Manual

Participatory Rapid Diagnosis and Action Planning for Irrigated Agricultural Systems (PRDA)

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Manual

Participatory Rapid Diagnosis and Action Planning for Irrigated Agricultural Systems (PRDA)

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INTERNATIONAL PROGRAMME FOR TECHNOLOGY AND RESEARCH IN IRRIGATION AND DRAINAGE

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Foreword

In Sub-Saharan Africa, agriculture accounts for approximately 70 percent of the economically active population and it remains a very important social and economic sector. In this part of the world, rainfed agriculture is largely dominant: Food security and income of rural populations are vulnerable to rainfall variability, and food production is often less then the requirements of a growing population. The volatile rains and soil degradation partly explain the stagnation of agricultural yields, one cause of the chronic food deficit.

Irrigation can increase and ensure agricultural production significantly and it is unquestionably one option for development. However irrigation investments must be carefully planned. Water is indeed a limited resource and sharing it between its multiple users' calls for integrated forms of management. In addition, irrigated agriculture requires relatively high investments in term of financial and human resources. Consequently irrigation productivity and sustainability must be assessed with care. The success of irrigation projects generally depend on the involvement of the concerned communities and a comprehensive analysis of the technical, economical, social and environmental factors.

Sectorial strategies of French cooperation for international development do not come without due consideration for the capacities of all stakeholders from the public and private sectors, this is particularly the case of the strategies for agriculture, food security and water management. The project titled "Amélioration des Performances des Périmètres Irrigués en Afrique – APPIA" is an illustration of this approach. This project, implemented in East Africa by the International Water Management Institute (IWMI) and in West Africa by the Regional Association for Irrigation and Drainage in West and Central Africa (RAID), has produced and disseminated a considerable amount of analysis and information in seven countries (Burkina Faso, Mali, Mauritania, Niger, Senegal, Ethiopia and Kenya) that should be made available to all irrigation stakeholders.

This is the reason why IWMI with the collaboration of the International Programme for Technology and Research in Irrigation and Drainage (IPTRID), is publishing, for the benefit of technicians of public services,

NGOs and Farmers organizations, this manual which offers a participative and practical methodology based on practices, experience and thinking of many farmers and irrigation professionals in Ethiopia and Kenya.

I trust that this manual will be useful to the practitioners wanting to plan and implement solutions responding to farmers' needs as well as to the requirements for thrifty and integrated water resources management.

Jean-Christophe DEBERRE

Director
Ministry of Foreign Affairs
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Avant-propos

En Afrique sub-saharienne, l'agriculture emploie près de 70 pour cent de la population active et reste un secteur économique et social essentiel. Dans cette partie du monde, l'agriculture est largement pluviale: la sécurité alimentaire et les revenus des ruraux restent tributaires d'une pluviométrie irrégulière, souvent en deçà des niveaux de production requis pour une population croissante. Les aléas climatiques et la dégradation des sols expliquent en partie la stagnation des rendements, une des causes de déficits alimentaires récurrents.

L'irrigation qui permet d'accroître et de sécuriser très sensiblement la productivité agricole est sans conteste une des options à développer. Mais elle requiert une grande attention. En effet, l'eau est une ressource limitée dont le partage et les usages multiples imposent une gestion intégrée. Par ailleurs, les investissements humains et financiers requis par une agriculture irriguée sont relativement importants. Aussi la rentabilité et la durabilité des projets d'irrigation doivent-elles être analysées avec soin. Enfin, d'une façon générale, l'engagement des communautés concernées et le traitement simultané de l'ensemble des facteurs techniques, économiques, sociologiques et environnementaux conditionnent la réussite des projets d'irrigation.

Les stratégies sectorielles de coopération de la France ne s'entendent pas sans une réflexion sur les capacités des acteurs publics et des professionnels, en particulier dans les secteurs de l'agriculture, de la sécurité alimentaire et de la gestion de l'eau. Le projet Amélioration des Performances des Périmètres Irrigués en Afrique (APPIA) en est une illustration. Mis en œuvre en partenariat avec l'Institut international de gestion des ressources en eau (IWMI) en Afrique de l'Est et l'Association régional sur l'irrigation et le drainage en Afrique de l'Ouest et du Centre (ARID) en Afrique de l'Ouest, ce projet a permis un important travail d'analyse et de capitalisation dans sept pays (Burkina Faso, Mali, Mauritanie, Niger, Sénégal, Ethiopie, Kenya). Ce travail doit être mis à la disposition de tous les partenaires et acteurs de l'irrigation.

Dans ce cadre, l'IWMI en collaboration avec le Programme international pour la recherche et la technologie en irrigation et drainage (IPTRID) édite aujourd'hui, à destination des techniciens des services publics, des ONG

comme des organisations paysannes, un manuel qui, sur la base des pratiques, de l'expérience et des réflexions de nombreux agriculteurs et professionnels éthiopiens et kenyans, propose une méthode concrète et participative.

Je forme le vœu que cet ouvrage soit utile à tous les praticiens désireux de concevoir et mettre en œuvre des solutions répondant aux besoins des agriculteurs et aux impératifs d'une gestion intégrée et économe des ressources en eau.

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This manual has been prepared under the project "Improving Irrigation Performance in Africa", better known by its French acronym APPIA. The APPIA is a follow-up of the project "Identification and dissemination of good irrigation practices in West Africa" (Identification et diffusion de bonnes pratiques d'irrigation en Afrique de l'Ouest) formulated and implemented by IPTRID between 1999 and 2001 in five West African countries. The project was implemented in close collaboration with the EIER-ETSHER Group, resulting from the merging of the Rural Equipment Engineering School and the School for Higher Technicians of Water and Rural Equipment (Groupe des écoles d'ingénieurs et de techniciens supérieurs de l'hydraulique et de l'équipement rural). Both projects were funded by the French Ministry of Foreign Affairs. The regional scale of the "good practices" project proved very relevant since it ensured making a comparative analysis of the irrigation performance of selected schemes across five countries and identifying good practices that deserved to be shared and discussed amongst irrigation professionals.

Based on these results, IPTRID and MAE jointly formulated the APPIA project which seeks to promote African expertise to produce, disseminate and use information for improving irrigation performance at local, national and regional levels. As per design, the APPIA project covers two regions with two implementing institutions: RAID with the support of EIER-ETSHER in West Africa and IWMI in East Africa. This manual was developed by IWMI in East Africa. Therefore IPTRID is very pleased to collaborate with IWMI on the production of this document and wishes to acknowledge the efforts made by the various institutions involved in this project.

A draft version of this manual, or parts thereof, has been field-tested by 69 irrigation professionals on 18 selected irrigation schemes in Ethiopia and Kenya as part of the APPIA project. Their experiences and comments have been used to write this improved version. Most examples used in this guidebook are taken from the selected schemes, hence thanks are due to the following:

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- *GohaWork Scheme*: Getu Gudeta, Mesfin Shiferaw, Mulisa Urga.
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Acronyms

ACCORD	African Centre for the Constructive Resolution of Disputes (NGO)
ACSI	Amhara Credit and Savings Institution, Ethiopia
AISCO	Agricultural Input Supply Corporation, Ethiopia
APPIA	Improving Irrigation Performance in Africa
ApproTEC	Appropriate Technologies for Entreprise Creation
AWTI	University of Arba Minch, previously known as Arba Minch Water Technology Institute
BoA	Bureau of Agriculture, Ethiopia
BoC	Bureau of Cooperative Promotion, Amhara, Ethiopia
CBO	Community-Based Organization
CIAT	Centro Internacional de Agricultura Tropical
Co SAERAR	Commission for Sustainable Agriculture and Environment Rehabilitation of Amhara Region, Ethiopia
DDC	District Development Committee (Garissa District, Kenya)
DPHA	Development and Promotion of Horticulture Association, Kenya
DPPC	Disaster Preparedness and Prevention Commission, Ethiopia
EIER-ETSHER	Group resulting from the merging of the Rural Equipment Engineering School (EIER) and the School for Higher Technicians of Water and Rural Equipment (ETSHER), Burkina Faso.
ESRDF	Ethiopia Social Rehabilitation and Development Fund
ETO	Evapotranspiration
FSPC	Food Security Planning Commission, Ethiopia
GMC	Garissa Municipal Council
GOK	Government of Kenya
IDD	Irrigation and Drainage Department (Ministry of Water & Irrigation)
ILRI	International Livestock Research Institute

IPTRID	International Programme for technology and Research in Irrigation and Drainage
IWMI	International Water Management Institute
JKUAT	Jomo Kenyatta University of Agriculture and Technology, Kenya
KARI	Kenya Agricultural Research Institute
MAE	French Ministry of Foreign Affairs
M&E	Monitoring and Evaluation
MoA	Ministry of Agriculture, Kenya
MoCD	Ministry of Cooperative Development, Kenya
MoWI	Ministry of Water and Irrigation, Kenya
NGO	Non governmental organization
NIB	National Irrigation Board, Kenya
O&M	Operation and Maintenance
OIDA	Oromya Irrigation Development authority, Ethiopia
ORDA	Organization for Relief and Development of Amhara Region, Ethiopia
PLA	Participatory Learning and Action
PRA	Participatory Rural Appraisal
PRDA	Participatory Rapid Diagnosis and Action Planning for Irrigated Agricultural Systems
RAID	Regional Association for Irrigation and Drainage in West and Central Africa (ARID in French)
RRA	Rapid Rural Appraisal
TARDA	Tana River Development Authority, Kenya
UoN	University of Nairobi, Kenya
UoN/ISD	University of Nairobi, Kenya/Institute of Social Studies for Development
USD	United State Dollar
WUA	Water Users Association
WUC	Water Users Committee (Board of the WUA)

Chapter 1
Introduction

This manual explains in a simple way how to carry out "Participatory Rapid Diagnosis and Action Planning of Irrigated Agricultural Systems" (PRDA) managed by farmers and covers both office and field activities.

To whom is this manual addressed?

Targeted people and organizations

The manual is meant primarily for front line and senior staff of extension organizations wanting to improve/modernise their services to farmers for irrigation purposes by assessing their requirements or interest. The combined results of several irrigation schemes can be used to formulate general policy recommendations.

The method explained therein can also be used by designing and implementing organizations to rapidly evaluate the quality of past irrigation development or rehabilitation projects. In such a case, the first part (situation analysis) is of particular interest.

While some previous experience in using PRA-tools is required, those who lack experience can use the manual during on-the-job training.

Targeted irrigation schemes

The manual has been prepared:

- for group-based irrigation schemes or clusters of individual schemes;
- for schemes in which most operation and maintenance are performed by farmers;
- where information and data are scarce;
- bearing in mind the situation in Sub-Saharan Africa.

What is PRDA?

PRDA is a method for analysing and improving the performance of an irrigation scheme together with farmers. When examining a patient, a doctor will first make a diagnosis of the illness before prescribing a treatment. Similarly, the PRDA makes a diagnosis of the main constraints of the irrigation scheme, which generates an action plan for improvement through, for example:

- increase in capital investment/input;

- changes to organization;
- individual farmer's skills.

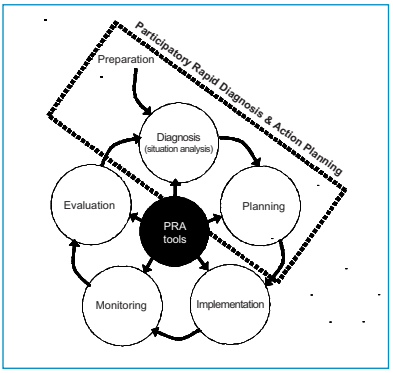
Action may be taken by farmers who independently change their plot practices; groups of farmers who collectively change their management practices; and/or extension organizations that modernise their services to farmers. Improvements made can be monitored and evaluated in subsequent years.

The figure 1 shows how the PRDA relates to a general project cycle for improving irrigation performance. It is recommended to use PRA tools throughout the process.

Farmer ownership of action plans is a major outcome of PRDA and a crucial factor in its success since it is implemented by farmers with support from extension organizations or development NGOs. Farmers' participation is therefore a must !

Standard Participatory Rural Appraisal methods in the manual are adapted to the specific situation of irrigation schemes.[1] Methodologies for Benchmarking and Rapid Appraisal of Irrigation Schemes are also used but in a modified form to suit the scale and limited availability of quantitative data of farmer managed irrigation schemes.

Figure 1. Participatory Rapid Diagnosis and Action Planning



[1] For the scientists: PRDA combines elements of Rapid Rural Appraisal (RRA), Participatory Rural Appraisal (PRA) and Participatory Learning and Action (PLA).

- RRA elements: rapid and performance assessment according to criteria set by the researcher;
- PRA elements: facilitating discussion amongst farmers and sharing of information with farmers;
- PLA elements: farmers and researchers can learn throughout the project cycle and use these lessons to engage in individual or joint action.

Objectives of PRDA

- identify the main limiting factors, how they are related and the opportunities for increased productivity and sustainability of an irrigated agricultural system;
- evaluate extension and other supporting services provided to farmers;
- identify practical steps and interventions to improve performance;
- describe the main characteristics of selected irrigated agricultural systems in order to enable more extensive monitoring of performance in the future.

How to use this manual

The Rapid Diagnosis and Action Planning for Irrigated Agricultural Systems is explained in a practical manner. Chapter 2 summarizes the overall method and different steps of the process. It also explains how it relates to training. In Chapter 3 the constituents of irrigation systems are introduced and are used throughout the PRDA. Chapter 4 and chapter 5 give information for organizing a PRDA and some practical tips and advice to conduct a PRDA. The tools that will be used during the PRDA are described in annex A. People with previous PRA experience can use this annex as a revision exercise and develop checklists for interviews. Finally in annex B, a series of Reporting Sheets are provided to write down and analyse results after fieldwork.

Chapter 2
Overview of procedure

The three main components of the PRDA are: (1) preparation; (2) diagnosis (situation analysis) of the scheme; and, (3) planning of solutions to improve irrigation performance (Figure 2). The following pages will describe these steps in more detail.

Step 1: Preparation

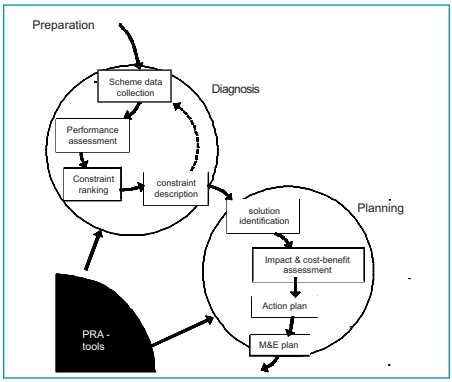
1A - Identify and consult with stakeholders

Rapid assessments can only be successful if the farming community trusts the institutions and/or team members who will conduct the diagnosis. It is also important to involve farmers from the very first stages to ensure that they do not feel the findings of the PRDA are being imposed on them from outside.

A very important first step for the PRDA is to seek farmers' permission and interest in having a Rapid Diagnosis of their irrigation schemes. Farmers should know from the beginning what they can expect from the participating organizations.

However, there is always the risk of raising expectations that cannot be met. Remember that farmers also evaluate you and they may exaggerate their stories in the hope of getting extra assistance or because they are afraid of having to pay more tax.

Figure 2. Details of project learning cycle for a Rapid Diagnosis



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

- We are here to learn from you about your irrigation scheme, how well it is performing and what are the main constraints.
- We hope that you can teach us to do our job better and improve our service.
- We want to share the information that you give us so that we can discuss how to improve your own irrigation scheme through simple solutions. However, we are not going to implement a project in your irrigation scheme. In the case of constraints outside of our capacity or not related to irrigation, we can only refer you to other organizations.

Meetings with the Water Users Association (WUA) are a good opportunity to introduce Rapid Diagnosis and to seek their agreement. These meetings can also be used later to discuss progress, results or to make working arrangements (e.g. to make appointments with people who will participate in group discussions or interviews).

The second important group of stakeholders for the PRDA is the potential partner organizations or people who could assist in a Rapid Diagnosis by, for example, assisting in field work, helping with implementation of solutions, funding, etc. The "Stakeholder analysis" described in annex A is an easy way to identify the most important partners.

1B - Select method and planning

Once you have the PRDA team together, involve all team members in selecting appropriate PRDA tools. Plan your PRDA during a period when farmers are operating the irrigation scheme (during the irrigation season) but are not very busy (not during harvest). Make sure that all team members are available for the whole time (Box 1).

Chapter 4 contains more detailed information on planning the PRDA and selecting tools. The recommended tools are explained in more detail in annex A.

Box 1. Example in the Golgota Irrigation Scheme

The PRDA team in the Golgota Irrigation Scheme (Ethiopia) met with the heads of the WUA almost every day. By discussing their work-plan, farmers were kept informed about progress. With the help of WUA, access to select other farmers for interviews and discussions the following day was made easier and saved a lot of time.

1C - Collect secondary information

Collect literature (secondary data) on the information scheme and its surrounding area.

1D - Report design characteristics

Before starting the actual field work it is important to have a basic idea of what the irrigation scheme will look like. It can also be a baseline against which to compare the actual situation on the ground (for instance if there are fewer farmers on the scheme than intended during the design, this can indicate some kind of land tenure problem). Reading design documents, topographic maps or soil maps can already indicate where constraints are likely to be expected.

Step 2: Diagnosis

2A - Scheme data collection

Apply the PRDA tools that you selected at step 1B but be flexible and select different tools if you need additional information or if the current tools are not useful for your specific site. For instance, biophysical measurements can be used when you need to validate farmers' opinions on water shortage; you can use the seasonal calendar to collect detailed information on a specific topic such as labour constraints. Applying PRDA tools requires certain skills and a respectful open-minded attitude. More on this can be found in Chapter 5.

2B - Basic performance assessment

The performance assessment step is trying to get a good understanding of the collected data by analysing it in a structured way. This will increase your basic knowledge of the irrigation scheme and put you in a better position to facilitate the next step.

Comparing performance with other irrigation schemes can also indicate where improvements are needed and on what aspects the scheme is already performing well.

Performance Assessment REPORT

2C - Constraint ranking

During the Data Collection and Performance Assessment you will probably have identified several constraints. The enormous amount of data must be organized and presented back to the farmers. You can do this, for example, by presenting your performance assessment to the WUA to see if they agree with your diagnosis. The community can then move on to the next step of prioritizing and selecting constraints that they like to tackle.

