

# **Research for Development Using Participatory Rapid Diagnosis and Action Planning for Irrigated Agricultural Systems**

**A Manual for Development Researchers and Practitioners  
Updated Edition**

**Philippe Lempériere, Martin L. van der Schans and  
Valentine Joseph Gandhi Bavanirajan**



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## **Dedication**

As this updated edition of the manual went through the final editorial stage Philippe Lempériere passed away unexpectedly on February 04, 2014. This manual is principally dedicated to his wife Khalda and son Basile, who meant so much to Philippe. The manual also acts as a tribute to the work and experience Philippe contributed to increasing understanding and improving of irrigation practices in sub-Saharan Africa.

Philippe Lempériere 1957- 2014

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*/ participatory management / farming systems / irrigated farming / irrigation schemes / irrigation systems / research / action plans / stakeholders / socioeconomic environment / farmers / farmers organizations / water users associations / water resources / women / geographical information systems /*

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## **About the Second Edition**

A first version of this Manual was developed for the APPIA project funded by the French government. The French acronym APPIA stands for Amélioration des Performances des Périmètres Irrigués en Afrique meaning “Improving Irrigation Performance in Africa”. During the course of the project, irrigation professionals tested the Participatory Rapid Diagnosis and Action Planning (PRDA) methodology in Ethiopia and Kenya and five West African countries: Burkina Faso, Mali, Mauritania, Niger and Senegal. A final workshop brought together all participants and the members of the APPIA project steering committee for evaluation. The manual was then jointly published by IWMI and FAO in 2006.

This updated and improved version takes into account outputs and lessons learnt from further studies in agricultural water management and participatory design and implementation of irrigation projects in Africa. It also includes a new section on the use of ICT tools in PRDA. It can be used as a guidebook for an on-the-job training course combining classroom sessions and fieldwork. Classroom sessions should be conducted before fieldwork to provide the participants with guidance on methods and tools and after fieldwork to capitalize on the lessons learnt.

## **Acknowledgements**

The authors would like to thank the network for Improved Management of Agricultural Water (IMAWESA) for publishing this manual. IMAWESA is supported by the International Fund for Agricultural Development (IFAD). They also thank all the irrigation professionals of the seven African countries (Burkina Faso, Ethiopia, Kenya, Mali, Mauritania, Niger and Senegal) that contributed to the first version of this manual, as well as all professionals and organizations in Burkina Faso and Kenya that have been using this methodology and for their feedback and inputs to this new version.

## **Acronyms**

APPIA - Amélioration des Performances des Périmètres Irrigués en Afrique

CAQDAS - Computer Aided Qualitative Data Analysis Software

GIS - Geographic Information Systems

GPS - Global Positioning System

ICT - Information and Communication Technologies



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# 1. INTRODUCTION: RESEARCH FOR RESEARCH VS. RESEARCH FOR DEVELOPMENT

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Over the last few decades research institutes such as the CGIAR have been conducting high-quality scientific research that aided improvement in yield, productivity, and income, and led to key policy changes around the world. CGIAR centers often conducted ‘research for research,’ usually in papers or reports, meaning, there was no continued involvement in the outcomes of their research findings beyond dissemination of data and knowledge. This is understandable given the mandate of the CG Centers, but it also led to issues with the adoption of research findings by development practitioners and ultimately farmers and their organizations. Development professionals, on the other hand, often design and implement projects on a modest scale and without strong research before designing interventions. This means they do not compare their interventions with existing interventions in similar situations or incorporate the lessons from such successes or failures. This also contributes to a lack of sustainability after NGOs or project implementers exit. When a project is introduced, whether focused on agricultural productivity or water management, a lack of farmer buy-in and participation from the beginning can lead to a lack of adoption or abandonment of the project intervention after the project period. In this manual we lay out tools that can be applied in the field in the context of irrigation projects that ensure the participation of all stakeholders involved, both horizontally and vertically. This manual is designed therefore as a research for development manual.

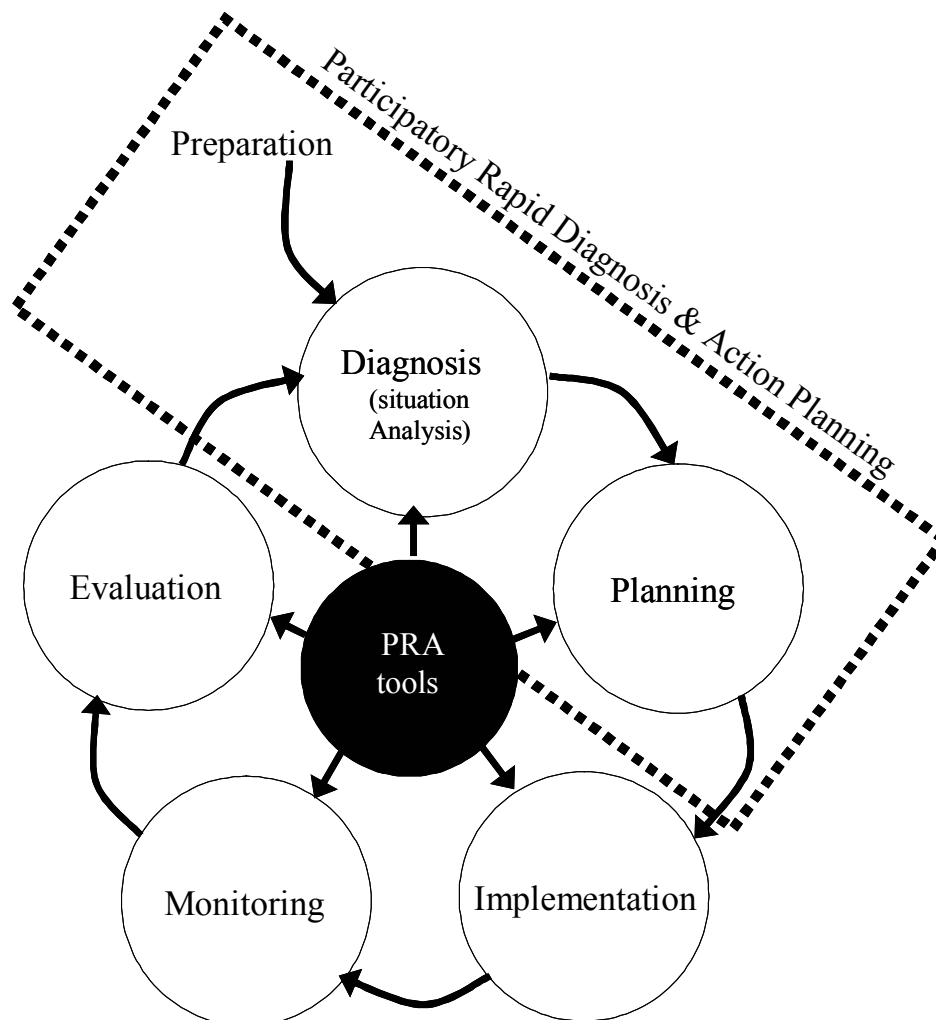
## 1.1 What is PRDA? Participatory Rapid Diagnosis and Action Planning (PRDA) is an approach for assessing and improving the performance of agricultural water management together with farmers. It consists of making an initial diagnosis, and then designing an action plan to improve performance, for example:

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- Strengthening farmer organizations in charge of irrigation management.
- Improving operation and maintenance (O&M) of irrigation systems.
- Increasing farmers’ access to agricultural inputs, credit and market.
- Improving extension and business support services.
- Intervening institutionally and organizationally, to secure farmers’ access to and sustainable management of, natural resources: land and water.
- Introducing locally adapted improved irrigated agricultural technologies.

After implementation, the improvements can be monitored and evaluated in subsequent years. Figure 1 shows how PRDA relates to a general project cycle. PRA tools are used throughout the process.

Figure 1. PRDA within a project cycle.



For PRDA, existing Participatory Rural Appraisal methods<sup>1</sup> are adapted to the specific situation of irrigation systems. Methodologies for benchmarking and rapid appraisal of irrigation schemes are also used but in a modified form to suit the limited availability of quantitative data notably on farmer-managed irrigation schemes.

<sup>1</sup> PRDA combines elements of Rapid Rural Appraisal (RRA), Participatory Rural Appraisal (PRA) and Participatory Learning and Action (PLA).

- RRA elements: Rapid performance assessment according to criteria set by the researcher or practitioner.
- PRA elements: Facilitating discussion amongst farmers and sharing of information with farmers and other stakeholders.
- PLA elements: Farmers and researchers/practitioners can learn throughout the project cycle and use these lessons to engage in individual or joint action.

## 1.2 Concept and entry points for PRDA in relation to irrigation

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### **Leadership of irrigating farmers and their organizations and demand-led extension services**

Since the 1990s, the centerpiece of the reforms in the irrigation sector in Africa has been invariably the transfer of management of public irrigation systems to farmer organizations such as water user associations (WUAs) combined with the downsizing or withdrawal of the government role in O&M, fee collection and conflict resolution. Over the same period of time, irrigation development has been increasingly led by farmers taking advantage of market opportunities and the availability of low-cost irrigation pumps. In many African countries, “informal” irrigation development exceeds formal, public irrigation development in terms of both size of irrigated land and number of farmers.

In this context, PRDA needs to respond to the requirement of empowering farmers and their organizations with a view to taking full responsibility for their irrigation systems. PRDA also contributes to promoting demand-led extension services provided by governments such as institutional/organizational strengthening, innovations, financial and technical support and capacity building.

### **Integration and sharing of local and technical knowledge**

The participatory approach of PRDA is meant to promote integration and sharing of expertise and experience of farmers and technical experts. In this way, PRDA can be used to establish effective partnerships between farmers and extension services to shift from an approach based on the dissemination of ready-made “one size fits all” technology packages to the design of locally adapted technology options meeting the needs, interests and capacity of farmers. In other words, PRDA is a tool to initiate farmer-focused, innovation-led irrigation extension service delivery.

## 1.3 Structure of this manual

---

This manual explains how to perform a “Participatory Rapid Diagnosis and Action Planning of Irrigated Agricultural Systems (PRDA)” particularly on those managed by farmers. Chapter 2 gives an overview of the methodology and its successive steps. In chapter 3, the constituents of irrigation systems are introduced and they will be used throughout the PRDA. Chapter 4 explains how to plan PRDA and chapter 5 introduces how ICT tools can be integrated with the participatory tools used for PRDA. Chapter 6 gives practical recommendations to conduct a PRDA. The tools that can be used for PRDA are described in the annex of this manual.

### **Target people and organizations**

This manual is primarily meant for frontline staff and senior staff of extension organizations and NGOs, who desire to improve and modernize their services to farmers engaged in irrigation by assessing their demands and objectives. Combined results of several irrigation schemes can be used to make general policy recommendations. PRDA can also be used by organizations designing and implementing irrigation projects to rapidly evaluate the quality of past irrigation development. In the case of rehabilitation projects, the first part, situation analysis, is of particular interest.

Some previous experience in using PRA tools is required. Those without previous experience can use this manual during on-the-job training.

**Target areas**

This manual has been developed for:

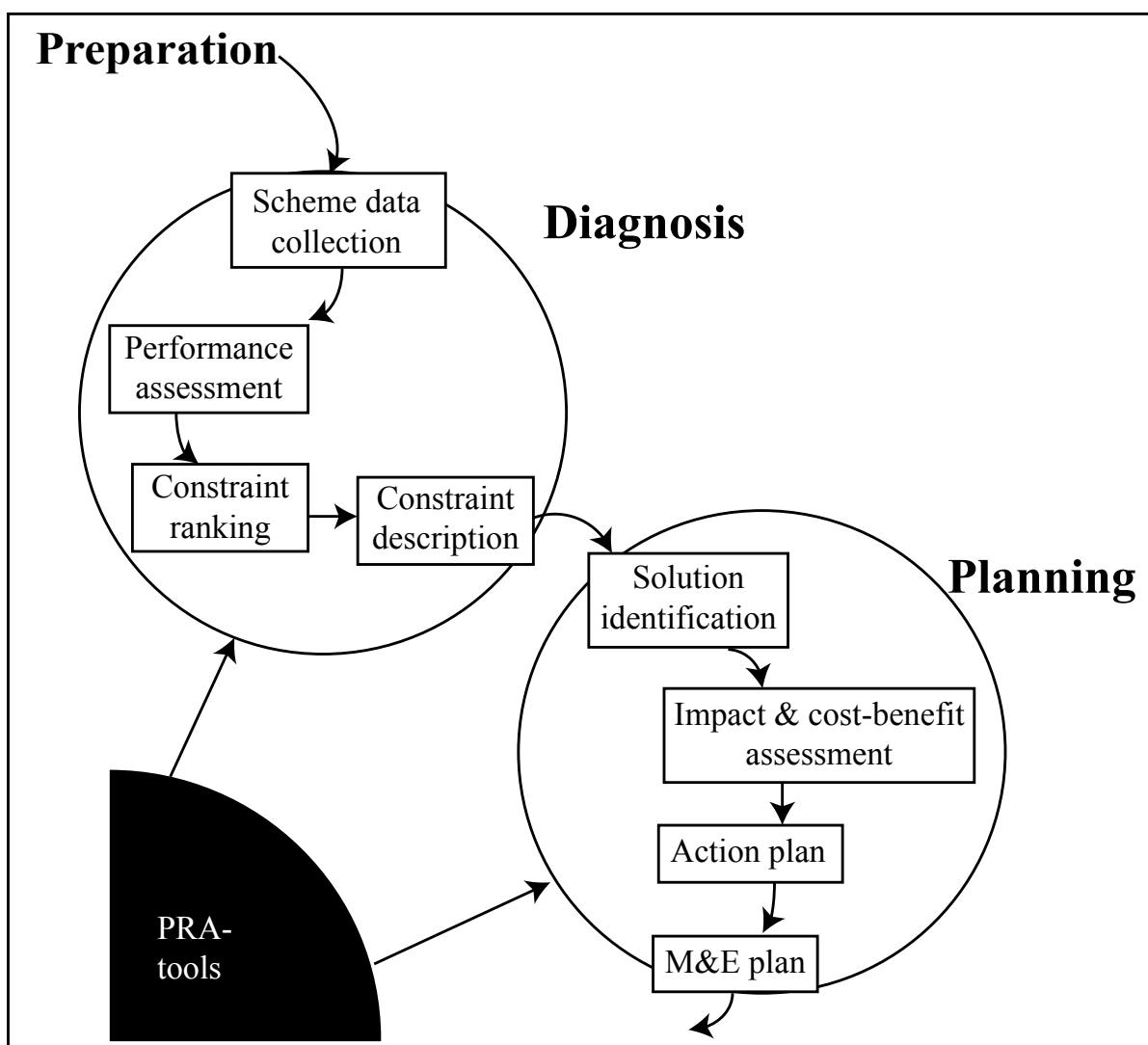
- Group-based irrigation schemes or clusters of individual schemes.
- Systems in which farmers are responsible for O&M. Contexts where documented information and data are scarce.
- The specific situation of irrigation development in sub-Saharan Africa.

## 2. OVERVIEW OF THE PROCEDURE

---

PRDA involves three main steps: (1) preparation, (2) diagnosis and (3) planning of interventions (Figure 2). PRA tools are used at each phase. This chapter describes the procedure in detail. A report should be produced at the end of most steps; templates of these reports are presented in Annex 2 B.

Figure 2. Procedure of PRDA.



### 2.1 Step 1. Preparation

---

#### 2.1.1. Step 1A: Identify and consult with stakeholders

- **WUAs or farmer organizations**

A very important first step for the PRDA is to seek farmers' permission and interest in having a Rapid Diagnosis on their irrigation schemes. Farmers should be informed about PRDA at the earliest possible stage.

Informing farmers carries the risk of raising expectations. Keep in mind that farmers will evaluate you and may give you biased information because, for instance, they want to be given a new irrigation pump or they do not want you to interfere with the conflicts occurring in their community.

An example of what to tell farmers about the PRDA is:

- We are here to learn from you about your irrigation scheme, such as how well it is performing and what the main constraints are.
- We hope you can tell us how to do our job better and improve our service.
- We want to share our knowledge with you by discussing how to improve your own irrigation scheme. But, we are not going to implement a project in your irrigation scheme.

Meeting with the leaders of a WUA is a good opportunity for introducing the Rapid Diagnosis and for seeking their agreement. These meetings can also be used later to discuss progress and results and to facilitate the implementation of the PRDA procedure, for instance, by scheduling appointments with people who will participate in group discussions or interviews.

At the end of the first meeting, ask the WUA leaders to show you their irrigation scheme and record some of the main characteristics that you do not already know, such as size of the scheme, type of water source and means of abstraction, type of water distribution (lined or earthen canals, pressurized pipes), main crops in wet and dry seasons, etc.

- **Other important stakeholders**

The second important group of stakeholders for the PRDA is the potential partner organizations or people who could assist in the rapid diagnosis, help design and/or implement solutions, and provide funding. It is also particularly important to identify potential linkages to be established between farmers and other stakeholders for implementation of the action plan, for instance, suppliers of agro inputs, credit institutions, agroprocessing firms or commercial farmers. The “stakeholder analysis” described in chapter 5 is an easy way to identify these partners.

### *2.1.2. Step 1B: Select method and PRDA*

Once the PRDA team is assembled, involve all team members in selecting appropriate PRDA tools. Plan your PRDA at a period when farmers are operating the irrigation scheme (preferably during the irrigation season) but not very busy (preferably not at harvest periods). Make sure that all team members will be available for the whole period. Chapter 4 contains detailed information on planning the PRDA and selecting tools. PRDA tools are described in Annex 1.

### *2.1.3. Step 1C. Collect secondary information*

Collect literature (secondary data) about the irrigation system (or scheme) and its surrounding area. Secondary data include:

- *Biophysical data*: types of soils, climate, hydrological data.
- *Socioeconomic data*: population density, poverty level, economic infrastructures (roads, dams, agro-industries), main cropping patterns and production level (irrigated and rain-fed).

Sources of information are maps and other geographical data, statistics, reports made by extension services, project documents, research publications, students’ theses, etc.

If the PRDA is to be conducted on a formal irrigation scheme, it is important to collect and review feasibility reports and design documents. This will give you an idea of what the irrigation scheme was expected to look like. It can also be a baseline to compare with the current situation of the scheme. For instance, if the current size of the irrigated area is significantly lower than the size indicated in the design document, this can indicate some kind of maintenance or soil-fertility problems. Reviewing design documents, topographic maps and soil maps can indicate where constraints are likely to be expected, for instance waterlogging in low areas with poor drainage.

The collected secondary information should be organized in a short “preparation report.”

### **Preparation REPORT**

## **2.2 Step 2: Diagnosis**

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### *2.2.1. 2A: Scheme of data collection*

Apply the PRDA tools that you selected at step 1B but remain flexible and use other tools if you need additional information or if the selected tools prove to be of little use in your specific site. For instance, biophysical measurements can be used when you need to validate farmers’ opinions on water shortage. A seasonal calendar is useful to collect detailed information on labor constraints. Applying PRDA tools requires skills and a respectful open-minded attitude. More on this can be found in chapter 6.

### *2.2.2. Step 2B: Performance assessment*

The objective of the performance assessment step is to get a good understanding of the collected information by analyzing it in a structured way. This will increase your knowledge and understanding of the irrigation system or scheme and put you in a better position to proceed to the next steps.

Comparing performance with other irrigation systems or schemes can also point out where improvements are needed and what aspects of the system or scheme are already performing well.

### **Performance Assessment REPORT**

### *2.2.3. Step 2C: Prioritization of constraints*

During the Data Collection and Performance Assessment steps you would have probably identified many constraints. The large amount of data must be organized and presented back to the farmers. You can do this, for instance, by presenting your performance assessment to the WUA to see if they agree with your diagnosis. It is only after this that you can move onto the next step of prioritizing constraints.

Prioritization of the constraints to be addressed by the action plan is crucial for two reasons. Firstly, the impact of the action plan depends on the relevance of the selected interventions and on their ownership by the beneficiaries. Secondly, the interventions will have a bigger impact if they focus on the main bottlenecks rather than addressing each and every constraint. It will be much easier to introduce other interventions after the farmers have assessed the impact of the first interventions.

The perception of the main constraints may vary between farmers with different social statuses, levels of income, genders, geographic positions of farms in the irrigation scheme, etc. It is therefore important to identify the main constraints faced by the various categories of farmers and by male and female farmers. This can be done best on the basis of the communities' ranking of constraints as this will most likely increase their interest/enthusiasm for the action plan. However, remain critical and use your own expertise in the selection of constraints. Keep in mind that farmers' opinion is not always right or comprehensive and that knowledge integration and sharing are a key principle of PRDA.

If farmers prioritize constraints that are not related to the mandate of the PRDA team it is best to refer them to the relevant organizations; for instance, the Public Health Department if farmers mention malaria as a major constraint. Do not try to deal with issues that are not related to irrigation.

Based on the selected constraints, you may have to use additional tools, collect more secondary data on some constraints or seek advice from a specialist before you proceed with identification of solutions.

#### *2.2.4. Step 2D: Detailed description of constraints*

### **2.3 Step 3. Action planning**

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A detailed description of the constraints is needed to better identify their underlying causes and their impacts and thereby learn what needs to be changed to solve these constraints. A detailed description of constraints will also show whether farmers themselves can initiate changes with minimal support or if they require capacity building or technical and financial assistance from other organizations.

#### *2.3.1. Step 3A. Solution identification*

The identification of solutions is closely related to a detailed description of the constraints. Therefore, these steps can be taken together in practice. However, in some cases the local knowledge of farmers may not be sufficient when the expertise of the PRDA team or other irrigation experts may be needed to identify solutions.

#### *2.3.2. Step 3B. Impact analysis*

Once possible solutions are identified, they have to be assessed to see whether or not they are likely to be successful and also to ensure they are acceptable to the farmers. In practice, these two issues are closely linked since solutions that are not accepted by farmers cannot be successful. Therefore, the assessment of solutions has to be done together with farming communities.

However, as with the identification of solutions, farmers' knowledge may not be sufficient to assess the solutions. In such cases, it is advisable to first test and demonstrate with farmers the identified solution in a small part of the scheme or system, or to take a group of farmers to another irrigation scheme or system (e.g., exchange visit) where the solution has already been accepted and implemented. This is particularly important if the envisaged solution is an innovation.

#### *2.3.3. Step 3C. Formulation of action plan*

It may not be possible to have a very well-designed action plan (logical framework) at the end of a PRDA. The action plan can be refined as its implementation goes along. Discuss with farmers to validate the action plan and find a consensus amongst farmers on its implementation; namely, identify if and what collective action is needed.

Discuss the action plan with other organizations and stakeholders that will be involved in the implementation of the action plan.

#### *2.3.4. Step 3D. Design of a monitoring and evaluation (M&E) plan*

Try to identify possible indicators for M&E of the impact of the action plan. If possible, you should start monitoring with the farmers as early as possible to allow better comparison of impact of the action plan in subsequent years (for instance, higher yields due to introduction of improved seeds).

Call a meeting with the farmers several weeks before the beginning of the next irrigation season:

- Rediscuss the action plan.
- Agree on a monitoring plan. This includes selecting indicators to monitor progress and impact.



### 3. IRRIGATION SYSTEMS

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Like all systems, irrigation systems are made up of several components or parts that interact with one another. For instance, the human body is an extremely complex system made up of several constituents (or subsystems): skeleton, muscular system, nervous system, blood circulation system, respiratory system, etc. All these components are linked and interact with one another. Irrigation systems are equally complex with multiple interacting parts.

**In order to make an action-oriented diagnosis of an irrigation system, it is necessary to combine the usual analytic approach with the much less usual systemic approach.**

The analytic approach seeks to reduce a system to its elementary constituents in order to study them in detail and understand the types of interaction that exist between them. The systemic approach considers a system in its totality and its own dynamics. Doing a PRDA implies combining both of the approaches that are more complementary. Table 1 below compares the traits of both approaches one by one.

Table 1. Comparison of the analytic and systemic approaches.

Analytic approach	Systemic approach
Isolates, then focuses on the components.	Unifies, then focuses on the interactions between the components.
Studies the nature of interactions.	Studies the effects of interactions.
Emphasizes on in-depth knowledge, details.	Emphasizes global perception.
Disciplines-oriented approach.	Multidisciplinary approach.
Leads to interventions programmed in detail.	Leads to action through objectives.
Possesses knowledge of details but poorly defined goals.	Possesses knowledge of goals but details remain in a gray area.

Generally, educational systems favor the analytic approach and therefore it is assumed that most users of this manual would not be very familiar with the systemic approach. Chapters 4 and 6 of this manual try to correct this bias by giving “hints” to use a systemic approach when doing a PRDA.

For this manual we have distinguished three main constituents in our representation of irrigated agricultural systems.

#### 3.1 The three main constituents and the socioeconomic environment

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For PRDA, we consider three main constituents of an irrigation system (Figure 3):

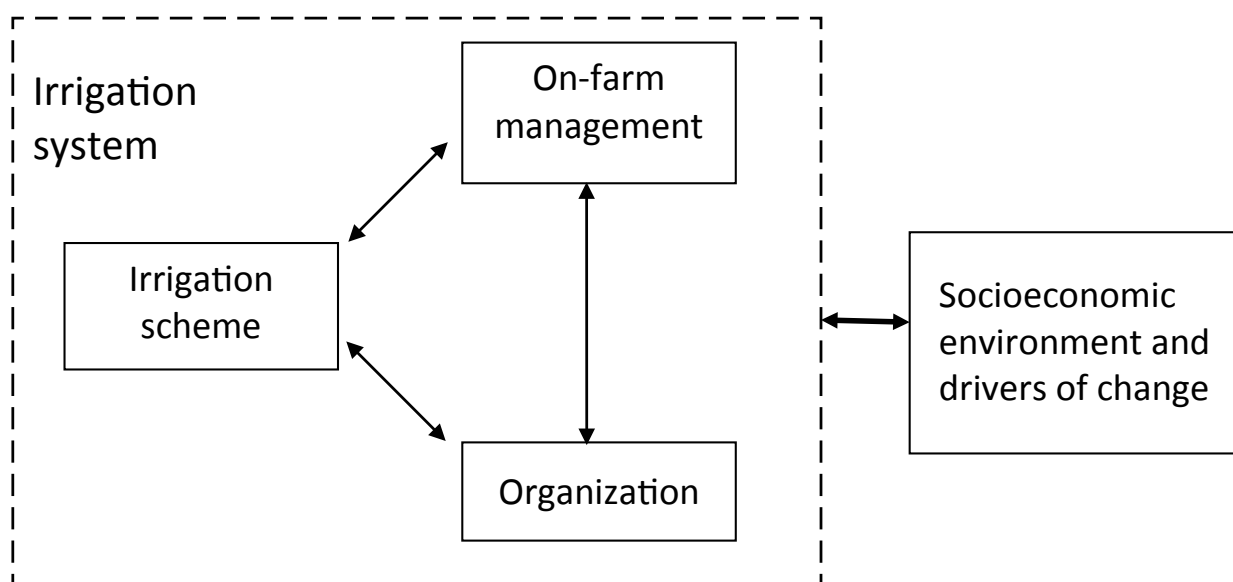
1. *Irrigation scheme*: Characteristics of the irrigation infrastructures and equipment (intake, canals and drainage ditches, water partition structures, pumps, etc.) and the irrigated area. Farmers and their organizations have to take into account the technical, organizational and financial constraints related to O&M of their irrigation scheme.

2. *On-farm management*: Irrigated agricultural production at farm level which includes the type of crops, agricultural technologies, allocation of labor inputs and capital (farming tools, oxen, etc.) in the production process.
3. *Organization*: Group-based irrigation systems imply an organization in charge of O&M. Organizational performance is an important factor of sustainability and productivity of irrigation systems.

### Relationship with the socioeconomic environment

Irrigation systems are not closed and isolated. Performance of irrigation systems also depends largely on their socioeconomic environment: policies governing irrigation and agricultural development, markets, credit institutions, extension services, research institutions, agro-industries, upstream and downstream water users, etc. Irrigation systems also respond to the drivers of change in their environment, for instance climate change, new market opportunities/demand.

Figure 3. The three main constituents and socioeconomic environment of an irrigation system.

