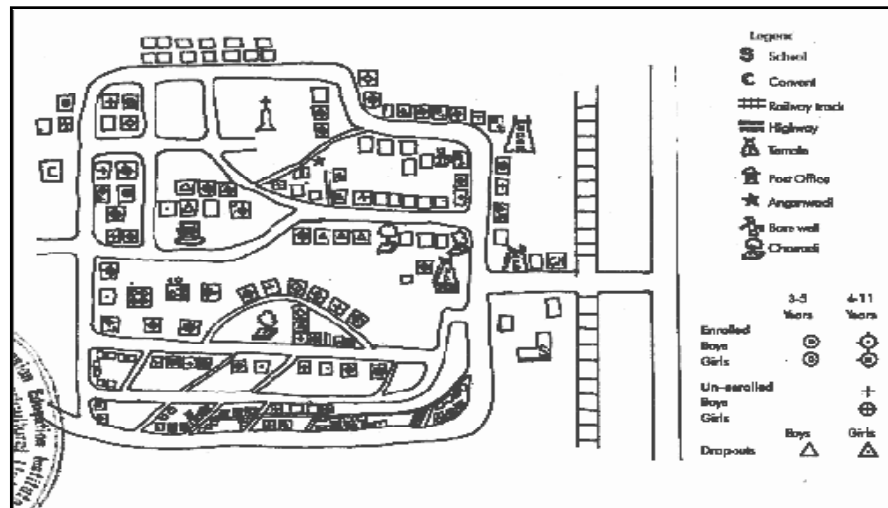
- Collecting demographic and other required information household-wise.
- Providing a forum of discussion in which to unravel the various aspects of social life.
- Serving as a guiding instrument during the process of planning interventions.
- Serving as a monitoring and evaluating tool.

The following social information are elicited from the social map which helps extension professionals to design and plan various interventions-

- Information on caste distribution in a village
- Neighbourhood of a village, spatial distribution of castes and the related information
- Community information about the village
- Social institutions information
- Family information
- Religion information
- Economy information
- Government institution information in the village

- Education background of villagers information
- Social groups information in the groups
- Leadership patterns existing in the village
- Value systems information of the village
- Social interactions information
- Cooperation information
- Competition information
- Conflict information
- Assimilation information
- Accommodation information
- Caste structure information
- Media of communication information
- Social norms, folkways, mores information about the village
- Social evils like dowry, alcoholism, child labour, prostitution information
- Religion, leadership pattern and customs existing in the society information.





**Fig. 1: illustrates a typical social map. The village mapped out is Chetlamallapuram in Kurnool, Andhra Pradesh. The map neatly depicts the lanes, sub-lanes, school, railway track, temple, post-office, well, community hall, etc., in the village.**

## ii. Resource Map

Resource map is one of the most commonly used PRA methods next to social map. While the social map focuses on habitation, community facilities, roads, temples, etc., the resource map focuses on the natural resources in the locality and depicts land, hills, rivers, fields, vegetation, etc. A resource map may cover habitation as well. At times, the distinction between the resource map and social map may get blurred. The local people are considered to have an in-depth knowledge of the surroundings where they have survived for a long time. Hence the resource map and social map drawn by the local people is considered to be accurate and detailed. It is important to keep in mind, however, that it reflects the people's perceptions rather than precise measurements to scale. Thus, a

resource map reflects how people view their own locality in terms of natural resources.

### Objectives:

Resource maps have been used for depicting of various aspects related to the natural resources management of a locality including:

- Topography, terrain and slopes
- Forest, vegetation and tree species
- Soil-type, fertility, erosion and depth
- Land and land use, command area, tenure, boundaries and ownership
- Water, water bodies, irrigation sources, rivers and drainage.
- Watershed development, various soil and water conservation measures, denuded areas, etc.
- Agricultural development, cropping pattern, productivity, etc.