Prioritization of constraints is one of the most important steps of the PRDA because it forms the basis for the Action Plan. Therefore, this exercise should be done systematically and with the full participation and agreement of the farming community. Many constraints faced by farmers may come up during the Rapid Diagnosis. However, the perception of main constraints often varies between different people based on their social status, income, gender, geographic position in the irrigation scheme, etc. It is therefore important to identify the main constraints faced by the different categories of farmers and males versus females.

As it is impossible to tackle all constraints you will have to make a selection of which ones to focus on. This can best be done on the basis of community ranking of constraints as it is more likely to increase interest and enthusiasm for identified solutions. However, remain critical in the selection of constraints as farmers' opinions are not always right. Criteria for constraint selection other than community ranking are: the mandate and experience of your own organization; the complexity of constraints; and, the wish to focus on constraints of the poorest group of people, etc.

If farmers prioritize constraints that are not related to the mandate of the PRDA team, you can only promise to forward their constraints to other relevant organizations. Do not try to deal with issues that are not related to irrigation as this might raise false hopes for farmers.

Constraint Identification REPORT

Based on the selected constraints, you may have to select different additional tools or collect more basic data on certain constraint areas before you can proceed with solution identification.

2D - Detailed constraint description

A detailed description of constraints is needed to identify the underlying causes and consequently what needs to be changed in order to solve them. A detailed description of constraints will also show whether these changes can be made by the farmers themselves or whether it is beyond their capacity, requiring other organizations to give assistance.

Step 3. Action planning

3A - Solution Identification

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

3B - Impact analysis

Once possible solutions have been identified they have to be assessed as to their success in solving the constraint(s) and whether they will be acceptable to farmer communities. In practice, the two issues are related since solutions that are not accepted by farmers are not usually successful. Therefore, the assessment of solutions has to be done together with farming communities. However, as with the identification of solutions, local knowledge may not be sufficient to assess solutions. In such cases, it may be a good idea to first test/demonstrate a possible solution on a small number of farmers or take a group of them to another irrigation scheme (exchange visit) where the solution has already been implemented.

3C - Formulation of action plan

At the end of a Rapid Diagnosis there should be some feedback to farmers on the situation of the analysis and identified solutions. Discuss with the group to validate the results and see whether they want to implement the findings/ proposed solutions.

Try to find consensus amongst farmers on the implementation of the action plan when collective action is needed. It may not be possible to attend an action plan (including a logical frame, list of activities, who will be responsible for what, time planning) during the Rapid Diagnosis itself , which takes two to three months. Actions can also be finalized just before the next irrigation season.

When external assistance is needed on certain topics, other potential partner organizations can be contacted.

3D - Design of a M&E plan

Try to identify possible indicators for monitoring and evaluating the impact of the identified solutions with your team. Usually, the solutions proposed by a PRDA can only be implemented the following year. When possible you should try to start monitoring with the farmers in the current year to allow better comparison of the impact of the action plan in subsequent years (for instance higher yields due to a different variety selection).

Call a meeting with the farmers several weeks before the irrigation season starts:

- re-discuss the action plan;
- agree on a monitoring plan, which includes selecting indicators to monitor progress and impact.

Chapter 3
Constitutents of irrigated agricultural systems

Like other systems, irrigated agricultural systems consist of several constituents that closely interact with each other. For instance, the human body is an extremely complex system made up of several constituents (or sub-systems): skeleton, muscular system, nervous system, blood circulation, respiratory system, etc. Long distance runners actually feel the interactions between the respiratory system, blood circulation and muscular system!

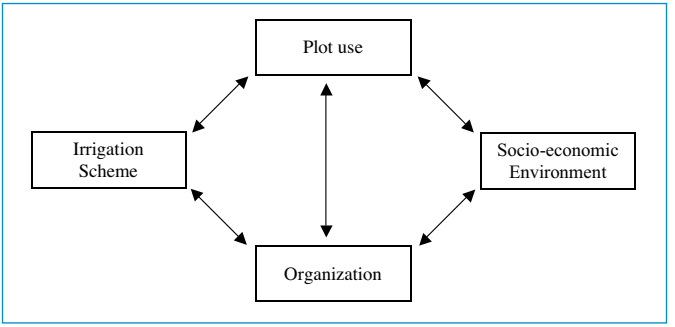
Any serious doctor must know the human body system and the interactions between its constituents in order to make a medical diagnosis and give a prescription to a patient. In the same way, a systemic representation of irrigated agriculture helps to classify the information collected, make a diagnosis and propose sound solutions to improve performance. For this manual we have identified four constituents in our representation of irrigated agricultural systems.

The four main constituents

Within the framework of this study, the following four main constituents are considered (Figure 3):

1. Irrigation scheme: the physical infrastructure to deliver water to irrigated land. Farmers and their organizations have to take into account the technical constraints due to the design of their irrigation scheme.
2. Plot use: agricultural production depends largely on farmers' decisions regarding type of crops, agricultural techniques, allocation of labour, inputs and capital to make use of their irrigated plots.
3. Organization: group-based irrigation systems imply an organization in charge of operation and management. Organizational performance is an important factor in the sustainability and productivity of irrigation systems.
4. Socio-economic environment: performance of irrigation systems also depends largely upon the socio-economic environment and the relationships that establish farmers and their organizations with external players, i.e. market traders and input providers, extension services, irrigation agencies, etc.

Figure 3. The four main constituents of irrigated agricultural systems

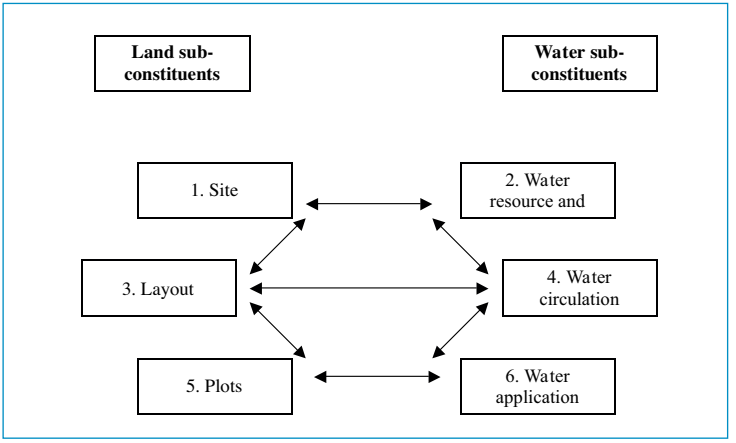


Irrigation scheme

An irrigation scheme is essentially a physical infrastructure designed to deliver water to irrigated land; it can be seen as a technical system whose main sub-constituents refer to land or water, as shown in Figure 4 below.

On the left-hand side are the constituents that refer to the land; they should be consistent with each other. 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 sub-constituents of irrigation schemes



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

- amount of water available and its variation year-round;
- reliability of the water source and possibilities for water storage;
- extent to which water supply to the scheme may be adjusted.

The site relates to the location of the irrigation system:

- total size of the command area;
- soil type and distribution in relation to the type of crops and irrigation methods;
- topography.

These two sub-constituents are closely linked and should be coherent with each other.

Let us now go to the other end of the irrigation scheme where the two sub-constituents are the plots and water use.

Plots: Main characteristics:

- size;
- shape (length and width);
- internal layout and quality of levelling.

Water application: Main characteristics:

- on-farm irrigation depth (m^3/ha or mm);
- on-farm irrigation technology;
- "main d'eau" or discharge at plot gate;
- irrigation scheduling: frequency and duration of water application;
- reliability.

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

It is possible to identify two sub-constituents 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 is the manner in which water is conveyed from the source to the plots. It refers to:

- type of water distribution: on demand or rotation, interval between irrigations, permanent (24 h/24 h) or impermanent water distribution;
- water conveyance: cross section, slope, discharge capacity and canal construction (earthen or lined canals, compaction); or characteristics of pipe distribution;
- type of water partition, water control and measurement structures.

Layout is the manner in which individual canals and plots are linked in space. This important sub-constituent should make the link between a large number of factors, such as:

- the size of the secondary and tertiary units in connection with the number of plots, the "main d'eau" (discharge at plot level), irrigation intervals and topography.
- 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 automatically lead to changes to the other one with the risk of damaging the cohesion of the whole irrigation scheme.

Plot use

Plot use includes all the agricultural techniques implemented by farmers and the outputs of their irrigated plots. Usually the cropping system on irrigated plots is a choice made at farmers' household level in relation to other farming and, sometimes, non-farming activities. The head of household makes decisions regarding labour, inputs and capital allocation with due consideration to the various constituents of the family's whole production system.

Characteristics of plot use:

Agricultural practices and production:

- type of crops or associations of crops and crop rotation;
- crop production process for one crop from soil preparation to harvest;
- yields of products and by products.

Agricultural outputs:

- intensification: value added per unit of land;
- labour productivity: value added per unit of family labour;
- Irrigation water productivity: value added per unit of diverted irrigation supply.

These characteristics should be considered according to the location of the plot within the scheme - head, middle or tail and type of soil (See paragraph "Interaction between the four constituents" below).

Type of crops or crop associations and crop rotation.

The first step to characterize "plot use" consists in identifying the succession of crops or association of crops on the plot. If it is of a regular nature, it is a fixed cropping rotation as with, for instance, the same crop or association of crops being cultivated every two or three years or more. The reasons for crop selection and changes in crop rotation are useful indicators of the objectives of irrigated farming. Information on crop rotation is usually obtained through retrospective investigation starting from the current crop and going back in time to check if crop succession is of a regular nature or not.

Crop production process

The production process relates to farmers' practices. It is first a matter of identifying the succession of elementary tasks/practices performed by farmers during the production process from soil preparation to harvest, including irrigation and use of inputs. One also has to understand the reasons why they are implemented in connection with the technical and socio-economic constraints farmers have to cope with.

The Ministry of Agriculture or other extension service frequently recommends a specific crop production process or a "technology package". The diagnosis should highlight and explain the differences, if any, between these recommendations and the actual farmers' practices.

Yields

The last step in the characterization of plot use consists in estimating the yield of each crop and identifying post-harvest utilization: market sale, home consumption, intra-consumption by farm livestock. Estimation of yields is difficult even when allowing for a 10 to 20 percent margin of error.

With rapid diagnosis, estimation of yields could be obtained from interviews with farmers. However, farmers usually estimate the yields using local units like bags, donkey loads, bowls, etc. One should not forget that local units are not standardized and must be calibrated by checking the weight/volume ratio.

Value added

	Value of production sold on the market and used for home consumption.
-	Cost of inputs: seeds, fertilizers, pesticide and water (i.e. water fee).
-	Cost of external service supply i.e. casual labour, rent of farming equipment, oxen, etc.
=	Value added.

Value added can be calculated for each crop or each irrigation season. Annual value added is the sum of value added at each irrigation season. Total value added is the sum of value added per crop.

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 value of production.

Organization
The organization should make a distinction between the objectives, structure and capacity.

The objectives relate to the functions of the organization. In irrigation systems the organization's objectives are usually one of the following or both:

- Water Users Associations for Operation and Maintenance (O&M):
  - water distribution management;
  - maintenance;
  - planning of cropping seasons;
  - establishing relations to share water resources with downstream and upstream water users.
- Cooperative Societies for marketing and input supply

It should be noted here that, on the one hand O&M require a somewhat "forced" cooperation between water users and, on the other hand, input

supply and marketing is a form of cooperation on a voluntary basis enabling farmers to organize themselves in view of their common interests.

The structure relates to sub-division of units for specific functions and to the vertical or horizontal relations between these units. An organizational chart is the usual way to represent the structure.

Objectives and structure set the operational framework of an organization (Box 2). However to achieve its objectives effectively, organization members must have the capacity and must adopt rules relating to:

- water distribution;
- mobilization of farmers for such labour-demanding tasks as maintenance;
- financial management: collection of water fees, bookkeeping, payment to external service providers and employees;
- relations with administrative authorities: adoption of a legal status, information on legal regulations for farmers organizations;
- internal communication: mode of decision making, conflict resolution, organization of meetings;
- establishment and development of relations with external organizations: service providers, traders, extension services, credit institutions projects, downstream and upstream water users, etc.

Box 2. Irrigation organization and the local community

In rural African communities, irrigation organizations are not isolated entities. In the eyes of farmers they are merely one of the several organizational bodies they belong to. Therefore to understand the actual operation of an irrigation organization, other important points have to be considered in addition to those described above. Existing relationships within the local community may play a significant role in O&M of irrigated agricultural systems and influence their performance.

Any local community may be seen as an organization that can also be analysed in terms of objectives, structure, capacity and rules. Naturally, an anthropological study is beyond the scope of this manual. However, the following points must be borne in mind while doing a PRDA in order to enhance its quality since useful information on the local community can be gathered through direct contacts with the farming community or a secondary data analysis.

Objectives

- Land attribution

Attribution of land rights is a major objective of the local community. Local land rights are often complex. For instance, land can be attributed to farmers at a certain time of the year and to cattle breeders at another. Particular ethnic groups may not have the right to particular types of land. Community leaders may grant or withdraw land rights according to long established legislation. Technically or ideologically (i.e. to benefit the poorest) oriented irrigated land distribution by irrigation agencies may raise conflicts between "traditional" and "modern" land rights and lead to poor land utilization or to the establishment of local mechanisms of exclusion and agricultural production control.

- Water distribution

Contrary to land distribution, in most African communities water distribution is not a historically established objective, except in "hydraulic societies" like the North African oasis, Egypt, or in the few communities having a long history of irrigated agriculture. Water is frequently seen as a common good, a gift of nature or of God, linked to strong cultural values that forbid men to appropriate water. The absence of historically established water rights makes water distribution a new and difficult objective for irrigation development. Since the turnover to newly constructed schemes or the management transfer of older schemes, farming communities have been trying with more or less success to craft[2] socially acceptable and applicable water distribution rights. Instead of defining a standard water distribution that would apply in all cases, irrigation agencies should assist farmers to develop their own water distribution rights.

Structure

In rural Africa, villages are the most important social units. Within villages, there are subdivisions into quarters, extended families[3] or clans. These subdivisions may or may not correspond to scheme divisions in irrigation blocks and influence O&M. In general, there are few organizational bodies across village boundaries and existing ones do not deal with agricultural production or land and water management. This may explain the difficulties

[2] For more information see Elinor Ostrom, 1992, " **Crafting institutions for self-governing irrigation systems "**, ICS Press, Institute for contemporary studies, San Francisco.

[3] Opposite to nuclear family in European culture.

of irrigation organizations in scheme-grouping beneficiaries from several villages and the absence of conflict-solving mechanisms with upstream-downstream water users.

There may be important differences between groups or persons within a village according to social status and wealth. Political power often lies in the hands of a few families and elders. With irrigation development, new social status and power positions are at stake. Established village leaders may try to strengthen their position and that of other groups - for instance, young farmers may attempt to gain their share of leadership. Conflicts and difficulties in irrigation management could be used in power struggles.

Irrigation agencies and external observers may misinterpret the nature of some of the specific functions within an irrigation organization. For example, they may consider the gate operators as important persons while farmers see them as simple domestics.

Capacity and rules

Regarding technical and management capacity, local communities have a history of accumulated knowledge and experience. The rules of political organization in African communities are based on principles that have little in common with those of formal irrigation organizations as designed by irrigation agencies. Hence, there is no reason why farmers should spontaneously adopt them. For instance, the election of formal committees or boards has clearly been transferred from western culture. On the other hand, irrigation development requires new rules and collective practices and new technical and managerial knowledge that do not pre-exist within the community. In other words, there is a recurrent dilemma between the adaptation of irrigation organizations to the local political and social context versus the implemention of the necessary managerial and technical changes imposed by irrigation development.

Women and irrigation

Over the last two decades gender issues have been on the agenda of rural development agencies, donors and political leaders. However, the gap between good intentions and concrete action is considerable. The contribution of African women to agricultural production is well known. Women constitute an important part of the labour force. In many African communities they have their own land rights and use freely what they produce on their own

land. It goes without saying that extension services and technology transfer target mostly men which often results in weakening women's social status. Irrigation development does not make an exception to this general picture. The exclusion/inclusion of women regarding access to land and water on irrigation schemes, particularly in the case of female-headed households, should be considered while doing a PRDA.

Socio-economic environment

The socio-economic environment of an irrigated agricultural system may constitute a range of relations with various external organizations and individuals:

- information, technology and knowledge through extension and development services and research organizations;
- upstream and downstream water users;
- markets of agricultural products and inputs;
- credit;
- other service suppliers, such as contractors for major maintenance or repairs, delegation of water management to an external operator, etc.

Interaction between the four constituents

Productivity and sustainability are often a result of the interaction between the four main constituents, as showed in the following examples.

Example 1

Irrigation scheme

On pump-fed irrigation scheme (sub-constituent 2).

Organization

The WUA must plan the starting and ending of the irrigation season, decide upon the daily schedule of irrigation (daily start and stop of the pump), and recover water fees from farmers to purchase gas-oil and spare parts.

Plot use

Since pump-fed irrigation is costly, farmers have to grow commercial crops and implement cropping systems that ensure a sufficient value added per

unit of land, meaning more or less intensive use of inputs, i.e. fertilizers, chemicals, improved seeds, etc.

Socio-economic environment
For inputs supply and marketing, farmers have to establish links with input providers and tradesmen.

Example 2: Interactions between sub-constituents of "Irrigation Scheme" and "Plot Use"

Water source ⟷ *Plot use*
Variation of year-round water sources and its reliability influence the choice of irrigated crops and the cropping calendar.

Site ⟷ *Plot use*
The type of soil may have a strong influence on the choice of irrigated crops. The distance of the site from farmers' houses may interact with the constraints regarding labour and determine who uses the plot - men and /or women, and waged labour.

Layout ⟷ *plot use*
Choice of crops, level of intensification (use of inputs, cropping intensity) and yields may differ significantly if there is uneven water access between head and tail plots.

Plot ⟷ *Plot use*
The size of plot may determine its use in several ways. Farmers may not be interested in cropping very small plots where production has too little value for labour compared to other farming or non-farming activities. Large plots may only be fully cultivated by farmers who can afford the required inputs and have access to animal traction or motorization.

Poor levelling of plots may lead to poor or time-consuming water application at plot level and sometimes abandonment of plots by farmers.