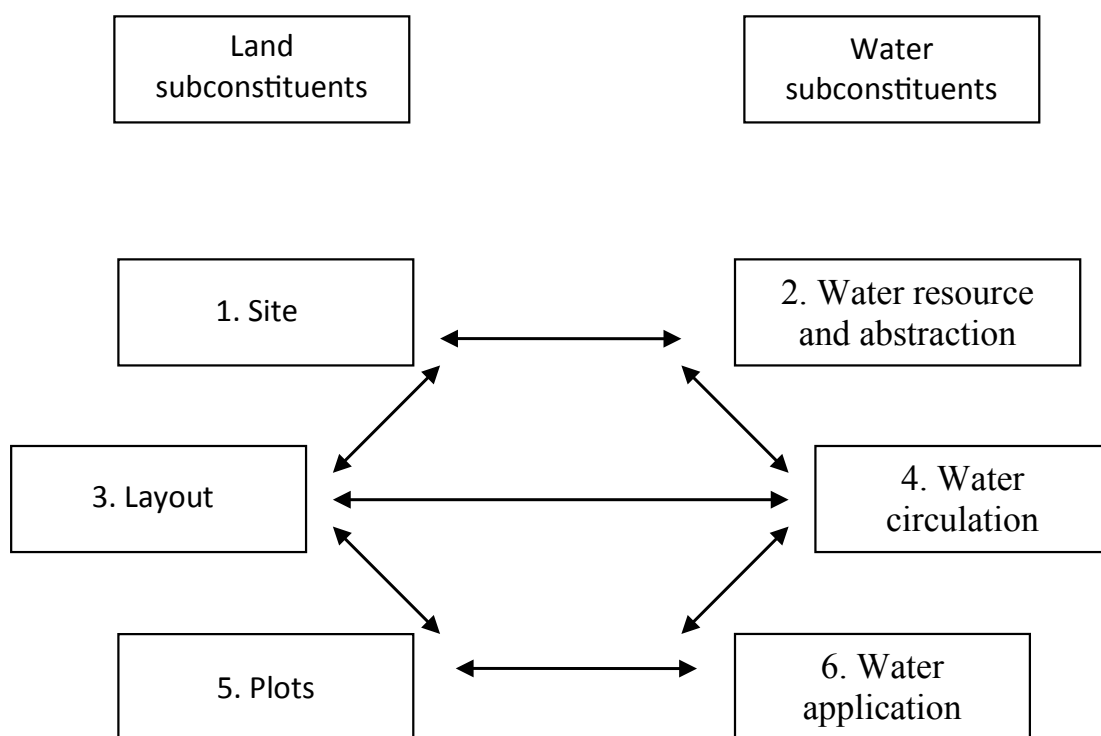


#### 3.1.1 Irrigation scheme

Since irrigation schemes are essentially physical infrastructures enabling people to deliver water to irrigated land they can be seen as a technical system. The main subconstituents refer to land or water as shown in Figure 4 below.

On the left-hand side are the constituents that refer to the land. These constituents should be consistent with one another. On the right-hand side are the “water constituents” that should be fitted to the “land constituents.” In addition, at each horizontal level there is a close link between the “land constituent” and the “water constituent” that should ensure the cohesion of the irrigation scheme.

Figure 4. The six main subconstituents of irrigation schemes.



*Water resource and abstraction:* The type of water source (river, dam, lake, underground water, etc.) and the technical means used to abstract water (diversion weir, pumps, etc.). This determines:

- The amount of water available and its variation around the year.
- The reliability of the water source and possibilities for water storage.
- The extent to which water supply to the scheme can be adjusted.

*The site:*

- Size of the command area.
- Soil types and distribution in the command area.
- Climate.
- Topography.

These two subconstituents are closely linked and should be consistent with each other.

Let us go to the other end of the irrigation scheme where the two subconstituents are the plots and water use.

*Plots:* The elementary land units<sup>2</sup> for water application and the main characteristics are:

- Size.
- Shape (length and width).

<sup>2</sup> Plots must not be confused with farms or landholdings; the latter may include several plots.

- Internal layout.
- Quality of leveling.

*Water application:* Main characteristics are:

- Irrigation technology (furrow, basins, flooding, drip irrigation, etc.).
- “Discharge at entry to plot gate” or “Main d’eau.”
- Irrigation scheduling: frequency and duration of water application.
- Irrigation depth (m<sup>3</sup>/ha or mm).
- Reliability of water supply to the farms.

Plots and water use are closely linked. At the design stage, decisions regarding one of them have a strong influence on the other.

“Layout” and “water circulation” are the two subconstituents that make the link between site and water source on the one hand, and plots and water use on the other, to give cohesion to the irrigation scheme.

*Water circulation:* The manner of how water is conveyed from the source to the plots. It refers to:

- The type of water distribution: on-demand or rotational, interval between irrigations, continuous (24 h/24 h) or noncontinuous water distribution.
- *Water conveyance:* Characteristics of canals (cross section, slope, discharge capacity, earthen or lined canals, compaction); or characteristics of pipe distribution.
- The type of water partition, water control and measurement structures.
- The drainage network.

*Layout:* The manner in which irrigation canals and/or pipes, drainage ditches and feeder roads are laid in the space. This important subconstituent should indeed make the link between a number of considerations such as the size of the secondary units, tertiary units and individual plots; the various types of soil and other land utilizations: roads, cattle breeding, forests, and inhabited areas.

Water circulation and layout are closely linked and interact with each other. Changes brought to one of them automatically lead to changes on the other with the risk of damaging the cohesion of the whole irrigation scheme.

### 3.1.2 *On-farm management*

On-farm management refers to the landholdings and the production process of individual farmers. It results from choices and decisions made by farmers. The heads of the farming household make decisions regarding the selection of crops, and the allocation of labor, inputs and capital with due considerations to the constraints they face and the opportunities they want to use.

The characteristics of “on-farm management” are:

## **Landholding**

- Size and location of irrigated farm.
- Nature of land rights.

## **Production process:**

- Cropping patterns and crop rotations.
- Agricultural technologies, including on-farm water management.
- Yields.

## **Economic outputs:**

- Land productivity: Value added per unit of land.
- Labor productivity: Value added per unit of family labor.
- Water productivity: Value added per unit of water.

## **Landholding:**

Landholding has a strong influence on farmers' strategies. For instance, if the landholding sizes are very small farmers are likely to opt for a strategy aiming at maximizing land productivity. If landholdings are insecure farmers may be reluctant to invest in soil fertility improvements or to plant perennial crops. Location of the landholdings within the scheme (i.e., whether at its head, middle or tail) could determine the ease of access to irrigation water.

## **Cropping patterns and crop rotations**

It is very important to identify and understand the succession of crops or association of crops in time. Reasons for crop selection and change in crop rotations are very useful indicators about the objectives as well as the constraints and opportunities of irrigated farming. Information on cropping patterns and crop rotations is usually obtained through retrospective investigation starting from the current crops and going back in time.

## **Agricultural technologies**

The production process relates to farmers' practices. Firstly, it is a matter of identifying the succession of elementary tasks that farmers perform during the production process, including soil preparation, planting, applying fertilizers, weeding and crop protection, and irrigation. Secondly, one has to understand the reasons why they are implemented in connection with the technical and socioeconomic constraints the farmers have to deal with, namely access to inputs and credit, labor constraints and so on.

Very often, extension services recommend a specific crop production process known as a "technology package." The diagnosis should enlighten and explain the differences, if any, between these recommendations and the farmers' actual practices.

## **Yields**

The last step in the characterization of the production process consists in estimating the yield of each crop (or of the main crops) and identifying post-harvest utilization: market sale, home consumption, inputs for livestock production (i.e., fodder crops). Estimating yields is often a difficult exercise during a rapid diagnosis even if one wants to know them with, say, a 20% margin of error. When doing a rapid diagnosis, estimation of yields could be obtained from interviews of farmers and extension agents. However, farmers usually estimate the yields using local units like

bags, bowls, etc. One should not forget that local units are not standardized and must be calibrated by measuring the weight/volume ratio.

## Economic outputs

The value added (sometimes named “gross margin”) measures the production of wealth in the production process which consumes inputs (seeds, fertilizers, etc.) and services for output production, i.e., commodities. The value added is usually distributed to various actors: farmers (income), government (taxes), farm workers (wages) and credit institutions (interest rates) (Table 2).

Table 2. Value added and value added redistribution.

Gross value of production	
-	Cost of inputs: seeds, fertilizers, pesticides
-	Services, i.e., repair/maintenance of pumps, rent of farming equipment, etc.
-	Spare parts, consumer goods (stationery, etc.)
-	Payment of the irrigation service fee, if any
=	Value added
-	Wages of casual and permanent workers
-	Interest paid on loans
-	Taxes
+	Subsidies or grants
=	Farm income

Value added can be calculated for each crop or each irrigation season. Annual value added is the sum of value added of each irrigation season in the year. Total value added is the sum of value added per crop. Any part of the production (i.e., grains) that is neither sold nor consumed but kept as an input for the next season (i.e., seeds) must not be included in the calculation of value added.

*Value added per unit of land (ha) is an indicator of intensification of the farming system.* For instance, shifting from grains to so-called “high-value crops” such as vegetables is an intensification of the farming system. Increasing yields through higher use of fertilizers is an intensification. Irrigation development allows farmers to grow two or more crops per year on the same land area; therefore, it increases the value added per unit of land compared to rain-fed farming. *Value added per ha is therefore a good indicator to measure impacts of interventions and compare the performance of several irrigation systems.*

*Value added per unit of labor is an indicator of labor productivity.* Generally, capital investments are the most straightforward way to increase labor productivity. For instance, when a farmer buys a tractor, he is able to plow more land and faster compared to plowing with animal traction; thus his labor productivity has increased. In smallholders’ irrigated farming systems, maximizing labor productivity is not an overall strategic objective; however, in periods of peak labor requirements some practices can be explained by such an objective. A typical example is delayed planting of irrigated crops because of late harvest of rain-fed crops.

*Value added per m<sup>3</sup> of water measures water productivity.* It is a good performance indicator for irrigation systems where water availability is limited or where water is costly, as in pump-fed schemes. It is usually difficult to estimate water productivity in African smallholder irrigation systems where data on volume of abstracted water are scarce or not available. However, it is relatively simple to measure the amount of water used for irrigation in pump-fed irrigation systems.

### **Categorization of farmers**

After identifying the characteristics of “on-farm management” you may find out that all farming households are not in the same situation with respect to landholding, crop production process and economic outputs. In such cases it is recommended to identify two to four categories of farmers (Table 3) in order to design tailor-made interventions responding to the needs of the various categories of farmers.

Table 3. Example of categorization of farmers in the Sourou Valley irrigation systems (Burkina Faso).

Categories	Smallholder farmers	Transition farmers	Commercial farmers
Size of irrigated landholding	0.25 – 0.5 ha	1.5 – 3 ha	10 – 20 ha
Crop rotation	Maize or rice in the wet season according to soils	Maize and rice in the wet season	Maize in the wet season
	Vegetables or rice in the dry season, also according to soils	Vegetables and rice in the dry season	Two cycles of vegetables in the dry season
		Own land on various types of soils	
Farming equipment	Hand tools only	Animal traction	Rent or own tractor
Labor	Family labor	Family + hired labor	Essentially hired labor
	Seek employment as farm laborers		
	Engage in nonfarming activities (fisheries, small businesses)		
Yields	Low yields because low access to inputs	Medium to high yields because of integration of crops and livestock	High yields

### **3.1.3 Organization**

To consider an organization, one can distinguish its objectives, structure, and internal rules and regulations.

## Objectives

The objectives relate to the functions of the organization. Usually in irrigation systems, the organization's objectives are one or both of the following:

- WUAs for O&M. Cooperative societies for marketing and input supply.

It should be noted here that O&M require a compulsory cooperation among water users. Cooperation for input supply and marketing is based on a voluntary basis leading farmers to organize themselves because of their common interest. However, WUAs and cooperatives are organizations with different natures. Experience shows that attempts to combine O&M and marketing in one organization often fail.

The functions of WUAs can be classified into three categories: (1) governance, (2) O&M, and (3) administrative and financial management.

### *Governance functions*

Governance (or social management) relates to the roles and responsibilities of the General Assembly of the WUA and the governance bodies. This involves the setting up, implementation and the modification of internal rules and regulations that are necessary to organize the day-to-day activities of WUAs such as:

- Election of office bearers.
- Approving annual/seasonal budget and action plan.
- Approving annual/seasonal activity and financial reports.
- Setting up/modifying internal rules and regulations.
- Enforcement of discipline by imposing sanctions against any individual farmer and/or group of farmers for any violation of the agreed upon bylaws and/or internal rules and regulations.
- Arbitration and settlement of any dispute arising over the O&M among individual farmers and/or groups of farmers.

### *O&M functions*

O&M functions relate to planning, implementation and monitoring of irrigation water distribution and maintenance works including:

- Preparation of the annual or seasonal operation/water distribution plan taking into account water availability.
- Operation of the irrigation system in order to convey irrigation water from the head works to the tertiary units in accordance with the annual/seasonal operation plan including water scheduling on a day-to-day basis.
- Assessing if irrigation water is distributed equitably between all secondary and tertiary canals and irrigation blocks.
- Prevention of wastage of water and ensuring efficient utilization of supplied irrigation water.
- Doing regular inspections of all irrigation and associated structures in order to assess the maintenance requirements.
- Preparation of the annual/seasonal maintenance plan and budget, based on the conducted inspections.
- Implementing the annual/seasonal maintenance plan.

### *Administrative and financial management functions*

The administrative and financial management functions relate to day-to-day administrative tasks and bookkeeping:

- Assessment, billing and collection of irrigation fees among all water users.
- Maintenance of all necessary financial and nonfinancial records.
- Hiring and supervision of permanent or seasonal staff as required.

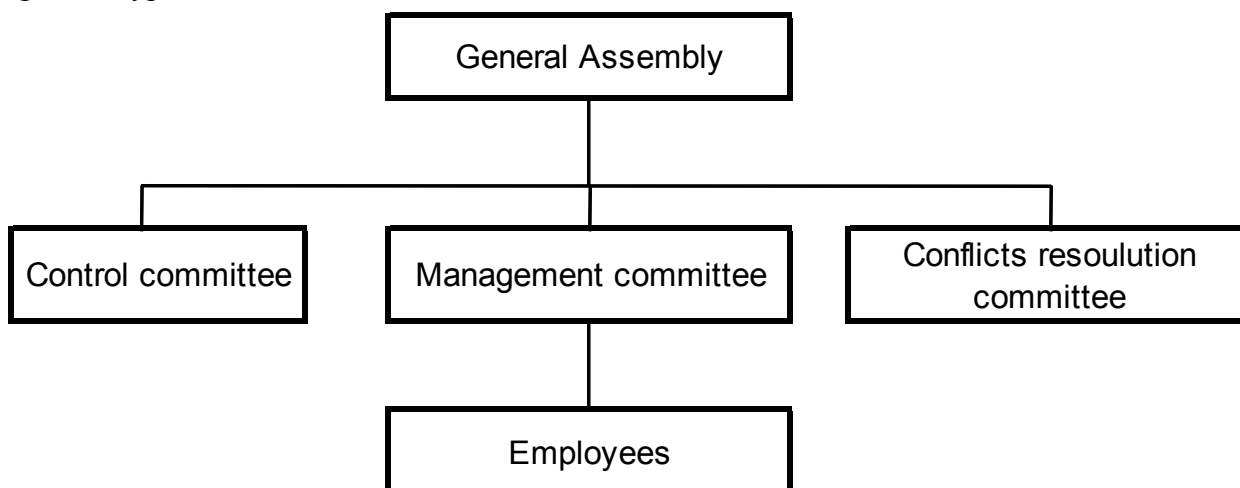
### **Structure**

The structure relates to subdivision in units for specific functions and to the vertical or horizontal relations between these units. An organization chart is the usual way to represent the structure.

Typically, a WUA structure (Figure 5) includes the following:

- The General Assembly, which is the supreme body of a WUA. The General Assembly adopts the annual/seasonal budget and action plan of the WUA, and sets its rules and regulations. In small WUAs all members participate in the General Assembly meetings; in larger WUAs members can be represented at the General Assembly meetings by elected representatives.
- The Management Committee, composed of persons elected (or appointed) by the General Assembly, is in charge of the day-to-day management of the WUA. The President of the Management Committee is also the President of the WUA. The Management Committee is accountable to the General Assembly.
- The Control Committee, which is in charge of controlling/auditing the financial management of the WUA so that WUA members are confident that the money they pay to the WUA (irrigation fees) is properly used. Members of the Control Committee are elected (appointed) by the General Assembly.
- Some WUAs establish a Conflicts Resolution Committee. Its mandate should be restricted to solving conflicts between WUA members and not disputes between members and the WUA itself, as that would undermine the power of both the Management Committee and the General Assembly.
- WUA employees are hired for specific tasks assigned to them by the Management Committee. They are accountable to the Management Committee for their performance. In practice, only large WUAs have employees, some of whom are permanent although they may not be employed full time; others are employed on a seasonal basis.

Figure 5. Typical structure of a WUA.



### Internal rules and regulations

Objectives and structure set the operational framework of an organization. However, to effectively achieve its objectives, organization members must adopt and enforce internal rules and regulations relating to:

- Rights and duties of members; among these water right is the most important right while contributing to the O&M costs, in labor and/or cash, is the most important duty.
- Roles and responsibilities of the governance bodies including the procedures for election and removal of office bearers.
- Procedures for calling meetings of the General Assembly.
- Voting procedures at General Assembly meetings.
- Purpose, composition, functions and powers of all governance bodies (committees).
- Procedures for resolving disputes.
- Description of the duties and responsibilities for any staff of the WUA and procedures for appointment and dismissal of staff.
- Procedures for setting and collection of Irrigation Service Fees (ISF).
- Penalties and sanctions to be imposed for default in payment of the ISF. Penalties and sanctions to be imposed on farmers for the violation of bylaws and/or internal rules and regulations.

The internal rules and regulations may be formal, written bylaws, written regulations adopted by the General Assembly or informal, based on truth and understanding within the community.

### Women and WUAs

Over the past three decades, gender issues have been on the agenda of rural development agencies, donors and political leaders. However, the gap between good intentions and real action is considerable. The contribution of women to agricultural production is well known. Women provide an important part of the labor force and in many African communities they have their own land rights and use freely what they produce on their own land. However, extension services and technology transfer continue to target mostly men; this often results in weakening women's social and economic status. Irrigation development is not an exception. Exclusion/inclusion of women regarding access to land and water in irrigation schemes, participation of women in decisions made in WUAs and inclusion of women as WUA leaders must be considered while doing a PRDA.

### 3.1.4 Socioeconomic environment

The socioeconomic environment of an irrigated agricultural system may constitute a range of relations with various external organizations and individuals with respect to the following:

- Policies and governmental programs governing development of irrigation and agriculture. Information, technologies and knowledge made available by extension services, research institutes and the private sector.
- Upstream and downstream water users.
- Markets of commodities, agricultural inputs, irrigation equipment and spare parts, building materials, etc.
- Credit.
- Other service suppliers, i.e., contractors for major maintenance or repairs, delegation of water management to an external operator, etc.

Major drivers of change in the environment of irrigation systems are:

- Climate change that can impact water availability.
- Urbanization and general economic growth leading to higher market demand, particularly for fruits, vegetables and livestock commodities.
- Emergence/development of the private sector and downsizing of government interventions.

## 3.2 Questions to be answered by the Rapid Diagnosis

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At the Rapid Diagnosis stage, data that are difficult to collect (i.e., agricultural yields, water use efficiency) should be roughly estimated. Priority is given to sound explanations of farmers' practices to have a global understanding of the irrigation system rather than collecting and processing quantitative data. In other words, the rapid diagnosis should balance and combine the analytic and systemic approaches.

The Rapid Diagnosis is also meant to establish a good working relationship between the team and the farmers' organization for future activities. It should not be perceived as an external investigation to pass judgment on farmer's practices, but as cooperative work to improve them. Sensitive information such as data on farmers' income should be collected only if farmers are not reluctant to give them. Otherwise, value added and farmers' income can be estimated from collected information about "on-farm management."

### 3.2.1 The central question

The central question to be answered during the Rapid Diagnosis is:

"How good is irrigated agricultural productivity and sustainability; what are the major constraints and what are the causes and effects of those constraints?"

It is important that the diagnosis distinguishes clearly between the *major* constraints or "bottlenecks" from other constraints. The action plan will have a better impact if it focuses on the major constraints rather than addressing each and every constraint. It would be much easier to introduce other interventions afterward, once the beneficiaries will have assessed the impact of the first interventions.

Since the central question is too wide to expect a straightforward answer, the analysis of data and information is done along a range of sub-questions divided along the lines of the constituents of irrigation systems. Note that these constituents do not imply some sort of chronological order for collecting information. Items of information collected in an interview with farmers or while visiting the scheme can apply to more than one constituent. The constituents of an irrigated agricultural system should be seen as a framework to coordinate data collection, as it goes along facilitating analysis and diagnosis.

### 3.2.2 Questions on “Irrigation scheme”

Analysis of irrigation systems should inform whether or not the irrigation infrastructure and equipment allow sufficient and secure access to water for all farmers and, if not, why.

This question immediately brings up a “philosophical” question. Whom do we include in “all farmers”: members of the WUA, farmers having a land right under the scheme or all water users? How do we define the boundaries of the scheme? Should it be limited to the area envisaged in the design, the area currently irrigated or the area potentially irrigable with the available water resource? Whatever definitions are chosen, the analysis can be best answered along the three horizontal lines between land and water subconstituents.

- Site and water resource

Is the water resource a limiting factor for supplying the command area, and which is the entire area that can be irrigated under the scheme and is fit for cultivation around the year? If yes, what are the causes and impacts? What solution has been found by farmers to alleviate the problem?

- Layout and water distribution

Is water distribution reliable throughout the scheme? Are some parts of the scheme affected by water stress or been abandoned because of lack of water? If yes, what are the causes? Are water losses important? If yes, what is the cause: problems of canal siltation, seepage, leakage, or overtopping?

Do water control structures on canals allow a satisfactory water distribution?

Is waterlogging a problem in some parts of the scheme? What is the cause and what is the effect?

- Plots and water use

Do the farmers have a good technical understanding of on-farm irrigation management? Are irrigation turns taken on a regular schedule and are they predictable? Are the plots well leveled? Is the irrigation method well adapted to crops and soil type?

Main quantitative indicators for the “irrigation scheme” are:

Relative irrigation supply:  $\frac{\text{Irrigation supply}}{\text{Irrigation demand}}$

Cropping intensity:  $\frac{\text{Annual cropped area (ha)}}{\text{Size of command area (ha)}}$

**Note:**

Relative water supply is the inverse of “irrigation efficiency.” It can be measured at various levels (scheme, secondary and tertiary units). Annual cropped area is usually the sum of cropped area in dry and wet seasons.

### 3.2.3 Questions on “on-farm management”

The analysis of “on-farm management” should answer the following questions:

- How good is the productivity of irrigated farming and what are the main constraints?
- Are land rights and water rights secure enough to allow farmers to invest in irrigated farming?
- Does the current level of economic outputs indicate that farmers have the capacity to pay all irrigation costs?
- What are the prospects and potential for improvement of on-farm management?

A better understanding of this requires a knowledge of the following:

- What objectives do farmers assign to irrigation: food security, cash income, mixed?
- Trend to crop specialization or diversification and reasons why? What are farmers’ criteria for crop selection?
- Intensification: level of inputs use, farming equipment.
- Soil fertility management practices (conservation agriculture technologies, intercropping, crop rotation, use of manure, crop – livestock integration, etc.).
- Major pests and diseases and how they are controlled.
- Labor availability and labor calendar (tasks carried out around the year).
- Land rights: What are the conditions for access to irrigated land in the scheme? Are land rights secure enough to allow farmers to invest in their land (i.e., increase soil fertility, plant perennial crops)? How many farmers are sharecroppers and under what terms?
- Water supply (or water rights): What are the conditions for access to water and against which there are obligations, i.e., payment of water fee, WUA membership? Is plot water supply secure enough to allow farmers to invest in making improvements to irrigated agriculture?

Main indicators of on-farm management are:

- Yields of main crops.
- Gross value of production/ha.
- Value added/ha.

### 3.2.4 Questions on “Organization” (WUAs)

A key question is: What are the achievements and challenges ahead of the WUA?

More specific questions are:

- What are the objectives and functions of the WUA?
- How well does the WUA perform its functions with regard to O&M?
- What are the internal rules and regulations and how are they enforced?
- What are the mechanisms for assessing and collecting the irrigation fee?
- Which management tools are used by the WUA (bookkeeping system, budget, annual or seasonal action plan for water distribution and maintenance)?
- How does the WUA deal with conflicts between farmers and between farmers and the WUA?

To what extent are women participating in the decision-making process within the WUA?

### 3.2.5. Questions on “Socioeconomic environment”

Concerning the socioeconomic environment, it is important to know whether surrounding institutions, organizations and individuals support farmers and the WUA.

*Policy:* How supportive or restrictive is the policy environment for farmers?

*Extension services:* What is the quality and quantity of extension services? Are the technologies and technical support promoted by extension services well adapted to local conditions and farmers’ needs?

*Inputs:* Are modern agricultural inputs available (considering price, quality, timing), such as improved seeds, chemicals and fertilizers? What are the linkages between informal groups of farmers or the cooperative and the inputs traders and service suppliers?

*Business services:* What supporting business services (e.g., for pump sales and after-sales services, repairs to irrigation infrastructure, etc.) are available? How well do they perform?

*Market and prices:*

- Are farm-gate prices of crops high enough to ensure a decent income for farmers (compared to poverty line and minimum wages)?
- Are commodity prices predictable and stable or fluctuating a lot?
- Are commodity prices much lower than in nearby cities due to poor access to markets? e.g., poor roads and distance to the market place, relative monopolistic position of a small number of traders, difficulty of reaching agreement between groups or individual farmers and traders.
- What are the relationships between informal groups of farmers or the cooperative and traders?

*Credit:*

- How good is access to credit?
- How high/low and manageable is the interest rate?

*Water rights (watershed level):*

- Are there conflicts over water at the watershed level between upstream and downstream water users?
- If there are conflicts, when do they happen (period of the year) and what are the causes of these conflicts? What are the impacts of these conflicts on availability of water at the head of the system? Are there mechanisms for conflict resolution?
- Is there any organization for allocating water rights at the watershed level? If yes, how well does it perform?

*Responses to drivers of change*

- How did farmers respond to changes in their environment over the past years, namely with regard to water availability, market, pest and disease problems, agriculture/irrigation policy, development projects?
- What are the current trends of development in the area in general, and in the scheme or system in particular?

## 4. PLANNING THE PRDA

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### 4.1 Selecting team members

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A PRDA team ideally has four persons, but this number may be smaller when dealing with very small irrigated landscapes of less than 100 ha. Ideally, the team members' disciplinary backgrounds and organizations should complement each other and jointly cover the four different constituents of an irrigation system (see Figure 3 [p.12]). For example:

- Irrigation Engineer
- Agronomist
- Economist
- Social Scientist
- Specialist of farmer organizations
- If you are using ICT tools, an Expert on ICT for Development

Having a senior team member makes dissemination of results easier and may also attract external support.

Each team member should look into details of constraints related to his/her own discipline (analytic approach). But all team members should attempt to have a global understanding of constraints by cross-checking information and assessing the causes and impacts of constraints (systemic approach) (see Box 1). For instance, an engineer may focus on problems related to water shortage and look for solutions related to the improvement of the intake or the conveyance system. But shortage of water may also be caused by poor organization of water availability and distribution, overirrigation by farmers at the head of the system or an inappropriate cropping calendar. A social scientist will be able to capture the human dynamics, such as conflicts or options to increase success by bringing people together. Working with people from different organizations may provide farmers with a broader range of support for implementing the action plan. It may also stimulate team members to look at the shortcomings of their own organization.

#### Box 1. Key principles of PRDA.

##### Key principles of PRDA

- Participation: Farmers and the PRDA team work together to collect and analyze data. Information should be shared with farmers.
- Flexibility: Selection of tools and planning may be adjusted according to findings and the work schedule of farmers.
- Integration: Integrate the knowledge of farmers and experts. Cost and time efficiency: Avoid spending too much time or money to collect very detailed information.
- Systematic approach: Try to get a global/multidisciplinary picture of important topics and interaction between constituents; assess impacts of constraints, and cross-check what is said.

## 4.2 Budget and other resources

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A PRDA can be very cheap. The main costs are staff time per diem, transport and some money for stationery. It can therefore be done as part of the “normal” extension job. If you are planning to use ICT tools, a one-time cost for setup of needed inputs is necessary.

## 4.3 Selecting information sources

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Would the information be “desirable/nice to know,” or “essential/really needed”? The temptation to collect data merely for the sake of interest (or because “it might be useful someday”) should be resisted. If there is a serious doubt as to whether a particular item of data should be collected or not, the general rule is to leave it out.

### 4.3.1 *The following information sources can be used*

- Farmers.
- Farmers with a special position in the WUA or Cooperative.
- Key informants such as local administrative leaders, experts, commodities traders, inputs suppliers.
- Feasibility studies and design documents (crop type, area, water distribution parameters).
- Previous reports or students’ theses related to irrigation.
- Maps (soil type, topography).
- Hydrological data (watershed level).
- Statistics on population (census), crop and livestock production in the scheme area.
- Data on market information. Administration of farmers’ organization (accounts, minutes of meetings, legal status, organizational chart, bylaws).
- Public services in charge of irrigated agriculture (irrigation development policy, extension service).
- Research centers and universities. NGOs working in the area.

### 4.3.2 *Critical questions to ask when searching sources to use*

#### 4.3.2.1 *Availability of sources*

- Are they inexpensive? (Using existing government statistics may be cheaper than doing a new survey to collect data yourself).
- Do we have easy access to them? (Some documents may be available only in another city).
- Are they likely to cooperate? (Experts may be very busy; farmers may be reluctant to show their financial status).

#### 4.3.3 *Credibility/reliability of sources*

- Is there reason to suspect that the informant will exaggerate or underplay the truth? People may not tell the truth because it is embarrassing or they have a strong interest in the outcome.
- Is the person the most suitable one to give information on the topic? Generally, farmers are in the best position to report on their own practices. First-hand reports are better than reports that copy information from first-hand reports.
- Is the person likely to remember accurately? Information given about past years is generally better than information from a still earlier period as people forget things.
- Is the information given by farmers likely to be complete? Documents may be missing.