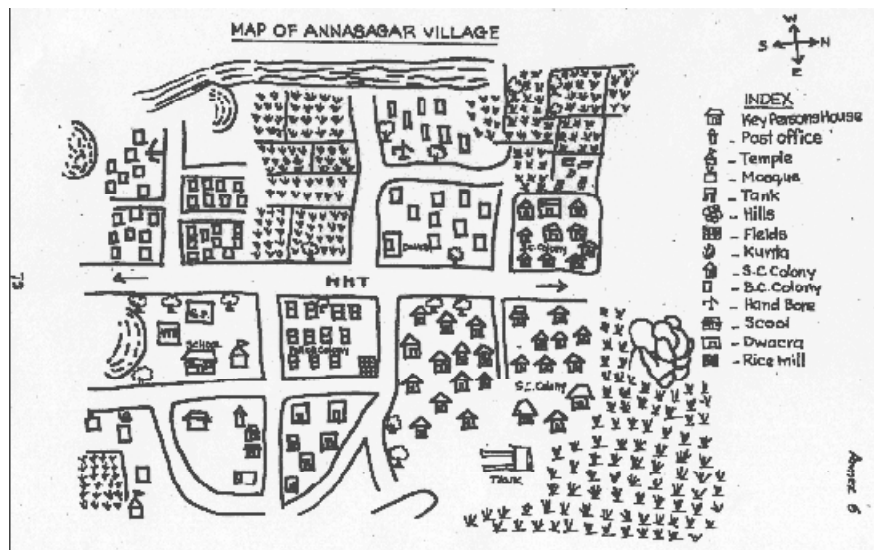


Fig. 2: Resource map of a village

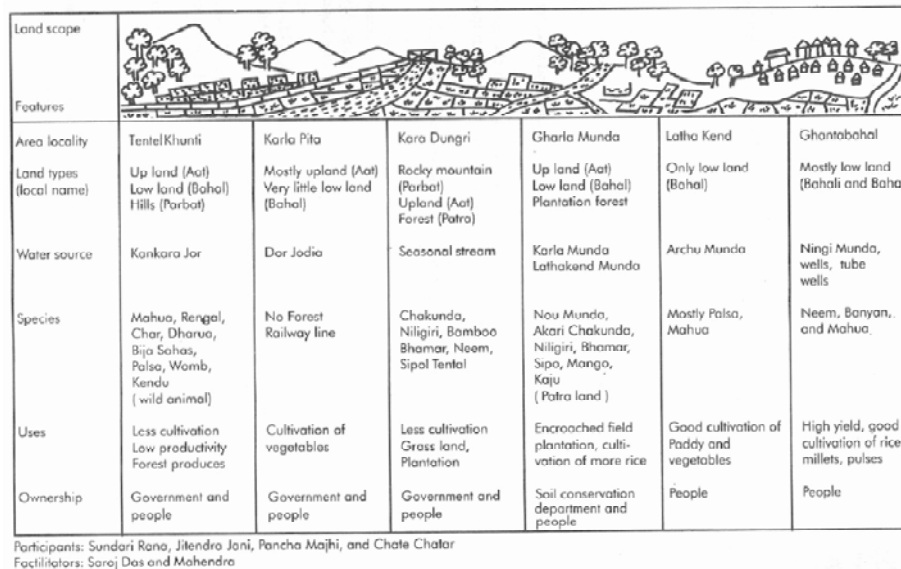
**The following information are elicited from resource map**

- Transport facilities information
- Communication facilities information
- Health and welfare societies information
- Supply and service agencies information
- Agricultural implements found in the village information
- Animals used for agriculture information
- Marketing facilities information
- Processing industries information
- Financial facilities information
- Advisory facilities information
- Community pastures or grazing land information
- Natural service versus AI for various animals information
- Labour availability for various purposes information.

**iii. Transect Diagram**

Transect is another PRA method used to explore the spatial dimensions of people's realities. It has been popularly used for natural resource management. It provides a cross-sectional representation of the different agro-ecological zones and their comparison against certain parameters including topography, land type, land usage, ownership, access, soil-type, soil fertility, vegetation, crops, problems, opportunities and solutions. Though natural resources remain the focus of any transect, this does not mean that there is no place for the depiction of social aspects. Various social aspects for e.g., the caste and ethnic determinants of a settlement

access and control and gender-related dimensions are captured in detail, depending upon the objectives of the exercise. A transect is different from resource map despite areas of overlap. The resource map provides a bird’s-eye view of the locality with a focus on natural resources. A Transect, however, depicts a cross-sectional view of the different agro-ecological zones and provides a comparative assessment of the Zones on different parameters. It is generally done after a resource map and therefore helps in triangulation. It also helps in taking forward the process of problem identification and planning for the development of the natural resources in the area. Transect differs from a historical transect in that the focus here is geographical while the focus in the latter is on trends or changes over time on aspects related to natural resources. It is generally like a snapshot of the same transect at different points of time.



**Fig. 3: Transect map of Kotha Molgara village**

### **Objectives**

- Appraisal of natural resources in terms of status, problems and potential
- Verification of issues raised during other PRA exercises particularly during social mapping, natural resources mapping, etc.
- Planning of various interventions and checking the relevance of the planned interventions
- Monitoring and evaluation of interventions and projects

### **iv. Mobility Map**

Mobility map is a PRA method used to explore the movement pattern of an individual, a group, or the community. The focus is on where people go and for what. Other aspects, like the frequency of visits, distance, and the importance of the place visited, may also be studied and depicted. It reflects the people's perception of movement patterns and the reasons there of.