It must also be mentioned here that on many schemes all plots are of the same size and one could conclude quickly (if not stupidly) that all farmers belong to the same homogeneous group. This assumption may turn out to be wrong and differences between categories of farmers in terms of objectives

of irrigation farming, production means and land tenure status may lead to differences in plot use.

Water circulation ⟷ *Plot use*
Water distribution based on rotation assumes that farmers will get water for their plots according to a fixed schedule and that they plan their activities rigorously.Farmers may make changes to the initial water distribution schedule according to their time and labour constraints. Over-estimation of water use efficiency at the design stage may result in water scarcity and uncertainty of water delivery at plot level. This may lead to changes in plot use and, in some cases, plot abandonment.

Example 3: Interaction between "Irrigation Scheme" and "Organization".
Water Circulation ⟷ *Organization*
Designed water circulation has a direct impact on organization. Distribution of water is a task the organization must implement.

Maintenance of earthen canals may be very demanding to the organization. Insufficient maintenance often leads to decrease in canal discharge capacity and subsequent changes in the water distribution schedule leading to possible conflicts between water users.

The type of water distribution and regulation structures determines the extent to which the organization has to define rules for water distribution. In some cases the organization has to appoint persons in charge of manipulating these structures.

Example 4: Interaction between Organization and plot use.
One objective of the organization may be the planning of the cropping season that has a direct impact on plot use (cropping calendar). On the other hand, individual farmers may decide themselves on the type of crops and seasonal calendar and request the organization to make changes in the water distribution. Irrigation requirements of individual farmers may differ according to the type of crops and type of soils of individual plots.

Questions to be answered during the Rapid Diagnosis

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 well-reasoned explanations of farmers' practices to set a qualitative picture of

the irrigated scheme rather than collecting and processing quantitative data. The Rapid Diagnosis is also meant to establish a good working relationship between the project and the farmers' organization for future project activities. Thus it should not be perceived as an external investigation to pass judgment on farmer's practices but as a collective reasoning to improve them. Sensitive information such as data farmers' income should be collected only if farmers are not reluctant to give it. Otherwise value added and farmers' income can be estimated from information collected about "plot use".

The central question to be answered during the Rapid Diagnosis: What are the limiting factors to irrigated agricultural productivity and farmers' interests?

Farmers' interests relate to the objective they assign to irrigation, for example: maximize food production/ha; maximize income/ha; maximize labour productivity.

As this question is too large to tackle at once, the analysis of available data will be done during a range of sub-questions divided along the lines of the conceptual framework. Note that these constituents do not imply some sort of chronological order for collecting information. Pieces of information collected in an interview with a farmer or while visiting the scheme can apply to various constituents. The four constituents of an irrigated agricultural system should be seen as a framework to co-ordinate data collection as it goes along for facilitating analysis and diagnosis.

Irrigation scheme: Should the analysis of the irrigation scheme tell whether there is insufficient or insecure access to water within all plots?
This question immediately brings up a "philosophical" question - what plots belong to a scheme: those envisaged in the design and construction; those according to WUA's objective; or the total potentially irrigable area? Whatever definition is chosen, the analysis can be best answered along the three horizontal lines between land and water sub-constituents.

- Site and water resource

Is the water resource a limiting factor to irrigating all the command area year-round? If yes, what are the causes and what solutions have been found by farmers to alleviate the problem?

- Layout and water distribution

Is water distribution reliable for all the command area? Have some parts of the command area been abandoned because of lack of water? If yes, what is the cause?
Are water losses important? If yes, what is the cause: problems of canal siltation, seepage, leakage, over-topping?
Do water control structures on canals permit a satisfactory water distribution?
Is waterlogging a problem in some parts of the command area? What is the cause?

- Plots and water use

Do the farmers have a good technical command of irrigation? Are the plots well levelled? Is the irrigation method well adapted to crops and soil?

Plot use

As a conclusion the analysis of plot use should answer the following question: How good is actual crop productivity in relation to farmers' practices, know-how and production means both in cash and yield?

A better understanding of this requires knowledge of:

- the objectives farmers assign to irrigation: food security, cash income, mixed?
- the trend towards crop specialization or diversification and reasons why? What are farmers' criteria for crop selection?
- labour intensification, labour competition between irrigation and other activities;
- intensification: use of inputs, farming equipment;
- land rights: what are the conditions for access to land? 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 rights: what are the conditions for access to water and against which obligations, i.e. payment of water fee?

Organization

Main question: What are the achievements and challenges ahead of the WUA and Cooperative Society?
It is important to answer the main question by:

- **comparing recommendations made by the irrigation agency at the design stage and actual organizational practices;**
- **finding explanations for irrigation organizational practices and constraints in the organization of the local community;**
- **exploring solutions adapted to the local community.**

More specific questions are:

- What are the objectives and activities of the organizations?
- How well do farmers perform the necessary activities to achieve its objectives?
- What are the Organization by-laws and how are they enforced?
- How is the unity or solidarity within the organization, especially between people of different ethnicities, religions or villages?
- How does the organization deal with conflicts between upstream/ downstream water users?
- What are the most common changes farmers make in O&M compared to design and recommendation of the irrigation agencies?
- What are the financial problems within the organization?
- To what extent are women participating in the decision-making process within the organization?

Socio-economic environment

Concerning the socio-economic environment, it is important to know whether surrounding organizations and individuals support farmers' income?

Policy: How supportive or restrictive is the policy environment for farmer-managed irrigated agricultural systems?

Knowledge: Quality and quantity of extension services vis à vis farmers needs.

Inputs: Are modern agricultural inputs available (price, quality, timing) such as improved seeds, chemical and fertilizers?

Sales: Are farm-gate prices of crops high enough for farmers (to keep their households above the poverty line)?

- Are prices low in general in nearby cities or at the world market?
- Are they lower than in nearby cities due to poor access to markets (e.g.

poor roads and distance to marketplace, relative monopolistic position of a few number of middlemen, difficulty in reaching agreement between groups or individual farmers and middlemen)?

Land tenure and water rights: What is the legislation for land tenure and water rights?

Credit: What are the conditions of credit access?

Upstream and downstream water users: What impact has conflicts with other water users on water availability at intake? What are the existing conflict resolution mechanisms/forums?

Chapter 4
Planning the PRDA

Selecting Team members

A PRDA-team consists ideally of four people, but this number may be smaller when dealing with irrigation schemes less than 100 ha. Team members should peferably be from different organizations and have different disciplinary backgrounds. Ideally, the team members' backgrounds and organizations jointly cover the four constituents. For example:

- Irrigation engineer
- Agronomist
- Economist
- Specialist of farmers' organizations.

Having a senior team member makes dissemination of results easier and may also attract external support (Box 3).

Team members can look in detail at problems related to their own disciplines. For instance, an engineer may focus on whether the information collected about the conveyance system makes sense and what technical solutions can be proposed. But they should also cross-check each other's information by

Box 3. Selecting farmers for the Team

In Kenya, a farmer representative of the Water Users Association also became a member of the team on several irrigation schemes. As a result, it seems that PRDA reports placed more importance on the hardware (upgrading irrigation infrastructure) and the need for capital investment from the Government or donors than on the software (increasing farmers' individual skills or improving organization). Recent history of government-led, top-down irrigation development in Kenya may be an explanation.

It is more common for advantages to be higher involvement and ownership by farmers. On the other hand, participating farmers would often be local leaders. They may be "gate keepers" trying to keep sensitive information away from other team members, making it even more difficult for other farmers to speak about organizational problems. As a conclusion, we would **not** recommend to include farmers in the PRDA team.

looking at it from different angles. Shortage of water may be caused by both technical problems and poor organization of water distribution.

Working with people from different organizations may provide farmers with a broader range of support for implementing an action plan. It may also stimulate team members to look at the shortcomings of their own organization.

There should be sufficient team members with previous experience of PRA work so that they can coach the others when working in pairs during field work (Box 4).

Budget and other resources

A PRDA can cost very little. 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.

Selecting information sources

Would the information be "nice to know", or do we "need to know"? The temptation to collect data merely for the sake of it (or because 'it might be useful some day') should be resisted. If there is a serious doubt as to whether an item should be collected, the general rule is to leave it out.

The following information sources are often used

- farmers;
- farmers with a special position in the WUA or Cooperative;

Box 4. Key Principles of PRDA

Participation: farmers and the PRDA team work together to collect and analyse data. Information should be shared with farmers.

Flexibility: selection of tools and planning may be adjusted according to findings and work schedule of farmers.

Teamwork: farmers and outside experts, men and women, mixture of disciplines.

Optimal ignorance: cost and time efficient.

Systematic: trying to get a complete picture of important topics, crosschecking what is said.

- key informants such as local administrative leaders, extension staff, experts;
- feasibility studies and design documents (crop type, area, water distribution parameters);
- maps (soil type, topography);
- farmers' organization/administration (accounts, minutes of meetings, legal status, organizational chart, by-laws);
- irrigation authority (irrigation development policy, extension service).

Critical questions to ask when searching sources to use

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).

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 because they have a strong interest in the outcome.
- Is the person the most suitable one to give information on the topic? Farmers generally 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 recent years is generally better than information from a long time ago as people forget things.
- Is their information likely to be complete? Documents may be missing. Informants may not have been present the whole time to get complete historical information.
- Do they possess the general background knowledge? Some people may not have enough understanding of a certain topic to be able to give good information.

Selecting Tools

PRDA tools are like "tricks" to extract and discuss data from the information sources listed above. The focus of the PRDA is on participatory tools because they are the most suitable to stimulate discussion and can increase the farmers'

ownership of final results. Information can be collected either in the field or in the office. Tools for analysing data analysis are "office tools" (Box 5).

Table 1 presents recommended tools for doing a PRDA, depending on the size of the irrigation scheme.

Box 5. Classification of PRDA tools

Tools mainly aimed at collecting information:

1. **Review of secondary sources** (literature): feasibility studies, design reports, books or reports about the area/region.
2. **Direct observations:** use your eyes and record physical structures, social differences, behaviour of farmers (for instance during a transect walk).
3. **Biophysical measurements:** canal discharge, size of plots, planting density, etc.
4. **Interviews/Discussions:** with individual farmers, households, communities, community leaders (elders, WUA Board, Farmer's Cooperative Board), key-informants (local Government officials, scientists).

During interviews/ discussions you can use:

- questionnaires;
- semi-structured interviews;
- mapping: irrigation system map, water resource mapping;
- ranking: constraint ranking, matrix ranking, actor constraint ranking, multi-criteria analysis;
- diagramming: historical trend, irrigation scheme time line, crop rotation calendar, seasonal calendar, Venn diagram, gender task analysis, water use matrix, cause-effect diagram.

Tools that can be used for Data analysis

5. **Stakeholder analysis.**
6. **Organizational analysis**.
7. **Input supply and marketing chain analysis.**
8. **Trend analysis:** historical diagramming, seasonal calendars daily activity charts.
9. **Benchmarking:** compare the situation (performance) at one irrigation scheme to findings at another location.

[Adapted from: Mikkelsen 1995 :70–74]

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

Name of PRDA-tool	10 ha	100 ha	1000 ha
Step 2a			
Transect walk	1x with group of 3 to 5 farmers	2x with group of 3 to 5 farmers	3x with group of 3 to 5 farmers
Irrigation system map	1x with group of 5 to 7 farmers	2x with group of 5 to 7 farmers	3x with group of 5 to 7 farmers
Venn Diagram	1x with group of 5 to 7 farmers	2x with group of 5 to 7 farmers	3x with group of 5 to 7 farmers
Crop-rotation and seasonal calendar	With 5 individual farmers	With 15 individual farmers	With 25 individual farmers
Cost-benefit analysis	For 2 major crops (5 farmers per crop)	For 4 major cbrops (5 farmers per crop)	For 6 major crops (5 farmers per crop)
Organizational analysis	For the whole scheme	For the whole scheme	For the whole scheme & for several sub-units
Rapid gender-based differences analysis	1x with group of women beneficiaries	1 or 2 x with group of women beneficiaries depending on number	1 – 3 x with group of women beneficiaries
Semi-structured interview (Health offices, local administrative head)	1x	1x	Depending on the boundaries of administrative units
Step 2b			
Rapid Benchmarking	1x	1x	1x
Step 2c			
Constraint ranking	2x with male and female (groups of 5-7 farmers)	3x with (groups of 5-7 farmers) near head, middle, tail & females	4x with (groups of 5-7 farmers) near head, middle, tail & females
Step 2d/3a			
Cause-effect diagram	1x with group of 5 -7 farmers	2x with group of 5 -7 farmers	4x with group of 5 -7 farmers
Step 3b			
Multi-criteria analysis	1x (same farmers as 2d/3a)	2x (same farmers as 2d/3a)	4x (same farmers as 2d/3a)
Step 3c			
Action plan formulation	1x with farmers & 1x with local officials	2x with farmers and 1x with local officials	4x with farmers and 1x with local officials

Annex A contains an overview of the PRDA tools mentioned in table 1 as well as some other tools that you can select. Therefore do not treat the list as a blueprint but be flexible to change when facing difficulties during fieldwork.

Doing a PRDA on a larger irrigation scheme usually requires more information than on a smaller one due to the complexity of problems. PRDA tools have to be repeated more often to get information from a larger number of farmers. However, the aim of the PRDA is to get a general picture of problems in the irrigation scheme, not an overview 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, most farmers will participate directly in the PRDA ensuring that collected information is probably true for all farmers. Feedback is also very direct. Working with larger groups of farmers requires a more careful selection or "sampling" of participants for interviews/ discussions to ensure that the information is representative of the whole group (see Chapter 5).

Communicating results and making action plans with a large number of individuals is also much more difficult in the short period of time. It assumes that those participating in meetings are informing others who are not present.

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

- Hold general assemblies of farmers' organizations on a regular basis.
- 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.

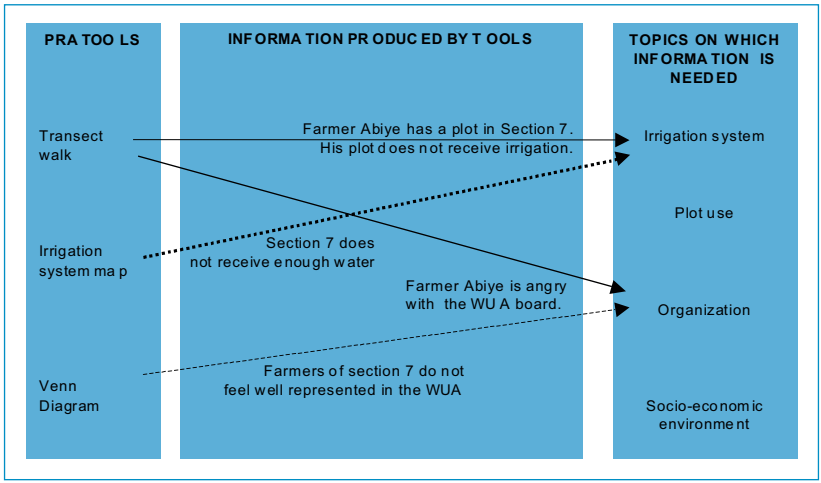
You may have to adapt the tools according to the scale of the irrigation scheme. Farmers of a 1000 ha irrigation scheme may not have time to do a whole "Transect

Walk" from intake to tail-end so you may have to split it up into smaller sections. When doing an "Organizational Analysis" a review of the formal administration and paid staff capacity is very important for large irrigation schemes. But most small irrigation schemes do not have any paid staff.

The following example shows the relation between the four Constituents and the PRDA-tools used to get information (Figure 5). One tool can provide information on multiple constituents. For example, a 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 and may also complement each other, explaining how the different constituents are related. 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 have the same constraints.

Figure 5. Relation between the four constituents and the PRDA-tools



Time Schedule

Table 2 indicates the approximate number of days required. Each pair of people can conduct a maximum of two groups or six individual PRDA tools per day. Make time during the afternoon of every field-day to write field reports immediately after applying the PRDA tools and discuss the findings with the team.

It is not necessary to work non-stop on the PRDA. You can plan days or weeks off in between for other work or holidays.

Table 2. Estimated time required to do PRDA with a team of four on different irrigation scheme sizes

	10 ha	**100 ha**	**1000 ha**
Step 1a	1 day	2 day	3 day
Step 1b	1 day	1 day	1 day
Step 1c	1 day	1 day	2 day
Step 1d	1 day	1 day	2 day
Step 2a	3 days	5 days	7 days
Step 2b	1 day	1 day	2 day
Step 2c	½ day	1 day	1 day
Step 2d/3a/3b	1 day	1 day	3 day
Step 3c	1 day	1 day	2 day
Step 3d	½ day	1 day	2 day
Total per person	11 days	15 days	25 days
Recommended team size	**2**	**2 to 4**	**4**

Chapter 5
Using PRDA Tools Effectively

Interviewing procedures

Preparation

- Make a checklist. Write down a list of key questions or topics you want to discuss to help your memory during the interview. Do not make the checklist too detailed as this can easily lead to a question-answer dialogue instead of an open minded discussion. Keep the checklist short to limit the time of the interview.
- The interviewing team should not be large (two-four persons). Select one person to lead the interview and another to take notes, but rotate roles for different interviews.
- Select and assemble the informants (See more on this in § 5.3 on sampling).

Beginning the interview

- Sit down in a suitable or shady spot. Make sure that everyone is comfortable and that you can communicate on an equal level (sitting on the only available chair already puts you on a "higher" and more important level).
- Begin the interview with traditional greetings in the local manner. Introduce yourself and let the farmers introduce themselves providing the group is not too large.
- Explain why you are there. Describe the purpose of the interview but without making implications or promises! State that you are there 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 informal conversation.
- If the informant is busy, ask when it would be appropriate to return.
- Begin questioning by referring to something or someone visible.

Never make an open judgment of farmers or tell them what to do. Remember, you are their guest and you are learning from them.

Directing the flow of the interview

- Start with easy questions on facts and events. Leave talk about opinions, feelings or other sensitive issues near to the end so that the respondent feels more at ease.
- Use simple wording.
- 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 in your mind to ask later on.
- Conduct the interview in an informal manner.
- Be open-minded, team members should not defend their disciplines.
- Avoid leading questions or ones that can be answered with only yes or no.
- Do not make value judgments or indicate belief by nodding or disbelief by shaking your head.
- In group interviews, try to prevent one person from dominating the discussion by asking direct questions to silent people.
- Respondents may not know the answer, be unwilling to reply or even untruthful. Judge the answer and do not believe everything. It may help to ask questions in indirect ways (see example in Box 6). Cross-check what people tell you (see below).