Informants may not have been present the whole time to get complete information.

- Do they possess the general background knowledge? Some people may not have enough understanding of a certain topic to give good information.

## 4.4 Selecting tools

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PRDA tools (Box 2) are a set of skills and approaches to extract data from the informants who are mentioned above and discuss them. PRDA focuses on participatory tools because they are most suitable to stimulate discussions and can increase the farmers' ownership of final results. Collecting information can be done either in the field or in the office. Tools for analyzing data are "office tools."

### Box 2. Classification of PRDA tools.

Tools aimed at collecting information:

Review of secondary sources (literature): Feasibility studies, design reports, books or reports about the area/region.

Direct observations: Use your eyes and record physical structures, social differences, behavior of farmers (for instance during a transect walk).

Biophysical measurements: Canals' discharge, size of plots, planting density, etc.

Interviews/Discussions: With individual farmers, households, groups of farmers, community leaders (elders, WUA board and Cooperative board), key-informants (local government officials, scientists).

#### 4.4.1 During interviews/discussions you can use:

- Questionnaires.
- Semi-structured interviews (interviews which follow a set of general areas rather than predefined specific questions).
- Mapping: Irrigation system map, water resources mapping.
- Ranking: Constraint ranking, matrix ranking, actor-constraint ranking, multi-criteria analysis.
- Diagrams: Historical trend, irrigation system time line, crop rotation calendar, seasonal calendar, Venn Diagram, gender task analysis, water use matrix, cause-effect diagram.

#### 4.4.2 Tools that can be used for data analysis

Classification of stakeholder analysis?

Organizational analysis: Linkages and relationships?

Input supply and marketing chain analysis; cost-benefit?

Trend analysis: Historical diagramming, seasonal calendars, daily activity charts.

Benchmarking: Compare the situation (performance) at one irrigation scheme with findings at another location.

Table 3 presents recommended tools for doing a PRDA, depending on the size of the irrigation scheme.

Table 4. Recommended PRDA tools for different irrigation scheme sizes (see Annex 1).

Name of PRDA-tool	10 ha	100 ha	1,000 ha
Step 2a			
Transect walk	1x with group of three to five farmers	2x with group of three to five farmers	3x with group of three to five farmers
Irrigation system map	1x with group of five to seven farmers	2x with group of five to seven farmers	3x with group of five to seven farmers
Venn Diagram	1x with group of five to seven farmers	2x with group of five to seven farmers	4.4.3 3x with group of five to seven farmers
4.4.4 Irrigation system time line	4.4.5 1x with group of five to seven farmers	4.4.6 3x with group of five to seven farmers	4.4.7 2x with group of five to seven farmers
4.4.8 Crop-rotation and seasonal calendar	4.4.9 With five individual farmers	4.4.10 With 15 individual farmers	4.4.11 With 25 individual farmers
4.4.12 Cost-benefit analysis	4.4.13 For two major crops (five farmers per crop)	4.4.14 For four major crops (five farmers per crop)	4.4.15 For six major crops (five farmers per crop)
4.4.16 Organizational analysis	4.4.17 For the whole scheme	4.4.18 For the whole scheme	4.4.19 For the whole scheme and for several subunits
4.4.20 Rapid gender-based differences analysis	4.4.21 1x with group of women beneficiaries	4.4.22 1 or 2 x with group of women beneficiaries depending on number	4.4.23 1 – 3 x with group of women beneficiaries
4.4.24 Semi-structured interview of key informants	4.4.25 1/informant	4.4.26 1/ informant	4.4.27 1/key informant
4.4.28 Step 2c			
Constraint ranking	2x with male and female (groups of five to seven farmers)	3x with (groups of five to seven farmers) near head, middle, tail and females	4x with (groups of five to seven farmers) near head, middle, tail and females
Step 2d/3a			
Cause-effect diagram	1x with group of five to seven farmers	2x with group of five to seven farmers	4x with group of five to seven farmers
Step 3b			
Multi-criteria analysis	1x (same number of farmers as in 2d/3a)	2x (same number of farmers as in 2d/3a)	4x (same number of farmers as in 2d/3a)
Step 3c			
Action plan formulation	1x with farmers and 1x with local officials	2x with farmers and 1x with local officials	4x with farmers and 1x with local officials

The annex contains an overview of the PRDA tools mentioned in the above table as well as other tools you may select. Do not treat the list as a blueprint; be flexible to change tools when encountering difficulties during fieldwork.

Doing a PRDA on a larger irrigation scheme or system usually requires more time because of its larger size and number of farmers. PRDA tools have to be repeated more often to get information from a larger number of farmers. However, the aim of PRDA is to get a general picture of problems in the irrigation scheme; not a knowledge of every farmer's individual constraints. Since important constraints are often shared by groups of farmers, the percentage of farmers participating in the PRDA can be less on larger irrigation schemes.

On very small irrigation schemes and systems, most farmers will participate directly in the PRDA ensuring that collected information is probably true for all farmers. Feedback is also direct. Working with larger groups of farmers requires a more careful selection or "sampling" of participants to interviews/discussions to ensure that the information is representative of the whole group.

Communicating results and making action plans with a large number of individuals are also much more difficult in the short period of time. It is recommended to discuss with participating farmers on mechanisms for informing absentee farmers, including women.

More generally, PRDA is an opportunity for boosting lively communication and discussion amongst farmers. There is a risk that this process weakens with time. The following recommendations may help maintain a good communication during implementation of the action plan:

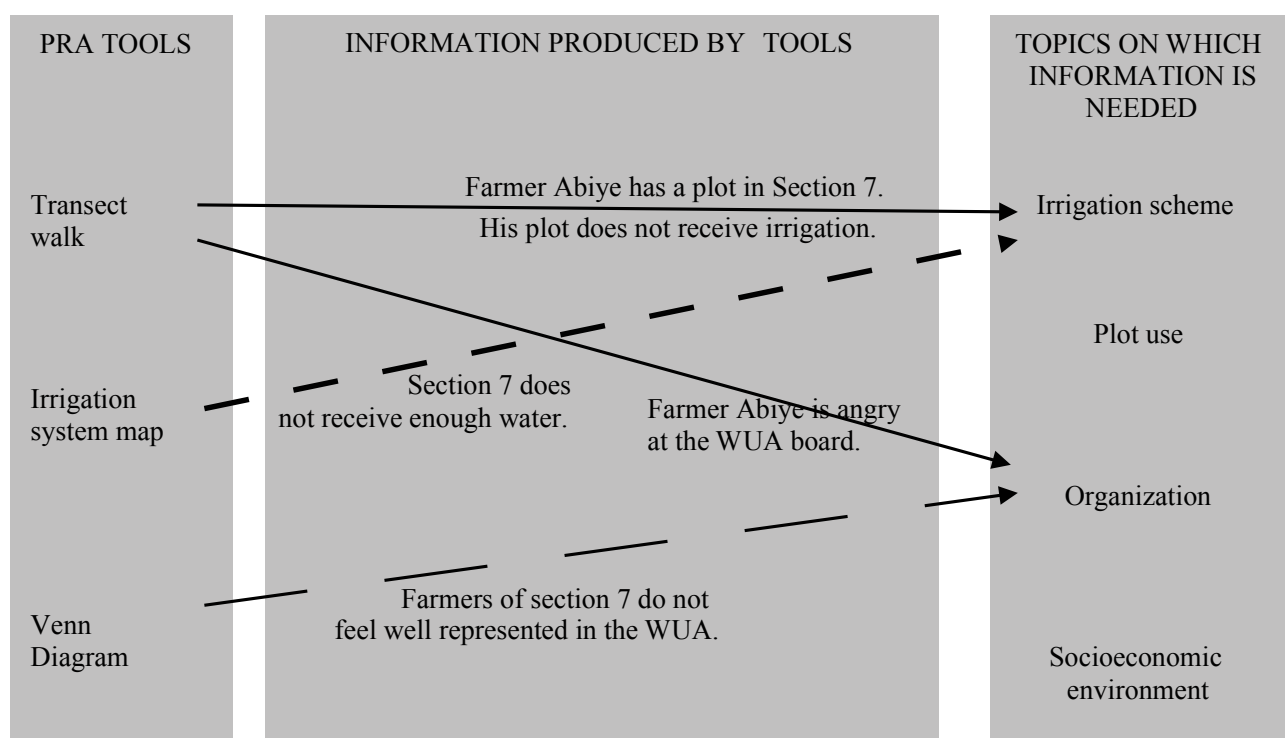
- Participation of PRDA team members in the general assembly meetings of the farmers' organization on a regular basis (participation in discussions but, of course, not in decisions made by the general assembly).
- Farmers' participation in monitoring and evaluation of the action plan will create opportunities to share information, fine-tune the diagnosis and discuss ways to improve the quality of the action plan. On large schemes, this can be facilitated by organizing groups of farmers according to the type of actions.

In undertaking a PRDA it may be necessary to adapt the tools according to the scale of the irrigation scheme. Farmers of a 1,000 ha irrigation scheme may not have time to do a whole "transect walk" from intake to the tail end, so it may be necessary to split it up into smaller sections.

Figure 6 shows the relation between the constituents of an irrigation system and the PRDA tools used to get information. One tool can provide information on multiple constituents. For example, transect walk, irrigation system mapping and seasonal calendar can all provide information related to water availability at plot level.

The information collected on one constituent can originate from multiple PRA tools. Information from different tools can be used for cross-checking. But the information also complements each other and explains the relation between the different constituents. For instance, the irrigation system map shows that the information from the transect walk "Abiye does not get irrigation water" has wider relevance because many farmers in Section 7, which refers to an area in the irrigation scheme, as used in the example in Figure 6, have the same constraints.

Figure 6. Relation between the constituents of an irrigation system and PRDA tools.



## 4.5 Time schedule

Table 4 indicates the approximate number of days required. Each pair of two persons can conduct a maximum two groups or six individual PRDA tools per day. Plan time during the afternoon of every field-day to write field reports immediately after applying the PRDA tools and discuss findings with the team. It is not necessary to work nonstop on the PRDA. An assessment can be planned with days or weeks off in between for other work or holidays.

Table 5. Estimated time required to do PRDA according to the size of the irrigation scheme.

Size	Less than 200 ha	200 ha +	1,000 ha +
Step 1a: Identify and consult stakeholders	1 day	2 days	3 days
Step 1b: Select method and planning	1 day	1 day	1 day
Step 1c: Collect secondary information	2 days	2 days	3 days
Step 2a: Scheme data collection	3 days	5 days	7 days
Step 2a: Interviews of key informants	1 day	2 days	3 days
Step 2b: Performance assessment	1 day	1 day	2 days
Step 2c: Prioritization of constraints	½ day	1 day	1 day
Step 2d/3a/3b	1 day	1 day	2 days
Step 3c: Formulation of action plan	1 day	1 day	2 days
Step 3d: Design of M&E plan	½ day	1 day	2 days
Total no. of days per person	12 days	17 days	26 days
Recommended team size	2-4 persons	4 persons	4 persons

## 5. USING ICT TOOLS IN PRDA

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“Information and Communication Technology (ICT) refers to the broad range of hardware, software, network infrastructure and media that enable the processing, storage and sharing of information and communication both among humans and computers, locally and globally” (InfoDev, Making Sense of ICT for Development, April 2007). ICTs have been used by scientists for Smart Water Management as a strategic enabler in the process of developing innovative solutions to address the problems of water scarcities. This is done by facilitating the collection and analysis of environmental data. ICT enables researchers and climatologists to build more accurate models for weather forecasting. The International Telecommunication Union lists the following ways in which ICTs have been used in water management.

### **Major roles for ICT in water management**

- Mapping of water resources and forecasting of weather.
- Remote sensing from satellites.
- In-situ terrestrial sensing systems.
- Geographical information systems.
- Sensor networks and the Internet.

### **Asset management for the water distribution network**

- Buried asset identification and electronic tagging.
- Smart pipes.
- Just-in-time repairs/Real-time risk assessment.

### **Setting up early warning systems and meeting water demand in cities of the future**

- Rainwater/Stormwater harvesting.
- Flood management.
- Managed aquifer recharge.
- Smart metering.
- Process knowledge systems.

### **Just-in-time irrigation in agriculture and landscaping**

- Geographical information systems.
- Sensor networks and the Internet.

ICT has been used effectively in collecting quantitative and climate data to aid irrigation schemes and for smart water management. With new technology, ICT tools can now be used in the PRDA process, as well. Qualitative research is important to understand social interactions, social contexts and the causes of failures and successes with agricultural water management. Analysis of complex social data, however, is difficult and there is a lack of specific guidance on how to carry it out. The philosophy underpinning information and communication technology (ICT) is not wholly compatible with that which underpins qualitative research. ICT is based largely on logical, objective and quantifiable procedures, whereas qualitative research requires a more subjective, interpretative stance and seeks to explore meaning. It is accepted that the mechanistic tasks of qualitative data analysis, for example, organizing, storing, reproducing and retrieving data, can be undertaken more efficiently and systematically using ICT than doing them manually. ICTs are not part of the PRDA tools or qualitative tools, but aid the PRDA process by simplifying the recording, storing and analysis of data. With the technology that is available, it is possible to collect qualitative data,

as well as analyze them, in combination with geospatial and quantitative data in real time. ICT tools are available in a wide range of options and each tool needs to be customized to the needs of individual projects or interventions. In this section we present three ICT tools or options that can be harnessed to effectively measure field conditions by integrating them with the participatory tools used for PRDA. These broadly cover the capabilities of most of the available ICT tools for research.

#### *5.1.1 SoftGis methodology*

Geographic Information Systems (GIS) can be defined as a set of methods, software and technologies developed for the storage, analysis and mapping of geographic information. For decades, the integration of social and territorial information through GIS was exclusively quantitative, and qualitative data were neglected. However, now qualitative GIS have brought together the critical human geography and the social sciences in the study of sociospatial phenomena. In fact, this breakthrough in the design and use of GIS has become an important resource for useful mixed method and multimethod approaches (Aitken and Craine 2009). Primarily, they are:

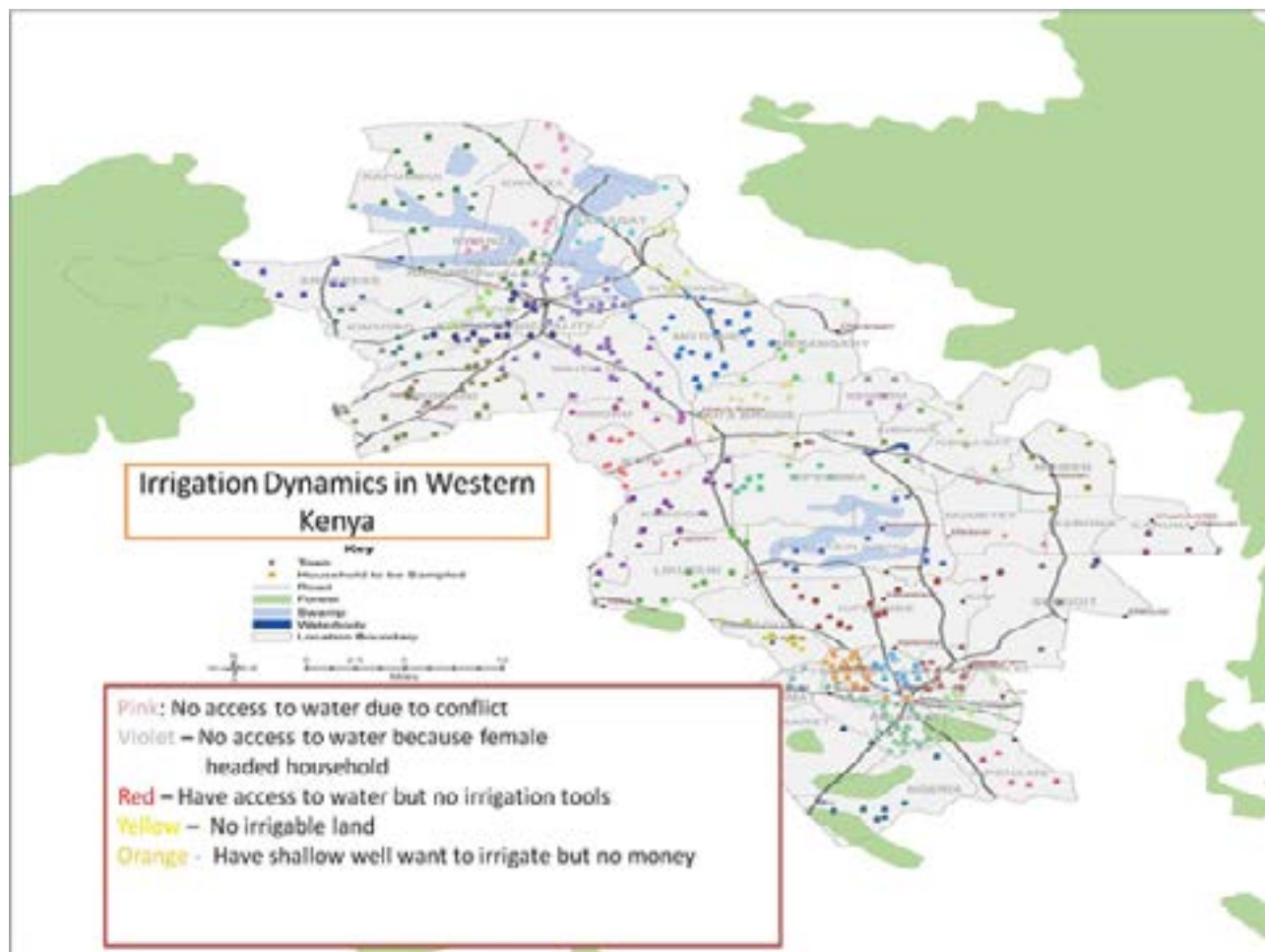
- Exploratory: Is there a spatial pattern?
- Descriptive: Has the pattern changed over time?
- Explanatory: What caused a pattern to change?
- Predictive: What do we expect the pattern to look like in the future?

There are software options that integrate qualitative research with GIS. One such example is SoftGIS. SoftGIS methods allow farmers and communities living around an irrigation scheme to produce localized experiential knowledge. Software like SoftGIS can assist researchers to ask how the everyday lives of the residents are organized, what kind of place-based positive and negative experiences (Manzo 2003) residents have and how they behave in their physical environment.

#### *5.1.2 SoftGis in PRDA*

Using GIS in PRDA involves the systematic collection of geospatial data to aid with the Rapid Diagnosis and Action Planning process. If Research for Research is the objective then the process is one of collecting data, analyzing them and passing them on to those who implement field-level interventions or make policy decisions. However, when conducting Research for Development, particularly of a participatory nature, it is key to combine objective geospatial data with how people who live within this space view it, i.e., the subjective view of the farmers within an irrigation scheme and dynamics associated with that setting, including conflicts between communities and other institutional constraints. An illustrative example of irrigation dynamics in Eldoret, represented in Western Kenya is given in Figure 7 below.

Figure 7. An integrated GIS map on irrigation dynamics in Western Kenya.



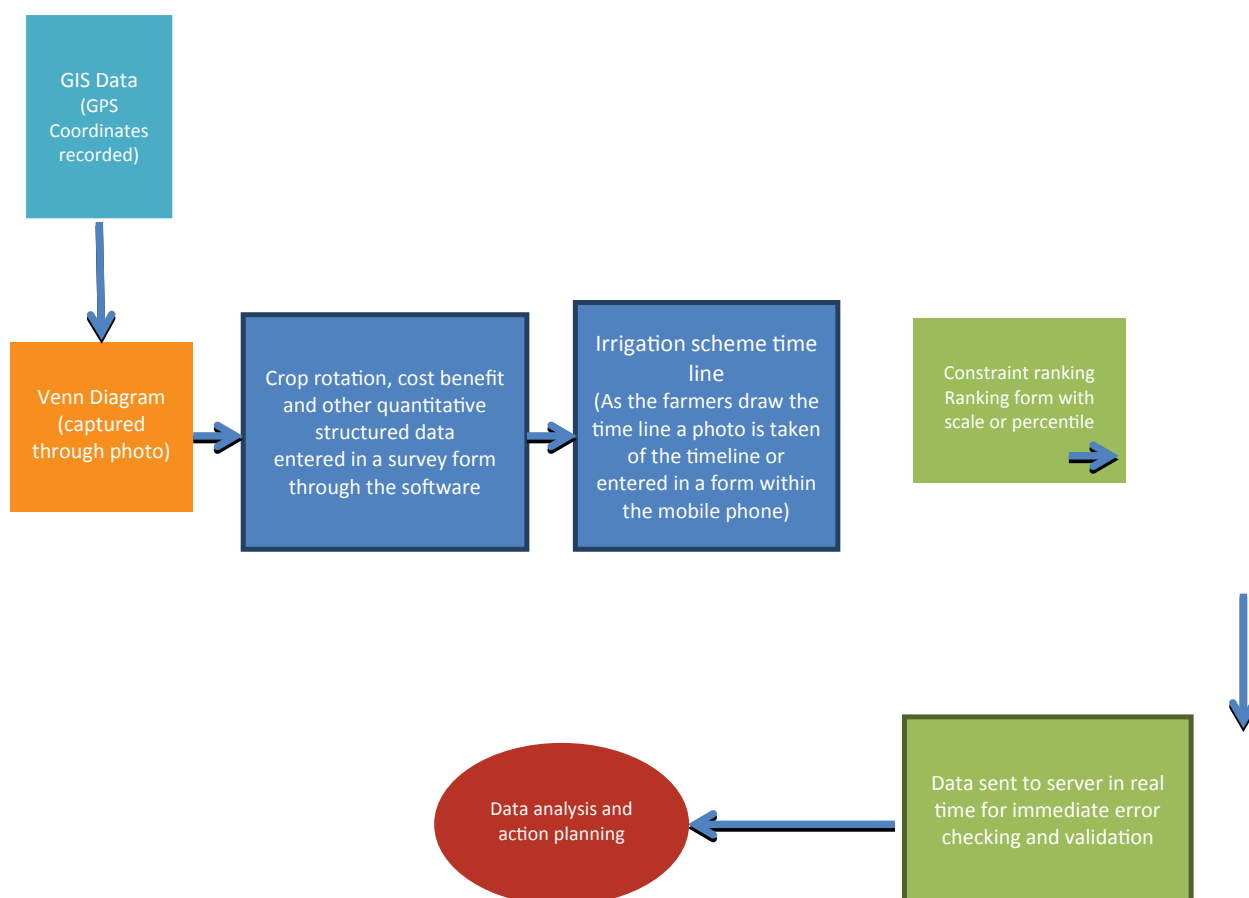
Source: Bavanirajan and Salasya 2001.

While using constraint analysis tools and other participatory tools, knowledge is also gathered from farmers on issues surrounding irrigation schemes that they experience in their everyday lives and overlay it with geographic data. This helps plan an intervention based on the agroecology as well as how the people who live in the system view it and what constraints they face and what opportunities they have to improve their livelihoods. This way there is coherence in planning an intervention that can be sustainable. This helps development practitioners design interventions that address both technological and social issues.

### 5.1.3 PRDA tools using mobile phones

Several of the tools described in Annex A can be used with mobile phone technology. This also makes it possible for integrating a mixed methods approach. For instance, an in-depth interview can be georeferenced and notes taken through customized software. There are several paid as well open-source software packages that can be customized to suit all of the tools within the PRDA. The schema below (Figure 8) describes how a mobile phone combines several participatory rapid diagnosis tools to simplify both the data collection and analysis.

Figure 8. Integrating mixed method data collection in PRDA using mobile phones.



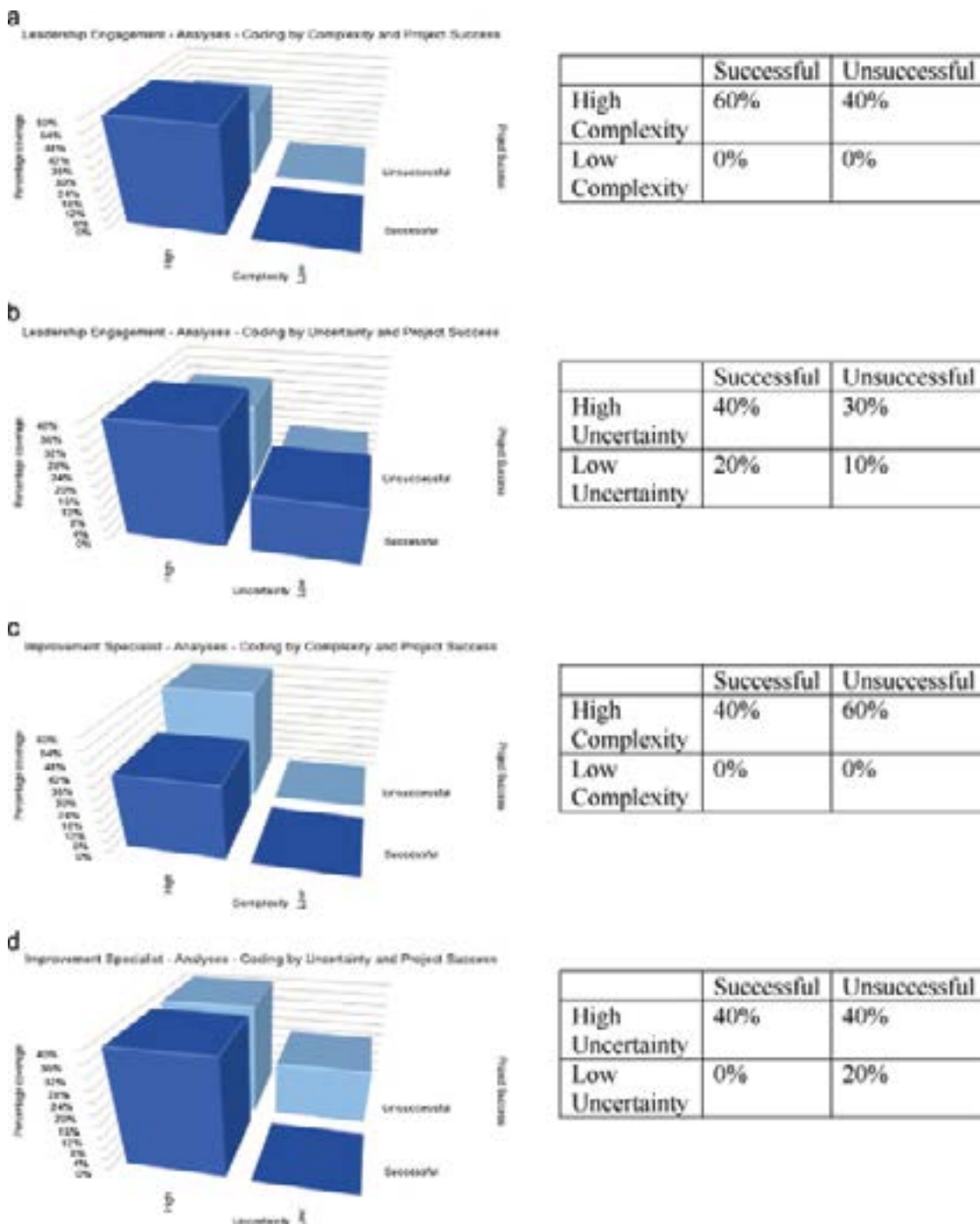
As described below, a survey based on a mobile phone can be used with GPS coordinates recording options within the customizable survey tool. The quantitative components would be in the form of a fill-in survey and the constraint ranking as a scale or percentile (even if the ranking is done through pebbles or beans, it can be photographed and recorded by filling in the form). Focus group discussions and key informant interviews can be in the form of a paragraph. The data collected in quantitative format through the mobile phones are often automatically analyzed at the server to which the data are sent, often at the software developer's portal. It can also be downloaded into software such as Excel for further analysis. The qualitative data are downloaded as images and the text and paragraph sections are downloaded in Word format. Integrating the participatory tools with ICT can simplify and quicken the process and give researchers real-time access to data. Using ICT tools for data collection makes the data collection process interesting and innovative for field staff as well. However, key to successful implementation of ICT-based PRDA requires extensive training along with field tests.

#### 5.1.4 Computer Aided/Assisted Qualitative Data Analysis Software

Computer Assisted Qualitative Data Analysis Software, CAQDAS – i.e., the application of qualitative data analysis software – has become very common among qualitative researchers. There is a considerable range of software programs to choose from, both paid and open sources. While each one includes specific tools for the handling and storage of different qualitative data, some of them can work only with text; the better ones can handle images, sound and video. Some qualitative data analysis software tools build on hierarchical trees of categories, others let the researchers create

their own “trees,” and others simply list the categories alphabetically. Most of them can create reports according to the analyst’s needs; some can be used as a first step in the analysis of data, and the results can be exported to other programs for further analysis. Data collected using mobile phones are imported into the software program which analyzes them in the form of themes, ranks priorities and gives visual outputs in the form of charts and diagrams on key issues. An illustrative example of CAQDAS data output of leadership engagement of a project is given below (Figure 9).