### **Objectives**

- Understanding the mobility pattern of local people where they go and for what
- Increasing gender sensitivity and awareness by using them for highlighting the difference between the mobility patterns of men and women
- Evaluation of the impact of certain interventions in terms of their effects on mobility patterns.

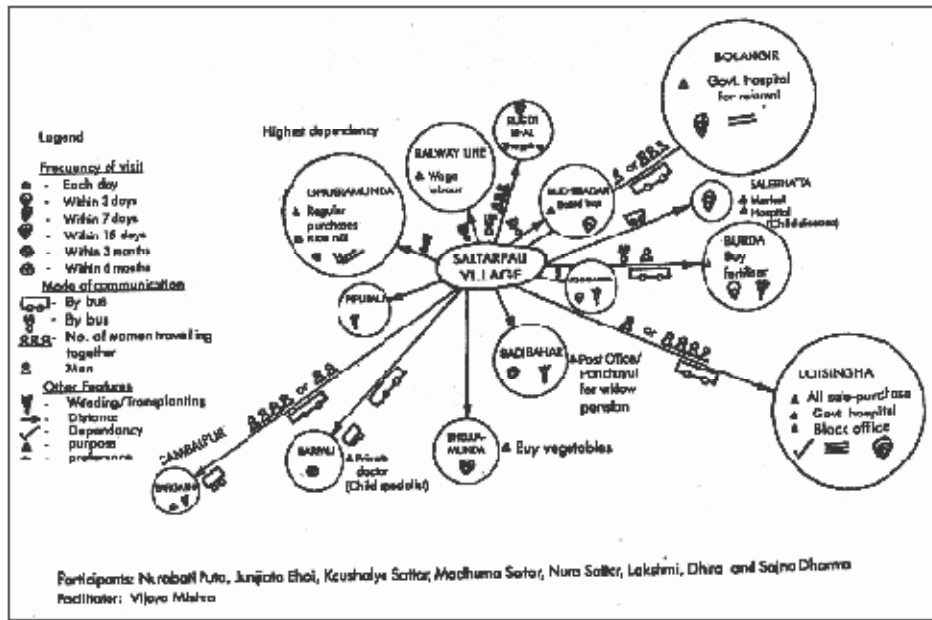


Fig. 4: Mobility map of a village

Mobility map is quite elaborate and deals with several aspects including:

- Frequency of visit (from daily to once within 6 months)
- Distance (between the places of visit and their village)
- Mode of transport (bus or walk)
- Purpose of visit (weeding, sale purchase, wage labour, medical facility etc.)
- Accessibility (in terms of size – the bigger the size the easier the access)

In addition it also specifies the places that they visit only in groups or with a male member. The use of symbols makes the diagram more interesting. A detailed gender analysis of the mobility pattern of men and women was also carried out as part of the discussion that followed.

### **Overlap with Services and Opportunities Map**

The mobility map at times overlaps with the services and opportunities map. Both the maps look quite similar. In the mobility map, however, the focus is on the places which people visit and the reasons thereof, while in the services and opportunities map, the focus is on the services and opportunities. In a mobility map the village is at the centre and the other places visited are placed around it. The distance of other places from the centre may or may not be proportionate to the actual distance. In the services and opportunities map, the services and opportunities available in the village are also represented.

### **B. Time related methods**

#### **i. Time Line**

Time line is an important PRA method quite commonly used to explore the temporal dimension from a historical perspective. Time line captures the chronology of events as recalled by local people. It is drawn as a sequential aggregate of past events. It thus provides the historical landmarks of a community individual or institution. The important point to note here is that it is not history as much the events of the past as perceived and recalled by the people themselves.