Recording the interview

The first output of semi-structured interviews is in note form. Accurate, detailed and complete recording is essential. It is therefore important that you take notes for the record during interviews.

Box 6. Examples of direct and indirect questions

Example of 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 solve his problem? How did other farmers react to him? What was the role of the WUA?

What to record?

- The setting: date, location, names and positions of respondents.
- What you see: condition of the farmer's field; behaviour of individuals; non-verbal reactions to questions that may also indicate the opinion of a person. Informants who do not take part in the discussion.
- What is said: verbal information of an interview. Write down important quotes.

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 and may make people reluctant to talk about sensitive issues.
- Do not record your own interpretation or opinion; this can be done afterwards.
- Number your questions/topics in the checklist. Mark answers under these numbers so that you do not have to note down the whole question.

Closing the interview

- Take no longer than two hours for group interviews and one hour for individual interviews.
- The note-recorder should make sure that the discussion leader has handled all important topics.
- Give a short summary of the discussion.
- Ask respondents if they have any questions or issues to raise.
- You may wish to ask respondents to show you their farms.
- Thank 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.

Assess the interview

Analyse the interview soon afterwards. Highlight your personal evaluations in the notebook, for instance by using a different colour of pen.

What was the quality of the information? Was it

- **A fact:** something definitely known to have occurred or be true?
- **An opinion:** view or judgment not necessarily based on fact or information?
- **A rumour:** general talk, report of doubtful accuracy?

Was the interview relaxed and open?
Did any individuals dominate it?
Was the interviewer impartial with respondents?

Try to discover similarity patterns or categories of respondents.
Crosscheck by comparing different responses or against other sources of information.

Ensuring good information

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 is seldom conducive to statistical analysis. Therefore, alternative ways need to be used to ensure the validity and reliability of findings:

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

- Stratified random sampling: Select a number of farmers from certain sub-groups 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, land owners and share croppers. Stratified random sampling should give priority to differences and diversity of situations (Box 7).

Box 7. Example of categories of farmers on the Mwea Rice Irrigation Scheme

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

1) tenants who cultivate a plot in the initial command area and are members of the WUA;
2) "legal out-growers", members of the WUA in extensions of the initial command area authorized by the WUA;
3) "illegal out-growers" who extended the command area without asking the permission of the WUA and who are in open conflict with it.

- Purposive sampling: Select key-individuals who have a position with the local administration (Government Health Officer), farmers' organization (Head of WUA), traders, or persons who have a good knowledge of the local area/community (community leaders, school teachers, NGO workers, etc).

In some areas the local Government or Head of WUA will provide you with a list of people to interview who, generally, are on a good footing with the local leadership. So try to also visit other farmers who are not on this standard list.

For direct observations with your own eyes (for example during a transect walk), it is important that you also visit (sample) both the head and tail end of the irrigation scheme.

Cross-checking

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

- comparing different types of information sources (interviews, observations);
- comparing the opinions of different people on one topic;
- using information from wet and dry seasons and from different years;
- using different PRDA tools to gather information about 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 social organization).

Following up on contradictions is a very good way to get a better understanding of a situation. Contradictions between individuals in group discussions or between groups of farmers can expose hidden conflicts and differences in farmers' objectives and strategies. Farmers' opinions or choices that are in contradiction with the PRDA-Team members' knowledge and experience do not necessarily mean the farmers are stupid or ignorant. Follow-up provides a good opportunity to learn from farmers and understand the logic behind contradictions.

Preventing bias

When doing a PRDA different people will give different importance or attention to different topics and interpret the same data differently. For instance, people working for the Irrigation Department do not always like

to admit to problems related to the design of the scheme and if they are economists, they tend 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.

Do not forget your own skills

Sometimes PRDA teams take what farmers tell them too seriously. Farmers often have good information about the local situation and the problems they face. They may even be able to tell why certain solutions may work or not based on experience and past trial and error. However, as irrigation professionals you may have more ideas about how things are practised elsewhere and about technically feasible solutions. When in doubt, use your common sense and technical knowledge to judge whether information is true or not!

Table 3[4] gives examples of the difference in perception of irrigation schemes between farmers and irrigation professionals. It can help you to better interact with farmers or better understand what they are saying.

[4] Extracted from « Communication between irrigation engineers and farmers, the case of project design in North Senegal ». Steven SCHEER. Thesis Landbouw Universiteit Wageningem, The Netherlands.

Table 3. Examples of difference in perception between farmers and irrigation professionals

General aspect of design	
Farmers' perception	**Professionals' perception**
Based on doing and learning by trial and error (i.e. extension of scheme, change to initial layout)	Based on scientific theory.
Problems occur because the technical design of engineers is disconnected from reality. Design should be done directly in the field.	Problems occur because of survey and construction errors.
Topography and earthworks	
The topography is easily adaptable to machines that "move the soil".	Topography conditions considerably limit the degree of freedom of a design (costs should be low).
High and low parts can be compared by alternatively choosing canal bottom, plot surfaces, etc, as reference points.	For an overview of the topographical situation a contour map is necessary.
Water flow	
Because of some kind of "pushing force" water, in some cases, can flow uphill at least over a limited distance, for instance to cross a small depression.	In canals, the water flows by gravity and the energy is provided by a down slope in the water level.
The shortest water way is preferred and long and winding canals are disliked because it takes too much time for the water to reach the plots.	Elevated canals or crossing with drains are to be avoided. The number of canals must be limited to lower costs.
Drains can be used as irrigation canals to keep the water way as short as possible.	Drains connect the lowest points and cannot be used for irrigating plots.
Operation and maintenance	
Water distribution can depend on the state of the canals and on interactions between farmers.	Water distribution should not change from year to year.
Maintenance is curative and related to short-term production instead of long-term sustainability.	Maintenance is preventive and is the most important factor of sustainability.
When the state of canals change, maintenance may be necessary and the water distribution adapted accordingly.	The irrigation system has to remain in its original state to guarantee designed water distribution.
In a situation of water scarcity, low and fertile plots are seen as the best plots.	Low plots that cannot be drained should be left out of the irrigated command area.

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Information sources per chapter and annex

Chapters 1 and 2: Based on Guijt, I. & Woodhill, J. 2002 and Mikkelsen, B. 1996.

Chapter 3: Contribution of Wageningen University of Agronomy to the Workshop "Conception Viable des Aménagements Hydro-agricoles Paysans en Afrique Sub-Saharienne" in 1990.

Chapter 4: A draft version of this Chapter was partly written by Sisaraw Dinky (Consultant). Adaptations were made based on Mikkelsen, B. 1996.

Chapter 5: Draft versions of this chapter were partly written by Simon Adebo and Sisaraw Dinky (Consultants). Adaptations were made based on Mikkelsen, B. 1996.

Annex A: Some tools were prepared specifically for this Manual. Others were adapted from: Guijt, I. & Woodhill, J. 2002 (Annex D), Jordans, E. 1998, Margoluis, R. & Salafsky, N. 1998, De Negri *et al.* 1998, Roche, C. 1999, Salomon, M. & Seegers, S. 1995.

Annex B: Some parts of the reporting sheets 2b were adapted from Burt, C. 2001 and from Molden *et al.* 1998.

Annex A
Description of tools

Tools that can be used for a Participatory Rapid-Diagnosis and Action Planning (PRDA) are described herein. The table A1 below classifies the selected (Participatory) Rapid Assessment tools according to the stage of the Rapid Diagnosis. Not all tools are used during the PRDA (the most important ones are marked with an asterisk). Additional tools are included in this annex in case you need to make a more detailed analysis during this Rapid Diagnosis or on another project in the future.

Table A1. Classification of the tools according to the stage of the Rapid Diagnosis

Step	Tool
Step 1A: *I*dentify stakeholders	Stakeholder analysis *
Step 1C/1D: Report design characteristics	Literature review *
Step 2A: Data collection	General Semi-structured interview 1 * Questionnaire Biophysical measurement Spatial data Transect walk * Irrigation system mapping * Water resource mapping Temporal data Historical Trend Time line Crop rotation calendar * Seasonal calendar * Socio-economic data Cost-benefit analysis * Venn diagram * Water use matrix * Task analysis by gender Organizational analysis * Rapid gender-based difference analysis* Input and market chain analysis

Step 2B: Performance assessment	Rapid benchmarking
Step 2C: Constraint ranking	Constraint ranking * Paired ranking
Step 2D/ 3A: Constraint description/ identifying solutions	Cause-effect diagram * Semi-structured interview (with expert on a certain topics) Literature review 2 Visit to other irrigation schemes (alone or with farmers)
Step 3B: Impact assessment	Options assessment chart * Matrix ranking
Step 3C: Action plan formulation	Presentation * Action plan matrix * Transfer of responsibility matrix
* = minimal recommended tools for the Rapid Diagnosis	

Annex A 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 field work.

Contents of Annex A

Stakeholder analysis

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

How:

1. List the criteria you will use to select who to involve in the Rapid Diagnosis.
   Possible criteria are:
   - skills or knowledge to assist in the Rapid Diagnosis;
   - could benefit from the Rapid Diagnosis;
   - trades or interacts with the farmers in the irrigation scheme;
   - lives near the irrigation scheme;
   - might provide funding;
   - is powerful in the area of the irrigation scheme;
   - has a formal role in the area or irrigation scheme;
   - 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 listed. For this you can use a stakeholder matrix with the 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 everyone in every activity or decision-making 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 be reached with the beneficiaries and the organizations that will assist in the Rapid Diagnosis. Lack of enthusiasm amongst farmers can be a good sign 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 (preventing a biased selection).

For small irrigation schemes it may be enough to simply make a list of stakeholders (Table A2 and Box A1).

Table A2. Example of a stakeholder matrix of one APPIA Scheme in Ethiopia

Organisation/ person name	Skills or knowledge to assist in the Rapid Diagnosis	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 & brokers			X			X		
Agricultural college	X							

Box A1. 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 the Rapid Diagnosis. Therefore, you may have to update your stakeholder matrix several times.

Literature review (1)

Why

Compare the actual current situation with:

- 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 socio-economic or land tenure situation.

How to

1. Discuss with other team members 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. If you collect a lot of literature, do not try to read everything but focus on the most important.
4. Try to check the reliability of collected literature by asking yourself questions, such as what methods did the authors use to collect data? How many people were interviewed? Also compare documents to see if there are contradictions.
5. Analyse 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 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 the 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 (Box A2).

Box A2. Guidelines for the Rapid Diagnosis "Step 1d"

"SHEET 1D" gives examples of useful information to collect about the design characteristics and construction before starting with the field work.

Possible sources of information are:

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

Guidelines for the Rapid Diagnosis "Step 2a"

Useful information to collect at a local government office or from an 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 farmers using agro-inputs (chemical fertilizer, manure, seeds, pesticides); average amount used per farmer, price of agro-inputs, and supplying organization;
- percentage of farmers using credit; average amount used per farmer and providing organization;
- Taxes per farmer (minimal, maximal, average).

Questionnaires

Why

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

How to

1. Agree on the information needed from the questions.
2. Prepare a list of questions that you want to ask. Questions can be very

specific and closed with a fixed choice (yes/no; a/b/c/d) or open-ended questions.
Fixed choice questions are good for gathering data that need to be analysed statistically.

3. Agree on how many people should be interviewed. You probably do not have to interview all the farmers of the irrigation scheme. But interviewing too few people will produce unreliable results. An alternative is to make evaluations after every five interviews. If everyone has the same answers you probably need to conduct fewer interviews than for those who have different answers.
4. Test the questionnaire on one or two farmers to make sure that the questions are understandable and that they are able to answer them accurately. This is also a good way to train the interviewers who will carry out the remaining interviews. When necessary, change or leave out questions after testing 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 results.
6. Analyse the information. Start with summarizing the results in a table. Calculate mean values and other statistics when necessary.

Semi-structured interview

Why

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

How to

1. Agree on the purpose and information needed from the questions.
2. Prepare a list of discussion topics or questions.
3. Agree on who/how many people should be interviewed and whether they should be conducted with individuals or in a group.
4. It is a good idea to test the questions on one or two people if you are going to perform many semi-structured interviews (Table A3 and Box A3). When necessary, change or leave out questions after testing before deciding on the final list of questions.

5. Perform the remaining interviews. It is particularly important to take accurate notes so that you can remember people's opinions afterwards.
6. Analyse information. If you have performed many interviews, it is best to first read 25 percent of the interview reports and then note the subjects most frequently mentioned. Then read all the interview reports, taking notes of what each person has said on each of these subjects.

Table A3. Differences between semi-structured interviews and questionnaires

Semi-structured interview	Questionnaire (survey)
Characteristics • Usually qualitative data. • List of topics with room for discussion.	• Quantitative data fit for statistical analysis. • Farmers choose from a predetermined list of fixed answers. • Very formal atmosphere.
Strengths • Interview matched to individual circumstances.	• Able to ask many questions to many people in a short time. • Simple data analysis. • Results can be easily compared. • Statistical analysis can provide more formal evidence on project results or needs.
Weaknesses • Requires skilled interviewer (difficult). • Less easy to analyse and compare results because you get different information from different people.	• Farmers may find the questions or answers from which to choose irrelevant to their situation. What farmers really think can remain hidden due to the limited number of choice of questions.

Box A3. 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 among farmers in the scheme compared to people living further away (malaria, bilharzias, etc).
Local Administrative Head	• Conflicts over water with people outside the irrigation scheme • Conflicts over land with people within and outside the irrigation scheme. • Have people from outside the irrigation scheme also requested irrigation facilities? • Existing plans to expand the command area. • Existing plans to upgrade/rehabilitate the irrigation scheme. • Percentage of farmers receiving food aid within the irrigation scheme and in the surrounding area. • Do farmers complain about the impact of food aid on price levels? • Do households within the scheme face occasional food shortages (which month)?

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 exactly what 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 percent is 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. Make step-by-step notes on how you perform the measurement (method) and the results.

Examples

Most biophysical measurements require a lot of effort for 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 constraint areas. Examples of low-tech easy measurements are given below in table A4.

Table A4. Easy methods to measure some variable

Variable to be measured	Description of easy method
Canal discharge	The following methods are recommended for reconnaissance studies when flow-measuring structures (weir, free overflow, flume) are not available. 1: floats • Select a straight canal stretch with a uniform shape (width and depth are constant for at least 10 metres). • Measure the wet cross-sectional area with a centimetre (in a rectangular canal this is equal to width * depth). • Measure the water velocity at the water surface. For this you need to measure the time needed by, for example, an orange to float from the beginning to the end of the straight canal section that you 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. • The discharge is equal to the product of the average velocity and the cross section area. 2: buckets • Bury a bucket or oil drum of known volume next to the canal but make sure that the water cannot flow in yet; for instance by using a wooden plate as sluice. • Take away the sluice/plate and use it to block the canal downstream of the bucket. • 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 The second method using buckets is more suitable for measurements in earthen canals with low flow rate or irregular shape.

Plot area	Farmers may be reluctant to tell the actual size of their plot. It can be useful, therefore, to check in a "disguised" manner. • Prepare yourself before going to the field by measuring the average length of your steps. For this you need to count your steps while walking 20 metres. Try to walk as constantly as possible. • Estimate the length and width of the plot by walking round it while counting your steps (length = number of steps x average step length). • The total area = length x width. • Irregular-shaped plots are more complex and require improvisation.
Soils texture and plasticity	• Try to roll a pipe of soils between your hands. If it breaks then the predominant texture is sand. • 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.
Plant density	• Measure the exact length and width of a rectangular part within a cropped plot using a centimetre. • Count the number of plants within the rectangle and calculate the plant density per square metre. • Compare with recommended planting distance in agronomic literature. • For crops planted in rows the distance between and within rows should be measured separately. 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.
Yield	Method 1: • Weigh all products coming from the field. Method 2: sub-sampling • Weigh yield only in pre-selected sub-sections of the plot in a known area. It is important to consider what "yield" to measure: total biomass, human consumable biomass, human consumable biomass after cleaning/treatment.

(Plot distribution efficiency)	Only carry out this measurement when high water losses are causing constraints as it is relatively time-consuming. Method 1: Distribution efficiency between furrows/basins: • Measure discharge and application time at the beginning of several furrows on a plot. Compare the total applied volume per unit length/area to see if water is distributed evenly among them. Method 2: Distribution efficiency within a furrow: • Measure discharge at the beginning, middle and end of each furrow. • Calculate the infiltration for both parts of the furrow (=upstream inflow – downstream outflow at the discharge measurement location). • Compare the infiltration rate in the upper and lower half of the furrow. Ideally they are almost equal. Discharge measurements within plots can be done with small flumes or V-notches (cheaper and easier to operate).

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). They provide a good first overview of the irrigation scheme and plot use.

How to

1. Decide what things to observe during the transect walk and divide tasks amongst the team members.
2. Assemble a group of farmers and start by briefly introducing the purpose of the tool. Make sure that it is clear to everyone.
3. Ask 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 on-the-spot before you start.
4. Ask farmers to take you to their own fields but follow the route that the water takes to get there. You, therefore, start at the headwork and then follow the water delivery system from the primary canal all the way to a tertiary unit and the farmers' inlet.

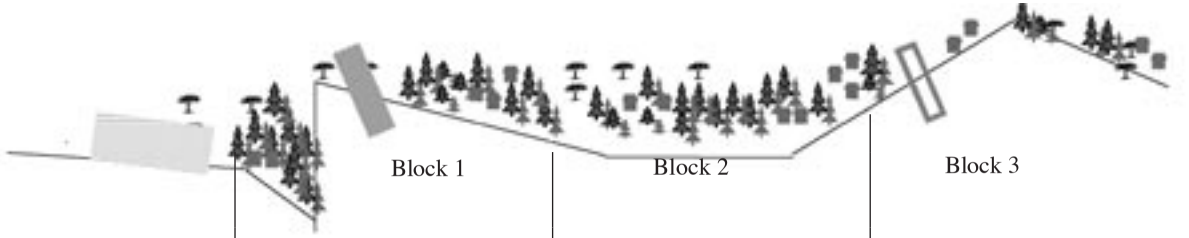
On the way you can make all kinds of observations on the scheme infrastructure and other plots (Figure A1 and Box A4). Try to ask questions on unexpected observations and solutions to constraints that have been tried locally. Since it is a farmer-managed scheme, all farmers should know the gate operation rules very well. It is also a good opportunity to check on this by asking several individual farmers.
Use your visit to the farmer's field to informally discuss the water delivery situation and organization.