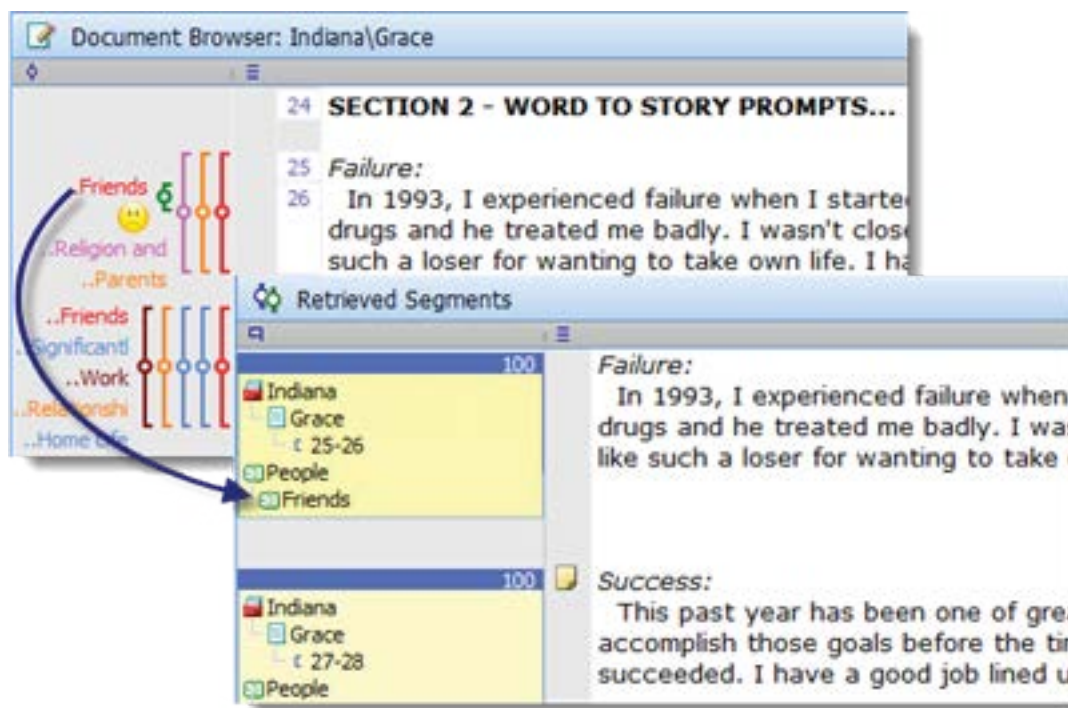
Figure 9. CAQDAS data output.



Source: Nair et al. 2011.

In a typical scenario an output such as this can come from focus group discussions; for instance, if we were to measure the effectiveness of a WUA and map the dynamics within, the data will be collected either through paper or through mobile phones and fed into the software. The software then thematically codes them and the number of times a particular issue arises, e.g., leadership, or conflicts in the community or institutional barriers, etc. The software converts them into frequencies for analysis. The coding is shown in Figure 10 below:

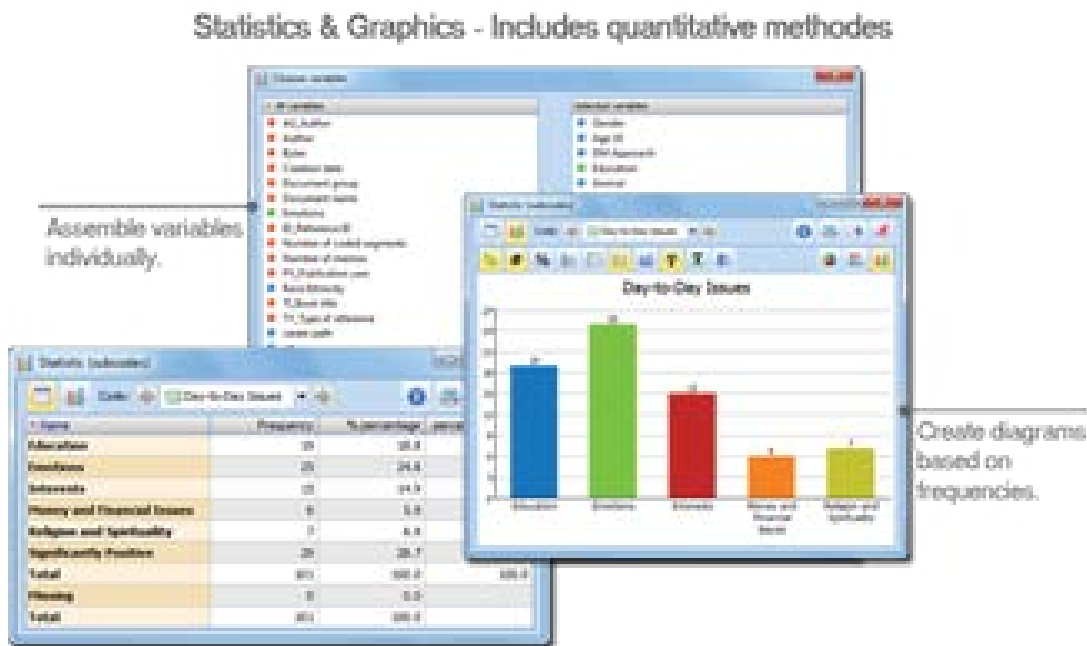
Figure 10. CAQDAS coding example.



Source: Maxqda.com.

Once the coding is done, it can also be combined with quantitative data. Items of important information are marked with different codes by using regular codes, colors, symbols, or emoticons. Some of the CAQDAS software create a living project document, so the analysis can be worked in a report format, which is then copied into a Word file. The themes and theories from PRDA tools can be organized in the form of memos on any element of the project report. So when we are looking at an irrigation scheme we are able to view the opportunities and constraints from a geospatial point of view, and also from socioeconomic, institutional and governance points of view. The use of ICT-based data analysis simplifies the storage and analysis and presents an easy-to-use report that can be immediately used for action planning. An example of how a combination of patterns observed in qualitative research mixed with quantitative data is shown in Figure 11.

Figure 11. Mixed methods analysis in CAQDAS.



Source: Maxqda.com.

Lastly, CAQDAS can also code audio and video files (Figure 12) without having to key in in a transcript. This is particularly useful while recording key informant interview or focus group discussions to capture every statement that was said and also to observe group behavior. With an irrigation scheme CAQDAS can be a powerful tool for researchers to capture multidimensional data; socioeconomic, sociocultural, geospatial and even value chains.

Figure 12. Video and audio auto transcript capture in CAQDAS.



Source: Maxqda.com.

Embedding the PRDA tools within ICT gives us a unique opportunity to capture data accurately and quickly. It also aids in quick analysis and decision making and project planning. It also helps store valuable field information and enables multiple levels of analysis. Information and Communication Technologies (ICTs) are transforming the way governments, businesses and individuals learn, work and communicate with each other. They will contribute to sustainable development in irrigation schemes and any development intervention if they are employed strategically within development programs to promote access and sharing of relevant knowledge as well as to foster participation of the poor and marginalized in decision-making processes.

## 6. USING THE PRDA TOOLS EFFICIENTLY

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### 6.1 Interviewing procedures

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#### 6.1.1 *Preparation*

- Make a checklist. Write down a list of key questions or topics that you want to discuss during the interview. Do not make the checklist too detailed as this can easily lead to a question-answer conversation instead of an open discussion. Keep the checklist short to limit the time of the interview.
- The interviewing team should not be large (two to four persons). Select one person to lead the interview and another one to take notes. But rotate roles for different interviews.
- Select and gather the informants.

#### 6.1.2 *Beginning the interview*

- Sit down in a suitable place or shade. Make sure that everybody is comfortable and that you can communicate on an equal level (sitting on the only available chair already puts you in a “higher” and more important position).
- Begin the interview with traditional greetings in the local manner. Introduce yourself and let the farmers introduce themselves if the group is not too large.
- Explain why you are there. Describe the purpose of the interview but do not imply or promise!! State that you are here to learn and mean it. Respondents may want to know what is expected of them, how they were selected, and if they can see the results.
- Spend some time in casual conversation.
- If the informant is busy, ask when it would be appropriate to return.
- Begin questioning by referring to something or someone visible.

Never give open judgment of farmers or tell them what to do. Always remember you are their guest and learning from them
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#### 6.1.3 *Directing the flow of interview*

- Start with easy questions on facts and events. Talk about opinions, feelings or other sensitive issues near the end so that the respondent feels more at ease.
- Use simple words.
- Take your time, allow your respondents to answer completely before moving on.
- Probe and explore important issues in detail using the six helpers: What? When? Where? Who? Why? How?
- Avoid making assumptions.
- Ask one question at a time.
- Do not interrupt each other. Write down new questions that pop up in your mind for you to ask them later on.
- Conduct the interview in an informal manner.
- Be open-minded, team members should not limit themselves to their discipline. Avoid leading questions or question that can be answered only with “yes” or “no”. Do not pass on value judgments or indicate belief by nodding or disbelief by shaking head.

- In group interviews, try to prevent one person from dominating the discussion by asking direct questions from silent people.
- Respondents may not know the answer, unwilling to tell it or even be untruthful. Judge the answer and do not believe everything. It may help to ask questions in indirect ways (see example below). Cross-check what people tell you.

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Example of a direct question: Are there conflicts about water distribution in this irrigation scheme?

Example of indirect questioning: When was the last dry year? Do you know a farmer who had too little water during that year? What did he do to manage his problem? How did other farmers react to him? What was the role of the WUA?

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#### 6.1.4 *Recording the interview*

The first output of semi-structured interviews is a series of notes. Accurate, detailed and complete recording is essential. It is therefore important that you record during the interview.

##### 6.1.4.1 *What to record?*

- Record the setting: Date, location, names and positions of respondents.
- Record what you see: The condition of the farmer's field. The behavior of individuals: Nonverbal reactions to questions can also indicate the opinion of a person.
- Record what is said: The verbal information of an interview. Write down important quotes

##### 6.1.4.2 *How to record?*

- Select one team member to take notes, but rotate between interviews. Ask the permission of your informants before you start writing; taking notes creates a more formal atmosphere which may make people reluctant to talk about sensitive issues.
- Do not record your own interpretation or opinion; this will be done afterward.
- Give numbers to your question/topics of the checklist. Mark answers under these numbers so that you do not have to note down the whole question.

##### 6.1.5 *Closing the interview*

- Take no longer than 2 hours for group interviews and 1 hour for individual interviews.
- The note-keeper should make sure that the discussion leader has handled all the important topics.
- Give a short summary of the discussion.
- Ask respondents if they have any questions or issues.
- You may want to ask respondents to show you their farms. Thank the respondents.
- Take a few minutes with your colleagues to reflect on the interview and fill in blanks in your notebook while the interview is fresh in your mind.

##### 6.1.6 *Assessing the interview*

Analyze the interview soon afterwards. Highlight your personal evaluations in the notebook, for instance using a pen of a different color.

What was the quality of the information, Was it

- A fact: something definitely known to have occurred or be true?
- An opinion: judgment or belief based on grounds but not evidenced?
- A rumour: general talk, report of doubtful accuracy?

Was the interview relaxed and open?

Did any individuals dominate it?

Did the interviewer bias respondents?

Try to discover similarity patterns or categories of respondents.

Cross-check by comparing different responses or against other sources of information.

## 6.2 Ensuring good information

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In addition to assessing individual interviews you also have to ensure the overall quality of your information. Due to the qualitative nature and relatively small sample size, PRDA-generated data are seldom conducive to a statistical analysis. Therefore, alternative ways need to be used to ensure the validity and reliability of findings.

### 6.2.1 Careful sampling

Strategic sampling (selection) of respondents will ensure that you hear all sides of an issue.

- Stratified random sampling: Select a number of farmers from certain subgroups according to well-reasoned criteria, i.e., males and females; farmers close to the end of the scheme and close to the intake; young and old farmers; and landowners and sharecroppers. Stratified random sampling should give priority to difference and diversity of situations.

On the Mwea Rice Irrigation Scheme in Kenya, there are three broad categories of farmers:

Tenants who cultivate a plot in the initial command area and are members of the WUA.  
“Legal out-growers,” members of the WUA in extensions of the initial command area authorized by the WUA.

“Illegal out-growers” who extended the command area without asking permission of the WUA and are in open conflict with it.

- Purpose sampling: Select key individuals who have a position with the local administration (government official), farmers’ organization (e.g., WUA head), traders or people who have a very good knowledge of the area. In some cases, the local government or the head of the WUA will give you names of people to interview. These people may be close to the local leadership; so where possible, try to visit other farmers whose names are not on the list recommended by local authorities.

### 6.2.2 Cross-checking

The aim of cross-checking or validation is to find out if the collected information is accurate. This can be done, for instance, by:

- Comparing different types of information sources (interviews, observations, secondary data).
- Comparing the opinions of different people on one topic.
- Use information on wet and dry seasons and in different years.
- Use different PRDA tools to gather information on the same topic but from different angles or perspectives. For instance, compare what people say about the WUA during the irrigation system map (perspective of water delivery) and the Venn Diagram (perspective of the social organization).

Following up on contradictions is a very good way to get a better understanding. Contradictions between individuals in group discussions or between groups of farmers can point towards hidden conflicts, and of differences in farmers' objectives and strategy. Farmers' opinions or choices that contradict the PRDA team members' knowledge and experience do not necessarily mean the farmers "lack capacities" since they may be based on solid grounds unknown to the team members. Following-up provides a good opportunity to learn from farmers and understand the logic behind contradictions.

### 6.2.3 *Preventing bias*

When doing a PRDA, different people will give different levels of importance or attention to different topics and interpret the same data differently. For instance, people who work for the Irrigation Department do not like to admit problems related to the design of the scheme and economists like to link every problem to the market. To prevent this kind of bias, the PRDA team should consist of experts from:

- Different disciplines.
- Different organizations.

### 6.2.4 *Do not forget your own skills*

Sometimes PRDA teams take what farmers tell them too seriously. Farmers often have good information on the local situation and the problems they face. They may even be able to tell why certain solutions may work or are not based on their experience and past trials. However, as professionals, you may have a better knowledge of interventions that have worked elsewhere and better information on improved technologies or technically feasible solutions. When in doubt, use your knowledge to assess information given by farmers.

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## ANNEX A. DESCRIPTION OF TOOLS

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Tools that can be used to do a Participatory Rapid-Diagnosis and Action-planning (PRDA) are described here. The table below contains a classification of the selected (Participatory) Rapid Assessment tools according to the stage in the Rapid Diagnosis. Not all tools will be used during the PRDA (the most important ones are marked by an asterisk [\*]). But additional tools are included in this chapter in case you need to make a more detailed analysis during this Rapid Diagnosis or in the future on another project.

<i>Step 1A:</i> Identify stakeholders	<ul style="list-style-type: none"> <li>Stakeholder analysis*</li> </ul>
<i>Step 1C/1D:</i> Report design characteristics	<ul style="list-style-type: none"> <li>Literature review*</li> </ul>
<i>Step 2A:</i> Data collection	<p>General</p> <ul style="list-style-type: none"> <li>Semi-structured interview*</li> <li>Questionnaire</li> <li>Biophysical measurement</li> </ul> <p>Spatial data</p> <ul style="list-style-type: none"> <li>Transect walk*</li> <li>Irrigation system mapping*</li> <li>Mapping of water resources</li> <li>Temporal data</li> <li>Historical trend</li> <li>Time line</li> <li>Crop rotation calendar*</li> <li>Seasonal calendar*</li> </ul> <p>Socioeconomic data</p> <ul style="list-style-type: none"> <li>Cost-benefit analysis*</li> <li>Venn Diagram*</li> <li>Water use matrix*</li> <li>Task analysis by gender</li> <li>Organizational analysis*</li> <li>Rapid gender-based difference analysis*</li> <li>Input and market chain analysis</li> </ul>
<i>Step 2B:</i> Performance assessment	<ul style="list-style-type: none"> <li>Rapid benchmarking</li> </ul>
<i>Step 2C:</i> Constraint ranking	<ul style="list-style-type: none"> <li>Constraint ranking*</li> <li>Paired ranking</li> </ul>
<i>Step 2D/ 3A:</i> Constraint description / Identifying solutions	<ul style="list-style-type: none"> <li>Cause-effect diagram*</li> <li>Semi-structured interview (with expert on certain topics)</li> <li>Literature review 2</li> <li>Visit to other irrigation schemes (alone or with farmers)</li> </ul>
<i>Step 3B:</i> Impact assessment	<ul style="list-style-type: none"> <li>Options assessment chart*</li> <li>Matrix ranking</li> </ul>
<i>Step 3C:</i> Formulation of action plan	<ul style="list-style-type: none"> <li>Presentation*</li> <li>Action plan matrix *</li> <li>Transfer of responsibility matrix</li> </ul>

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\* = Minimal recommended tools for the Rapid Diagnosis.

This annex continues with a description of PRA tools. The recommended tools for the PRDA also contain a guideline/checklist to ensure that important information for the reporting sheets is available after the fieldwork.

Names of tools	Page
Stakeholder analysis	A 3
Literature review 1	A 5
Questionnaires	A 7
Semi-structured interviews	A 8
Biophysical measurements	A 10
Transect walk	A 12
Mapping the irrigation system	A 15
Mapping water resources	A 18
Crop rotation calendar	A 19
Seasonal calendar	A 20
Irrigation scheme time line	A 23
Historical trends	A 25
Cost/benefit analysis	A 26
Venn Diagram	A 28
Water use matrix	A 31
Task analysis by gender	A 32
Organization analysis	A 33
Rapid gender-based difference analysis	A 37
Inputs chain analysis	A 39
Rapid benchmarking	A 41
Constraints ranking	A 43
Pair-wise constraints ranking	A 45
Cause-effect diagram	A 46
Literature review 2	A 50
Matrix ranking	A 51
Solution assessment chart	A 53
Presentation of final diagnosis	A1.55
Action plan matrix	A 56
Transfer of responsibility matrix	A 58
Monitoring and Evaluation plan	A 59

## ***Stakeholder analysis***

### **Why:**

A stakeholder analysis can help decide whom to involve in the Rapid Diagnosis.

### **How:**

1. List the criteria you will use to select whom to involve in the Rapid Diagnosis. Possible criteria are:
  - Skills or knowledge to assist in the Rapid Diagnosis.
  - Person(s) supposed to benefit from the Rapid Diagnosis.
  - Trade or interact with the farmers in the irrigation scheme.
  - Live near the irrigation scheme.
  - Might provide funding.
  - Those powerful in the area of the irrigation scheme.
  - Having a formal role in the area or irrigation scheme.
  - Those who might benefit from results to improve their policy.
2. List all people and organizations that you think might be important for the Rapid Diagnosis. Possible groups of stakeholders are:
  - Local leaders and subgroups of farmers using the irrigation scheme.
  - Local leaders and groups of people outside the irrigation scheme.
  - Government agencies.
  - NGOs working in the area.
  - Local businessmen or companies.
  - Local schools/colleges/research institutes.
3. Classify stakeholders on the basis of the criteria you listed. For this you can use a stakeholder matrix with the names of stakeholders along one axis and the criteria along the other. An example is given below.
4. Decide which people and organizations are most important for the Rapid Diagnosis.
5. Plan “how” and “when” to involve these people and organizations. This is best done by asking them how they want to be involved. Remember that participation does not mean involving everybody in every activity or decision at all times. It may in fact be necessary to involve certain “weak” groups more often to strengthen their position. Also, people may not want to participate because they are too busy or are afraid that it will harm their interests. Agreement should especially be reached with the beneficiaries and the organizations that will assist in the Rapid Diagnosis. Lack of enthusiasm amongst farmers can be a good signal that they are afraid of the Rapid Diagnosis or do not expect to get enough benefits in exchange for their contributions.
6. It is wise to ask advice from several other people from different groups/ organizations to ensure that all important stakeholders are included (to prevent a biased selection).

**For small irrigation schemes it may be enough to just make a list of stakeholders**

**Example of a stakeholder matrix of one APPIA scheme in Ethiopia**

Name of organization/ person	Skills or knowledge to assist in the Rapid Diagnosis	Persons supposed to benefit from the Rapid Diagnosis	Trade or interact with the farmers in the irrigation scheme	Live near the irrigation scheme	Might provide funding	Are powerful in the area of the irrigation scheme	Have a formal role in the area or irrigation scheme	Might benefit from results to improve their policy
Irrigating farmers (beneficiaries)		X		X				
Head of WUA						X		
WUA		X					X	
Head of Peasant Association							X	
Inhabitants of Gorke				X				
Local	X		X					
Oromya Irrigation Development Authority, Central Branch					X			X
Woreda office = local administration office						X	X	
Bureau of Cooperatives	X							
CARE					X			
Local vegetable traders and brokers			X			X		
Agricultural college	X							

## ***Guidelines for the Rapid Diagnosis***

“STEP 1a”.

Stakeholder analysis is not only useful at the beginning of the project but also later on. Your knowledge of the irrigation scheme’s stakeholders will improve after you have started with the Rapid Diagnosis. Therefore, you may have to update your stakeholder matrix several times.

### ***Literature review (1)***

#### **Why**

Compare the actual current situation to:

- The intended (projected) situation according to the design of the irrigation scheme.
- Household welfare before construction of the irrigation scheme (impact).

Provide basic information on the current socioeconomic or land tenure situation.

#### **How to**

1. Discuss with other team member what questions you want to answer and the type of information you need for this.
2. List possible sources of information.
3. Collect only the literature that you think is most needed and is easy to collect. Do not try to read everything; if you collect a lot of literature focus on the most important.
4. Try to check the reliability of collected literature by asking yourself questions. For example: What methods did the authors use to collect data? How many people were interviewed? Also compare documents to see if there are contradictions.
5. Analyze the literature by trying to write down the answers to the questions that you formulated at the beginning. Did you manage to collect all the information you needed or are there still gaps? Is it very important to fill these gaps? If yes, select another method to collect the necessary information.
6. Store the collected information in your office. Or, if you cannot get a copy yourself, make a note of its title, author, date of publication and publisher. Also write down the location and person from whom you received the document so that you can easily find it again when needed.

## Guidelines for the Rapid Diagnosis

### “STEP 1d”

“SHEET 1D” gives examples of useful information to collect before starting with fieldwork about the design characteristics and construction.

Possible sources of information are

- Feasibility studies, design documents, as built documents.
- Government statistics, soil maps, monographs.

### “STEP 2a”

Useful information to collect at a local government office or NGO about the current situation of the irrigation scheme:

- Household size (minimal, maximal, average).
- Actual number of plots and plot size (minimal, maximal, average).
- Crop types in irrigation scheme last year and area (hectares) of each crop.
- Average crop yields.
- Crop market prices.
- Percentage of farmer using agro inputs (chemical fertilizer, manure, seeds, pesticides); average amount used per farmer, price of agro inputs, and name of supplying organization.
- Percentage of farmers using credit, average amount used per farmer and name of providing organization.
- Taxes per farmer (minimal, maximal, average).

## ***Questionnaires***

### **Why**

To get very specific data or opinions from a large number of people in a structured way so that you can conduct a survey using questionnaires. Questionnaires can create a very formal atmosphere and therefore do not encourage farmers to talk about other constraints. They are only recommended when you need very detailed information on a specific topic.

### **How to**

1. Agree on the information need of the questions.
2. Prepare a list of questions that you want to ask.  
Questions can be very specific, closed questions with fixed choices (yes/no; a/b/c/d) or open-ended questions.  
Fixed choice questions are good for gathering data that need to be analyzed statistically.
3. Agree on how many people should be interviewed. You probably do not have to interview all farmers of the irrigation scheme. But interviewing too few people will produce unreliable results. Another way is to evaluate after every five interviews. If everybody tells the same answers you probably need to conduct fewer interviews than if all people tell different stories.
4. Test the questionnaire on one or two farmers to make sure that the questions are understandable and that farmers are able to answer them accurately. This is also a good way to train the interviewers who will do the remaining interviews. Change or drop-out questions after testing when necessary before deciding on the final list of questions.
5. Perform the remaining interviews. It is important not to change questions after deciding on the final list to enable comparison of the results.
6. Analyze the information. Start with summarizing the results in a table. Calculate mean values and other statistics when necessary.

## ***Semi-structured interview***

### **Why**

To gain in-depth information on specific topics from people. Usually, several broad questions are used to guide the discussion but new questions may arise during the interview. This allows people to talk about, for instance, unintended impacts (positive or negative) or opinions about the quality of services.

### **How to**

1. Agree on the purpose and information need of the questions.
2. Prepare a list of discussion topics or questions.
3. Agree on who/how many people should be interviewed and whether interviews should be conducted with individuals or in a group.
4. It is a good idea to test the questions on one or two persons if you are going to perform many semi-structured interviews. Change or drop out questions after testing when necessary before deciding on the final list of questions.
5. Perform the remaining interviews. It is especially important to take accurate notes (report) so that you can remember opinions of people afterwards.
6. Analyze information. If you have performed many interviews, it is best to first read 25% of the interview reports and then note the subjects most frequently mentioned. Then read all interview reports, taking notes of what each person had said on each of these subjects.

## **Differences between semi-structured interviews and questionnaires**

Semi-structured interview	Questionnaire (survey)
Characteristics	
<ul style="list-style-type: none"><li>• Usually qualitative data.</li><li>• List of topics but room for discussion.</li></ul>	<ul style="list-style-type: none"><li>• Quantitative data fit for statistical analyses.</li><li>• Farmers choose from a predetermined list of fixed answers.</li><li>• Very formal atmosphere.</li></ul>
Strengths	
<ul style="list-style-type: none"><li>• Interview matched to individual circumstances.</li></ul>	<ul style="list-style-type: none"><li>• Able to ask many questions from many people in a short time.</li><li>• Simple data analysis.</li><li>• Results can be easily compared.</li><li>• Statistical analysis can provide more formal evidence on project results or needs.</li></ul>
Weaknesses	
<ul style="list-style-type: none"><li>• Requires skilled interviewer (difficult).</li><li>• Less easy to analyze and compare results because you get different pieces of information from different people.</li></ul>	<ul style="list-style-type: none"><li>• Farmers may find the questions or answers from which to choose and ignore those irrelevant to their situation. What farmers really think can remain hidden due to the limited number of choices on which they can answer.</li></ul>

## Guidelines for the Rapid Diagnosis

“STEP 2a”

Semi-structured interviews will be done with several key informants

Local Health Officer	Is there a higher prevalence of water-related diseases such as malaria, bilharzias, etc., among farmers in the scheme compared to people living further away?
Local Administrative Head	<ul style="list-style-type: none"> <li>• Conflicts over water with people outside the irrigation scheme.</li> <li>• Conflicts over land within and with people outside the irrigation scheme.</li> <li>• Have people from outside the irrigation scheme also requested irrigation?</li> <li>• Existing plans to expand the command area.</li> <li>• Existing plans to upgrade/rehabilitate the irrigation scheme.</li> <li>• Percentage of farmers receiving food aid within the irrigation scheme and in the surrounding area.</li> <li>• Do farmers complain about impact of food aid on price levels?</li> <li>• Do households within the scheme face occasional food shortage (if so, which month)?</li> </ul>

## Biophysical measurements

### Why

To assess the actual productivity, potential productivity and efficiency losses. Another purpose can be to validate (check) what farmers tell you.

### How to

1. Decide what exactly you want to measure and if the measurement is really essential to help identify improvement for farmers.
2. Decide how accurate measurements should be. For a Rapid Diagnosis a margin of error between 10 and 25% can be acceptable.
3. Select a suitable method: Rapid, low cost and preferably not technically sophisticated so that farmers can also understand what you do.
4. Perform the measurement. It can be a good idea to also involve some farmers in the measurement and preparation to increase their acceptance or trust of outcomes.
5. Take step-by-step notes of how you perform the measurement (method) and the results.

### Examples

Most biophysical measurements take a lot of effort relative to the amount of information they provide; especially information that is relevant to farmers. You may however want to use some of these methods when you need to collect additional information in certain areas of constraints. Examples of low-tech easy measurements are given below.