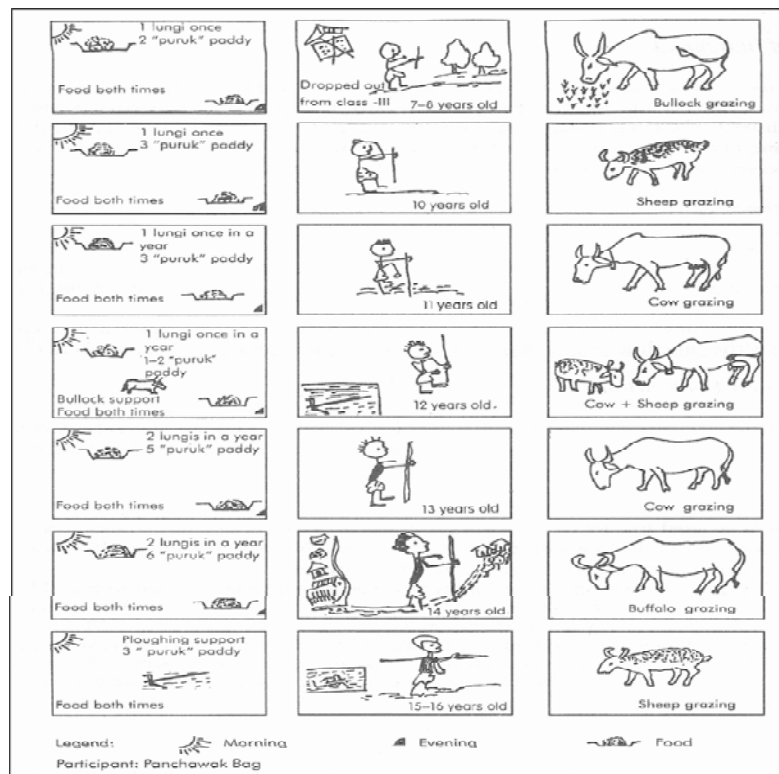
#### **Objectives**

- To learn from the community what they considered to be important past events.
- To understand from the community the historical perspective on current issues.

- To generate discussions on changes with respect to issues you are interested in e.g. education, health, food security, gender relations, economic conditions, etc.
- To develop a rapport with the villagers, since a discussion about the past of the village can be a good non-threatening and enjoyable starting point.

The following information is elicited from the time line

- Information on technological time line in a village
- Year wise information
- Preferable select an old person in the village for this technique



**Fig. 9: Time Line of Khairmal village – Child Labourer**



## **ii. Trend Analysis**

Trend analysis is a popular PRA method used to explore temporal dimensions with a focus on change. It captures and trends related to certain variables over different spans of time. It is, thus, people's account of the past and of how things have changed and hence also provides a historical perspective. The local people have a good understanding of the present situation and the changes that have taken place over the years. Trend analysis can provide a good idea of the quantitative changes over time in different aspects of village life, such as yields, population, livestock population, the number of trees, area under cultivation, rainfall, etc., It helps to understand increases and decreases in the variable under study over a period of time. It generally charts broad movements in different aspects of the local people lives rather than precise shifts. The discussion that follows a trend analysis may also look into the causes of changes and thus provide an understanding of the dynamics of change.

### **Objectives**









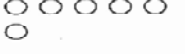
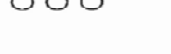

- Learn from the community as to how they perceive change over time in various areas/aspects of their lives.
- Integrate significant changes in the village profile.
- Discuss village problems and any increase or decrease in the severity of the problems over the years rather than asking direct questions.
- Discuss interventions and measures which had worked out or failed in the past and the reasons thereof.

- Understand people’s perception of not only the past and present but also of the shape of things to come in the near or distant future with or without intervention.
- Produce a conducive environment, after discussions on reasons for the present state of affairs to plan the possible interventions.

**The following information are elicited from time trend analyses**

1. Trend analysis of production,
2. Productivity,
3. Price of major enterprises in a village

It starts from major cropping season eg. KHARIF-RABI-SUMMER.

Natural resources Period	 Water	 Tree	 Farmland
<b>1960</b> (Independence)	<ul style="list-style-type: none"> <li>• Rains daily during June</li> <li>• No wells</li> <li>• Water always in the river</li> </ul>		
<b>1970</b> End of civil war	<ul style="list-style-type: none"> <li>• Rains at least once in 2-3 days in June</li> </ul>		
<b>1979-80</b> (Shagari)	<ul style="list-style-type: none"> <li>• Rains at least once in 4 days in June</li> </ul>		
<b>1999</b> (Today)	<ul style="list-style-type: none"> <li>• Rains sometimes once in 8-10 days in June</li> <li>• River and well dry in dry season</li> </ul>		
Participants: Adama, Elizabeth Sule, Omojo Peter, Ochesija Nicholas and Oglinulu Okpachu Facilitators: Paul C			

**Fig. 10: Trend Analysis of Aukpa-Adoka, Nigeria (Natural) Resources)**

### **iii. Seasonal Diagram**

Season diagram is also called seasonal calendar, seasonal activity, profile and seasonal analysis. Seasonal diagram is one of the popular PRA methods that have been used for temporal analysis across annual cycles, with months or seasons as the basic unit of analysis. It reflects the perceptions of the local people regarding seasonal variations on a wide range of items. Seasonal diagram, however, are not based on statistics, though they may be triangulated against secondary or primary data in order to verify the information generated.