5. This procedure is repeated with the next farmer after you have returned 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 can then start the walk with team members only 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 point observations (such as a damaged water distribution structure).

Figure A1. Transect of Zenguene irrigation scheme in Amhara Region, Ethiopia



1	Land use	- House yard gardens - Housing area - Cultivated - Main road	- House yards gardens - Housing area - Cultivated	- House yard garden - Housing area - Cultivated - Stony
2	Soil type/colour	Loam-brown	Loam-brown (+ stones)	Loam-brown (+ stones)
3	Trees	- Eucalyptus - High land bamboo	- Eucalyptus - High land bamboo	- Eucalypus - High land bamboo
4	Crop Type	- Barley - Potato - Onion	- Barley - Potato - Maize	- Barley - Maize
5	Crop disease/Pest	- Aphids - Nematods - Root rot	- Aphids - Tuber rot	- Aphids
6	Water application	- Furrow System	- Furrow System	- Furrow System
7	Water uses	- Human & animal drinking - Washing - Irrigation	- Human & animal drinking - Washing - Irrigation	- Human & animal drinking - Washing - Irrigation

Box A4. Guidelines/checklist for a 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 headwork. If not well maintained: current impact and likely future impact on total water availability for the scheme.
- Damages to infrastructure, conveyance canals, night storage facilities.
- 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 to "As Built" document)
- Multiple uses (other than irrigation of plots).

- Field levelling
- 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/ Diseases
- Other major land use besides irrigation (forest, settlement).

Topics for discussion with farmers met on 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 is. Also, farmers can assist to make 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. Make sure that it is clear to everyone.
2. Present a map of the irrigation scheme with the main characteristics of the area.
3. Ask farmers if 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 (Table A5, Figure A2 and Box A5).

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

Table A5. Examples of elements that can be included in the map

General	Irrigation and drainage	Small irrigation structures
• Roads • Houses/villages • Temples/churches/ mosques/holy forests • Rivers, streams, lakes • North-south directions • Bridges • Hills/mountains	• Water intake (weir, pumps, wells, reservoirs) Canal layout (primary, secondary, tertiary, field canals and drains) • Command area • Boundaries of tertiary units • Water flow directions in the field	• drop structures • cross regulators • distributors • tertiary off-take • field canal off-take • siphons, aqueducts

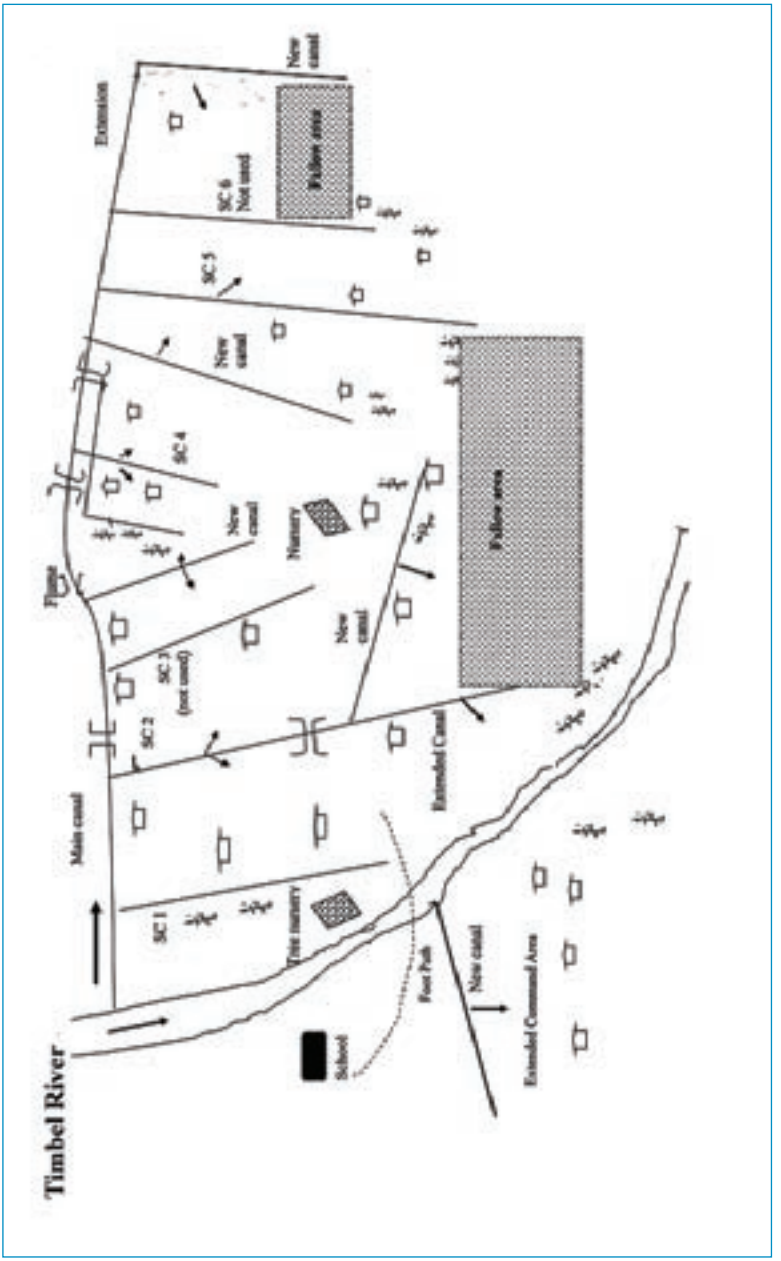


Figure A2. Irrigation system map of Tembel irrigation scheme, Amhara Region, Ethiopia.

Box A5. 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;
- OR 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 occur. 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 the decisions on water distribution and maintenance;
- are there conflicts with distribution
- [Try to find out if all farmers agree on theses issues by stimulating discussion. Take careful notes especially when there is disagreement between farmers on these issues]

- Most important maintenance tasks.
- Part of the irrigation scheme that requires most maintenance work.
- Other organizations doing maintenance tasks in the scheme.
- Maintenance tasks that are not well performed.
- If there are conflicts about maintenance?

Ask farmers to indicate on the map:

- sources for drinking water, livestock drinking, washing clothes, bathing and other multiple uses.

Discuss if 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 its relation to water use by other communities. The primary concern is not with cartographic precision but with getting useful information about local perceptions of resources.

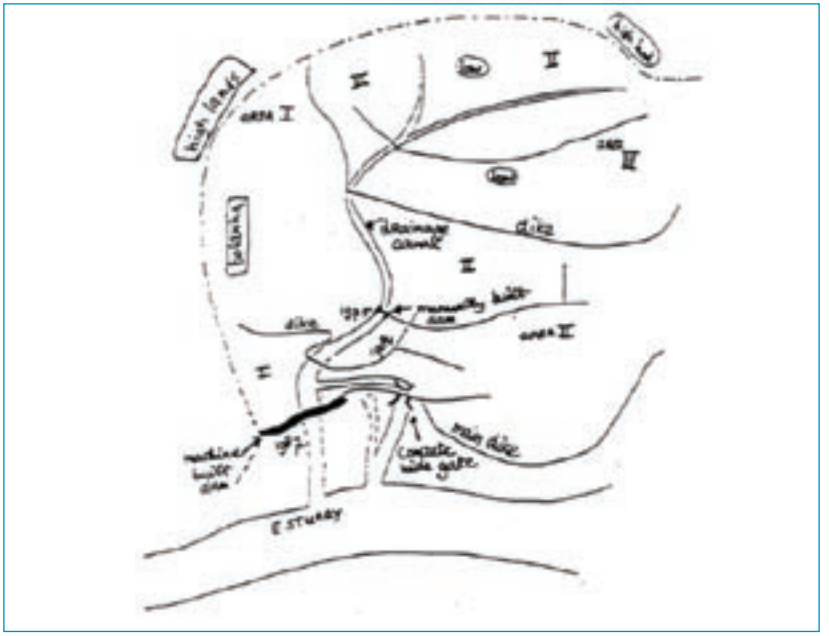
How to

The procedure for making a water resource 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 would like them to look in the the future.

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

Example (Figure A3)

Figure A3. Hydrological situation in the Bolanha of Quide-Com



Source: Neefjes K. in: Jordans, E. 1998.

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. Make sure that it is clear to everyone.
2. Draw a vertical line on a piece of paper and divide it into sections, each representing one year (or ten years if you want to go back far in time.)
3. Ask farmers to name important events that occurred during the period of the historical calendar. Usually it is more important to know the sequence of events than to have accurate dates.
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

Note the change of dry season crop choice following the upgrading of the scheme and establishment of a 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 (Table A6).

Table A6. Crop rotation calendar for Genet Irrigation Scheme

Crop season		Crop or association of crops	Problem/remarks
1998	dry season	Eucalyptus tree, pepper, onion, potato, "Gesho"	Irrigation water started to reduce Got seeds from local market
	rainy season	Teff, "Kosoyea" (local sorghum variety), chickpea	With water shortage/poor productivity Got seeds from local market
1999	dry season	Eucalyptus tree, pepper, onion, potato, "Gesho"	With water shortage Got seeds from local market
	rainy season	Teff, "Kosoyea" (local sorghum variety), chickpea	With water shortage/poor productivity Got seeds from local market
2000	dry season	Eucalyptus tree, pepper, onion, potato, "Gesho"	With water shortage Got seeds from local market
	rainy season	Teff, "Kosoyea" (local sorghum variety), chickpea	With water shortage/poor productivity Got seeds from local market
2001	dry season	Eucalyptus tree, pepper, onion, potato, "Gesho"	With water shortage Got seeds from local market
	rainy season	Teff, "Kosoyea" (local sorghum variety), chickpea	With water shortage/poor productivity Got seeds from local market
2002	dry season	Eucalyptus tree, pepper, onion, potato, "Gesho", Papaya	ORDA develop the traditional scheme Nursery site established inside scheme by ORDA Got seed & seedlings from ORDA nursery site & local market
	rainy season	Teff, "Kosoyea" (local sorghum variety), chickpea	With supplementary irrigation Got seed and seedlings from ORDA nursery site and local market
2003	dry season	Pepper, onion, garlic, papaya	Got seed and seedlings from ORDA nursery site & local market
	rainy season	Teff, "Kosoyea" (local sorghum variety), chickpea	
2004	dry season	Pepper, onion, garlic, papaya	Got seed and seedlings from ORDA nursery site and local market

Source: Courtesy of Selassie, J.H., Mengesh, S. & Gashaw, M.

Seasonal calendar

Why

The seasonal calendar shows the temporal relation between main household activities and constraints recurring annually. It can be used to assess when opportunities exist for improvement. The seasonal calendar can easily be combined with the crop rotation calendar of the past five to ten years.

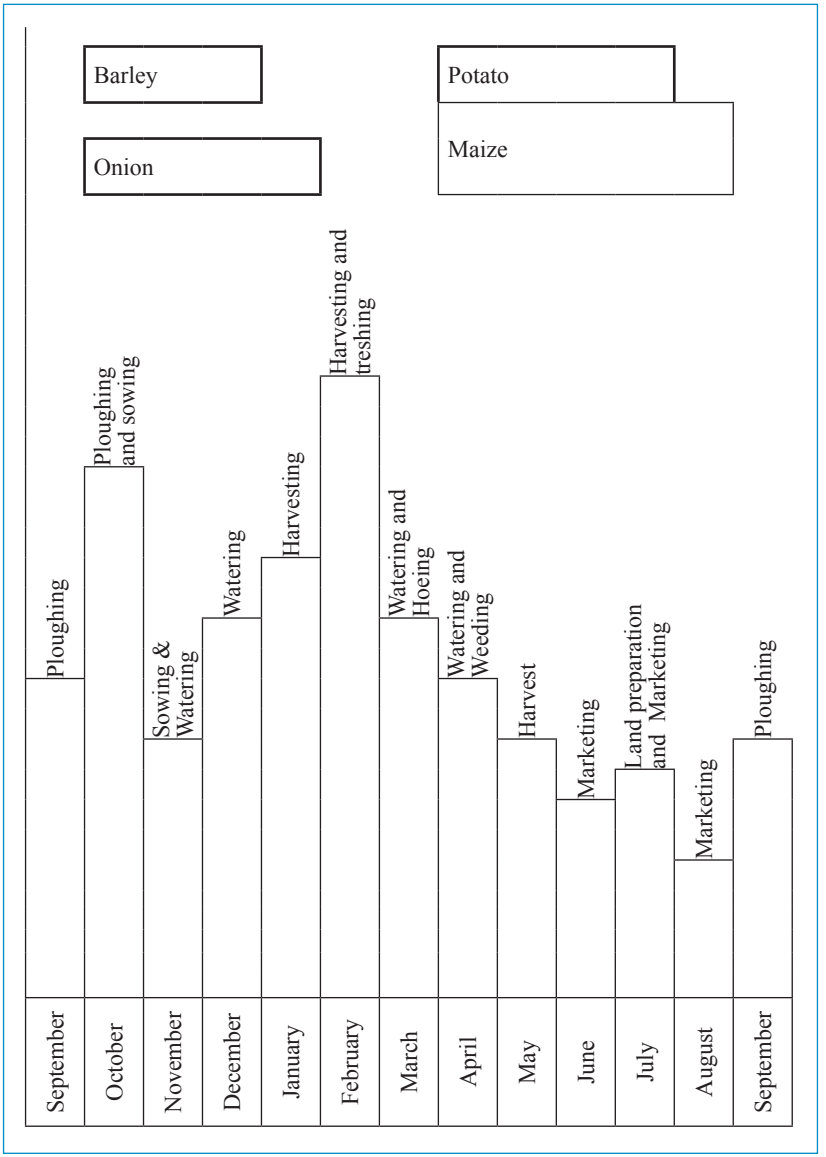
How to

1. Start by briefly introducing the purpose of the tool. Make sure that it is clear to everyone.
2. Draw a line representing one complete year. Divide the year into months or seasons, depending on what farmers are most familiar with. Make sure that the calendar line is at a convenient moment (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 their opinions on the causes of constraints, what solutions may be possible and if cooperation with other farmers is needed for this purpose.

Examples

Figure A4 gives a general impression of the annual crop planning and the month in which farmers are most busy (Box A6).

Figure A4. Seasonal Calendar of one farmers at Zenguene Irrigation Scheme (Ethiopia)



Source: Courtesy of Ameshe, F. & Tesfaw, A.

Box A6. Guidelines for a Rapid Diagnosis "STEP 2a"

Try to get husbands and wives together when possible.
Try to take farmers to their own fields to facilitate easier explanation and carefully observe farmers' responses or opinions.

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 farmers to draw a crop rotation calendar (5 or 10 years) of his irrigated plot
- list of important events during the past five or ten years;
- crop type on the irrigated plot for each year's dry and rainy season;
- water shortages for each year's dry and rainy season: causes of shortages; lack of rainfall or lack of irrigation water.
- pests, input supply or marketing problems during a specific year.

Ask farmer to draw a Seasonal calendar of the irrigated farming system for the previous 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 season);
- crop disease, water shortages, waterlogging;
- yields of main crops;
- man-days spent on each component during the year (including irrigation maintenance and non-irrigated activities of the whole farming system)

OR ask percentage of labour needed relative to the busiest month;
- post harvest losses, processing techniques, conservation techniques.

Discussion topics
Plot use
- irrigated plot size, dry-land plot size;
- type of traction used (hand, drought animal, tractor) and how obtained (own, borrowed, rented);
- tenure of irrigated land (share cropper, owner, lease):
- 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.

Socio-economic
- what is done with the cropping advice of the extension officer;
- where crops are marketed, problems with marketing;
- access to credit, use of credit.

Irrigation scheme time line

Why

To get a long-term picture of the important historical events of the irrigation scheme and how they relate to each other. This tool can especially help to explain conflicts or management problems that have evolved over the past few years and subsequently to identify the kind of solutions that may be necessary.

How

This tool can be applied directly to farmers or you can do it yourself after field work to compile the information obtained from farmers through other tools (e.g. crop rotation calendar and organizational analysis).

What to do after field work

1. Put the past five to ten 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 each 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 by or related to the other.
4. Use this drawing to trace back the source of problems.

Apply it directly with farmers

1. Start by briefly introducing the purpose of the tool. Make sure that it is clear to everyone.
2. Ask farmers to name or write down the major events in chronological order. Explore the causes of important events.
3. Write the events down and ask farmers to explain which ones 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 when it started or what caused it.

Example (Table A7)

Table A7. Time line of Dodicha Irrigation Scheme

Year	Irrigation scheme	Plot use	Organization	Socio-Economy
1999	Construction started		1st WUA committee election	
2000	Construction finished	Land distribution	Coop formation 2nd election	DA[5] present
2000		Plots not cultivated due to lack of money for inputs	Conflict between some farmers and Committee because of cattle damage to canals	DA present
2001			3rd election	DA present
2002	Stacking of motor pump Water shortage	100 % cultivated	Corruption Conflict on production sale	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 50% of plots cultivated Input problem	Conflict between beneficiaries and Committee	French beans investor provided credit but not for all Conflict on annual crop planning
2004				

[5] DA = Development Agent = local extension officer

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 on 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. Make sure that it is clear to everyone.
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 the events or indicators along the side. You can also add events which the farmers themselves find important.
4. Discuss important events with farmers. Also ask them 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 by, for example, drawing a graph or dividing stones/beans.

Optional:

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

Example (Table A8)

Table A8. 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	Insufficient	Sufficient	Abundant
Yields of main crops	Average	Average	High
Soil fertility	Low	Average	High
Pasture land area	Inexistent	Scarce	Sufficient
Grass for house roofing	Inexistent	Limited	Abundant
N° of cattle heads	Small	Average	High
Firewood	Unavailable 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 had 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 to include and exclude.
2. Prepare a list of questions for the farmers.
3. Try to complete the list of questions together with a farmer for one selected crop during an interview.
4. Analyse the outcome of the interview.