Variable to be measured	Description of easy method
Canal discharge	<p>The following methods are recommended for reconnaissance studies when flow-measuring structures (weir, free overflow, flume) are not available.</p> <p>1: Floats</p> <ul style="list-style-type: none"> <li>• Select a straight canal stretch with a uniform shape (width and depth are constant for at least 10 meters).</li> <li>• Measure the wet cross-sectional area in meters or centimeters (in a rectangular canal this is equal to width * length?)</li> <li>• Measure the water velocity at the water surface. For this you need to measure the time needed by, for instance, an orange to float from the beginning to the end of the straight canal section that you have selected. Multiply by factor 0.9 for a clear concrete canal or factor 0.8 for a rough earthen canal to get the average velocity in the whole canal.</li> <li>• The discharge is equal to the product of the average velocity and the area of the crosssection.</li> </ul> <p>2: Buckets</p> <ul style="list-style-type: none"> <li>• Bury a bucket or oil drum of known volume next to the canal but ensure that the water cannot flow in yet; for instance using a wooden plate as sluice.</li> <li>• Take away the sluice/plate and use it to block the canal downstream of the bucket.</li> <li>• Measure the time required for the bucket to fill with water. The estimated canal flow rate is equal to the bucket volume divided by its filling time.</li> </ul> <p>The second method using buckets is fitter for measurements in earthen canals with a low flow rate or irregular shape.</p>
Plot area	<p>Farmers may be reluctant to tell the actual size of their plot. For this purpose it can be useful to check in a “disguised” manner.</p> <ul style="list-style-type: none"> <li>• Prepare yourself before going to the field by measuring the average length of you steps. For this you need to count your steps while walking 20 meters. Try to walk as constant as possible</li> <li>• Estimate the length and width of the plot by walking around it while counting your steps (length = number of steps x average length of a step).</li> <li>• The total area = length x width.</li> <li>• Irregular shaped plots are more complex and determining their areas require improvisation.</li> </ul>
Soils texture and plasticity	<ul style="list-style-type: none"> <li>• Try to roll a pipe of soils between your hands. If it breaks then the predominant texture is sand.</li> </ul>

	<ul style="list-style-type: none"> <li>Try to make a loop (360 degrees turn) of the pipe. If this is possible then you are dealing with clay. Otherwise it is a loamy soil.</li> </ul>
Plant density	<ul style="list-style-type: none"> <li>Measure the exact length and width of a rectangular part within a cropped plot in meters or centimeters.</li> <li>Count the number of plants within the rectangle and calculate the plant density per square meter.</li> <li>Compare with recommended planting distance given in agronomic literature.</li> <li>For crops planted in rows the distance between rows and within rows should be measured separately.</li> </ul> <p>Results are more accurate when a larger number of individual plants are included by using larger rectangles. However, a larger area also requires more counting time and effort.</p>
Yield	<p>Method 1:</p> <ul style="list-style-type: none"> <li>Weigh all products coming from the field.</li> </ul> <p>Method 2: Subsampling</p> <ul style="list-style-type: none"> <li>Weigh yield only in preselected subsections of the plot with known area.</li> </ul> <p>It is important to consider what “yield” to measure: total biomass, human consumable biomass, human consumable biomass after cleaning/treatment.</p>
(Plot distribution efficiency)	<p>Do this measurement only when high water losses are causing constraints as it is relatively time-consuming.</p> <p>Method 1: Distribution efficiency between furrows/basins:</p> <ul style="list-style-type: none"> <li>Measure discharge and application time at the beginning of several furrows on a plot. Compare the total applied volume per unit length/see if water is distributed evenly among the furrows.</li> </ul> <p>Method 2: Distribution efficiency within a furrow.</p> <ul style="list-style-type: none"> <li>Measure discharge at the beginning, middle and end of each furrow.</li> <li>Calculate the infiltration for both parts of the furrow (=upstream inflow – downstream outflow at the discharge measurement location).</li> <li>Compare the infiltration rate in the upper and lower halves of the furrow. Ideally they are nearly equal.</li> </ul> <p>Discharge measurements within plots can be done with small flumes or V-notches (cheaper and easier to operate).</p>

## ***Transect walk***

### **Why**

Transect walks are a structured way to walk through an area to observe particular things or indicators (such as water availability, maintenance status, crop diseases). This provides a good first overview of the irrigation scheme and plot use.

### **How to**

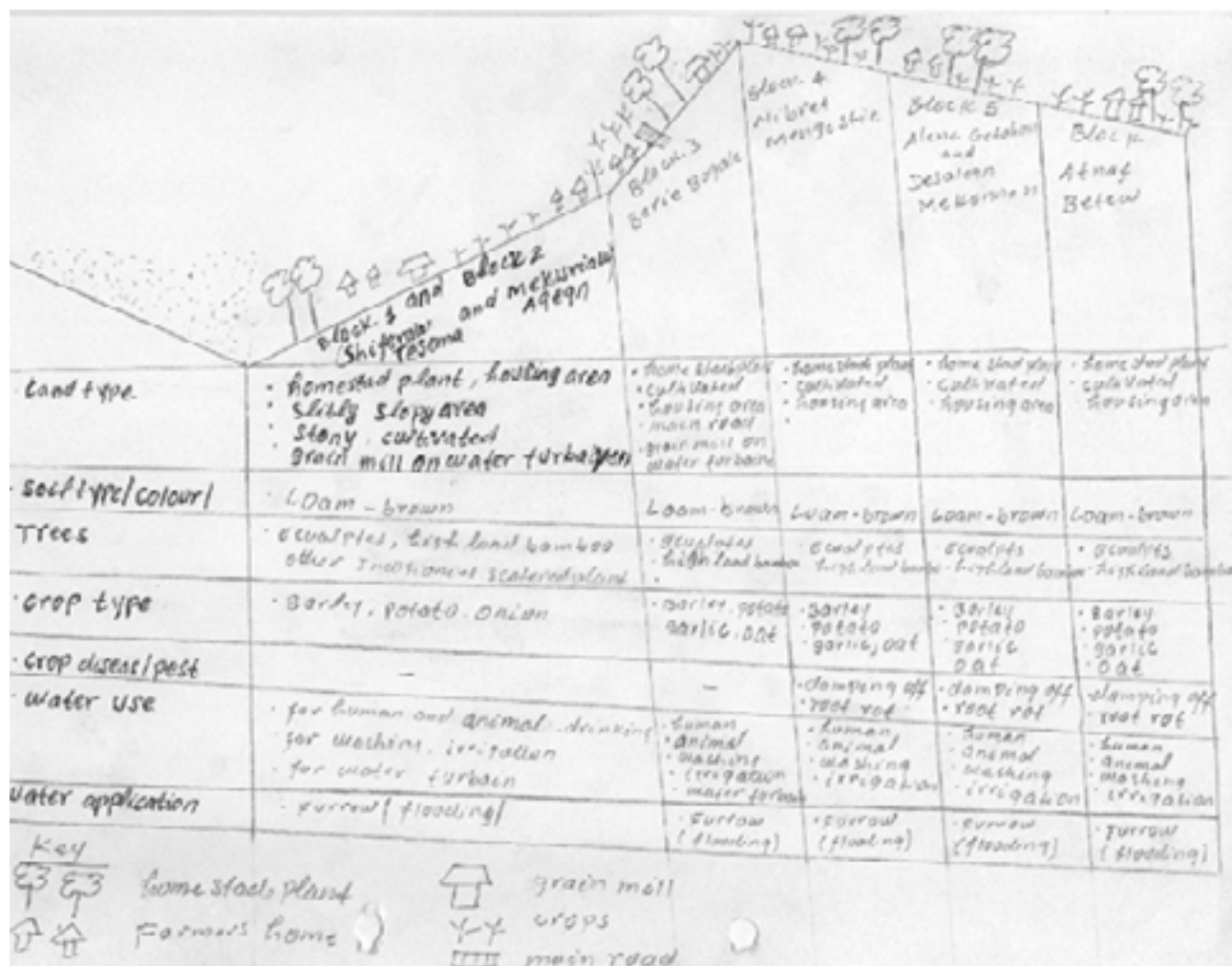
1. Decide what things you will observe during the transect walk and divide tasks amongst the team members.
2. Get a group of farmers and start by briefly introducing the purpose of the tool. Ensure that it is clear to everybody.
3. Ask the farmers to indicate their own plot on your sketch map of the irrigation schemes. If you do not have a sketch map you can ask farmers to draw one at the spot before you start.
4. Ask the farmers to take you to their own field but following the route that the water takes to get there. So you start at the headworks and then follow the water delivery system from primary canal all the way to a tertiary unit and the farmers' inlet.  
On the way, you can make all kinds of observations on the scheme infrastructure and other plots. Try to ask questions on unexpected observations and solutions to constraints that have been tried locally. Since it is a farmer-managed scheme, all farmers should know the gate operation rules very well. But this is a good opportunity to check this by asking several individual farmers.  
Use your visit to the farmers' field to informally discuss the water delivery situation and organization.
5. This procedure is then repeated for the next farmer after you return to the main canal (so start with the farmer's plot located closest to the intake and finish at the tail).
6. Remember to also include the drainage system at the end of your transect walk.

### **Alternative**

7. Another option is to plan your transect walk before you go to the field, based on your system map. You then do the walk only with team members but try to talk with farmers you meet on the way.
8. Information-gathered during transect walks is usually presented in a cross section. The different zones of the irrigation schemes are shown at the top of the diagram while different observation categories are written on the left-hand side (such as water availability, maintenance status, crop diseases). Information is filled in for each category and zone. Remember to indicate your transect route on a map so that other people know where the different zones are located.  
An alternative is to draw your observations on the map. This may be particularly useful for certain very specific points of observations (such as a damaged water distribution structure).

## Example

Transect of Zenguene Irrigation Scheme in Amhara Region, Ethiopia.



	Block 1 and Block 2 Shifera and Mekuria Aqeqn	Block 3 Berie Bopale	Block 4 Aibred mengo shie	Block 5 Alena Gelabon and Desalegn Mekuria 21	Block 6 Atnas Befew
Land type	<ul style="list-style-type: none"> <li>homestead plant, housing area</li> <li>shilly slopy area</li> <li>stony, cultivated</li> <li>grain mill on water turbine</li> </ul>	<ul style="list-style-type: none"> <li>home stock plant</li> <li>cultivated</li> <li>grain mill area</li> <li>main road</li> <li>grain mill on water turbine</li> </ul>	<ul style="list-style-type: none"> <li>home stock plant</li> <li>cultivated</li> <li>housing area</li> </ul>	<ul style="list-style-type: none"> <li>home stock plant</li> <li>cultivated</li> <li>grain mill area</li> </ul>	<ul style="list-style-type: none"> <li>home stock plant</li> <li>cultivated</li> <li>grain mill area</li> </ul>
soil type/colour	L.Oam - brown	L.Oam - brown	L.Oam - brown	L.Oam - brown	L.Oam - brown
Trees	<ul style="list-style-type: none"> <li>acacias, Eucalyptus, baobabs</li> <li>other traditional scattered trees</li> </ul>	<ul style="list-style-type: none"> <li>acacias</li> <li>high land baobabs</li> </ul>	<ul style="list-style-type: none"> <li>acacias</li> <li>high land baobabs</li> </ul>	<ul style="list-style-type: none"> <li>acacias</li> <li>high land baobabs</li> </ul>	<ul style="list-style-type: none"> <li>acacias</li> <li>high land baobabs</li> </ul>
crop type	Barley, potato, Onion	Barley, potato, garlic, oat	Barley, potato, garlic, oat	Barley, potato, garlic, oat	Barley, potato, garlic, oat
crop disease/pest	-	-	damping off, root rot	damping off, root rot	damping off, root rot
water use	<ul style="list-style-type: none"> <li>for human and animal drinking</li> <li>for washing, irrigation</li> <li>for water turbine</li> </ul>	<ul style="list-style-type: none"> <li>human</li> <li>animal</li> <li>washing</li> <li>irrigation</li> <li>water turbine</li> </ul>	<ul style="list-style-type: none"> <li>human</li> <li>animal</li> <li>washing</li> <li>irrigation</li> </ul>	<ul style="list-style-type: none"> <li>human</li> <li>animal</li> <li>washing</li> <li>irrigation</li> </ul>	<ul style="list-style-type: none"> <li>human</li> <li>animal</li> <li>washing</li> <li>irrigation</li> </ul>
water application	furrow (flooding)	furrow (flooding)	furrow (flooding)	furrow (flooding)	furrow (flooding)

house tree farmer's home main road	grain mill crops
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## Guidelines/Checklist for the Rapid Diagnosis

“STEP 2a”

### Things to observe:

#### Design and construction

- Differences between design document and actual situations (changes made by farmers; scheme expansion).

#### Irrigation scheme

- Maintenance status of the headworks. If not well maintained: current impact and likely future impact on total water availability for the scheme.
- Damages to infrastructure, conveyance canals, night storage facility.
- Locations with large structural water losses (damages, high seepage, too low canal capacity, high plot-end losses).
- Do plots receive water?
- Do plots receive adequate water?
- Waterlogging.
- Presence and status of drainage systems (compare with the “As Built” document).
- Multiple uses (other than irrigation of plots).
- Field leveling.
- Field application method (furrow, basin, sprinkler).
- Main d’eau (=plot-level discharge) in relation to plot size.
- Soil erosion on irrigated plots.

#### Plot use

- Are crops planted on all plots?
- What type of plants?
- Crop pests/Diseased.
- Other major land use besides irrigation (forest, settlement).

### Topics for discussion with farmers met during the walk

- Water delivery or gate operation rules (check if all farmers agree/tell the same story and compare what farmers say about the “official” rules).
- Reasons for inadequate or no water delivery to plots (when appropriate).

## ***Irrigation and drainage system mapping***

### **Why**

Assess the functioning (quality) and organization of the water supply situation. A map of the area can be used by farmers to explain where constraints occur and what the cause of these constraints is. Also, farmers can assist in making an improved map of the irrigation scheme.

### **Materials**

- Large map of the irrigation area with the rivers, intake structure, irrigation pumps, wells, layout of the irrigation and drainage canals (drinking water sources).
- Markers/pens/pencils.
- (Another option is to ask farmers to draw a map in the sand with sticks, pebbles, leaves, etc.).

### **How to**

1. Start by briefly introducing the purpose of the tool. Ensure that it is clear to everybody.
2. Present a map of the irrigation scheme with the main characteristics of the area.
3. Ask farmers whether they think the map is good or if they want to make changes or add details.
4. Ask each farmer to mark the location(s) of his or her field(s) on the map and discuss its distance from the main intake and main canal.
5. Ask farmers questions on water distribution and maintenance issues (see “Questions to be asked”). Try to stimulate discussion when certain issues are causing constraints.

## Example

Irrigation system map of Tembel Irrigation Scheme, Amhara Region, Ethiopia.



## Examples of elements that can be included in the map

General	Irrigation and drainage structures	Small irrigation
<ul style="list-style-type: none"> <li>• Roads</li> <li>• Houses/villages</li> <li>• Temples/Churches/Mosques/Holy forest</li> <li>• Rivers, streams, lakes</li> <li>• North-south directions</li> <li>• Bridges</li> <li>• Hills/Mountains</li> </ul>	<ul style="list-style-type: none"> <li>• Water intake (weir, pumps, wells, reservoirs). Canal layout (primary, secondary, tertiary, field canals and drains).</li> <li>• Command area.</li> <li>• Boundaries of tertiary units.</li> <li>• Water flow directions in the field.</li> </ul>	<ul style="list-style-type: none"> <li>• Drop structures</li> <li>• Cross regulators</li> <li>• Distributors</li> <li>• Tertiary offtake</li> <li>• Field canal offtake</li> <li>• Siphons, aqueducts</li> </ul>

It is not necessary to include all these elements. Make your own judgment based on what information you already have. Adding too many details to a map costs time and can make it more complicated to understand.

## Guidelines/Checklist for the Rapid Diagnosis

“STEP 2a”

Ask farmers to indicate on the map:

- Areas that are not irrigated.
- Areas that are inadequately irrigated.
- Areas that are frequently flooded/waterlogged.
- Areas that have salinity problems.
- Areas with low crop yields (due to pests, water shortage, flooding).

Discuss the main causes of inadequate irrigation and drainage and indicate on the map where the *causes* of these problems lie, e.g.,

- Large structural water losses (collapsed canal, too low canal capacity).
- Lack of water at the headwork.
- Poor functioning of night storage.
- Bad status of the drainage system.
- Other multiple uses (damage due to livestock), etc.

Ask farmers:

- How water is distributed: rotation and water distribution rules.
- How often fields are irrigated; how many at the same time.
- Who makes decisions on water distribution and maintenance.
- Whether there are conflicts on distribution.
- [Try to find out if all farmers agree on these issues by stimulating discussion. Especially take careful notes when there is disagreement between farmers on these issues]. What are the most important maintenance tasks?
- Which part of the irrigation scheme requires most maintenance work?
- What other organizations do maintenance tasks in the scheme?
- For maintenance tasks that are not well performed, whether there are conflicts on maintenance?

Ask farmers to indicate on the map:

- Sources of drinking water, livestock drinking, washing clothes, bathing and other multiple uses.

Discuss whether there are conflicts with other multiple uses of the irrigation water.

Discuss with farmers to indicate on the map:

- Possibilities for the irrigation scheme to be extended.
- Possibilities for improving the layout.

## Water resource mapping

### Why

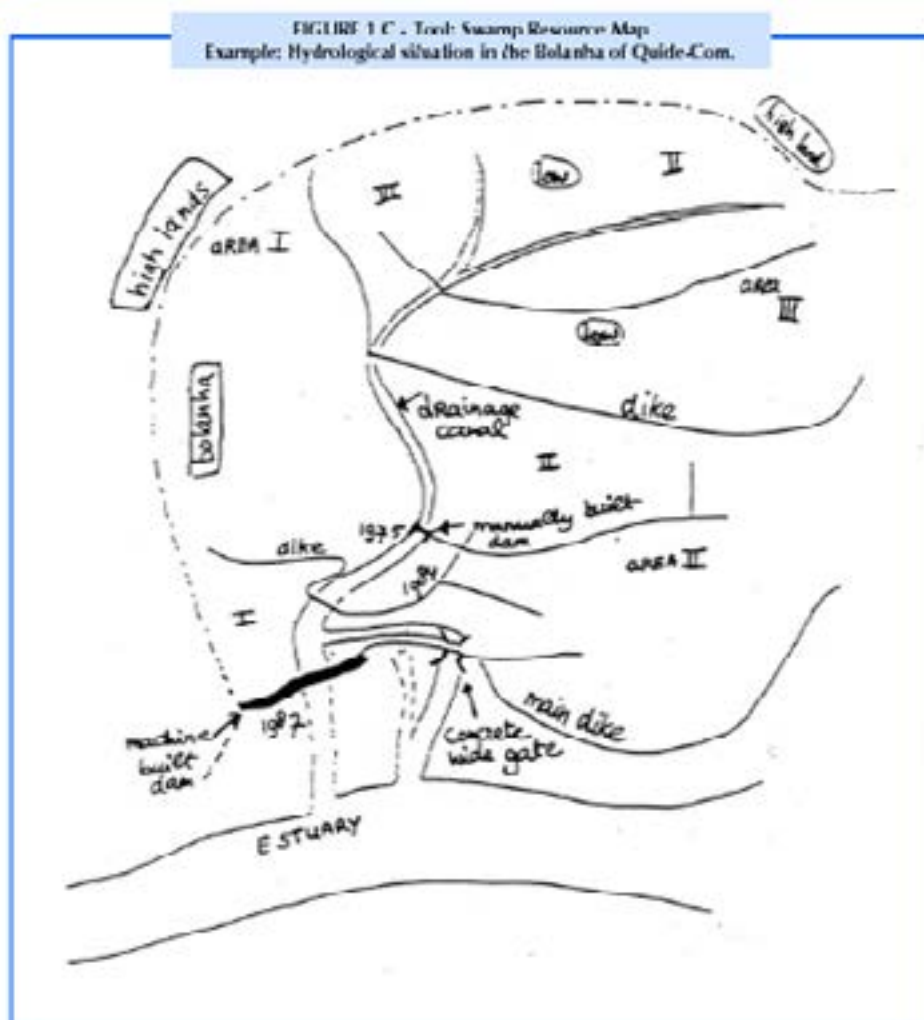
Map a community water resource base and relations to water use of other communities. The primary concern is not with cartographic precision, but with getting useful information about local perceptions of resources.

### How to

The procedure for making a water resources map can be similar to irrigation system mapping but with more focus on letting farmers draw their own map of the whole area surrounding their irrigation scheme. Maps can also be drawn of how participants want the future to look like.

Possible discussion topics are: availability of water resources, access amongst different social and gender groups, decision-making process on water resources use.

### Example



## ***Crop rotation calendar***

### **Why**

To get a long-term picture of the farming system calendar and important historical events for individuals.

### **How to**

1. Start by briefly introducing the purpose of the tool. Ensure that it is clear to everybody.
2. Draw a vertical line on a piece of paper and divide it into sections, each representing one year (or 10 years in case you want to go back very far in time).
3. Ask farmers to name important events that occurred during the period of the historical calendar. Usually, it is not important to have absolute dates but rather the sequence of important events.
4. Ask farmers to indicate for each year the properties of their irrigated cropping system that you want to monitor (water shortages, crop type, conflicts in the WUA, etc.).

### **Example**

Crop rotation calendar for Genet Irrigation Scheme. Note the change of dry-season crop choice following the upgrading of the scheme and establishment of the nursery site. If, as in this example, a farmer complains year after year about water shortage it is important to ask additional questions on the causes and cross-check the information

[Courtesy of Joseph H./Selassie, Sisay Mengesh, Mengistie Gashaw].

Crop season		Crop or association of crops	Problem/Remark
1998	Dry season	Eucalyptus tree, pepper, onion, potato, “gesho”	Irrigation water started to reduce Obtained seeds from local market
	Rainy season	Teff, “kosoyea” (local sorghum variety),	With water shortage/Poor chick pea productivity Obtained seeds from local market
1999	Dry season	Eucalyptus tree, pepper, onion, potato, “gesho”	With water shortage Obtained seeds from local market
	Rainy season	Teff, “kosoyea” (local sorghum variety),	With water shortage/Poor chick pea productivity Obtained seeds from local market
2000	Dry season	Eucalyptus tree, pepper, onion, potato, “gesho”	With water shortage Obtained seeds from local market
	Rainy season	Teff, “kosoyea” (local sorghum variety),	With water shortage/Poor chick pea productivity Obtained seeds from local market
2001	Dry season	Eucalyptus tree, pepper, onion, potato, “gesho”	With water shortage Obtained seeds from local market
	Rainy season	Teff, “kosoyea” (local sorghum variety),	With water shortage/Poor chick pea productivity Obtained seeds from local market
2002	Dry season	Eucalyptus tree, pepper, onion, potato,	ORDA developed the traditional “gesho”, papaya scheme Nursery site established inside the scheme by ORDA Obtained seeds and seedlings from ORDA nursery site and local market
	Rainy season	Teff, “kosoyea” (local sorghum variety), chick pea	With supplementary irrigation Obtained seeds and seedlings from ORDA nursery site and local market
2003	Dry season	Pepper, onion, garlic, papaya	Obtained seeds and seedlings from ORDA nursery site and local market
	Rainy season	Teff, “kosoyea” (local sorghum variety), chick pea	
2004	Dry season	Pepper, onion, garlic, papaya	Obtained seeds and seedlings from ORDA nursery site and local market

## ***Seasonal calendar***

### **Why**

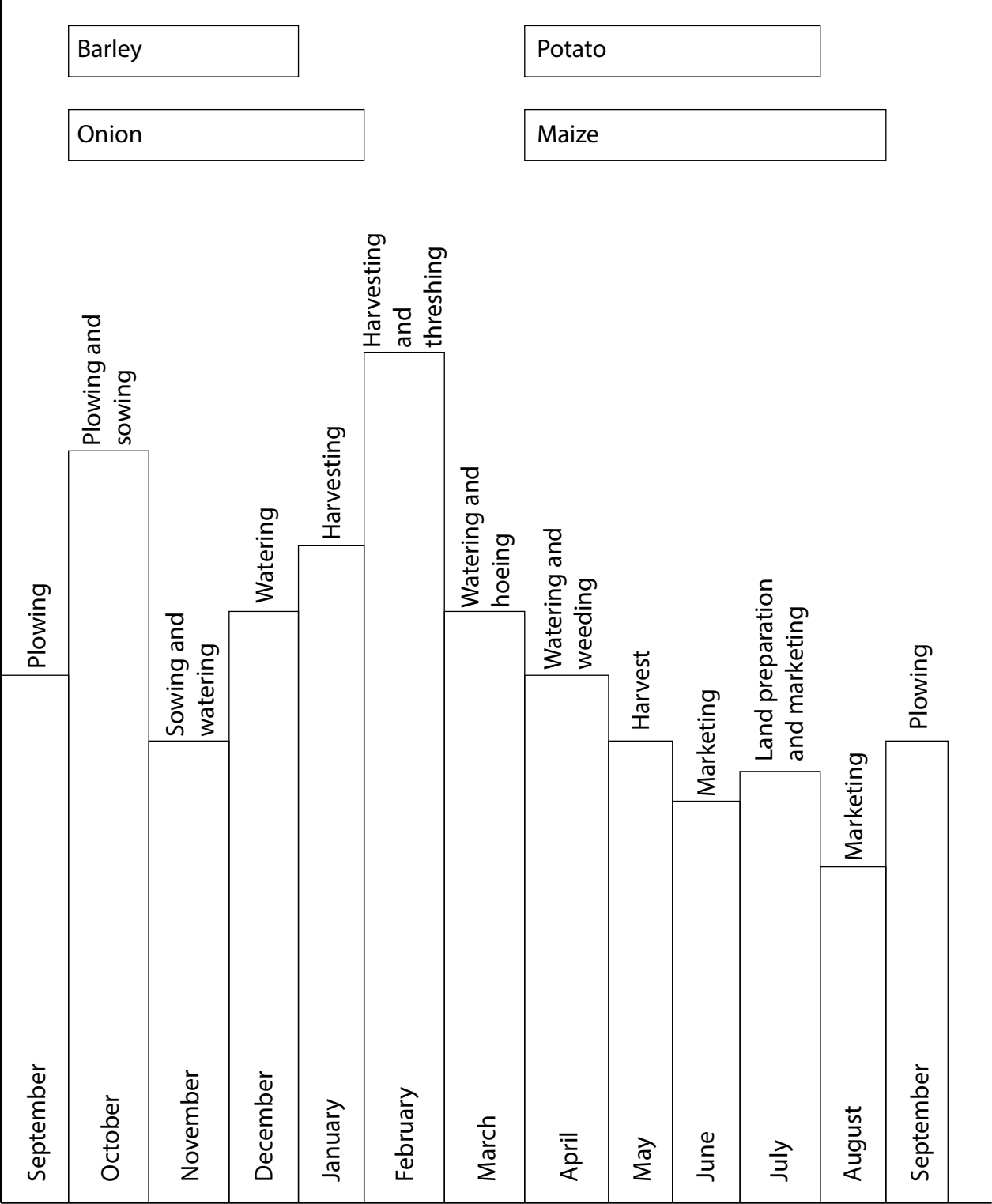
The seasonal calendar shows the temporal relation between main household activities and constraints occurring every year. This can be used to assess when opportunities exist for improvements. The seasonal calendar can be easily combined with the crop rotation calendar of the past 5 to 10 years.

### **How to**

1. Start by briefly introducing the purpose of the tool. Ensure that it is clear to everybody.
2. Draw a line representing 1 full year. Divide the year in months or seasons, depending on what farmers are most familiar with. Make sure that the calendar line is at a convenient moment (so for instance not during a harvest but in a period between two crops with little activity).
3. Ask farmers to draw the main seasonal activities (sowing, weeding) and constraints (water shortage, pests) on the calendar. Use different parallel lines to indicate different topics (see examples below).
4. Discuss with farmers what in their opinion are the constraints and causes, what solutions may be possible and whether cooperation with other farmers is needed for these solutions.

### **Examples**

Seasonal calendar of two farmers at Zenguene and Tikurit Irrigation Scheme, both in Ethiopia. The first image gives a general impression of the annual crop planning and during which month farmers are most busy. The second one provides more detailed information on the labor needs of individual crops and activities.

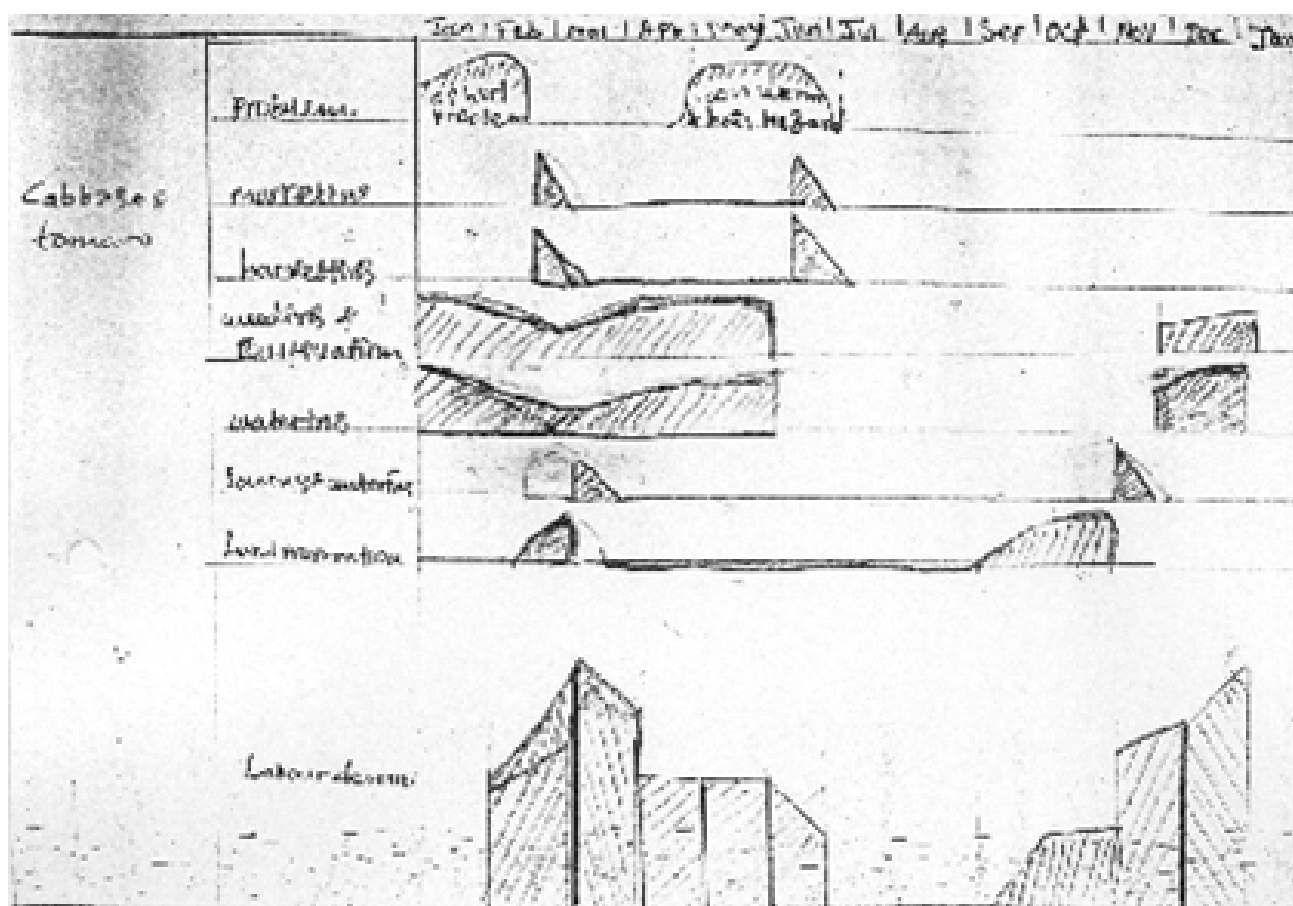


Barley

Onion

Potato

Maize



## Guidelines for the Rapid Diagnosis

“STEP 2a”

Try to get husband and wife together when possible.