#### **Objectives**

The major strength of seasonal analysis is that it depicts a range of items and their magnitude, which helps in understanding how these items are related to and influence one another. These relationships can be quite revealing.

- Seasonal diagram helps to identify heavy workload periods, of relative ease, credit crunch, diseases, food security, wage availability etc.
- It has proved to be useful in project planning, i.e., when to implement various activities.
- It has been used to identify periods of stress and to plan for when intervention is most required.
- It is possible and analyses the livelihood patterns across the year.

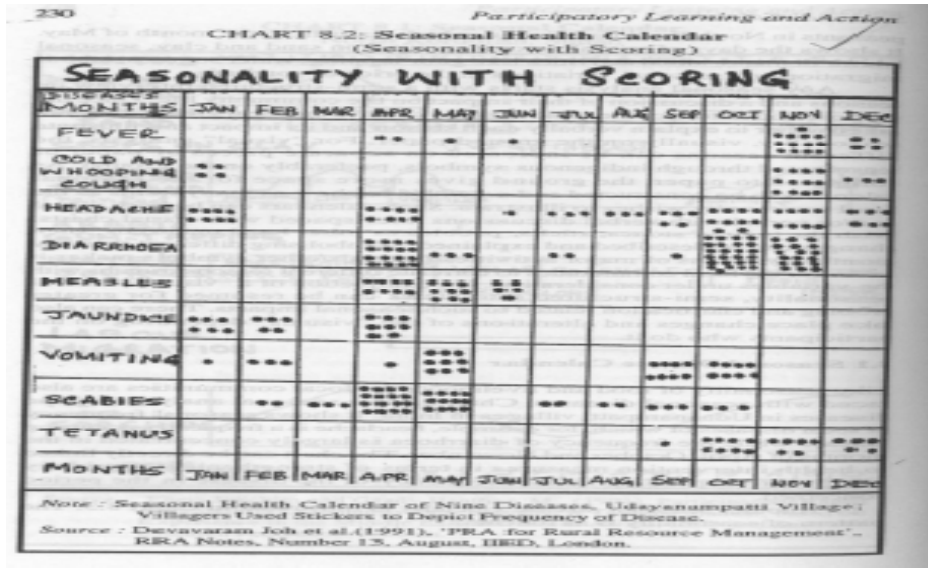


Fig. 12: Seasonal diagram of occurring of prevalent diseases in a village

#### iv. Daily Activity Schedule

Daily Activity Schedule illustrate all of the different kinds of activities carried out in one day. They are particularly useful for looking at relative work-loads between different groups in the community. Comparisons between clocks show who works the longest hours, who concentrates on a few activities and who does a number of tasks in a day, and who has the most leisure time and sleep.

#### C. Relation related methods:

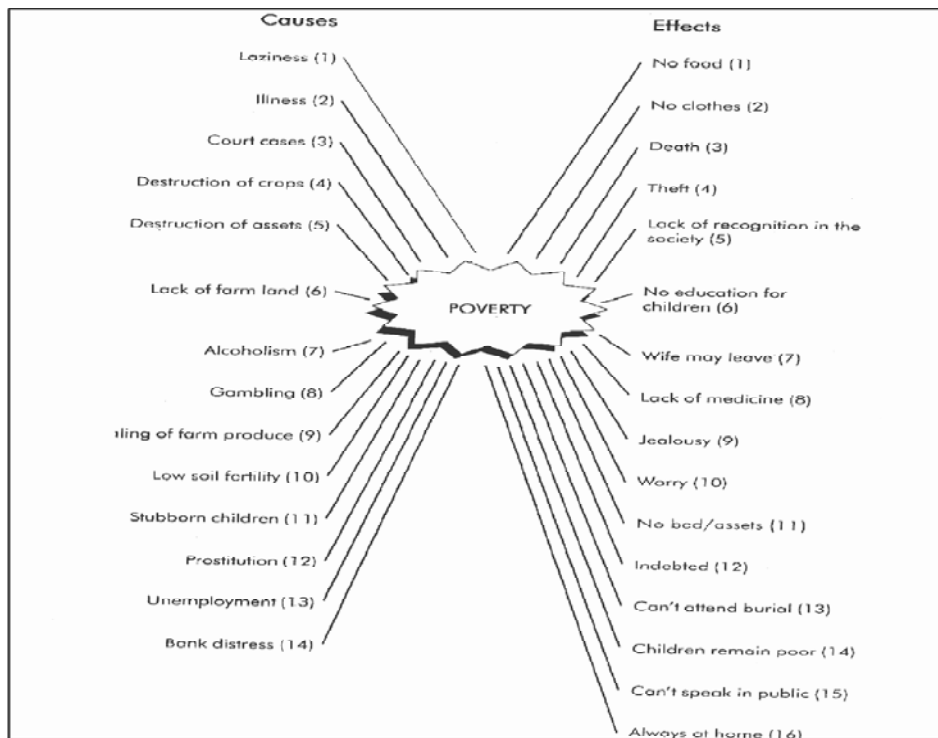
##### i. Cause and Effect Diagram (problem tree)