Example
A typical cropping pattern is two cultivations of onion and one cultivation of maize annually. Ethiopian birr have been converted to US dollars (1 $ = 8.6 birr) in Table A9 (Box A7).

Table A9. **Cost benefit-analysis on Golgotha Scheme in Ethiopia**

Benefits/ha	**US Dollars**
Onion (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**

Labour/ha	**Man-day**
Onion (2 X 440)	880
Maize	162
Total	**1 042**

Value added	**US Dollars**
Value added/ha	2 605
Value added/man-day	2.50
Value added / household (Average plot size = 0.7 Ha)	1 823

Box A7. Guidelines/Checklist for a Rapid Diagnosis 'Step 2a"

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

Crop type
- area of selected crop (see biophysical measurement if farmer cannot tell).

Family labour
- list labour activities (OR ask the farmer to draw them in a seasonal calendar);
- man-day labour spent on each activity.

Cash cost of inputs
- agro-inputs (seeds, fertilizers, pesticides and other agro-chemicals);
- water fees (including fuel for pump and maintenance costs);
- casual wage labour;
- production services (rent of: farming equipment, oxen, etc);
- marketing services (transport, packing, broker, market fees).

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 if intercropping takes place.

Value of production
- yield (does not have to be in kilograms, but should be in units known to the 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;
- labour productivity = gross value added/man-day.

Discussion with farmer
- gross value added per man-day in relation to local wage labour rate.

Venn-Diagram

(Also known as Institutional Linkage Diagram)

Why

Assess farmers' opinions/perceptions of:

- the importance of different local people, groups and organizations to the functioning of their irrigation schemes;
- their relations (power structure), responsibilities, activities, decision-making process and areas 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 wood twigs;
- markers/pens/pencils.

How to

1. Start by briefly introducing the purpose of the tool. Make sure that it is clear to everyone.
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 to productivity.
    - It may be necessary to prioritise by, for instance, asking participants to select the ten most important ones.
4. Start with a very large circle representing the central element of the Venn Diagram, which is all the farmers (beneficiaries) belonging to the irrigation scheme. Represent each other element (person, group or organization) with a separate circle. Important elements are represented in 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 in relation 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 frequently have to be placed closer to each other.

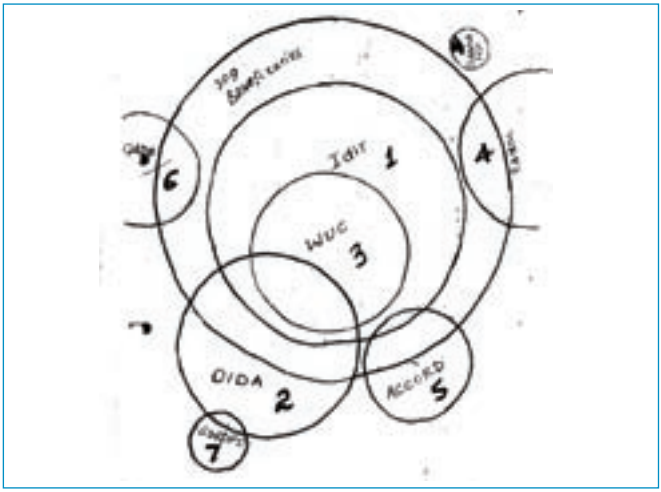
The positioning of the circles thus shows the influence of various elements on the decision-making of farmers. This may be through indirect interaction (in the example, "MOE" has an indirect influence through "teachers")

6. Make sure you draw a copy of the diagram once consensus is reached for your field report.

Example

Idir is a traditional savings organization for funerals but in this case it takes a leading role in sponsoring and managing the irrigation scheme (Figure A5 and Box A8).

Figure A5. Venn diagram of Goha Work Irrigation Scheme, Ethiopia.



WUC = Water Users Committee (Board of the WUA).
OIDA = Oromia Irrigation Development Authority that constructed the irrigation Scheme
ESRDF: Ethiopia Social Rehabilitation and Development Fund – the donor that funded the OIDA to construct the scheme.
ACCORD = NGO that supports local schools.

Box A8. Guidelines / checklist for the Rapid Diagnosis "STEP 2a"

If you perform this tool more than once:
- focus the first time on the Water Users Association 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 relation 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 between farmers of the WUA/Cooperative;
- whether the WUA/Cooperative is 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. Make sure that it is clear to everyone.
2. Draw a matrix and ask 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 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 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 with both male and female groups and discuss the differences in a plenary session.
7. Fill out the matrix for both the rainy and dry season.

Example (Table A10)

Table A10. Water Use Matrix with group of females at Tilkit Irrigation Scheme, Ethiopia

Water Uses	**Dry Season**			**Rainy Seasons**			
	Water Sources			**Water Sources**			
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 protection	xxx xxx	x		xxx xxx	x		

Source: Courtesy of Beshir Ali, Derso Desalegne, Gebayaw Arage, Wondimenew Sitotaw.

Task analysis by gender

Why

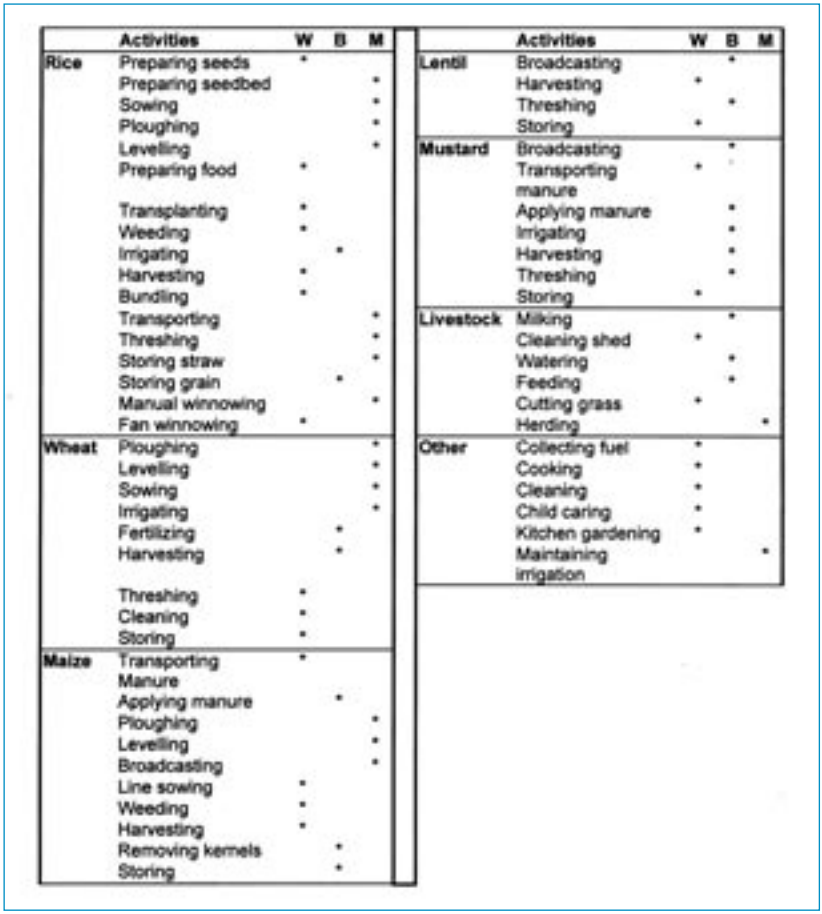
To collect information, raise awareness and understand how household and community tasks are distributed according to gender. This information can also be used to decide whom to target (male or female) with extension work or development interventions.

How to

1. Start by briefly introducing the purpose of the tool. Make sure that it is clear to everyone.
2. Write down (or draw) different tasks on paper cards. Ask participants to add cards for other activities that they find important.
3. Ask participants to sort the cards into categories 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 rainfed crops, e.g. rice, wheat, etc., then livestock keeping, then household tasks and lastly community tasks.
4. Ask the group to analyse the workloads of men and women. Link the tasks and workloads to irrigation activities; focus the discussion on the constraints to and opportunities for participation by women. Considering the gender division of labour, who should be involved in irrigation planning activities?

Example (Figure A6)

Figure A6. Division of tasks in rice production in Northwest Bangladesh



	Activities	W	B	M
Rice	Preparing seeds	*		
	Preparing seedbed			*
	Sowing			*
	Ploughing			*
	Levelling			*
	Preparing food	*		
	Transplanting	*		
	Weeding	*		
	Irrigating		*	
	Harvesting	*		
	Bundling	*		
	Transporting			*
	Threshing			*
	Storing straw			*
	Storing grain		*	
	Manual winnowing			*
	Fan winnowing	*		
Wheat	Ploughing			*
	Levelling			*
	Sowing			*
	Irrigating			*
	Fertilizing		*	
	Harvesting		*	
	Threshing	*		
	Cleaning	*		
	Storing	*		
Maize	Transporting Manure	*		
	Applying manure		*	
	Ploughing			*
	Levelling			*
	Broadcasting			*
	Line sowing	*		
	Weeding	*		
	Harvesting	*		
	Removing kernels		*	
	Storing		*	

	Activities	W	B	M
Lentil	Broadcasting		*	
	Harvesting	*		
	Threshing		*	
	Storing	*		
Mustard	Broadcasting		*	
	Transporting manure	*		
	Applying manure		*	
	Irrigating		*	
	Harvesting		*	
	Threshing		*	
	Storing	*		
Livestock	Milking		*	
	Cleaning shed	*		
	Watering		*	
	Feeding		*	
	Cutting grass	*		
	Herding			*
Other	Collecting fuel	*		
	Cooking	*		
	Cleaning	*		
	Child caring	*		
	Kitchen gardening	*		
	Maintaining irrigation			*

Source: Zwarteveen, M. and Neupane, N. 1995 in Jordan, E. 1998

Organizational analysis

Why

To obtain structured information on the functioning of a Water Users Association or Cooperative Society. For this we need to check if the WUA/ Cooperative has the structure, capacity and adopted rules to carry out the activities to fulfil its objectives.

How to

1. For organizational analysis three information sources can be used:
   - board members and other important members (people with specific functions such as accountants or block leaders);
   - written administrative matters 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 what the building looks like.
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. However, 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, tools to maintain canals.

Example

The matrix shows that the scheme is performing poorly as a result of organizational problems that have forced the Executive Committee to take over many of the tasks (Figure A7, Table A11 and Box A9).

Figure A7. Water Users' Cooperative Structure and Objective Matrix of Dodidcha Irrigation Scheme, Ethiopia

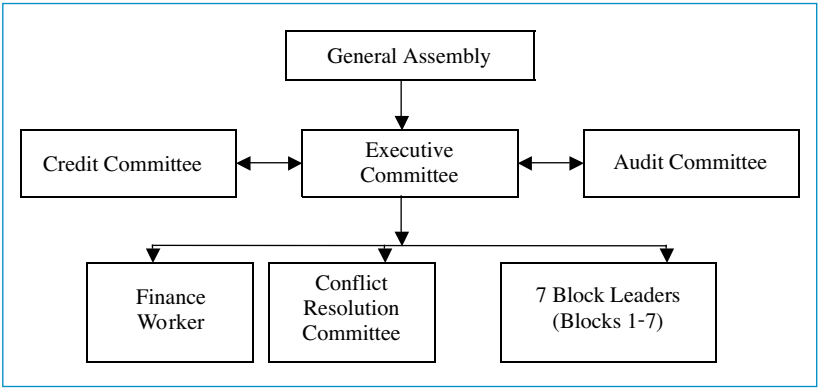


Table A11. Organizational Analysis of Dodicha Irrigation Cooperative

Objectives	Responsible for organizing	To be performed by	But actually performed by	Achievement
Preparing annual work plan	Executive Committee	Executive Committee	Executive Committee	With less than 40% farmers
Seeking credit service	Executive Committee	Credit Committee	Executive Committee	Only very few farmers get credit
Motor and pump	Executive Committee	Executive Body	Executive Committee	Yes
Secondary canals	Block Leaders	Block Leaders	Executive Committee	Yes
Tertiary canal	Block Leaders	Block Leaders	Executive Committee	Yes
Looking for well- marked access	Executive Committee	Executive Committee	Executive Committee	Yes
Collecting loans from farmers	Credit Committee	Credit Committee	Executive Committee	Very poor
Collecting inputs and others fees	Credit Committee	Credit Committee	Executive Committee	Yes
Water scheduling	Executive Committee	Block Leaders	Executive Committee	Water reaches only 60% of plots

Box A9. Checklist for the PRDA "STEP 2a"

Organizational chart
Ask the farmers to draw the organizational chart.
Questions to ask about the organizational chart:

- Who are the members of each element of the organization?
- Can all farmers vote if there is a general assembly?
- What are the preconditions for membership of each element of the organization?
- How are the members of each element selected (through elections, seniority, local nobility, etc)?
- Roles of each element of the organization?

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

Column 1:
Objectives of the WUA/Cooperative.

Give suggestions (probe) to farmers about possible objectives if you think their list is incomplete. Some objectives may be fulfilled by external organizations (e.g: a government agency that carried out 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 carries out each activity?

Column 4:
How well is each objective fulfilled (is the job done properly or too late, etc)?

Column 5 (optional):
What tasks are actually performed in order to reach organization objectives and how often (e.g. desilting of main canals 2x per year)?

Column 5 (optional):
What tasks are actually performed in order to reach organization objectives and how often (e.g. desilting of main canals 2x per year)?

Column 6 (optional):
What are the costs of carrying out each of the tasks mentioned. Give both the cash cost and/or labour costs contributed by farmers themselves in man-days (hired labour which is paid should be considered as cash cost).

Rules and Regulations

- Are there formal written rules (by-laws)?
- Do all farmers know these rules?

- What are the 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 fees, not contributing to maintenance work or stealing water)?
- How many times were these fines applied last year? Is every violation punished? Try to discuss about specific events 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

Why

To analyse gender issues in a particular scheme with the aim to plan action for higher productivity through more gender equity. For this we need to check the differences between male and female farmers regarding water rights and inclusion in Water Users Associations or Irrigation Cooperatives.

How to

1. It is recommended to perform this tool at the end of step 2a "scheme data collection" so as to use previously collected information for cross-checking purposes.
2. Obtain information from the WUA, Irrigation Cooperative or Scheme Development agent on the number and percentage of women farm decision-makers in the scheme and the number and positions of women having a specific function/responsibility within the WUA or Irrigation Cooperative.
3. Organize a group interview with a group of 10–15 female farmers having plots at the 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. Using the checklist, try to fill in information on water and land rights of women farmers and their inclusion as members or leaders in WUA or Irrigation Cooperatives.
5. Fill in other information by cross-checking with previously collected information on plot use "seasonal calendar", organization "Organizational analysis", socio-economic environment "Venn diagram".
6. After the interview, fill in the table A12 below. Performance is rated good (+) if there are no gender-based differences. If you find that mild differences negatively affect women farm decision-makers, performance is rated average (+-). If most female farm decision-makers face major problems compared to males, the performance is low (-).

Table A12. Legal and actual land rights

Legal "official" and actual land rights	Official membership rights	Actual water rights at farm level	Actual participation in 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 compared to men. The main stakeholder is the one who had the greatest influence in developing rules and practices related to issues (Box A10).

Source: van Koppen, B. 2002. A gender performance indicator for irrigation – Concept tools and applications. *IWMI Research report* No 59. Colombo.

Box A10. 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 patterns and cropping intensity: current and past change;
- Past crop failure due to lack of water and reasons why?
- 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 labour.

Concretized participation in scheme organization and inclusion as leaders

Use the organizational chart of the WUA or irrigation cooperative to get information about:

- who are members of each element of the organization?
- do women farm decision-makers actively participate to general assemblies? Are they listened to?
- Do preconditions for membership of each element of the organization tend to include/exclude women farm decision-makers;
- How are members of each element selected (through elections, ege seniority, local notability), number and percentage of women farm-decision makers.

Ability to function as leaders

Did women members of the organization receive training to perform their tasks and responsibilities? If yes, what kind of training and who gave the training?
To what 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 performed to provide inputs to the irrigation scheme (fertilizers, seeds) or to sell its production (crops). It 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 coloured 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 fertilizers from both state and private suppliers or when crops are sold both at local market and in a distant town. It may be necessary to perform additional interviews to obtain complete information on the chain and its constraints.

Option

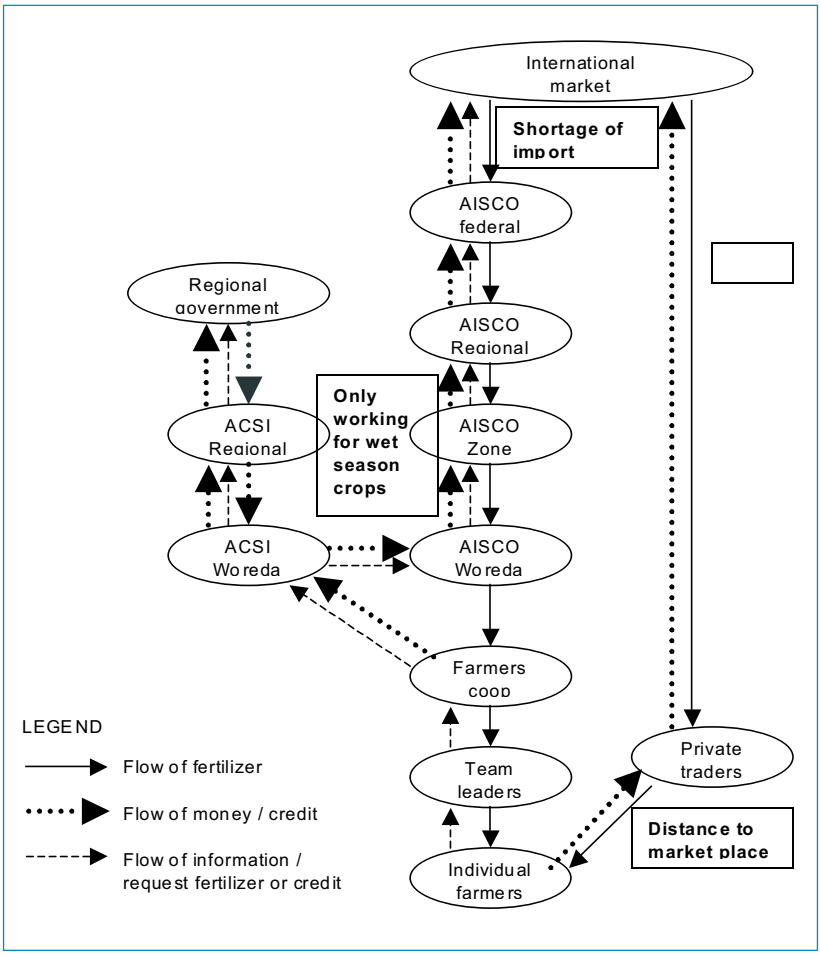
6. You can make separate diagrams on how the chain should currently function in theory or how you would like the chain the function in the future.