Try to take farmers to their own field to allow easier explanation and check farmers' responses or opinions with your own eyes.

The seasonal calendar can be done in combination with the crop rotation calendar.

### Whole production system

- What are the different components that constitute all household activities?
- Ranking of main income sources/household activities.

### Ask a farmer to draw a crop rotation calendar (5 or 10 years) of his irrigated plot

- List important events during the past 5 or 10 years.
- Crop type on the irrigated plot for each year's dry and rainy seasons.
- Water shortages for each year's dry and rainy seasons. Causes of shortage: lack of rainfall or lack of irrigation water?
- Pest, input supply or marketing problems during a specific year.

### Ask a farmer to draw a Seasonal Calendar of the irrigated farming system during the last year with “normal” water availability

- Main plot activities: land preparation, sowing, weeding, harvest, agro inputs (are they purchased or not – avoid asking price if this is sensitive).
- Irrigation: number of irrigations per cropping season (dry and wet seasons).
- Crop disease, water shortages, waterlogging.
- Yields of main crops.
- Person-days spent on each component during the year (including irrigation maintenance and nonirrigated activities of the whole farming system) – OR ask percentage of labor needed relative to the busiest month.
- Post-harvest losses, processing techniques, conservation techniques.

### Discussion topics

#### Plot use

- Irrigated plot size, dryland plot size.
- Type of traction used (hand, draft animal, tractor) and how obtained (own, borrowed, rented).
- Tenure of irrigated land (sharecropper, owner, leaseholder).
- Access to irrigation water, water rights.
- Application rate, cost and source of agro inputs (chemical fertilizer, manure, seeds, pesticides).
- Decision maker on different crops (male/female).
- Reasons for crop selection.
- Most important productivity constraints and intensification constraints.

#### Socioeconomic

- What was done with the cropping advice of the extension officer?

Where crops were marketed, problems with marketing, access to credit, use of credit, etc.

## ***Irrigation scheme time line***

### **Why**

To get a long-term picture of the important historical events of the irrigation scheme and their relations. This tool can especially help explain conflicts or management problems that evolved over the past few years and therefore what kind of solution may be necessary.

### **How**

This tool can be applied directly to farmers or used after fieldwork by yourself to compile the information you got from farmers through other tools (e.g., crop rotation calendar and organizational analysis).

#### *To do after fieldwork*

1. Put the past 5 or 10 or 20 years (depending on how far you want to go back) on the left vertical axis of a piece of paper. Make four columns; one for every constituent.
2. Write down the major events or changes that occurred in the irrigation scheme according to the four constituents.
3. Draw lines between major events or changes if one is caused or related to the other.
4. Use this drawing to backtrack the source of problems.

#### *To apply it directly with farmers*

1. Start by briefly introducing the purpose of the tool. Ensure that it is clear to everybody.
2. Ask farmers to name or write down the major events in chronological order. Probe for causes of important events.
3. Write down the events and ask farmers to explain which events are related and how certain main problems are caused. The time line can be an easy way to see if the explanation farmers give you is sensible.
4. Cross-check the exact dates with other PRDA tools if it is important for the explanation of a problem, i.e., when it started or what caused it.

## Example

Time line of Dodidcha Irrigation Scheme  
(DA = Development Agent = local extension officer)

Year	Irrigation scheme	Plot use	Organization	Socioeconomy
1999	Construction started		1st WUA committee election	
2000	Construction finished	Land distribution	Coop formation 2 <sup>nd</sup> election	DA present
2000		Plots not cultivated because no money for inputs	Conflict between some farmers and Committee because of damage to canals by cattle	DA present
2001			3rd election	DA present
2002	Stacking of motor pump, i.e., adding a second pump to the back of a primary pump Water shortage	100% cultivated  Conflict on production sale	Corruption	Provision of credit  No DA
2002	Stacking of motor pump  Water shortage	90% cultivated	Corruption  Conflict on credit repayment  Formation of groups among farmers to take over the scheme	Credit revolved  No DA
2003	Stacking of motor pump  Water shortage	Less than 50% of plots cultivated  Input problem	Conflict between beneficiaries and Committee	French beans investor provided credit but not for all  Conflict in annual crop planning
2004				

## ***Historical trends***

### **Why**

To understand structural changes to certain topics of interest. The difference with time line is that this tool focus is on general trends over a certain time period instead of specific events during each year.

### **How to**

Historical trends can be recorded as graphs (similar to time lines) or as a matrix. The procedures for using a matrix are:

1. Start by briefly introducing the purpose of the tool. Ensure that it is clear to everybody.
2. Draw columns and rows on a sheet of paper to make a matrix. List historical dates along the top. For example: today, 10 years ago, 20 years ago.
3. Write down the events or indicators along the side. You can also add events that farmers themselves find important.
4. Discuss important events with farmers. Ask them also how key indicators have changed over time. (For example: important local events, important external events, major social changes, development interventions, major trends.) They can indicate this for instance by drawing a graph or dividing the number of stones/beans.

Optional:

1. Extend the time line to the future (5) years and ask farmers what they would like to see changed in their cropping system by then. Discuss the constraints with them.

### **Example**

Historical trend of Gologota Irrigation Scheme, environmental indicators.

Indicators	Today	10 years ago	20 years ago
Population density	Highly increasing	Average	Low
Food security	Food-secure	Food-secure	Food-insecure
Rainfall	Not sufficient	Sufficient	Abundant
Yields of main crops	Average	Average	High
Soil fertility	Low	Average	High
Pastureland area	Nonexistent	Scarce	Sufficient
Grass for house roofing	Nonexistent	Limited	Abundant
Heads of cattle	Small	Average	High
Firewood	Not available in the area	Available but in limited quantity	Available

The area is food-secure despite increasing population and decreasing soil fertility. Compensated by more and more massive use of chemical fertilizers. Irrigation has a negative impact on the environment.

## ***Cost-Benefit analysis***

### **Why**

To evaluate the profitability of crops selected by farmers.

### **How to**

1. Decide what type of cost and benefits you include and which you exclude.
2. Prepare a list of questions for the farmers.
3. Try to fill out the list of questions together with a farmer for one selected crop during an interview.
4. Analyze the outcomes of the interview.

### **Example: Cost-benefit analysis on Golgotha scheme in Ethiopia**

Typical cropping pattern is two cultivations of onion and one cultivation of maize every year. Ethiopian Birr have been converted to US dollars (USD1.00 = 8.6 Birr).

Benefits/ha	US dollars
Onions (2 X 1,860)	3,720
Maize	488
Total	4,208

Costs/ha	US dollars
Onion seeds (2 x 130)	260
Maize seeds	17
Pesticides for onions (2 X 183)	366
Pesticides for maize	27
Rent of tractor and other production services	551
Total	1,604

Labor/ha	Person-days
Onions (2 X 440)	880
Maize	162
Total	1,042

Value added	US dollars
Value added/ha	2,605
Value added/Person-days)	2.50
Value added/household (Average plot size = 0.7 ha)	1,823

## Guidelines/Checklist for the Rapid Diagnosis

‘Step 2a’

This tool can be easily used together with the seasonal calendar because both require information on labor.

### Crop type

- Area of selected crop (see biophysical measurement if farmer cannot tell).

### Family labor

- List labor activities (OR ask the farmer to draw them in a seasonal calendar).
- Person-days of labor spent on each activity.
- Cash cost of inputs
- Agro inputs (seeds, fertilizers, pesticides and other agrochemicals).
- Water fee (including fuel for pump and maintenance cost).
- Casual wage-labor.
- Production services (rent of farming equipment, ox, etc.).
- Marketing services (transport, packing, broker, market fee).

Make sure you take only a proportion of the fixed production costs if only part of the farmer's land is cultivated with the selected crop or intercropping takes place.

### Value of production

- Yield (need not be necessarily in kilograms, but should be in a unit known to farmer).
- Price at farm gate (this depends on where the farmer sells crop). Take local market price for home consumption. Also add the local market price of forage by-products consumed by farmers of livestock.
- Price of the crop at the nearest large market town (if farmer sells crop in another location).

### Calculations

- Gross Value Added = Value of production – Cost of inputs
- Land productivity = Yield (kg)/ha
- Intensification = Gross value added/ha
- Labor productivity = Gross value added/person-day

### Discussion with farmer

- Gross value added per person-day in relation to local wage-labor rate.

## **Venn-Diagram**

(Also known as Institutional Linkage Diagram)

### **Why**

Assess farmers' opinion/perception of:

- The importance of different local people, groups and organizations to the functioning of their irrigation scheme.
- Their relations (power structure), responsibilities, activities, decision-making process and area of conflict. This may be used as a starting point to improve working relations.

### **Materials**

- Open circles with large and small diameters made from paper or twigs.
- Markers/pens/pencils.

### **How to**

1. Start by briefly introducing the purpose of the tool. Ensure that it is clear to everybody.
2. Ask farmers to name individuals, groups or organizations that use the irrigated farming system or influence the productivity of their irrigated plots (list them on paper cards).
3. Ask farmers to explain whether each person, group or organization is very important, important, not so important or unimportant for agricultural productivity (let them make a ranking).
- Important refers to the influence that these entities have on agricultural productivity during the current year. Agricultural productivity would be much lower (or higher) without important entities, while important entities do not make much difference on productivity.
- It may be necessary to prioritize, for instance by asking participants to select the ten most important entities.
4. Start with a very large circle that represents the central element of the Venn Diagram which represents all the farmers (beneficiaries) belonging to the irrigation scheme. Represent each of the other elements (person, group or organization) with a separate circle. Important elements are represented on large circles, while smaller circles are used for unimportant entities (based on your ranking).
5. Discuss with the farmers how the circles should be placed relative to the central element.
  - A small circle within a larger one represents an element within a larger group.
  - Overlapping circles represent elements with overlapping functions/ activities or joint decision making.
  - Elements that interact a lot have to be placed closer to each other.
6. The positioning of the circles thus shows the influence of various elements on the decision making of farmers. This may be through indirect interaction (e.g., in the example, “MOE” [meaning “Ministry of Education”] has an indirect influence through “teachers”).
7. Make sure you draw a copy of the diagram once consensus is reached for your field report.

### **Example**

Venn Diagram of Goha Work Irrigation Scheme, Ethiopia.

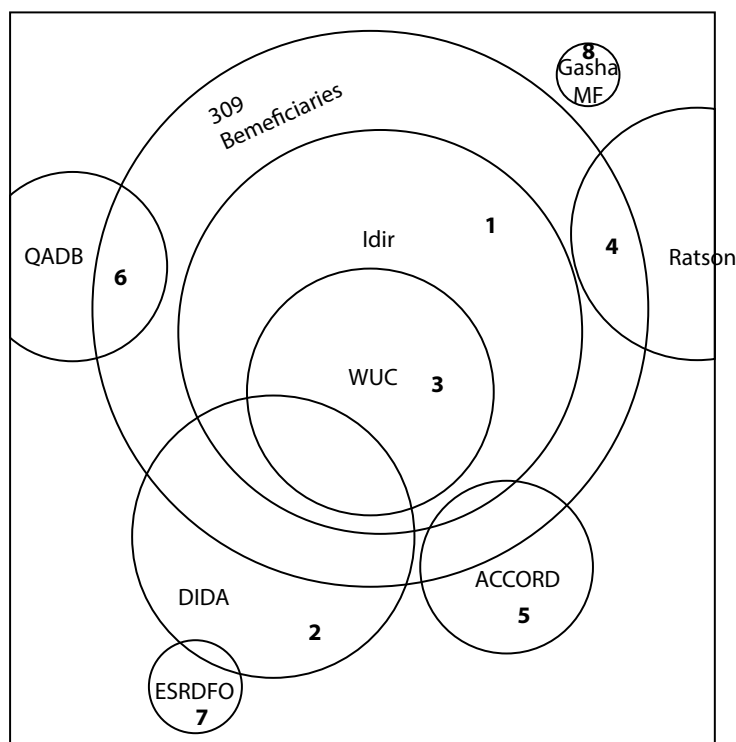
**Idir** is a traditional savings organization for funerals but in this case it takes a leading role in sponsoring and managing the irrigation scheme.

WUC = Water Users Committee (the board of the WUA)

OIDA = Oromia Irrigation Development Authority that constructed the irrigation scheme.

ESRDF= Ethiopia Social Rehabilitation and Development Fund: Donor that funded the OIDA to construct the scheme.

ACCORD = NGO that supports local school.



## Guidelines/checklist for the Rapid Diagnosis

“STEP 2a”

If you perform this tool more than once

- Focus the first time on the WUA and other elements that influence water delivery to irrigated plots.
- Focus the second time on the Cooperative. If there is no cooperative, try to map the relations to people/ organizations that currently perform the usual functions of a cooperative (marketing, input supply).

Things to include in the diagram

- Organizations of farmers, important farmers (local leaders).
- External organizations, individuals or groups (market in a nearby town or village) used to sell crops and buy inputs.
- Organizations and individuals providing information (extension).

Discussion topics

- External organizations with which the WUA/Cooperative should improve its relations.
- Conflict among farmers of the WUA/Cooperative.
- Is the WUA/Cooperative responsive to farmers’ needs?
- Organizational causes of poor water delivery and maintenance OR poor input supply and crop marketing.

## **Water-Use matrix**

### **Why**

Understand the situation of different uses and sources of water and plan changes.

### **How to**

1. Start by briefly introducing the purpose of the tool. Ensure that it is clear to everybody.
2. Draw a matrix and ask the participants to list their main water sources along the horizontal axes (or use pictures instead of text).
3. Ask participants to list their main uses of water along the vertical axes.
4. Then ask the participants to distribute stones/beans in the matrix, to indicate from which water source they get water for each water use. More stones indicate higher importance.
5. Discuss matters in the matrix:
  - Water use constraints. Are these constraints equal for all people? How can access be improved?
  - Conflicts or negative impacts related to use of the same water source (especially different uses of irrigation water).

### *Optional:*

6. Perform the exercise both with male and female groups and discuss the differences in a plenary session.
7. Fill out the matrix both for the rainy season and the dry season.

### **Example**

Water Use Matrix with group of females at Tilkit Irrigation Scheme, Ethiopia [courtesy of Beshir Ali, DersoDesalegne, GebayawArage, WondimenewSitotaw].

### Water Use Matrix with group of females at Tilkit Irrigation Scheme, Ethiopia

Water uses	Dry season			Rainy seasons			
	Water sources			Water sourcess			
Water use	Spring	River	Pond	Spring	River	Rain	Pond
Cooking	xxx xxx	xx		xxx xxx			
Irrigation	xx	xxxx					
Washing	xxxx	xxx xx		xxx xxx	x		
Home-made furniture	xxx xxx	x		xxx xxx	x		
Local building	xxx xxx	x		xxx xxx	x		
Livestock		xxx xxx			xxx xxx		xxx xx
Drinking	xxx xxx	x		xxx xxx			
Fire	xxx xxx	x		xxx xxx	x		

### *Task analysis by gender*

#### **Why**





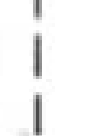

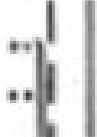











To collect information, raise awareness and understand how household and community tasks are distributed according to gender. This information can also be used to decide whom to target (male or female) with extension work or development interventions.

#### **How to**

1. Start by briefly introducing the purpose of the tool. Ensure that it is clear to everybody.
2. Write down (or draw) different tasks on paper cards. Ask participants to add cards with other activities that they find important.
3. Ask the participants to sort the cards by categorizing them according to who generally performs a task: a man, a woman or both. A start could be made with the cultivation of different irrigated and rain-fed crops, e.g., rice, wheat, etc., then livestock keeping, then household tasks and lastly community tasks.
4. Ask the group to analyze the workloads of men and women. Link the tasks and workloads to irrigation activities; focus the discussion on the constraints and opportunities for participation by women. Considering the gender division of labor, who should be involved in irrigation planning activities?

#### **Example**

Combination of seasonal calendar of rainfall distribution and cropping pattern and gender disaggregated activities [Wickramasinghe 1995 in Jordan 1998: 58]

Lowland paddy	male	female	children
Highland vegetables	vegetable	vegetable	
Productive paddy	  	  	  
forestry			
vegetables	  	  	  
animal husbandry			
Reproductive			
breed			
water			
childcare			
washing			
construction			

U = land preparation  
 N = nurseries  
 TP = transplanting  
 W = weeding  
 SP = spraying  
 H = harvesting  
 T = threshing  
 P = processing  
 S = storage  
 A = marketing

## ***Organizational analysis***

### **Why**

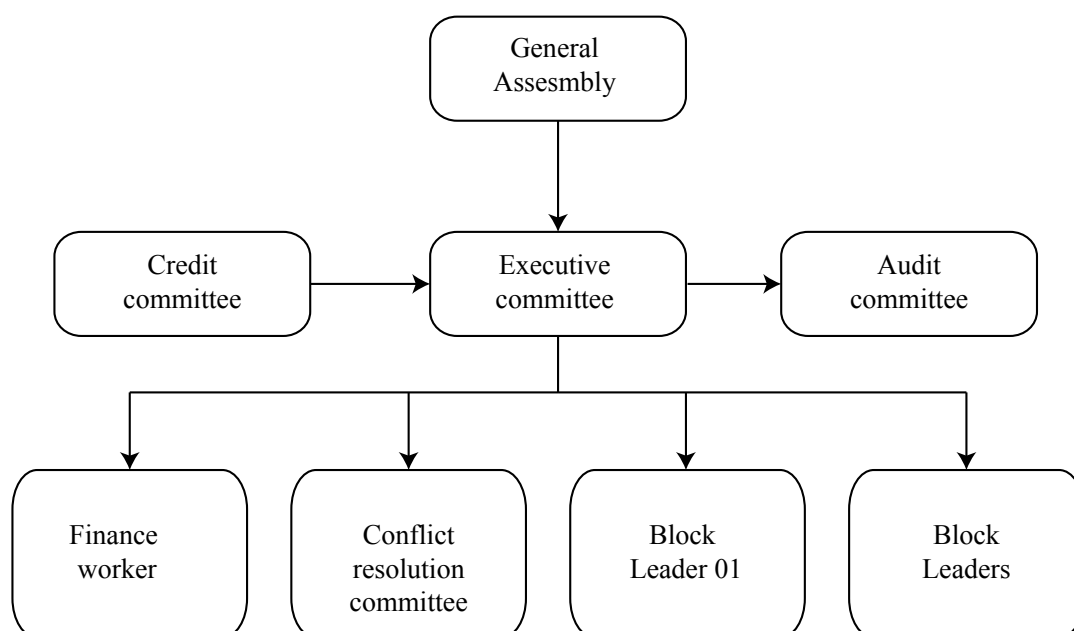
To get a structured information on the functioning of a WUA or Cooperative Society. For this we want to check if the WUA/Cooperative has the structure and capacity and adopted rules to do activities that fulfill its objectives.

### **How to**

1. For organizational analysis three information sources can be used:
  - Boards and other important members (people with specific functions such as accountants or block leaders).
  - Written administration and accounts of the WUA/Cooperative society.
  - The appearance of the office building (if there is one).
2. Make an appointment with the board members, preferably at their office building so that you can ask to see their administration and see the appearance of the building.
3. Try to fill in the checklist presented below by interviewing the board and other members.
4. Then try to fill in additional information and cross-check the interviews by studying the administration and accounts. But farmers may not like to show this to you; so do not push too much for this information.
5. Another way to cross-check information is to have a look at the office building to see if it is well maintained or empty, if there are files for documents and tools to maintain canals.

### **Example**

Water User/Cooperative structure and objective Matrix of Dodidcha Irrigation Scheme, Ethiopia. The matrix shows that the scheme is performing poorly as a result of organizational problems that force the executive committee to take over a lot of tasks.



main objectives of board of the Union (committee)

Objectives	Responsible to plan or organize	Expected to be performing	Sub, performed by	Is objective achieved
* preparing annual work plan	Executive body	Same	Same	Yes near 100%
* looking for credit save	"	"	"	save for long period but less successful
* distribution of received money within maintainance	"	credit committee	Executive body	70% only
* meeting	"	Executive body	Executive body	Yes
* secondary level	Block leaders	Block leaders	Executive body	Yes
* primary level	"	"	Executive body	Yes
* looking for good financial access	Exec. body	Exec. body	Exec. body	The more that save & price is higher and while looking credit into more good.
* collecting loan from farmers	Credit committee	Credit committee	Exec. body	Very less
* collecting input and other feed	Credit committee	Credit committee	Exec. body	Yes
* worker schedule	Exec. body	Block leaders	Exec. body	worker schedule only in this level and not to outside
* Signing agreement with diff. money lenders & unions	"	Exec. body	Exec. body	OK but not to the credit and interest of others

## Checklist for the PRDA

“STEP 2a”

### **Organization chart**

Ask the farmers to draw the organization chart.

Questions to ask about the organization chart:

- Who are members of each element of the organization?
- Can all farmers vote if there is a general assembly?
- What are the preconditions to be a member of each element of the organization?
- How are the members of each element selected (through elections, eldest persons, the local nobility, etc.)?
- What are the roles of every element of the organization?

### **Objectives**

Draw a matrix of six columns and ask farmers to add the following information:

#### *Column 1:*

The objectives of the WUA/Cooperative.

Give suggestions to (probe) farmers about possible objectives if you think their list is not complete. Also, some objectives may be fulfilled by external organizations (e.g., a government agency that does the maintenance of the intake and main canal structures).

Examples of WUA objectives are:

- Maintenance of intake, main canal and structures, secondary canal and structures, tertiary canal and structures, field intakes.
- Water scheduling and delivery in the main canal, secondary canal, tertiary level.
- Planning of the irrigation cropping seasons.

Examples of Cooperative objectives are:

- Marketing of crops
- Purchase of inputs
- Collecting of crops to be marketed jointly
- Training of members through a private extension officer

#### *Column 2:*

Which element of the farmers' organization is responsible for organizing, supervising or controlling each activity?

#### *Column 3:*

Who does each activity?

#### *Column 4:*

How well is each objective fulfilled? (Is the job done properly or not or too late, etc.)

#### *Column 5 (optional):*

What activities does the organization actually perform in order to reach its objectives and how often (desilting of main canals 2x per year)?

#### *Column 6 (optional):*

What are the costs of doing each of the activities mentioned? Give both the cash cost and/or labor costs that farmers contribute themselves in person-days. (Hired labor which is paid should be considered as cash cost).

### **Rules and Regulations**

- Are there formal written rules (bylaws)?
- Do all farmers know these rules?
- What are rules or prerequisites for membership of the WUA/Cooperative?
- Are there rules that govern the meetings of the general assembly (what is the frequency of meetings, can farmers call extra meetings)?
- What is the percentage of farmers attending the general assembly?
- Can all farmers check if their contribution is well spent by the board? (Are there accounting and internal rules?)

**Capacities:**

- How often do farmers break rules?
- Are there fines for farmers breaking rules (penalties for not paying water fee, not contributing to maintenance work or stealing water)?
- How many times were these fines applied last year? Is every violation punished? Try to discuss specific events that occurred during the past year.
- How much money does the WUA/Cooperative have in the bank?
- What is their annual budget?
- Do they have access to credit?
- Have members of the WUA/Cooperative received training on how to run their organization?
- Is the WUA/Cooperative capable of liaising with external players?
  - Is there a contract with government agencies that do maintenance?
  - Has the organization expressed its needs to extension organizations?
  - How does the organization deal with external newcomers who also use their irrigation water?

**Conclusion:**

If the WUA/Cooperative is not capable of fulfilling its objectives what are the main causes, according to the farmers?

***Rapid gender-based difference analysis***

*Source:* Barbara van Koppen: A gender performance indicator for irrigation: Concepts, tools and application. IWMI Research Report No. 59.

**Why**

To analyze gender issue in a particular scheme with the aim to plan action for higher productivity through more gender equity. For this we want to check differences between men and women farmers regarding water rights and inclusion in a WUA or Irrigation Cooperative.

**How to**

1. It is recommended to perform this tool at the end of step 2a “scheme data collection” to use prior collected information for cross-checking purposes.
2. From the WUA, Irrigation Cooperative or scheme development agent, get information on the number and percentage of women farm decision makers in the scheme and number and position of women having a specific function/responsibility within the WUA or Irrigation Cooperative.
3. Organize an interview with a group of 10–15 women farmers having plots at head, middle and tail of the scheme and all women having a specific organizational function/responsibility. Start briefly by introducing the purpose of this tool.
4. Try to fill in information on water and land rights of women farmers, and their inclusion as members or leaders in a WUA or Irrigation Cooperative using the checklist.
5. Fill in other information by cross-checking with prior collected information on the plot using “seasonal calendar,” organization “Organizational analysis,” and socioeconomic environment “Venn Diagram.”
6. After the interview, fill in the table below. Performance is rated good (+) if there are no gender-based differences. If you found that mild differences affect negatively women farm decision makers, performance is rated average (+-). If most women farm decision makers face major problems compared to men, the performance is low (-).

Legal “official” and actual land rights	Official membership rights	Actual water rights at farm level	Actual participation to scheme organization	Actual inclusion as leaders	Ability to function as leaders
(Performance)	+ / +- / -				
Main stakeholder: Government agency/Local community/both through institutional arrangements.					

Categorical rights define in general terms the legal status of persons as well as the type of rights regarding an object or a property. Concretized rights are the actual implementation of categorical rights. For example, in a particular scheme women may have categorical water rights as they are members of the WUA, but their actual access to water (concretized rights) may be less secure than that of men.

The main stakeholder is the one who had the greatest influence in developing rules and practices related to issues.

## ***Checklist for PRDA***

### **Land rights**

Land rights are often very complex in rural Africa (see chapter 3, § 3.1.3 Irrigation and the local community). Here we will try to answer the following questions:

- Did women have land rights within the site before construction of the scheme? If yes, were these land rights maintained after completion of the scheme?
- How specific attention to women has been given in the land distribution process after completion of the scheme.
- Do you own land in the scheme?
  - If yes, how did you get land property rights? Allocation by government agency or traditional village committee, heritage from husband/father, etc. How are your property rights recognized by the government and/or within the local community?
  - If no, how do you get land access rights? Sharecropping, renting, free loan?
- Who decides about crop management on your land (choice of crops, buying of inputs, marketing)?

### **Water rights**

Question to be answered is “To what extent do women have sufficient and secure access to water to irrigate their land?” This can be addressed through:

- On-farm cropping pattern and cropping intensity: current and past change.
- Past crop failure due to lack of water and reasons for it.
- Participation of women to conflict resolution mechanisms regarding water distribution.
- Women’s obligations related to O&M: payment of water fee both in cash and labor.

### **Concretized participation to scheme organization and inclusion as leaders**

Use the organization chart of the WUA or Irrigation Cooperative to get information by asking the following questions:

- Who are members of each element of the organization?
- Do women farm decision makers actively participate in the general assembly? Are they listened to?
- Do preconditions to be a member of each element of the organization tend to include/exclude women farm decision makers?
- How are members of each element selected (through elections, eldest persons, local nobility), number and percentage of women farm decision makers?

### **Ability to function as leaders**

Did women members of the organization receive training to perform their task and responsibility? If yes, what kind of training and who gave the training?

To which extent are women leaders accepted and listened to by the whole farming community?

## ***Input and market chain analysis***

### **Why**

Input or market chains are a visualization of activities that are performed to provide inputs to the irrigation scheme (fertilizers, seeds) or sell its production (crops). This can be used to:

- Explain the cause of constraints related to input supply or marketing related to price, timeliness, quality, etc.
- Show gaps in our knowledge of input or marketing constraints.
- Identify solutions.

### **How to**

1. Decide which input or market chain you want to study.
2. Write down the organizations involved in the selected chain.
3. Use three different color arrows to indicate flow of goods, cash and information between the organizations. Flow of goods may be inputs or crops; cash is the money used to pay for these inputs or crops; information is the requests or orders to deliver the goods at a certain time and space.
4. Indicate in the chain where constraints occur.
5. Your figure may contain several separate chains; for instance, if farmers get their fertilizer from both state and private suppliers or when crops are sold both at the local market and in a distant town.