Cause effect diagram is a popular PRA method which falls under the family of flow and linkage diagram methods. Also known as fishbone or *Ishikawa* diagram, it focuses on the causal factors of a phenomenon, activity, or

problem, and the effects thereof. The cause-effect diagram presents visually the causes, effects and their inter-linkage, which help in arriving at an in-depth understanding of a particular topic, and provide scope for analysis and subsequent action by the local people.

The problem tree is used to analyse relationships between problems, including their causes and effects. The objective tree is derived from the problem tree, gives visual form to the solutions of the problems.

The problem tree and the objective tree help the research team to make an inventory of problems and their probable solutions as perceived by the target group or other stakeholders in the project.



**Fig. Cause and effect diagram of 'poverty' in a village**

Note: Figures in parentheses indicate priority ranking (1=high and 16=low)

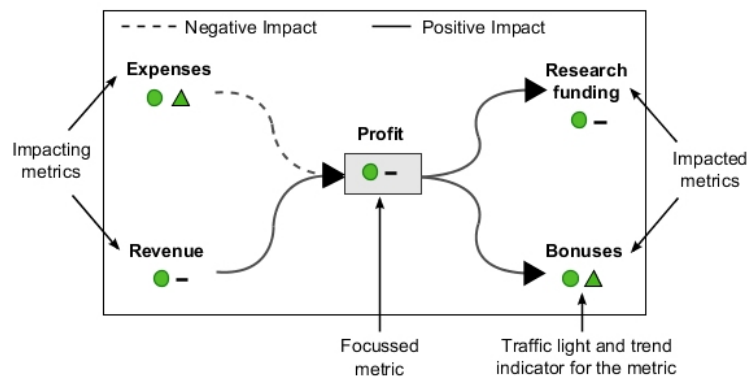
It can thus be used in the analysis of the target group and in the organisational analysis and the analysis of the project proposal. It is mostly known as a technique to design or to analyse project proposals. Both the problem and the objective tree are 'built' with the help of index cards.

**ii. Impact diagram**

Impact diagrams visualize the positive and negative relationships between the metrics in your metrics cube. This type of diagram shows how the business actually works by displaying how one metric impacts another metric.

For example, an impact diagram might show how *Revenue* and *Expenses* impact *Profit*, which then impacts *Bonuses* and *Research Funding*.

Impact diagrams display traffic light and trend indicator icons to show the status and the trend of each metric in the diagram. When a user interacts with an impact diagram, they can select a different dimension context. The traffic light and trend indicators update with new values for the selected dimension.



**Note:** A metrics cube can have only one impact diagram and it is created automatically when you create a metrics cube.

### **Designing Impact diagrams**

Impact diagrams organise the metrics into three categories- *Impacting* metrics, *Focused* metrics and *Impacted* metrics.

- Impacting Metrics - examples include *Expenses* and *Revenue*
- Focused Metrics - examples include *Profit*
- Impacted Metrics - examples include *Research Funding* and *Employee Bonuses*

### **Nature of Impact property**

The nature of impact property configures the line type to show impact relationships between the metrics in the diagram. The nature of impact property can be used to show if a metric has a positive or negative impact in relation to the focused metric.

- **Positive** - Displays a solid line in the diagram to show a positive impact from one metric to another metric.
- **Negative** - Displays as a dashed line in the diagram to show a negative impact from one metric to another metric.

This property can be set for each metric in the *Impacting Metrics* and *Impacted Metrics* lists.

### **iii. Well-being ranking methods**

Well-being ranking, also known as wealth, ranking and well-being analysis, is a PRA method commonly used for ranking and grouping household and communities on the basis of income, wealth, and other perceivable well-being criteria. Well-being ranking is based on the perception of the local

people. It helps to understand the local people's perception of wealth, well-being and their views on socio-economic disparities between households.

While wealth ranking was the initial activity in vogue, the realization that wealth or income as the sole criteria of well-being does not reflect the realities of the people has grown. While wealth ranking reveals a materialistic focus on income and assets, well-being is more oriented towards the quality of life. Well-being is culture-specific and is difficult to measure. Well-being ranking however provides a unique method for exploring local people's thinking on well-being. Therefore well being ranking method has gained prominence. In fact, the sensitivity involved in exploring wealth has also induced facilitators to opt for well being rather than wealth ranking. However, well-being ranking is a relative and not an absolute assessment of people's wealth or well-being.