Example

The official market chain starts when farmers request ACSI to give them credit for inputs. ACSI then gives the money to AISCO which buys and 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 (Figure A8).

[Adapted from chain made by Beshir Ali, Derso Desalegne, Gebayaw Arage, Wondimenew Sitotaw]

Figure A8. The official and unofficial private fertilizer input supply chain for Tilkit Irrigation Scheme, Ethiopia



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 the direction in which to search for improvement.

What is an indicator

Performance is expressed using indicators that contain certain information. For example, "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 and are expressed in numbers. An example of an opinion-indicator is: "percentage of farmers dissatisfied with the service of extension organizations".

How to

1. Select the type of information against which you want to compare 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 only take a little time and effort to collect data for the indicator.
    - It is only useful to select indicators that are also available for other irrigation schemes (otherwise it is not possible to compare). Make sure 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 to other schemes.
7. For poor performing indicators, discuss whether the causes are within the reach of farmers to change (e.g. poor water distribution) or very difficult to influence (e.g. very irregular rainfall) (Table A13).

Table A13. 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 information in a short time period at low costs	Variance of water supply to all individual plots of the scheme	Percentage of farmers dissatisfied with water availability at plot level
Unambiguous	Another person should get the same result when s/he tries to collect the same data	Percentage of plots that look 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 and 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) (Box A11).

Box A11. PRDA Guidelines "STEP 2b"

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

Constraint ranking

Why

Identify main constraints to agricultural productivity and farmers' interests as experienced by individuals or groups of users of the irrigation scheme. Each person may have a different ranking of constraints. This gives the impression that there are different interests or opinions. Consensus may be reached later 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. Make sure that it is clear to everyone.
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 farmers to rank each constraint themselves by putting five beans (or stones) at the most important constraint, four beans at the next important constraint, etc. the least important constraint gets 0 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 beans of all farmers and ranking 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 a 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 to avoid an absence of solutions to constraints. For example, "There is no road" is a constraint that already carries a solution - namely the construction of a road. Taking such a constraint as a starting point for further analysis might raise farmers' expectations that they will get a road and in the end will lead 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

The scheme has only very recently been constructed, which explains why many farmers complain of lack of awareness of irrigation practices (Table A14 and Box A12).

Table A14. Problem ranking with male farmers at the head of the Nilli Irrigation Scheme, Ethiopia

Constraints	Informants					Total	Ranking
	abiye	nigist	biniam	bifkadu	tilahun		
Waterlogging						0	
Absence of stop logs for canal gates		xxxx				4	
Shortage of labour power for intensive dry and wet season		xxx		xx		5	
Free grazing		xxxxx	xx	xxxx	xxx	14	2nd
Pest problems	xxxx	x	x	xxx	xxxx	13	3rd
Lack of improved vegetable and crop seeds	xxx	xx	xxx		x	9	
Shortage of labour power due to intensive malaria cases	xxxxx		xxxx	xx	xx	13	3rd
Lack of awareness on irrigation agronomy and practices	x		xxxxx	xxxxx	xxxxx	16	1st
Illegal water use/ stealing of water	xx					2	

Source: Courtesy of Selassie, J.H., Mengesh, S. & Gashaw, M.; with minor adaptations (Names of farmers changed from original).

Box A12. Rapid Diagnosis guidelines "STEP 2c"

The Constraint Ranking exercise will be repeated several times with different categories of farmers to show up the differences and similarities between 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 mention solutions only instead of constraints with constraint ranking.

Materials

- Pen and paper cards.

Process

1. Start by briefly introducing the purpose of the tool. Make sure that it is clear to everyone.
2. Name or present two cards with possible constraints that you identified in advance. Try to use peoples' own names for constraints. Adjust the name of constraints when needed during the exercise.
3. Ask farmers to state which of the two constraints is most 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 (Table A15)

Table A15. Pair-wise constraint ranking with tail-end farmers on Nilli Irrigation Scheme, Ethiopia

	Water losses	Poor access	shortage of labour	Shortage of water	Lack of experience	Insufficient water flow	Remained stones	count	rank
Water losses due to seepage		Water loss	Shortage of labour	Shortage of water	Water loss	Water loss	Water loss	4	3rd
Poor access for improved vegetable and crop seeds			Shortage of labour	Shortage of water	Poor access	Poor access	Poor access	3	4th
Shortage of labour power due to severe malaria case				Shortage of labour	Shortage of labour	Shortage of labour	Shortage of labour	6	1st
Shortage of irrigation water and inequitable distribution of water					Shortage of water	Shortage of water	Shortage of water	5	2nd
Lack of experience on irrigation agro-nomy and practices						Insufficient water flow	Lack of experience	1	6th
Insufficient water flow through tubes installed at the main canal and division boxes							Insufficient water flow	2	5th
Remained stones on plots								0	7th

Source: Courtesy of Joseph H/ Selassie, Sisay Mengesh, Mengistie Gashaw.

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. You first 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. Make sure that it is clear to everyone.
2. Select one of the constraints/problems selected previously by the farming community and place in the centre 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 completed, you can discuss with farmers which elements of the diagram can be improved (what solution is needed 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 the 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.
- You may also need to draw different diagrams for different categories of farmers to prevent losing information
- In your final diagram try to indicate which of the four constituents (infrastructure, plot use, organization, socio-economic) each part of the diagram belongs.

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

Example
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 (Box A13 and Figure A9).

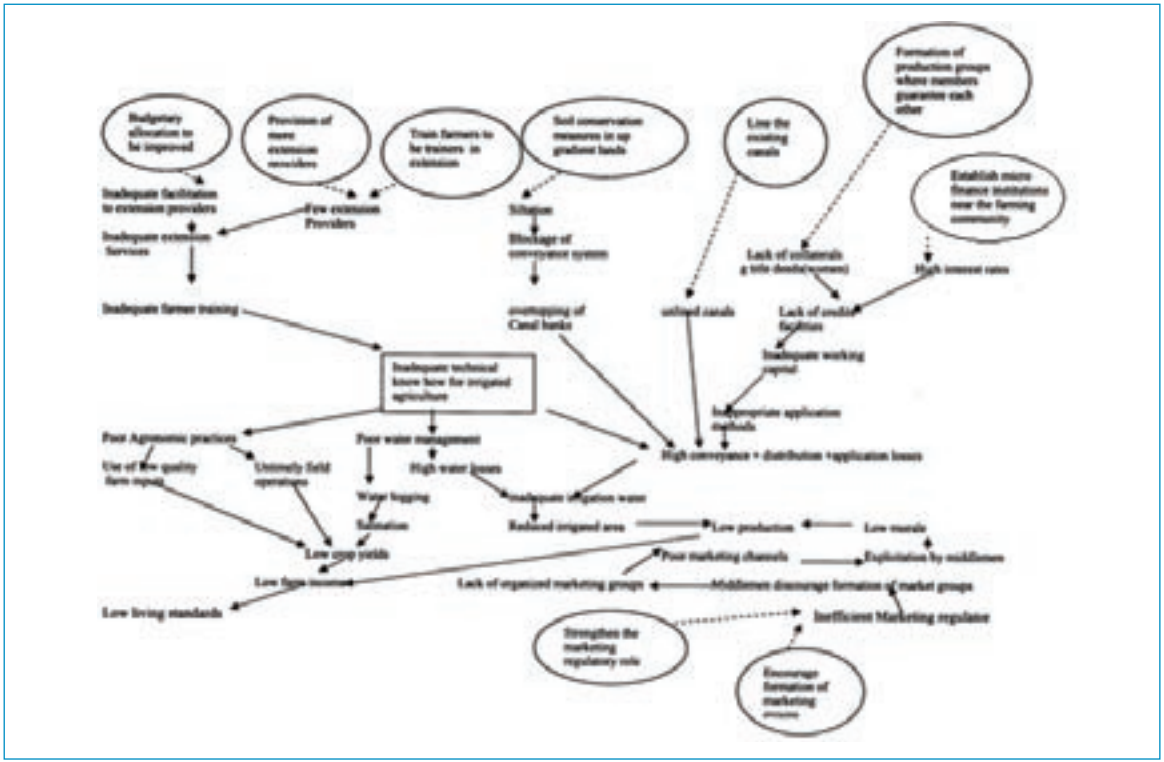
Box A13. Guidelines for the PRDA "Step 2d/ 3a"

Try to involve different groups of farmers for this tool:

- WUA Board;
- farmers close to the head (near the intake);
- farmers close to the tail;
- female farmers.

Keep the discussion on the irrigation scheme.

Figure A9. Cause-effect diagram made after discussion with farmers of Yatta Furrow Irrigation Scheme, Kenya



Source: Courtesy of Makau, M.M., Ndetu, V., Mutedina, A., Kavisu, S.Y. & Mangusa, P.

Literature review (2)

Why
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 a theoretical possibilities to increase yield with improved farming practices.

Scientific research publications can provide experiences in other countries of 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 on irrigation development or rehabilitation in the same area may also give useful advice. Try to obtain them through the local government and NGOs.

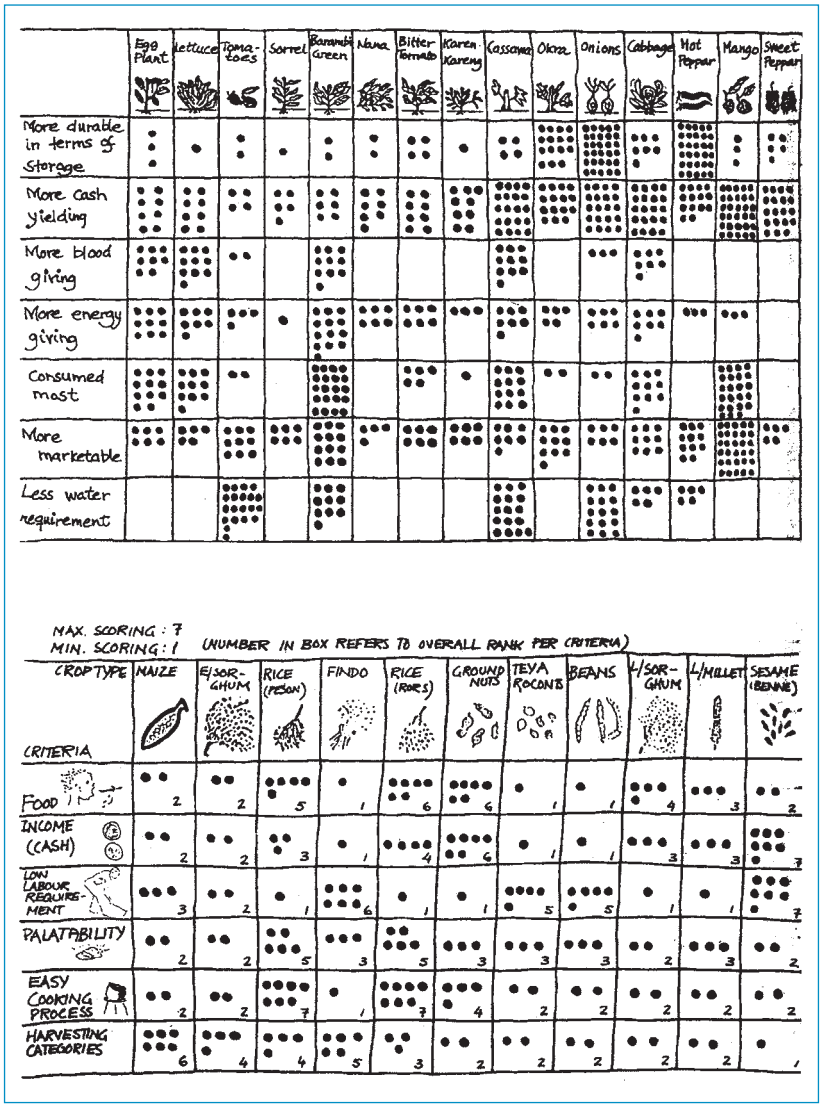
Matrix ranking

Why
Helps identify preferences for certain topics or solutions based on farmers' own criteria and reveals the reasons for the preferences of different groups.

How to
1. Start by briefly introducing the purpose of the tool. Make sure that it is clear to everyone.
2. (Ask farmers to) list the topics to be evaluated. Make negative criteria positives for better comparisons: eg. "pollutes water" becomes "prevents water pollution."
3. Ask farmers to list criteria or "indicators" to compare the different topics.
4. Ask farmers to rank their preferences for each topic using beans (or stones) More stones stands for a topic that they like more according to the criteria.
5. Discuss the reasons for farmers' choices and for other possible criteria.

Example
The example below gives information on the criteria applied by young and old women to assess the value of different groups (Figure A10). Note that both groups use 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.

Figure A10. Criteria applied by women to asses the value of different groups



Source: Mikkelsen, B. 1996.

Solution assessment chart

Why

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

How to

1. Start by briefly introducing the purpose of the tool. Make sure that it is clear to everyone.
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 situation);
    - 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 farmer's opinion on the impact of each solution in the matrix. One option is to use "+" and "-" signs. Another option is to use symbols as below:
    ☺ solution that farmers like
    ☹ solution with negative impact
    😐 solution with no impact
    ? impact of solution is unknown

6. Then discuss the difficulty of implementing each solution:
    - time to benefit ("+" stands for a faster solution, while "-" means that the solution takes longer);
    - cash cost ("+" means that there are lower costs!);
    - labour costs ("+" means their labour 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 needed for implementing a solution are also the farmers who will 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 (e.g: 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

Note that farmers interpret the cash cost of Food-for-Work very low indicating that they made this diagram from their own perspective (Table A16).

Table A16. Options assessment chart made with five farmers at the tail end of Nakwamoru Irrigation Scheme, Kenya (with small adaptations)

	Impact of solution			Difficulty to reach solution				
Solution	**Productivity**	**sustainability**	**equitability**	**Time to benefit**	**Cash cost**	**Labour costs**	**External dependency**	**"best bet"**
Formulation of by-laws	☺	☺	☺☺	☺☺	☹	☺☺	☺	2nd
Training of water management	☺☺	☺	☺	😐	☹	☺☺	☺	3rd
Provision of gates/checks	☺☺	☺☺	☺	😐	😐	☹	☹	4th
Proper cleaning of canals	☺☺	☺	☺	☺	☺	☺☺	😐	1st
Food-for-work	😐	☹	😐	☹☹	☹	😐	☹	6th
Desilting/ construction of new intake	☺☺	☺	😐	☹	😐	☹	😐	5th

Source: Courtesy of: Atambo, D., Wasike, E., Lusweti, A., Losikiria, A. & Ekai, P.

Box A14. Guidelines for the PRDA "Step 2d/ 3a"

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

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.

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 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 (Box A 15).

Box A15. Guidelines for the PRDA "Step 2c"

Give at least one presentation to the WUA and other interested farmers. You may have to repeat the presentation for different sub-units in a very large scheme. It can be useful to also present the results to the local Government or NGO.

Action plan matrix

Why

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

How to

1. Start by briefly introducing the purpose of the tool. Make sure that it is clear to everyone.
2. Draw a matrix with five columns. In the first column write down solutions that have been agreed with farmers. Three levels of solutions can be distinguished:
    - The first level can be implemented with little outside assistance (e.g. 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 of external organizations being willing to support or give funding are higher when farmers also make a contribution to the costs. Generally, they take more time than the first category.
    - The third level are solutions which 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 quick 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 arrive at solutions. Try to be as detailed and precise as possible and write them down in column 2.
4. Column 4 contains the organisations responsible for organizing or implementing each activity.
5. The final column contains the date by which the solution should be implemented.

Example (Table A17)

Table A17. Action plan for Qahira Irrigation Scheme, Kenya (with slight adaptations)

Selected solutions (AIM?)	Activities to implement (WHAT?)	Resources necessary (WHAT?)	Responsible organisation/ people (WHO?)	Time planning (WHEN?)
Construction of lined canal (portion)	Raising of canal Regarding 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 & storage marketing	Seed variety Fruit seedling Nursery 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 DPHA DDC	April 2004
Facilitate extension agents	Purchase vehicles Purchase motorbikes Increase budget allocation	Vehicles Motorbikes Fuel Oil Spare parts	GOK Farmers Donors/NGO to be identified	Immediately
Revive Farmers' Cooperative Society	Training on management	Cash Credit and facilities grants Trainers (MoA, MoCD, MoWI)	Min. Coop Dev. Farmers MoA Arid Land Resource Management	Immediately

Source: Courtesy of Osman, A., Mworia, S., Gafow, A. & Abdikadir, S. M.

Box A16. 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 labour 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 the hopes are for the situation after implementation of the action plan.

Optional

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

Example (Table A18)

Table A18. Transfer of responsibility matrix for organization of training for a village community

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		xxxxx x	xxxx		xxxxx x	Xxxx	xxxx	xxx	xx
Scheduling training		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		xxxxx x	xxx		xxxxx xxx	Xx	xxx	xxxx	xx
Evaluations	xxxxx		xxxxx	xxxxx		xxxxx	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%

Source: Guijt I. & Woodhill J. 2002

Monitoring and Evaluation Plan

Why

To enable future monitoring and evaluation of planned solutions. For this you need to check both (1) if a solution is implemented on time, and (2) if it has the planned positive impact on irrigation performance. However, monitoring has a wider purpose than checking only. It can also help to improve your strategy because it enables adjustments if implementation is not satisfactory or planned positive impact has not been 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 what constituent of the irrigation scheme will change/improve as a result of a 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 they 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 what parts of the M&E activities.

Some criteria for selecting indicators of change

The paragraph on Rapid Benchmarking already explains some important criteria for making indicators (Table A19). However, there are other criteria when you make indicators for impact of solutions on irrigation performance. This is because you do not want to compare change over time instead of differences between schemes.