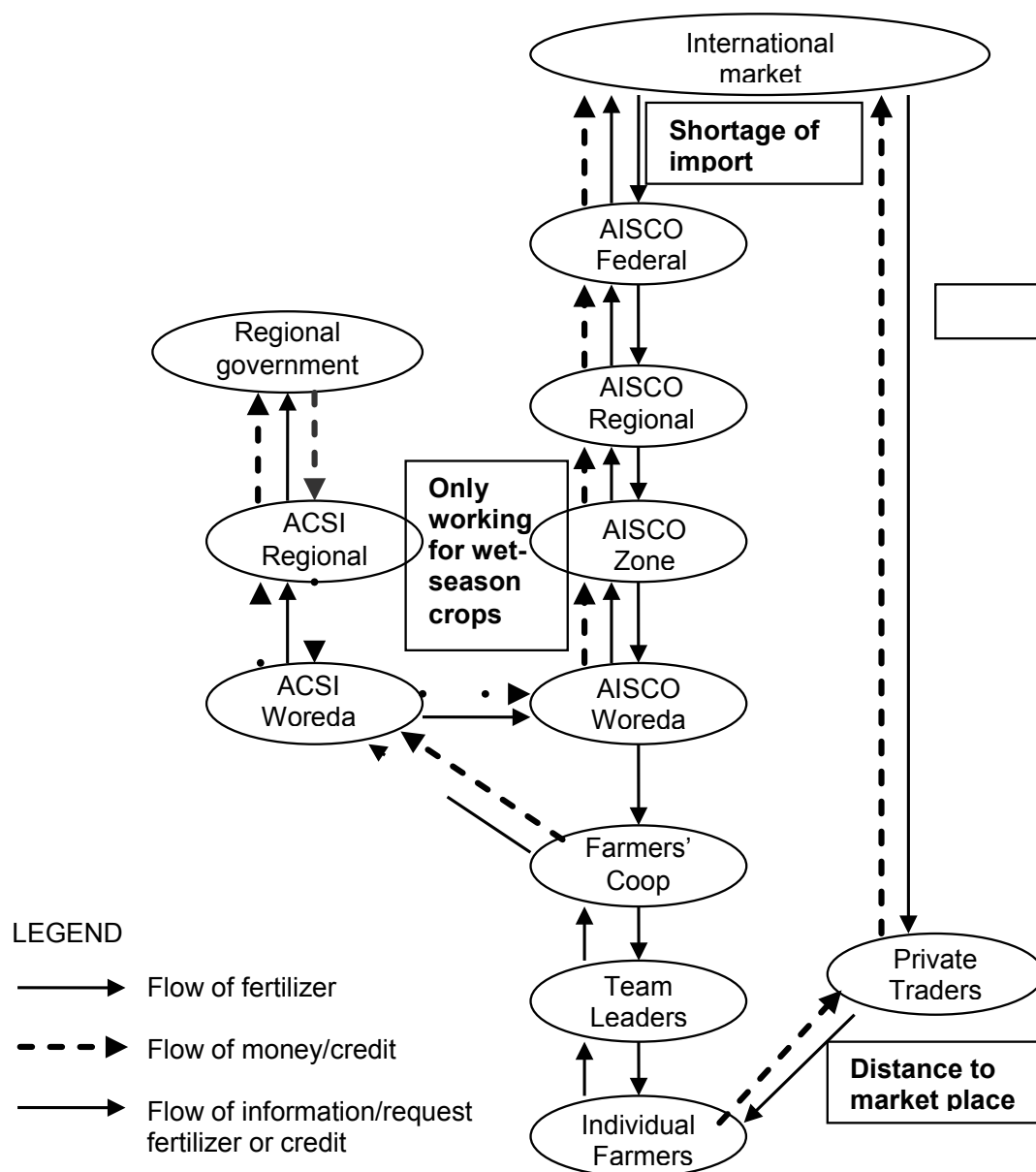
It may be necessary to perform additional interviews to get complete information on the chain and its constraints.

### **Option**

6. You can make separate diagrams of how the chain should currently function in theory or how you want the chain to function in the future.

### **Example**

The official and unofficial private fertilizer input supply chain for Tilkit Irrigation Scheme, Ethiopia. Official chain starts when farmers request ACSI to give them credit for inputs. ACSI then gives the money to AISCO which buys and then delivers fertilizers to farmers. The farmers have to repay their loan to ACSI at the end of the season. Note that the second unofficial supply chain is much shorter but more expensive. [Adapted from a chain made by Beshir Ali, Derso Desalegne, Gebayaw Arage, Wondimenew Sitotaw]



## Rapid benchmarking

### Why

To compare the performance of different irrigation schemes or between farmers within the same scheme. Poor performance in a certain location or aspect usually indicates a direction in which to search for improvement.

### What is an indicator?

Performance is expressed using indicators that contain certain information. For instance: “percentage of plots within the irrigation schemes that are not receiving irrigation water” is an *indicator*. It provides *information* on “the water delivery in the whole irrigation scheme.”

Many indicators consist of measurements, observations or farmers’ opinions expressed in numbers. An example of an opinion-indicator is: “percentage of farmers unsatisfied with the service of extension organizations.”

### How to

1. Select the type of information against which you want to compare with other irrigation schemes.
2. Brainstorm on which indicator you can best use to represent the information.
3. Select indicators:
  - Remember that you are doing a *Rapid Diagnosis*: It should take only a *little time and effort to collect data* for the indicator.
  - It is useful to select only indicators that are also available for other irrigation schemes. (Else it is not possible to compare.) Ensure that the other indicators have the same definition as yours and are calculated using the same methods.
  - Other irrigation schemes should preferably be of the same type (gravity/pumped, farmer-managed, similar size, climate, country/continent).
4. Collect information needed to calculate or describe the indicator.
5. Use the collected information to calculate the indicator.
6. Compare the indicator with those in other schemes.
7. Discuss on poor performing indicators whether the causes are within the reach of farmers to change (e.g., a poor water distribution) or very difficult to influence (e.g., very irregular rainfall).

## Some criteria for indicator selection

Criteria		Bad example	Good example
Specific	Reflect topics that the PRDA tries to change	Number of inhabitants per clinic	Size (ha) of irrigated plots per farmer
Easy to collect	It must be possible to collect the information in a short time period at low cost	Variance of water supply to all individual plots of the scheme	Percentage of farmers unsatisfied with water availability at plot level
Unambiguous	Another person should get the same result when he/she tries to collect the same data	Percentage of plots that looks well maintained	Percentage of plots without weeds
Comparable	The item that is compared should also exist in other schemes/countries	Average value added in local currency	Average value added in USD/ha

## Finding comparable information

Benchmarking indicators for other irrigation schemes are readily available when the PRDA is done simultaneously on more schemes. Information on crop yield and water distribution indicators can also be found through literature, the Internet, national extension organizations and research institutes (e.g., [www.iwmi.org](http://www.iwmi.org)).

## PRDA Guidelines

“STEP 2b”

Reporting SHEET 2b contains examples of indicators that can be used for comparison with other schemes.

## ***Constraint ranking***

### **Why**

Identify main constraints to agricultural productivity and farmers' interests experienced by individuals or groups of users of the irrigation scheme.

Each person may have a different rankings of constraints. This gives an impression of different interests or opinions. Consensus may later be reached through discussion.

### **Materials**

1. Pen and sheet of paper (another option is to write in the sand).
2. Small stones or beans.

### **Process**

1. Start by briefly introducing the purpose of the tool. Ensure that it is clear to everybody.
2. Ask farmers to think about the main constraints to their irrigated agricultural productivity.
3. List the constraints using farmers' own names for the constraint to be ranked.
4. Ask each farmer to rank each constraint for himself/herself by putting five beans (or stones) at the most important constraint, four beans at the next important constraint, etc. The least important constraint gets no beans. Each farmer can use a separate column as in the example below.
5. After this, calculate the total score for each constraint by adding up the number of beans of all farmers and rank them from most important to least important.
6. Discuss why farmers chose a certain ranking; especially on points where they have different opinions. You can make the discussion easier by comparing two constraints in pairs (paired ranking).

### **Alternative**

7. Another option is to let the group of farmers decide on the ranking of constraints. The advantage is that this stimulates discussion thus giving more insight into the background or magnitude of constraints.

### **Tips on use**

Make sure that people tell you their constraints and not absence of solutions to constraints. For example: "There is no road" is a constraint that already carries solutions; namely, the construction of a road. Taking such a constraint as a starting point for further analysis will raise expectations with farmers that they get a road and in the end leads to disappointment if you are not able to satisfy their wishes.

If people see the absence of a road as a constraint, try to understand what constraints they face as a result. Ask them why they see the absence of a road as a constraint? Or probe when necessary: "Is the road a constraint because you cannot sell your products, you lose a lot of time going to the market?"

By first focusing on constraints you will increase the range of possible solutions later on!

### **Example**

Problem ranking with male farmers at the head of the Nilli Irrigation Scheme, Ethiopia. The scheme is only very recently constructed which explains why many farmers complain of lack of awareness on irrigation practice. [Courtesy of Joseph H/Selassie, SisayMengesh, MengistieGashaw; with minor adaptations] (Names of farmers changed from original.)

Constraints	Informants					Total	Ranking
	Abiye	Nigist	Biniam	Bifkadu	Tilahun		
Waterlogging						0	
Absence of stoplogs for canal gates		xxxx				4	
Shortage of labor power for intensive dry and wet seasons		xxx		xx		5	
Free grazing		xxxxx	xx	xxxx	xxx	14	2 <sup>nd</sup>
Pest problems	xxxx	x	x	xxx	xxxx	13	3 <sup>rd</sup>
Lack of improved vegetable and crop seeds	xxx	xx	xxx		x	9	
Shortage of labor power due to intensive malaria cases	xxxxx		xxxx	xx	xx	13	3 <sup>rd</sup>
Lack of awareness on irrigation agronomy and practice	x		xxxxx	xxxxx	xxxxx	16	1 <sup>st</sup>
Illegal water use/stealing of water	xx					2	

## Rapid Diagnosis guidelines

“STEP 2c”

The Constraint Ranking exercise will be repeated several times with different categories of farmers to capture the differences and similarities between the users.

- Five farmers from the tail end of the irrigation scheme. Make sure they include both rich and poor farmers.
- Five farmers near the intake of the scheme.
- Five female farmers.

## ***Pair-wise constraint ranking***

### **Why**

The purpose is identical to constraint ranking. Pair-wise constraint ranking can be used to validate the outcomes of constraint ranking. Also, it can be useful when farmers only mention solutions instead of constraints with constraint ranking.

### **Materials**

- Pen and paper cards.

### **Process**

1. Start by briefly introducing the purpose of the tool. Ensure that it is clear to everybody.
2. Name or present two cards with possible constraints that you identified in advance. Try to use people's own names for constraints. Adjust the names of constraints when needed during the exercise.
3. Ask farmers to state which of the two constraints is more important to them, and why. Take note of each "vote."
4. Repeat this procedure for as many constraint pairs needed until a trend is visible. Try to mix constraints as much as possible to prevent strategic voting.
5. Write the results of each "vote" in a matrix and count how many times each constraint has "won" and how many times it has "lost." The result is the basis for your ranking.

### **Example**

Pair-wise constraint ranking with tail-end farmers on Nilli Irrigation Scheme, Ethiopia [courtesy of Joseph H./Selassie, SisayMengesh, MengistieGashaw].

Water losses	Poor access	Shortage of labor	Shortage of water	Lack of experience	Insufficient water flow	No. of stones remaining	Count	Rank
Water losses due to seepage	Water loss	Shortage of labor	Shortage of water	Water loss	Water loss	Water loss	4	3 <sup>rd</sup>
Poor access for improved vegetable and crop seeds		Shortage of labor	Shortage of water	Poor access	Poor access	Poor access	3	4 <sup>th</sup>
Shortage of labor power due to a severe malaria case			Shortage of labor	Shortage of labor	Shortage of labor	Shortage of labor	6	1 <sup>st</sup>
Shortage of irrigation water and inequitable distribution of water				Shortage of water	Shortage of water	Shortage of water	5	2 <sup>nd</sup>
Lack of experience on irrigation agronomy and practice					Insufficient water flow	Lack of experience	1	6 <sup>th</sup>
Insufficient water flow through tubes installed at the main canal and division boxes						Insufficient water flow	2	5 <sup>th</sup>
No. of stones remaining on plots							0	7 <sup>th</sup>

## ***Cause-effect diagramming***

### **Why**

Flow diagrams are visualizations of processes or events. They can be used to:

1. Explain connections/relations between different factors that cause problems (identify the underlying cause of problems).
2. Show gaps in our knowledge of problem causes.
3. Identify solutions.

### **Materials**

- Cause-effect diagrams can be drawn on paper.
- Lines can also be drawn in the sand using local objects to represent different elements (this way illiterate people can also participate and the diagram can be changed easily).

### **How to**

*In the office (before going to the field):*

Cause-effect diagramming requires some preparation before discussion with farmers. First you need to develop an initial diagram of the irrigation scheme's constraints together with the other PRDA members (see instructions below).

*In the field with farmers:*

1. Start by briefly introducing the purpose of the tool. Ensure that it is clear to everybody.
2. Select one of the constraints/problems selected previously by the farming community in the center of a paper sheet (or in the sand).
  - The topic can be an event/activity (e.g., "many farmers do not participate in maintenance") or a status (e.g., "lack of water at the intake").
  - The topic must be specific (a bad example is "credit problems" as these can be very broad).
3. Ask what happens as a result of the constraint. The answers are written in the diagram and connected by lines if there is a causal relation.
  - Also try to find out indirect consequences by asking questions (probing). If a person mentions an indirect consequence, then ask to explain what caused this more directly. This helps to develop the diagram in a series of cause-effect chains.
  - You can also ask if the impact of consequences is the same for all farmers in the irrigation scheme.
4. Then ask about the causes of constraints and also try to put them in the diagram. See if it is possible to connect different constraints in one diagram.
5. Once complete, you can discuss with the farmers which elements of the diagram can be improved (so what solution needs to be done to overcome the constraint).

*In the office (after discussion with farmers):*

Repeat this tool several times starting with different problems and different groups of farmers. In the end, you will be able to combine all items of information into one or several cause-effect diagrams.

- The final number of diagrams depends on the number of constraints that can be fitted into one diagram.

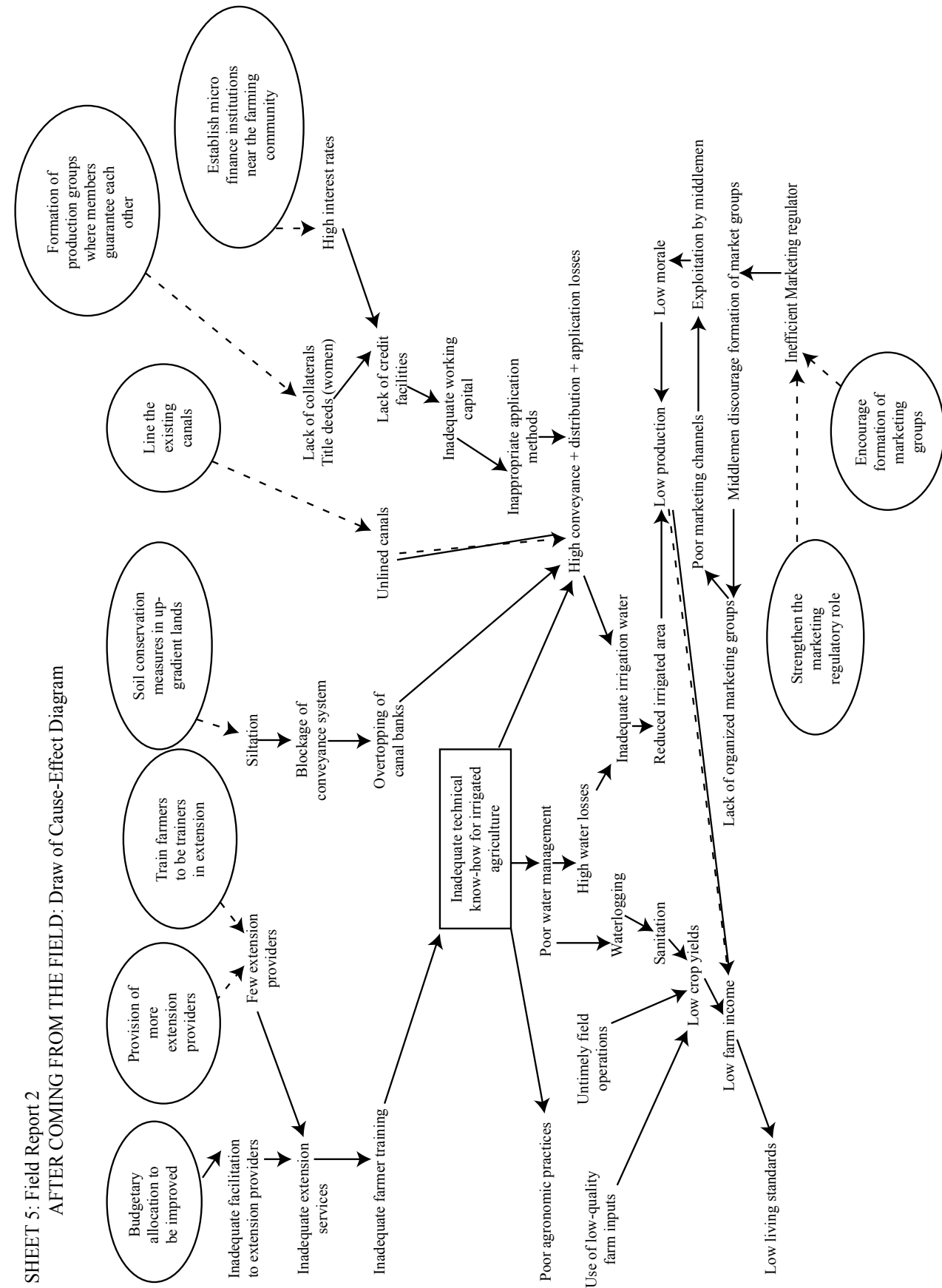
- Also, you may need to draw different diagrams for different categories of farmers to prevent loss of information.
- Try to indicate in your final diagram to which of the four constituents (infrastructure, plot use, organization, socioeconomic) each part of the diagram belongs.

Describe your cause-effect diagram in writing to explain elements and relations in more detail.

### **Example**

Cause-effect diagram made after discussion with farmers of Yatta Furrow Irrigation Scheme, Kenya. The diagram also shows solutions identified and proposed by farmers (written in the circles) that can be implemented as solutions to root causes of identified problems [Courtesy of Morris M. Makau, Veronica Ndetu, Ann Mutedina, S.Y. Kavisu and Peter Mangusa].

## AFTER COMING FROM THE FIELD: Draw of Cause-Effect Diagram



## Guidelines for the PRDA

“Step 2d/ 3a”

Try to involve different groups of farmers for this tool:

- The WUA board.
- Farmers close to the head (near the intake).
- Farmers close to the tail.
- Female farmers.

Keep the discussion on the irrigation scheme.

## Literature review (2)

### Why

A literature review can also be useful during a later stage of the PRDA.

During performance assessment (step 2b) it may be useful to have information on local potential yields at research stations or average yields of the area. This is to compare whether there are theoretical possibilities to increase yield with improved farming practices.

Scientific research publications can give experiences in other countries with certain constraints and ideas on possible solutions (step 3a/b). Research publications may be available from the national or local agricultural research organization. Evaluation reports of irrigation development or rehabilitation in the same area may also give useful advice. Try to get them through the local government and NGOs.

## Matrix ranking

### Why

Helps identify preferences for certain topics or solutions based on farmers' own criteria. This reveals the reason for the preference of different groups.

### How to

1. Start by briefly introducing the purpose of the tool. Ensure that it is clear to everybody.
2. Ask farmers to list the topics to be evaluated. Make negative criteria positives so that all can be well compared: e.g., “pollutes water” becomes “prevents water pollution.”
3. Ask farmers to list criteria or “indicators” to compare the different topics.
4. Ask the farmers to rank their preferences for each topic using beans (or stones). More stones stand for a topic that they like more according to the criteria.
5. Discuss the reasons for farmers' choices and on other possible criteria.

















### Example

The example below shows information in the criteria applied by young women and old women to assess the value of different groups. Note that each group uses different criteria and that the young women use a larger variety of crops. This shows that splitting into more groups can provide more information than taking the average result of a joint matrix ranking [Mikkelsen 1996: 123 – 125].

	Egg Plant	Lettuce	Toma- atoes	Sortel	Bambara Green	Nana	Bitter Tomato	Karen Kareng	Cassava	Okra	Onions	Cabbage	Hot Pepper	Mango	Sweet Pepper
More durable in terms of Storage	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
More cash yielding	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
More blood giving	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
More energy giving	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Consumed most	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
More marketable	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Less water requirement	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

MAX. SCORING : 7

MIN. SCORING : 1 (NUMBER IN BOX REFERS TO OVERALL RANK PER CRITERIA)

CROPTYPE	MAIZE	E/SOR- GHUM	RICE (POON)	FINDO	RICE (RMS)	GROUND NUTS	TEYA ROCONB	BEANS	L/SOR- GHUM	L/MILLET	SESAME (RENNIE)
CRITERIA											
FOOD 	• 2	• 2	• 5	• 1	• 6	• 6	• 1	• 1	• 4	• 3	• 2
INCOME (CASH) 	• 2	• 2	• 3	• 1	• 4	• 6	• 1	• 1	• 3	• 3	• 1
LOW LABOUR REQUIRE- MENT 	• 3	• 2	• 1	• 6	• 1	• 1	• 5	• 5	• 1	• 1	• 1
PALATABILITY 	• 2	• 2	• 5	• 3	• 5	• 3	• 3	• 3	• 2	• 3	• 2
EASY COOKING PROCESS 	• 2	• 2	• 7	• 1	• 7	• 4	• 2	• 2	• 2	• 2	• 2
HARVESTING CATEGORIES	• 6	• 4	• 4	• 5	• 3	• 2	• 2	• 2	• 2	• 2	• 1

## ***Solution assessment chart***

### **Why**

Solution assessment chart is a specific type of matrix ranking. It helps make choices resulting in realistic and concrete solutions that can be implemented.

### **How to**

1. Start by briefly introducing the purpose of the tool. Ensure that it is clear to everybody.
2. Explain the possible solutions that have been identified previously.
3. List the solutions in a matrix with at least seven columns.
4. Discuss and reach consensus on the *impact* of each solution on:
  - Farmers' productivity (for this you can compare cost-benefit analysis for the current and desired future situations).
  - Sustainability of the solution (maintenance requirement, environmental impact, etc.).
  - Equitability (does the solution benefit all farmers in the scheme or only certain groups?).
5. Indicate the farmers' opinion on the impact of each solution in the matrix. One option is to use “+” and “-” signs.
  - 😊 Solution that farmers like.
  - 😞 Solution with negative impact.
  - 😐 Solution with no impact.
  - ? Impact of solution unknown.
6. Then discuss the difficulty of *implementing* each solution:
  - Time to benefit (“+” stands for a faster solution, while “-” means that the solution takes a longer time).
  - Cash cost (“+” means that there are lower costs!!).
  - Labor costs (“+” means the labor requirements are lower!!).
  - Dependency on external organizations (“+” means lower dependency).
    - 😊 A solution that is easy to implement.
    - 😞 A solution that is difficult to implement.
    - ? Difficulty of implementation is unknown.
7. Discuss whether the farmers who are needed for implementing the solution are also the farmers who benefit. If not, what is their incentive to cooperate with the solution?
8. Decide which solution is the “Best bet” according to the farmers.

### ***Alternative***

9. Another option is to let farmers decide on the criteria or add criteria (for instance, applicability to local cultural norms; amount of land needed). This may better reveal the reason for the preferences. Criteria selected by farmers are likely to change from group to group.

### **Example**

Options assessment chart made with five farmers at the tail end of Nakwamoru Irrigation Scheme, Kenya (with small adaptations). Note that farmers interpret the cash cost of Food-For-Work very low, indicating that they made this diagram from their own perspective [Courtesy of: Daniel Atambo, Emanuel Wasike, Alphas Lusweti, Alfred Losikiria, Peter Ekai].

Solution	Impact of solution				Difficulty to reach solution			“Best bet”
	Productivity	Sustainability	Equitability	Time to benefit	Cash cost	Labor costs	External dependency	
Formulation of bylaws	😊	😊	😊😊	😊😊	😞	😊😊	😊	2 <sup>nd</sup>
Training of water management	😊😊	😊	😊	😞	😞	😊😊	😊	3 <sup>rd</sup>
Provision of gates/ checks	😊😊	😊😊	😊	😞	😞	😞	😞😞	4 <sup>th</sup>
Proper cleaning of canals	😊😊	😊	😊	😊	😊	😊😊	😞	1 <sup>st</sup>
Food for work	😞	😞	😞	😞😞	😞	😞	😞	6 <sup>th</sup>
Desilting/Construction of new intake	😊😊	😊	😞	😞	😞	😞	😞	5 <sup>th</sup>

Another option is to use stones instead of smiles. More stones stand for a solution that has a more positive impact or that is easier to reach.

### Guidelines for the PRDA

“Step 2d/ 3a”

You can apply this tool with the same group that made the cause-effect diagram.

## ***Presentation of final diagnosis***

### **Why**

To present your gathered information to farmers as a basis for jointly formulating an action plan to improve irrigation performance.

### **How to**

Hold a presentation for the farmers (and other stakeholders) followed by a discussion. Suggested format:

1. Introduce yourself.
2. Summary of main positive and negative points of the irrigation scheme. Use relevant PRDA tools to illustrate your points.
3. Detailed description of main problems and possible solutions. Use Cause-Effect Diagram and Multi-Criteria Analysis to illustrate.
4. Discussion on main positive and negative points.
  - Do farmers agree with your diagnosis?
5. Discussion on extension work.
  - How can organizations providing extension to farmers improve their services? What lessons can they take from the farmers?
6. Discussion on possible solutions (see action plan matrix).

It may not be possible to agree on an action in one morning or afternoon. You may have to plan additional sessions before consensus can be reached.

## **Guidelines for the PRDA**

“Step 2c”

Give at least one presentation for the WUA and other interested farmers. In a very large scheme you may have to repeat the presentation for different subunits. It can also be useful to present the results at the local government or NGO.

## ***Action plan matrix***

### **Why**

To make a detailed plan for activities necessary to implement a solution with clear division of responsibilities and deadlines.

### **How to**

1. Start by briefly introducing the purpose of the tool. Ensure that it is clear to everybody.
2. Draw a matrix with five columns. In the first column you write down solutions that are agreed with farmers. Three levels of solutions can be distinguished:
  - The first level can be implemented with little outside assistance (e.g., a different water rotation schedule). Most can be implemented soon.
  - The second level can be implemented by farmers with considerable external assistance (e.g., constructing a storage facility). The chances that external organizations are willing to support or give funding are higher when farmers also make a contribution to the costs. Generally, they take some more time than the first category.
  - Solutions of the third level require a change of policy or laws by the government (e.g., training of extension workers, farmers' water rights). These solutions are difficult to implement.

It is best to go only for solutions of level 1 and maybe level 2 to have a fast result and prevent raising false expectations. Third-level solutions should be communicated to very senior staff as they are outside the capacity of most extension and development workers.

3. Discuss with farmers which activities have to be carried out to reach the solutions. Try to be as detailed and precise as possible and write them down in column 2.
4. Column four contains the organizations responsible for organizing or implementing each activity.
5. The final column contains the date by when the solution should be implemented.

### **Example**

Action plan for Qahira Irrigation Scheme, Kenya (with slight adaptations) [courtesy of Osman Ahmed, S. Mworira, AbdirahmanGafow, Abdikadir S. Mohammed].

Selected solutions (AIM?)	Activities to implement (WHAT?) (WHO?)	Resources necessary (WHAT?)	Responsible organization / people	Time planning (WHEN?)
Construction of lined canal (portion)	Raising of canal; guarding of canal	Cement, sand, ballast, gates	Farmers	Immediately
Acquire high capacity pumping set	Purchase pumping set	Funds	Farmers	Ongoing project
Diversity of high-value crops	Land preparation Watering Planting Spraying Harvesting and storage Marketing	Seed variety Fruit seedling Chemicals Manure Extension service	Farmers	Ongoing project
Market site by Garissa Municipal Council (GMC)	Allocate land and fencing	Land Posts Barbed wire Nails Carpenter	GMC MOA Development and Promotion of Horticulture Association (DPHA) Drylands Development Center (DDC)	April 2004
Facilitate extension agents	Purchase vehicles Purchase motorbikes Increase budget allocation	Vehicles Motorbikes Fuel Oil Spare parts	Government of Kenya Farmers Donors/NGO to be identified	Immediately
Revive Farmers' Cooperative Society	Training on management	Cash Credit and facilities grants Trainers ([MOA] Ministry of Cooperative Development [MOCD], Ministry of Water and Natural Resource Development [MOWNRD])	Ministry of Cooperative Development Farmers MOA Arid land Resource management	Immediately

## Guidelines for the PRDA

“Step 2c”

The action plan matrix is a very useful tool to use during presentation of the final diagnosis to farmers.

## **Transfer of responsibility matrix**

### **Why**

Identify who is currently responsible for certain tasks and how this will change during implementation of the action plan. This may also provide information on capacity-building needs.