### **Process**

Well-being ranking can be done in different ways including:

- a. Card Sorting Method
- b. Social Mapping Method

#### **a. Card Sorting Method**

The steps in the process of well-being ranking using the card sorting method include:

- Arrange for a list of households in the locality where you want to do the well-being ranking






























- Write the names of the head of households on small cards-one household per card.
- Explain the purpose of the exercise to the participants. Ask them to rank the households based on the well-being of the households concerned.
- Let the participants do the ranking on their own.
- While dealing with small villages with households ranging 30-40, ask the participants to arrange the households in descending order of well-being, ie., higher to lower on well- being.
- As the participants arrange the household cards, ask them why they have placed the cards in a particular order. This gives you the criteria participants are using to do the well-being.

**Ranking**

Well-being Groups (characteristics)	Quality of land	Availability of water for irrigation	Livestock ownership	Land holding	Quality of food	Quality of house (walls, floor, roof etc)	Dependence on labour	Dependence on forest or wood	Dependence on stone cutting	Quality of clothes
Manages well (Grain from own land lasts for 8-10 months) (17)	●●●●	●		●●●● ●●●●	●●●● ●●●●	●●●● ●●●● ●●●●				●● ●●●● ●●●●
Somewhat manages (Grain from own land lasts for 6-8 months) (21)	●●●●		●●	●●	●●●●	●●●●	●●	●●●●		●● ●●●●
Manages with difficulty (Grain from own land lasts for 3-4 months) (39)			●	●	●●	●●●●	●●●● ●●●●	●●●● ●●●●	●●●●	●●●●
Dependent on labour and forest (42)					●	●●	●●●● ●●●● ●●●●	●●●● ●●●●	●●●● ●●	●

Participants: Anand Chandra Pradhan, Nuri Pradhan, Chandrasekhar Pradhan, Arjun Pradhan, Kishore Pradhan, Sanjay Biswal, Pradeep Behera, Dhaba Behera, and Narayan Pradhan  
Facilitators: Subyasachi Kati, Vijaya Mishra, and Aninda Banerjee

**Fig. Matrix scoring of socio economic status of various groups: Dhauradadar**

Problem	 Drinking water	 Medical facility	 Lack of transport facility	 Lack of veterinary facility	 Lack of middle school	 Lack of fodder	Priority frequency
 Drinking water	x						5
 Medical facility		x					4
 Lack of transport facility			x				1
 Lack of veterinary facility				x			3
 Lack of middle school					x		0
 Lack of fodder						x	2

Participants: Mirgo, Uli, Shorbari, Begarom Jat, Sumanagar and Premagar

**Fig. Pair wise ranking with visuals: Problem prioritization**

**Social map for Well-being Ranking**

A simple technique of doing a well-being ranking relies on the social map. The houses in the social map are ranked on the basis of well-being using symbols or colour codes. Suppose the participants come out with five categories of well-being, using five different colours or symbols, the houses could be classified directly on the map itself by the participants. The criteria for each category of well-being can also be generated involving the participants.

**Well-being Ranking and Matrix Method**

Well-being ranking can also be combined with matrix method as shown in Fig. 11.

In village Dhauradadar of Orissa, the villagers classified the households into four categories of well-being and scored them on various criteria, including the ownership of good quality land, availability of water, quality of clothes, etc. The villagers labelled the four well-being groups as 'manages well'(11 households), 'somehow manages'(20 households), 'manages with difficulty' (62 households) and dependent on labour and forces' (39 households). These categories were defined largely in terms of household food security from grain produced in their own lands. While the top category of 'manages well' has grain produced sufficient for 8-10 months, the 'somehow manages' category produces grain lasting 6- 8 months. The category 'manages with difficulty' hardly has grain sufficient for 3-4 months, whereas the 'dependent on labour and forest are the most vulnerable.

It is also interesting that each well-being categories, however, as shown manages category the easy they are distributed across the well-being categories, however, as shown in Table 1 is revealing. The ganda (SC) have 80 percent of their households below the second well-being category and almost half of the households are in the poorest category.

The better-off categories are well placed with respect to various productive assets, e.g., good quality land, irrigation facilities, land holdings etc., the categories 'manages with difficulty' and dependent on labour and forests are dependent more on labour, forests, and hazardous occupations like stone cutting, etc., their well-being actually gets reflected in the quality of their houses, food and clothes.