The tool can be especially useful in areas where farmers see attracting aid as one of their possible strategies (next to growing crops, rearing livestock or finding wage labor jobs) as a reaction to frequent exposure to development aid projects.

### **How to**

1. For each element of the irrigated agricultural system addressed by the action plan: ask farmers to list the major tasks and responsibilities. Write them in the first column of a matrix.
2. Ask participants to name the major stakeholders directly involved in running the irrigation scheme and write them at the top row of the matrix.
3. For each task: ask participants to distribute five stones among the stakeholders according to how much responsibility they have. When a stakeholder gets five stones it means he is totally responsible.
4. Create a second matrix with the same tasks and stakeholders. Repeat the process of distributing stones to represent what hopes there are for the situation after implementation of the action plan.

### **Optional**

5. Repeat the process again to reflect the situation in the past (10 years). This may be useful when the irrigation scheme was better performing in the past and you want to learn how things were done at that time.

### **Example**

Transfer of responsibility matrix for organization of trainings to a village community [Guijt and Woodhill 2002: D45].

Task	Past (1995)			Present (2001)			Future (2005)		
	Village group	Local NGO	Local govt.	Village group	Local NGO	Local govt.	Village group	Local NGO	Local govt.
Fund-raising		xxxxx xxxxx			xxxxx xxxxx			xxxxx xxxxx	
Choosing trainers		xxxxxx	xxxx		xxxxxx	xxxx	xxxx	xxx	xx
Scheduling trainings		xxxxx xxxxx		xxx	xxxxx xx		xxxxx xxxxx		
Follow-up		xxxxx xxxxx			xxxxx xxxxx		xxxxx	xxxxx	
Organizing participants	xxxxx xxx	xx		xx	xxxxx xxx		xxxxx xxxxx		
Designing training tools		xxxxxx	xxx		xxxxx xxx	xx	xxx	xxxx	xx
Evaluations	xxxxx		xxx xx	xxxxx		xxxxx x	xxxxx	xxx	xx
Totals	13	44	14	18	43	11	39	26	6
Percentage	19%	63%	19%	23%	61%	16%	54%	37%	9%
Change from 1995				+4%	-2%	-3%	+35%	-26%	-10%

## ***Monitoring and Evaluation (M&E) plan***

### **Why**

To enable future monitoring and evaluation of planned solutions. For this you need to check whether (a) a solution is implemented on time, and (b) it has the planned positive impact on irrigation performance. However, monitoring has a wider purpose than only checking. It can also help improve your strategy because it enables adjustments if implementation is not satisfactory or the planned positive impact is not achieved.

### **How to**

The best way to monitor an action plan is to determine indicators before you start implementation. For this you need two types of indicators.

- Indicators to monitor the progress of implementation.
- Indicators to monitor impact on irrigation performance.

To ensure ownership, the indicators should be developed together with the farming community. This in turn will increase both their awareness of the relevance of the indicators and willingness to collect the necessary data. Plan a meeting with the farmers after you have finalized the action plan but before the start of the next cropping season.

1. Explain the purpose to the farmers.
2. Start by developing indicators of impact. For this you have to think which constituent of the irrigation scheme will change/improve as a result of the solution and how this can be measured. Indicators can be selected from criteria developed by farmers for matrix ranking or solution assessment chart to make sure that these are relevant to them.
3. Finish by developing indicators to monitor progress of implementation. For this you take the list of activities from the action plan matrix and transform the most important activities into indicators. Write down the final list of indicators. Decide who is responsible for which parts of the M&E activities.

### **Some criteria for selecting indicators of change**

The chapter on Rapid Benchmarking has already explained some important criteria for making indicators. However, when you make indicators for impact of solutions on irrigation performance, note that there are also some other criteria; that is more criteria may be required when developing the indicators to assess impact from the solutions that were implemented in the scheme.

This is because you do not want to compare change over time instead of differences between schemes.

Criteria		Bad example	Good example
Sensitive to change	Reflect on topics that the solution tries to change	Number of clinics in the area	Yield per ha
Easy to collect	It must be possible to collect the information in a short time period at low cost	Variance of water supply to all individual plots of the scheme	Percentage of farmers unsatisfied with water availability at plot level
Unambiguous	Another person should get the same result when he/she tries to collect the same data	Percentage of plots that are looking well maintained	Percentage of plots without weeds
Time bound	Describe by when a certain change is expected	Yields per ha	Yields per ha increased before 1 January 2006

### Some criteria for selecting indicators of progress

The chapter on Rapid Benchmarking has already explained some important criteria for making indicators. However, when you make indicators for impact of solutions on irrigation performance, there are some other criteria too. They are making a distinction between general indicators for schemes and indicators that enable measuring whether the scheme has been successful with introducing certain solutions. This is because you do not want to compare change over time instead of differences between schemes.

Criteria		Bad example	Good example
Specific	It should be clear <i>who</i> should do <i>what</i>	Training given	The extension officer has given training to 50 farmers on plot water management
Time bound	Describe by when a certain activity is expected to take place	The WUA has formulated bylaws	The WUA has formulated bylaws before 1 January 2005

## Annex B

### PREPARATION REPORT

The preparation report is written during step 1: “Preparation.” Its objective is proper planning of PRDA, documenting preliminary information extracted from the review of secondary data and for team members to visit the scheme.

## 1 GENERAL INFORMATION

### 1.1 The team members

Names – organization (employer) – Position title

### 1.2 The irrigation system

Name of the scheme and location – administrative unit

Basic description of the irrigation system

Description	Examples
Type	Communal scheme or cluster of individual schemes
	Irrigation scheme
Water source	River, dam, reservoir, natural lake, springs, shallow wells, boreholes
Water abstraction	Diversion, motorized pumps, treadle pumps, other
Size of irrigated area (ha)	
Water distribution	Open canals (lined, unlined), pressurized pipes
	On-farm management
Number of farmers and size of landholdings	
Main crops in the wet season	
Main crops in the dry season	
Organization - WUAs	
Type	Formal irrigation cooperative, traditional irrigation committee, other
Number of members	To compare with number of farmers/water users
Functions	Water distribution, maintenance, inputs supply, marketing, others
Irrigation fee and labor contribution	Irrigation fee - birr/ha/year Labor contribution to maintenance: person-days per year

Write down other items of important information you have extracted from the review of secondary data: information on irrigation infrastructure/organization/on-farm management, and socioeconomic environment – drivers of change.

### 1.3 Socioeconomic environment

---

Marketed crops in the dry season	Try to get information on quantities sold and prices
Marketed crops in the wet season	Try to get information on quantities sold and prices
Organization for marketing	Cooperative/marketing groups/individuals
Organization for inputs supply	Cooperative/marketing groups/individuals

---

Write down other items of important information you have extracted from the review of secondary data about the socioeconomic environment – drivers of change.

### 1.4 Climate data

---

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
P (mm)												
Meant (°C)												
Eto (mm)												

Source: Nearest meteorological station.

## 1. REVIEW OF FEASIBILITY STUDY AND DESIGN REPORT

---

For public/formal irrigation scheme only if the documents were available to you.

### a. Design and construction

---

Name of design organization

Name of contractor that built the scheme

Describe how farmers participate to design and to construct

First year of operation of the scheme:

Indicate if the WUA and the extension services have a copy of the design documents

### b. Site

---

Size of command area as per design (ha)	
Major type of soils %	Name  command area 1 2 3

Comments if any:

(Try to link soil types and topography: identify areas with poor drainage, sloping areas with risk of soil erosion).

Add a copy of the soil map if available.

### c. Water source and abstraction

---

Type of water source and mean of abstraction as per design	
Mean of abstraction as per design	
Designed intake capacity (l/s)	
Estimated peak net crop water requirement for the projected cropping pattern (mm/day)	
Estimated irrigation efficiency (%)	
Estimated peak irrigation requirement (l/s/ha)	

Comments if any:

**d. Layout and water distribution**

Size of secondary units (ha)	Unit 1      Unit 2      Unit 3      Unit 4 Unit 5      Unit 6      Unit 7      Unit 8, etc.
Average size of tertiary unit (ha)	
Designed access roads	In secondary units (yes or no) In tertiary units (yes or no)
Type of water distribution network	Main canal (length; lined or not lined) Secondary canals (lengths for each unit; lined or not lined) Tertiary canals (lengths) Or same exercise for pressurized system
Type of water partition structures	In main canal In secondary canals In tertiary canals
Drainage system	“Natural” = none Surface drains Design capacity of surface drains (l/s/ha)

Comments if any:

Add a copy of the map of the irrigation system if available.

**e. Plot and water application**

Size of designed plot size (ha)	If designed plot size is equal in all the command area: If not equal: Minimum size    average size    maximum size
Plot leveling during construction	Yes/no or some
Designed “main d’eau” = discharge at plot gate (l/s)	
Projected irrigation method	Basins/furrows/flooding/sprinkler/drip irrigation
Recommended crops in the rainy season Crop 1 Crop 2 Crop 3, etc.	Recommended irrigation interval (days) and irrigation depth (mm) for each crop
Recommended crops in the dry season Crop 1 Crop 2 Crop 3, etc.	Recommended irrigation interval (days) and irrigation depth (mm) for each crop

**f. On-farm management**

Number of farmers		
Average size of individual landholding		
Projected cropping intensity (%)		
Crops suitable for the project and expected yields according to type of soil and fertilizers used		
Type of soils	Dry season yields      Fertilizers	Dry season yields      Fertilizers
Soil 1	Crop 1 Crop 2 Crop 3	Crop 1 Crop 2 Crop 3
Soil 2	Crop 1 Crop 2 Crop 3	Crop 1 Crop 2 Crop 3
Soil 3	Crop 1 Crop 2 Crop 3	Crop 1 Crop 2 Crop 3, etc.

Comments if any:

**g. Organization (WUA)**

Organization in charge of managing irrigation	WUA/cooperative/traditional community-based organization/private company/government agency
Projected O&M cost	
Projected irrigation fee	In money: In labor (number of person-days per year)
Cost recovery/sharing	% of O&M cost to be paid by farmers % O&M cost to be paid by government (subsidies)

Comments if any:

#### **h. Socioeconomic environment**

Projected markets for main crops	Home consumption/national market/export
Crop 1	
Crop 2	
Crop 3	
Crop 4, etc.	
Type of organization for marketing	No (individually) Cooperative Informal marketing groups Other:
Type of organization for inputs supply	No (individually) Cooperative Informal marketing groups Other

Comments if any

#### **i. Likely main constraints**

Based on the review of secondary data, visit of the scheme and your own knowledge and expertise, indicate what the most likely main problems of the irrigation system are.

## 2. DATA COLLECTION REPORTS

---

NB: Make one report for each tool

Name of scheme:	PRDA team members
-----------------	-------------------

Name of tool:

Name of farmers or other key informants:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6, etc.

Indicate why and how you select the interviewed individuals or group

### **INFORMATION LEARNT ON THE CONSTITUENTS OF THE IRRIGATION SYSTEM**

---

Irrigation scheme

On-farm management

Organization

### **INFORMATION LEARNT ON THE SOCIOECONOMIC ENVIRONMENT**

---

### **3. PERFORMANCE ASSESSMENT REPORT**

---

The performance assessment report is meant to organize the collected information in a structured way. In a second effort, the information is analyzed with a view to understand and assess how the system performs and what its dynamic (trends and change over time) is and what the main constraints are. In doing so, it is important to enlighten the nature and impacts of interaction between the three constituents and between the system and its economics.

The following is the model of a report; you may not have collected all the information mentioned in the following model. Do not try to make up information that you have not collected. Indicate what farmers told you and also use your own expertise to assess the information.

#### **1. ASSESSMENT OF “IRRIGATION SCHEME”**

---

Most of the information on “irrigation scheme” would result from application of the following tools: (1) transect walk, (2) irrigation system mapping, (3) irrigation system time line and, if necessary, (4) biophysical measurements.

##### **1.1 Site and water resource**

---

In this section, compare water availability and intake capacity with actual peak irrigation water requirements to tell whether or not there is enough water for all the command area.

If there is not enough water at intake, explain why:

- Insufficient water availability (water source) in which months of the year?
- Poor maintenance of intake (water abstraction).
- Change in cropping pattern or crop rotation: for instance, some irrigation schemes were designed for supplementary irrigation but farmers may also irrigate in the dry season.
- Uncontrolled expansion of the command area.

Indicate whether farmers have expanded the command area and if so when and for what reason (good market opportunities, population increase, funding by an NGO or government, or other).

Indicate whether parts of the command area are abandoned and, if so, why.

Describe the conflicts linked to water shortage and how they are addressed by farmers.

Indicate whether farmers have expanded the command area and, if so, when and for what reason (good market opportunities, population increase, funding by an NGO or government, or other).

##### **1.2 Layout and water distribution**

---

In this section:

- Assess the quality of maintenance of irrigation and drainage networks, irrigation structures (gates, weirs, etc.) and feeder roads. A simple classification is enough, for instance: excellent, good, poor, no maintenance at all.
- Indicate type of water losses (overtopping of canals, seepage in canals, breaches in canals) and causes of water losses (sedimentation, insufficient canal capacity, sandy soils, etc.). Assess the importance of the problem of water losses (limited or serious).

- If not in good maintenance, assess the likely causes and impacts according to farmers and your expertise.
- Indicate whether farmers have built new canals and canals that are no longer in use, reasons mentioned by farmers and reasons you may think for yourselves.
- Type of water scheduling at secondary and tertiary canal levels: fixed rotation/ negotiated amongst farmers/on demand as pleased.
- Assess the equity of water distribution by comparing number of irrigation turns, discharge at plot gate, and duration of irrigation turn at head, middle and tail of the irrigation network.
- Indicate % area with adequate water supply (i.e., timely and reliable water supply and sufficient amount of water at farm gate) in dry and wet seasons.
- Assess areas of waterlogging, periods of waterlogging, causes and impacts.
- Assess areas with soil erosion and importance of soil erosion (moderate or serious); likely causes and impacts.
- Conjunctive use of water: indicate whether some farmers use an additional source of water (i.e., groundwater, on-farm water harvesting ponds), in addition to canal water. Give the reasons mentioned by farmers and the reasons according to your expertise. Describe the impacts of conjunctive use on cropping patterns, crop rotations and yields.
- Insert a map of the irrigation system showing:
  - Abandoned area/canals.
  - Expansions of command area, new canals built by farmers.
  - Areas without water, insufficient water and waterlogging.
  - Areas with low yields.
  - Damaged, poorly functional irrigation canals and drains.
  - Damaged, poorly functional irrigation infrastructures.

### 1.3 Plots and water application

---

In this section assess:

- The efficiency of water application at plot level. Indicate irrigation methods (basins, furrow, others) and whether or not these methods are adapted to the type of crops, the soil and topography (leveling).
- Adequacy of water application to plots based on number and interval of irrigation turns in head, middle and tail of the scheme and information given by farmers about irrigation practices.

### 1.4 Conclusion on irrigation scheme

---

Main constraints related to “irrigation scheme, causes and impacts of these constraints.”

## 2. ASSESSMENT OF “ON-FARM MANAGEMENT”

---

Most of the information on “on-farm management” would be generated by application of the following tools: “transect walk” for direct observations, “seasonal calendar,” “crop rotation calendar,” “irrigation system time line” and, if necessary, “biophysical measurements.”

### 2.1 Landholding

---

In this section indicate:

- Number of households cultivating land in the command area.
- Size of irrigated farms (average, minimal, maximal).
- Tenure of irrigated farms: % of owners (official title), % of official tenants, long-term lease by government, % of farmers renting land, % of sharecroppers.

### 2.2 Crop production process

---

Give a description of the typical cropping patterns and most common crop rotation in the irrigation system and explain the reasons for selection of crops by farmers.

Summarize your direct observations: occurrence of weeds, plantation density, symptoms of water stress, symptoms of pests and diseases, symptoms of soil erosion, salinity problems, etc.

Make a typical seasonal calendar indicating the following;

- Elementary tasks (soil preparation, sowing, weeding, harvesting, post-harvest processing).
- Approximate time (person-days) spent for each activity.
- Farming equipment used: animal traction, manual tools, tractor.
- Use of external waged workers (as opposed to family workers) and for which activities.
- Use of improved or local seeds or seedlings.
- Use of chemical fertilizers; type and quantity.
- Occurrence of pests and diseases and use of pesticides.
- Use of organic fertilizers (manure, compost); quantity.
- Use of animal traction for soil preparation of manual.

Indicate approximate yield of major crops and try to compare them with a reasonable benchmark, for instance yields of model farmers or target value from literature or target value from extension services.

Are there major differences between farmers’ production process and technology packages recommended by the extension services? If yes, explain why.

### 2.3 Economic outputs

---

Value added for major crops

Total value added/ha for typical cropping patterns and crop rotation = land productivity

Total value added per person-days (family + external labor) = labor productivity

Optional: you can try to estimate farmers’ income.

	Gross value of production
-	Cost of inputs: seeds, fertilizers, pesticides
=	Value added
-	Payment of the irrigation service (= irrigation fee)
-	Wages of casual and permanent workers
-	Payment of external services (i.e., rent of oxen or tractor, etc.)
-	Interest paid on credit
-	Taxes
+	Subsidies or grants
=	Income

As for yields, try to compare economic outputs to benchmarks. Compare also the economic outputs of the major crops to better understand the strategy of farmers.

## 2.4 Categorization of farmers

---

Try to divide farming households into two to four categories; possible criteria for categorization are:

Size of farms and type of land tenure

Type of crops and orientation of irrigated farming: subsistence, market, mixed

Capital investment: number of oxen owned, use of agrochemicals and improved seeds or seedlings.

## 2.5 Conclusion on “on-farm management”

---

- How good is the productivity of irrigated farming and what are the main constraints?
- Are land rights and water rights secure enough to allow farmers to invest in irrigated farming?
- Does the current level of economic outputs indicate that farmers have the capacity to pay all irrigation costs?
- What are the prospects and potential for improvement of on-farm management?

You may answer these questions separately for the various categories of farmers.

### **3. ASSESSMENT OF “ORGANIZATION – WUA”**

---

#### **3.1 Type of organization and legal status**

---

A WUA is a traditional community-based committee, as are Irrigation Cooperative, and other types.

Assess the legal status: Is the organization officially recognized by the local administration? Does the organization have formal bylaws? Can the organization open a bank account and have access to credit?

Assess what kind of support was given to the organization by the government, NGOs or projects (training, financial support, etc.).

#### **3.2 Membership**

---

In this section give:

- Criteria for membership.
- Number of members.
- Membership ratio (%): number of members/total number of water users.
- Percentage of women members/Total number of members.

Based on the membership ratio and interviews with farmers, assess:

- Whether or not all farmers recognize the organization as the institution responsible for the management of their irrigation scheme.
- Whether or not the organization has sufficient authority and support from farmers to enforce its rules and regulations with regard to O&M of the scheme (or if the organization is considered to be weak by farmers).

#### **3.3 Structure**

---

Insert the organizational chart of the organization and indicate the main roles and responsibilities of each governance body; examples: general assembly, management committee, control committee, etc.

Indicate how members of the governance bodies are appointed or elected and number of members of each body.

#### **3.4 Objectives and functions**

---

Describe the objectives of the organization: O&M of the irrigation scheme and possible other objectives, for instance, marketing of crops or input supply to members.

Describe the essential functions performed by the WUA with regard to O&M of the irrigation scheme; whether these functions are poorly performed; assess the reasons and impacts of poor performance. Essential functions with regard to O&M of the irrigation scheme are:

- Preparation of annual or seasonal operation/water distribution plan taking into account water availability.
- Operation of the irrigation system in order to convey irrigation water from the headworks

to the tertiary units in accordance with the annual/seasonal operation plan including water scheduling on a day-to-day basis.

- Assess if irrigation water is distributed equally between all secondary and tertiary canals and irrigation blocks.
- Prevention of wastage of water and control of efficient utilization of supplied irrigation water.
- Doing regular inspections of all irrigation and associated structures in order to assess the maintenance requirements.
- Preparation of the annual/seasonal maintenance plan and budget base of the conducted inspections.
- Implement the annual/seasonal maintenance plan.
- Assessment, billing and collection of irrigation fees among all water users (indicator: level of water fee and recovery rate).
- Maintenance of all necessary financial and nonfinancial records.
- Enforcement of discipline by imposing sanctions against any individual farmer and/or group of farmers for any violation of the bylaws and/or internal rules and regulations.
- Arbitration and settlement of any dispute arising over the O&M among individual farmers and/or groups of farmers.

### **3.5 Bylaws and internal rules and regulations**

---

Does the organization have formal bylaws and internal rules and regulations?

What are the provisions of the formal or informal rules and regulations with regard to:

- Rights (including water rights) and duties of members?
- Roles and responsibilities of the governance bodies including the procedures for election and removal of office bearers?
- Procedures for calling meetings of the General Assembly?
- Voting procedures for General Assembly?
- Purpose, composition, functions and powers of all governance bodies (committees)?
- Procedures for resolving disputes?
- Description of the duties and responsibilities for any staff to be employed by the Irrigation Committee and procedures for appointment and dismissal of staff?
- Procedures for setting and collection of ISF?
- Penalties and sanctions to be imposed for default of payment of the irrigation fee?
- Penalties and sanctions to be imposed on farmers for the violation of any provision in the Irrigation Committee Bylaws and/or Individual Rights and Responsibilities?

Assess whether or not the bylaws and internal rules and regulations are effectively enforced, and if not, what the causes and impacts are.

If not for formal bylaws, do you think that there is sufficient trust and understanding among the farmer community for effective implementation of rules and regulations?

Do the rules and regulations apply equally to all farmers? If not, explain why.

### **3.6 Conclusion on “Organization – WUA”**

---

What are the achievements and challenges ahead of the organization?

What are the prospects and potentials for strengthening the organization?

## **4. ASSESSMENT OF “SOCIOECONOMIC ENVIRONMENT”**

---

### **4.1 Extension services**

---

Do extension services recommend a particular crop choice and technology packages? If yes, estimate the percentage of farmers following extension service recommendations. If this percentage is low describe the reasons mentioned by farmers and add other reasons you may think of, based on your expertise and experience.

Describe the sources of information on recently adopted agricultural or irrigation technologies or organizational reform.

Describe the kind of training recently received by farmers.

### **4.2 Inputs supply**

---

Type	Suppliers	Availability of supply	Prices	Quality
Improved seeds and seedlings				
Chemical fertilizers				
Pesticides				

Comments:

### **4.3 Marketing**

---

Explain how farmers market their crops: individual basis, informal marketing groups, cooperatives, other organizations.

Explain who buys the crops produced by farmers (traders, public enterprises) and the relationship between farmers and buyers (trust, existence of formal contracts, credit or technical support).

Try to make a graph of approximate farm gate prices of major crops throughout the year.

### **4.4 Access to credit**

---

Assess farmers' access to credit.

### **4.5 Other business services**

---

List other business services provided to farmers and assess their performance. Other business services may include irrigation pump dealers and suppliers of spare parts, contractors for maintenance of irrigation infrastructure, etc.

### **4.6 NGOs or projects providing support to the irrigation system**

---

Explain how they provide support and outcomes/outputs of this support.

#### **4.7 Water management at watershed levels**

---

Describe existing conflicts (or risk of conflict) between downstream and upstream water users having the same water resource.

Explain the causes and impacts of these conflicts and how they are solved.

#### **4.8 Conclusion on “socioeconomic environment”**

---

Assessment on how actors in the socioeconomic environment support farmers.

## 5. GENERAL CONCLUSION

---

What are the constraints to irrigated agricultural productivity and sustainability and what are the causes and effects of those constraints?

It is important to distinguish between the major constraints or “bottlenecks” and other constraints. The action plan will have a better impact if it focuses on the major constraints rather than addressing each and every constraint. It would be much easier to introduce afterward other interventions once the beneficiaries will have assessed the impact of the first interventions.

### **Major constraints (try to select one to three such constraints)**

Brief description and likely causes and impacts.

### **Other constraints**

Brief description and likely causes and impacts.

### **Responses to drivers of change**

Draw an irrigation scheme time line for the past 5, 10 or 20 years and enlighten change with regard to the following:

- Irrigation schemes: Annual water availability (drought years), rehabilitation project.
- On-farm management: Changes in crop selection, occurrence of pests and diseases, adoption of new technologies, increase of yields.
- Organization: Major events or crises.
- Socioeconomic environment: Drought years, market demand and prices, development projects, policy and institutional reforms.

Enlighten related events, cause-effect relationships.

## **6. CONSTRAINTS IDENTIFIED DURING PERFORMANCE ASSESSMENT**

Extract from your performance assessment report:

### **1. Major constraints (try to select one to three such constraints).**

Brief description and likely causes and impacts.

### **2. Other constraints**

Brief description and likely causes and impacts.

## **7. OUTCOMES OF CONSTRAINTS RANKING WITH FARMERS**

Indicate the outcomes of problem ranking by groups of farmers with their own description of the constraints.

Did most/all farmers agree on the constraints and ranking during the participatory sessions? Or is there a lot of disagreement amongst farmers on what the main problems are?

Do you think all farmers felt free to discuss the constraints openly? Or did a few persons dominate all discussions and rule out other farmers? If yes, what did you do to ensure all farmers have a say?

## **8. FINAL SELECTION OF CONSTRAINTS**

Indicate the constraints you have selected for in-depth analysis.

Are the selected constraints the same as the major constraints you have identified in your performance assessment?

Are the selected constraints the top-ranked priorities of farmers?

If the answer is “no” to one or both of the above questions, explain how you selected the constraints.

## **9. IN-DEPTH ANALYSIS OF SELECTED CONSTRAINTS**

See description of cause-effect diagram in Annex 1: PRDA tools.

### **9.1 Initial cause-effect diagram**

Draw and comment cause-effect diagrams of the selected constraints made by the PRDA team before fieldwork.

You may ask experts outside the team to help you with the cause-effect diagrams.

## **9.2 Cause-effect diagrams produced by groups of farmers**

---

Draw and comment cause-effect diagrams of the selected constraints made during fieldwork.

## **9.3 Final cause-effect diagram(s)**

---

After fieldwork draw a diagram or several final diagrams combining all the information.

- The number of final diagrams depends on the number of constraints that can be fitted into one diagram.
- Also, you may prefer to draw different diagrams for different categories of farmers to prevent losing information.
- Indicate in your final diagram which constituent (infrastructure, on-farm management, organization, socioeconomics) each element of the diagram relates to.

Comment your cause-effect diagram(s) to explain elements, cause-effect relation and interaction amongst the four constituents.

# **10. ASSESSMENT OF SOLUTIONS**

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Once the constraints are selected and analyzed, you can proceed to the design of solutions or interventions addressing these constraints. Assessment of solutions follows the same procedure as the in-depth analysis of constraints but using the “solution assessment chart” described in Annex 1.

## **10.1 Initial assessment chart**

---

Draw and comment the solution assessment chart of the selected solutions made by the PDA team before fieldwork. You may ask experts outside the team to help you with the chart.

## **10.2 Assessment chart produced by the group of farmers**

---

Draw and comment cause-effect assessment charts made during fieldwork. Explain differences with the initial chart.

## **10.3 Final assessment chart**

---

Draw and comment final assessment chart made by the team after fieldwork. Explain differences with the charts produced by the group of farmers.

Indicate which of the four constituents each solution relates to. Enlarge on linkages and synergies between solutions.

## 4. ACTION PLAN REPORT

---

Name of irrigation scheme	Name of team members
---------------------------	----------------------

### Presentation(s) of the action plan to farmers

---

Number of presentations :	
Number of people attending	Background of people attending (committee members, females, local administration, etc.)
- Presentation 1:	- Presentation 1:
- Presentation 2:	- Presentation 2:
- Presentation 3:	- Presentation 3:

### Topics of the presentation(s)

---

What positive aspects of the irrigation scheme did you mention?

What negative aspects of the irrigation scheme did you mention?

What possible action plan activities did you mention that could be implemented by farmers alone?

What possible action plan activities did you mention that could be implemented with external assistance?

### Reactions to the presentation

---

Did farmers agree upon the positive and negative aspects?

Yes/no; comments.

Did farmers agree upon the action plan?

Yes/no comments for “outputs”; “activities”; “resources”; “responsible organizations” and “planning.”

What additional changes did farmers propose?

Were the reactions similar for all the presentations?

## The Action plan

Outcomes	Indicators	Organizations to collect indicators
1.	1.	1.
2.	2.	2.
3.	3.	3.
Activities	Responsible farmer organizations/groups	Organizations providing external assistance
1.1 (Outcome 1)	1.1 (Outcome 1)	1.1 (Outcome 1)
1.2	1.2	1.2
1.3	1.3	1.3
1.4	1.4	1.4
2.1 (Outcome 2)	2.1 (Outcome 2)	2.1 (Outcome 2)
2.2	2.2	2.2
2.3	2.3	2.3
3.1 (Outcome 3)	3.1 (Outcome 3)	3.1 (Outcome 3)
3.2	3.2	3.2
3.3	3.3	3.3

Comments

## Resource for external assistance: Staff time and cash costs

### Planning

Indicate tentative duration, start and end dates for each activity.

Activities	Duration	Start date	End date
1.1 (Outcome 1)			
1.2			
1.3			
1.4			
2.1 (Outcome 2)			
2.2			
2.3			
3.1 (Outcome 3)			
3.2			
3.3			





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