### **Venn Diagram**

Venn diagram is one of the commonly used methods in PRA to study institutional relationship and is sometimes also referred to as institutional diagram. It is however, popularly known as *Chapati* diagram (*Chapati* means 'round bread' in Hindi) as the method uses circles of various sizes to represent institutions or individuals. The bigger the circle, the more important is the institution or individual. The distance between circles represents, for example, the degree of influence or contact between institutions or individuals. Overlapping circles indicate interactions and the extent of overlap can indicate the level of interaction.

### **Objectives**

- i. To study and understand local people's perceptions about local institutions, individuals, programmes, etc.
- ii. The method provides valuable insights into and analyses of the power structure, the decision- making process, etc., the need to strengthen the community's institutions can also be ascertained.
- iii. The relative importance of services and programmes has also been studied using the Venn diagram

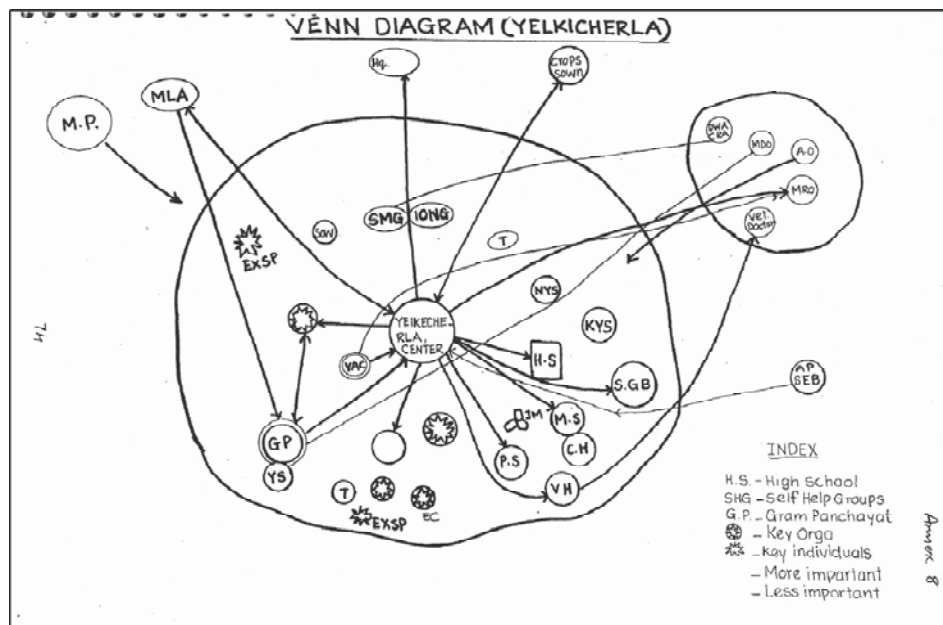
### **Venn diagram is particularly useful when you want to study and analyse**

- Various institutions and individuals and their influence on the local people.
- Various groups and individuals in the locality and their influence.

- The main actors in the community and their conspicuous and inconspicuous influence.

**The following information is elicited in Venn diagram**

- a. Relative importance of various institutions in the village
- b. Relationship among them,
- c. Linkages among them
- d. Weaknesses with respect to decision making process
- e. Development of the village by institutions
- f. Duplication of efforts among institutions
- g. Gap identification between institutions
- h. Objectives and felt needs of farmers
- i. Concentration of power within villages



**Fig. Venn Diagram**

In fact, you can use a Venn diagram if you are inclined to use a simple participatory visual method and have a number of items to be studied: institutions, individuals, diseases, social groups, natural resources or any of their combinations; to study these items in relation to a few variables, preferably two, which could include importance, prevalence and perceived proximity.

### **Matrix Ranking**

Matrix scoring or ranking, elicits a community's criteria of value of a class of items (*trees, vegetables, fodder grasses, varieties of a crop or animal, sources of credit, market outlets, fuel types*) which leads into discussion of preferences and actions by the implementers and the local community.

The purpose of matrix ranking is to rank the value of a particular activity or item according to a range of criteria.

For example, a range of different land care group activities could be assessed against a set of criteria such as attendance rate, cost and value to members.

### **Livelihood Analysis**

Livelihoods consist of the capabilities, the assets - both material and social resources - and the activities required for a means of living.

#### **What are the core principles of livelihood analysis?**

- ✓ People-centred
- ✓ Holistic (implemented in partnership)
- ✓ Dynamic

- ✓ Building on the *strengths* of the poor
- ✓ Linking the “micro” with the “macro”
- ✓ Sustainability-focused
- **Livelihood Assets :**
  - Human capital,
  - Social capital,
  - Physical capital,
  - Financial capital,
  - Natural capital.