Table A19. Criteria for selecting indicators of change

Criteria		Bad example	Good example
Sensitive to change	Reflect 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 information in a short time period at low costs.	Variance of water supply to all individual plots of the scheme.	Percentage of farmers dissatisfied with water availability at plot level.
Unambiguous	Another person should get the same result when s/he tries to collect the same data.	Percentage of plots that look 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 paragraph on Rapid Benchmarking already explains some important criteria for making indicators (Table A20). However, there are other criteria when you make indicators for impact of solutions on irrigation performance. This is because you do not want to compare change over time instead of differences between schemes.

Table A20. Criteria for selecting indicators of progress

Criteria		Bad example	Good example
Specific	It should be clear who should do what.	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 by-laws.	The WUA formulated by-laws before 1 January 2005.

Annex B
Reporting Sheets

Presentation

The following Reporting Sheets suggest a format for presenting your data. They are meant as a guide on the type of information to collect for the Rapid Diagnosis and to help you with analysing results. It will also make a comparison of results with other participants' schemes easier. The name of each reporting sheet refers to the different steps of the project cycle explained in Chapter 2 (Tables B1 and B2).

IT IS NOT COMPULSORY TO FILL IN ALL THE REPORTING SHEETS AND FOR SMALLER IRRIGATION SCHEMES YOU NEED ONLY TO REPORT ON TOPICS WHERE CONSTRAINTS ARE FACED

Table B1. Classification of the reporting sheet according to the step of the project cycle

Name of sheet	When to be filled in	
SHEET 1a/1b: Planning report	Step 1B	After finishing the planning of your PRDA.
SHEET 1c/1d. Design characteristics report	Step 1D	Before first field visit, using design documents and other literature.
SHEET 2a. Scheme data collection report	Step 2A	During field visits for scheme data collection.
SHEET 2b. Performance assessment report	Step 2B	After field visits for scheme data collection.
SHEET 2c. Problem identification report	Step 2C	After community problem ranking.
SHEET 3c. Action plan report	Step 3C	After feedback of results to farmers.
SHEET 3d. M&E proposal	Step 3D	Before implementing solutions/ improvements.
SHEET X. Noticeable findings	Throughout the process.	

Reporting Sheet 2b also gives recommendations on which tools to use for collecting the required information during Step 2a. A more detailed description of these tools is given in Annex A.

Table B2. Abbreviated name of tools

Abbreviated name of tool	Full name of tool in guidebook
Biophys	Biophysical measurement
cba	Cost-benefit analysis of a specific crop
Croprot	Crop rotation calendar (in combination with seasonal calendar)
Interview	Semi-structured interview with key informants
Literature	Literature review
Mapping	Irrigation system mapping
Season	Seasonal calendar (in combination with historical calendar)
Transect	Transect walk
Usematrix	Water-use matrix
Venn	Venn diagram

SHEET 1a/1b: Planning report

Names of all team members	Organization (employer)	Position held
1.		
2.		
3.		
4.		

Name of the scheme Province	

Introduction to farmers	See description in Chapter 2
What was the farmers' first reaction to the PRDA? Do you think they have false expectations?	

Stakeholder matrix	See description in Chapter 5
Drawing of stakeholder matrix	

What organizations should be contacted during the PRDA?	

Methods	See table page in Chapter 2
Name of selected tools 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	How often to be applied with farmers

Time planning	See table page in Chapter 2
Make a schedule on a daily basis of what to do	

Budget	
Direct cash cost Transport ……. Stationery ……. Per diem ……. Other…… Total ……	Name of organization that will pay for the costs
Man-days needed per team member 1. 2. 3. 4.	Is the employer willing to release the person for the full period?

SHEET 1c/1d: Design characteristics report

Use written documents: feasibility study, design report, statistics of local Government or NGO

Names of all team members		
DC1	Name of the scheme	
DC2	Region/district	
DC3	Type of scheme	
Design and construction		
DC4	Describe how farmers participate in the design	
DC5	Describe how farmers participate in the construction	
DC6	First year of operation	
DC7	Does WUA have a copy of the design document? YES / No Does the extension office have a copy of the design document? YES / No	
1. Irrigation scheme		
Climate		
	Annual rainfall (mm/year)	
	Annual ETO (mm/year)	
	Peak ETO (mm/day)	
	Mean Annual temperature (°C)	
1.1. Site		
	Designed command area ……(ha)	
	Major soil type	Name Percentage of command area 1. 2 3.
1.2 Water Source and abstraction		
	Type of water source: river, dam reservoir, ……	
	Means of abstraction: diversion, motor pump, ……	
	Design capacity at intake: ……(l/s)	
	Design water supply (l/s/ha) = Design intake capacity (l/s) / Design command area (ha)	
	Estimated peak **Net** crop water requirement …… (l/s/ha) (for projected cropping pattern)	
	Estimated irrigation efficiency as per design: …… %	
	Estimated peak irrigation requirement as per design …… (l/s/ha) Estimated peak crop water requirement (l/s/ha) * 24 hours) / Estimated irrigation efficiency (%) * projected daily irrigation duration (hours)	

1.3. Layout				
	Size of secondary unit (ha)	Unit 1 Unit 4 Unit 7	Unit 2 Unit 5 Unit 8	Unit 3 Unit 6 Unit 9
	Average size of tertiary unit (ha)			
	Designed access roads	In secondary unit: yes/no	In tertiary unit: yes/no	
1.4. Water distribution				
	Type of distribution network	Lined canals: ……m Unlined canals: ……m Pipes: ……m		
	Design water distribution schedule	at secondary level: fixed rotation/negotiated request/on demand as desired at tertiary level: fixed rotation/negotiated request/on demand as desired		
	Reservoir for night storage:	YES / NO Design volume ……..m^3		
	Type of drainage system	Natural/none Surface drains (% of area):		
1.5. Plots				
	Plot levelling during construction: Yes / Some / No			
	Is designed plot size equal in all the command area? Yes/No If yes, size: ha			
	If no, minimum size ha ; Average size ha ; Maximum size ha.			
1.6 Water application				
	Projected "main d'eau" = discharge at plot gate:……l/s			
	Projected irrigation method at plot level:	Basins/Furrows/Sprinkler/Drip		
	Recommended crops 1. 2. 3. 4. 5.	Growing seasons	Recommended irrigation interval (days) and irrigation depth (mm)	

2. Plot Use

	Number of farmers (water users)……..	
	Average size of individual plots ……..(ha)	
	Projected cropping intensity (%)	100 * cropped area in humid season + cropped area in dry season) (1) / Total command area – fallow land (2 (1) Count perennial crops only single time (2) Fallow land = land not cultivated for 1 year or more
	Projected irrigation intensity (%)	100 * number of months with irrigation) / 12

Projected most suitable type of crops and expected yield according to type of soils and recommended fertilization

	Dry season yield (kg/ha) Fertilization	Wet season yield (kg/ha) Fertilization
Soil 1	1. 2.	1. 2.
Soil 2	1. 2.	1. 2.
Soil 3	1. 2.	1. 2.

3. Organization

	Organization in charge of organizing O&M	WUA /Government agency/NGO/Private company/ …….
	Type of organization(s) in charge of paying for O&M	WUA/Government agency/NGO/Private company / …….

4. Socio-economic environment

	Projected market for crops	Home consumption/ national market/export market

Main Problems

Before you start with the fieldwork, what do you think are the main problems of the irrigation scheme?

1.

2.

3.

SHEET 2a: Data collection Report (example)

Name of Tool: .....

Group 1	(date : .....)
Names of farmers	Head/middle/tail
1.	
2.	
3.	
4.	
5.	
6.	
7.	

Information learnt on the four constituents

1. Irrigation scheme:

……..

2. Plot use:

……..

3. Organization:

……..

4. Socio-economic environment:

……..

Add drawing of tool

……

Name of Tool: .....

Group 2	(date : .....)
Names of farmers	Head/middle/tail
1.	
2.	
3.	
4.	
5.	
6.	
7.	

Information learnt on the four constituents

1. Irrigation scheme:

……..

2. Plot use:

……..

3. Organization:

……..

4. Socio-economic environment:

……..

Drawing of tool

……

SHEET 2b: Performance Assessment Report

"SHEET 2b" consists of three parts.

- Part 1 allows you to organize your field data to make a basic description of the scheme's performance.
- The results are then summarized in Part 2 in order to compare the irrigation scheme's performance with other irrigation schemes or benchmarking data.
- After this you can conclude in Part 3 which constituents of the irrigated agricultural system experiences major constraints.

DO NOT TRY TO MAKE UP INFORMATION THAT YOU DID NOT COLLECT IN THE FIELD. IT IS NOT COMPULSORY TO FILL-IN THE WHOLE SHEET!

Name of irrigation scheme	Names of all team members

→ *Part 1:Basic description*

Design and construction

	Are there major differences between the "as-built" document and the actual construction of the scheme?	YES/NO (If yes, give a description, who has made the changes, indicate on map) How were farmers involved in these changes?	Mapping transect
	Has the scheme's command area been expanded?	YES/NO (If yes, give a description, who has made the changes, indicate on map) Additional area = …… ha; total constructed command area = …… ha How were farmers involved in this expansion?	Mapping transect
	Actual irrigation requirement	Estimated peak irrigation scheme requirement including expansion of command area …… (l/s) Estimated peak crop water requirement (l/s/ha) * size of total command area (ha) *) 24 hours Estimated Irrigation efficiency as per design (%) / 100% * daily duration of irrigation (hours	Design doc.

Irrigation scheme			
Site			
Water resource and abstraction			
Wr1	Water availability at the intake	Describe any conflicts on water shortages with other people in the same watershed or lake shore: If dam or natural lake: Water levels were too low for - sufficient intake during ..…. years in the past …….. years (= ….% of years) - having any intake during ..…. years in the past …….. years (= ….% of years) (intake was zero l/s) IF river source: the stream was completely diverted at the headwork during ..…. years in the past …….. years (= ….% of years)	Interview (WUA) Timeline mapping
Wr2	Maintenance status of headwork	Excellent/fair/poor/very poor (describe shortcomings): Likely impact without excellent maintenance:	Transect
		IF dam: -None, -Currently storage is …. mm^3 (….% of design capacity) - Failure risk of ……% within next 5 years	IF diversion/ pump: -None -Currently abstraction is ……l/s (…….% of design capacity) - Failure risk of ……% within next 5 years
Layout			
L1	Apparent damages	To the irrigation structures (gates, weirs, etc): YES/NO (if yes, indicate likely causes on map). To the conveyance network: YES/NO (if yes, indicate likely causes on map). To access roads network: YES/NO (if yes, indicate likely causes on map).	Mapping transect
L2	Change	Added canals : Yes/No (if yes indicate likely causes on map). Area fallow during: - dry season: …….% of total command area …….% of the tertiary unit located furthest from the intake - wet season: ……% of total command area …….% of the tertiary unit located furthest from the intake (Only include wet season if used for supplementary irrigation) Indicate on map Reasons mentioned by farmers (if more than 0%): Other reasons that you can think of yourself:	

Water distribution					
WC1	Water scheduling	Actual schedule at	- secondary level: fixed rotation/ negotiated request/on demand as pleased - tertiary level: fixed rotation/ negotiated request/on demand as pleased	Compare to "SHEET 1d"	Mapping transect
WC2	Equity	Average number of irrigations by plot in dry season Plots at head Plots in middle Plots at tail end		Average number of irrigations by plot in wet season Plots at head Plots in middle Plots at tail end	Transect Mapping Time line
WC3	Reliability	Area with adequate * water supply during: (* adequate refers to amount and timeliness of delivery to plots)			Transect mapping timeline
			- dry season: …….%of total command area …….% of the tertiary unit located furthest from the intake - wet season** …….%of total command area …….% of the tertiary unit located furthest from the intake (**Only include wet season if used for supplementary irrigation)		
		Reasons mentioned by farmers (if less than 100%): Other reasons that you can think of yourself:			
WC4	Water losses	Type of water losses: - overtopping in canals: YES/NO - seepage in canals: YE S/NO - breach in canals: YES/NO - surface drainage at end of plots YES/NO - Other (explain)	If Yes, importance. limited/serious	Cause of losses (sedimentation, breach, under-design, other)	Mapping Transect

<table>
<tr><td>WC5</td><td>Water-logging</td><td colspan="5">Command area experiencing waterlogging (%): ……. (Indicate on scheme map and compare with topographic map).
Describe impact on crop yield and soil salinity:</td><td>Mapping transect</td></tr>
<tr><td>WC6</td><td>Drainage system</td><td colspan="5">What is the status of the drainage system: GOOD, AVERAGE, BAD (compare with design map).
Describe where drainage water is going (especially if significant amounts are re-used within the system):</td><td>Mapping transect</td></tr>
<tr><td rowspan="2">WC7</td><td rowspan="2">Multiple uses</td><td>Other purposes of irrigation water in the scheme or near the intake</td><td>% of households using water for this purpose</td><td>Water use compared to gross intake (>5%, <5%)</td><td>Problems (conflicts) at irrigated plots caused by multiple uses:</td><td rowspan="2">Mapping transect use matrix</td></tr>
<tr><td>Drinking
Washing clothes
Washing people
Animal drinking
Other
……..
……..</td><td></td><td></td><td>Problems faced by multiple uses (related to water):</td></tr>
<tr><td colspan="7">Plots</td></tr>
<tr><td rowspan="2">P1</td><td rowspan="2">Plot water efficiency</td><td>% of plots</td><td>-Good levelling: ….. %
-Poor levelling: ….. %
-No levelling: …… %</td><td colspan="2">Describe the impact on plot water efficiency within the field according to farmers (if not good levelling)</td><td rowspan="2">transect mapping time line</td></tr>
<tr><td colspan="5">reasons mentioned by farmers (if not good levelling):

Other reasons you can think of yourself:</td></tr>
</table>

Water use										
WU1	Plot level application	Location in scheme	Field application method	Average duration (hours) *	Number of simultaneous applications in the scheme	Average main d'eau (l/s) **	Average amount per gift (mm/event) ***	Number of applications per irrigation season	Mean irrigation interval ****	Mapping transect
		Head Middle Tail								
		* Duration of an irrigation gift = time period during which a farmer's plot receives water without interruption (usually between several hours and half a day). ** = discharge to individual plot during irrigation = gross intake/simultaneous number of applications * estimated efficiency. Main d'eau can also be measured with a flume or another appropriate device. *** = Main d'eau (l/s) X duration (hour) X 0.36/ plot size (ha). **** = Duration of irrigation season (days) /number of applications during irrigation season.								

Irrigation system map with:

- areas without water, water shortage, waterlogging;
- areas with low yields;
- damaged infrastructure, damage conveyance systems;
- access roads;
- change or expansions to the command area;
- added canals.

Plot Use			
Total farming system			
PU1	Plot distribution	Number of households in the command area: Owning land -……. Explain if different than "SHEET 1d: Cultivating land : - ……(=water users) P1" Irrigated plot size: -average …….ha -minimal …….ha -maximal …….ha Number of water users with rainfed plots outside the scheme: ……. size of rainfed plots: Average …….ha (Minimal ……ha) (Maximal …….ha)	Literature (WUA) OR interview Calendar time line
PU2	Farming equipment	Number of water users owning oxen…….. Average number of oxen…….. (Minimal …….) (Maximal …….) Number of water users owning tractor(s)……..	
PU3	Family labour	Average number of man-days spent on each farm production component per year: - scheme maintenance ……. man-days - irrigated farming ……. man-days - rainfed farming ……. man-days - livestock ……. man-days - …….. ……. man-days - …….. ……. man-days	Calendar time line
PU4	Labour and investment priorities	Farmers mentioning irrigated agriculture as main income source ……. % of total water users. IF less than 100percent, what is the impact on irrigation performance (competition for labour, capital investment, inputs between irrigation and other production activities)? Other major income sources of income: rainfed agriculture/livestock/wage labour / ……	Calendar rotation

Irrigated farming component					
PU5	Tenure of irrigated land	Farmers with:	-own land (official title) -own land (squatted) -sharecropper -other	……% …….% ….. ..% describe terms ……. ……% describe:…….	calendar time line
PU6	Soil erosion	NONE/MODERATE/SEVERE. Describe causes:			Transect
PU7	Irrigated plot management	Make a <u>typical</u> **seasonal calendar** of plots in the irrigation scheme for the main crops • crop choice • activities (sowing, weeding, harvesting, grazing) • man-days spent on different activities • prevalence of diseases • use of agro-inputs (chemical fertilizers, manure, • labour demand (including scheme maintenance) • religious non-working days • yields of main crops (See Chapter 5 for more explanation on how to make a seasonal calendar).			Calendar

PU8	Annual variations	Draw an **irrigation scheme time line** (for the past five or ten years) of: • irrigation scheme: annual water availability in the scheme, annual rainfall, interventions; • plot use: average yields, pest problems, changes in crop selection; • farmers' organization: events or crises; • socio-economic: market prices, local development projects Use arrows to indicate related events. (see Chapter 5 for more explanation on how to make an irrigation scheme time line). .	Time line Literature

PU9	Crop rotation on irrigated plots	Give a description of the most common crop rotation OR give the major crop types if crops are not rotated in a fixed order. Differentiate between the dry and wet season. If there is more than one category, indicate the percentage of farmers. Category 1: (……%) Category 2: (……%) Category 2: (……%) Cropping intensity* = ……. (%) Cropping intensity* = ……. (%) Cropping intensity* = ……. (%) Irrigation intensity** = ……. (%) Irrigation intensity** = ……. (%) Irrigation intensity** = ……. (%) Average cropping intensity ……. (%) * 100 x cultivated area in Humid season + cultivated area in dry season)[1] / total command area – fallow land [2] [1] count perennial crops only single time [2] fallow land = land not cultivated for 1 year or more Average irrigation intensity ……. (%) ** 100 x number of months with irrigation) / 12	Time line
PU 10	Selection of major crops	Crop type Decision-maker: %male/ % female) Reason mentioned for crop selection 1. 2. 3. 4.	Calendar Time line
PU 11	Use of agro-inputs	% of farmers using Amount used (kg/ha) Cost (kg/ha) Improved seeds Chemical fertilizer Manure Pesticides	

PU 12	Post harvest processing	Describe: Crop type, processing technique, net value added.			Calendar time line
PU 13	Post harvest losses	Describe: Crop type, current conservation technique, net lost produce.			Calendar time line
PU 14	Productivity constraints	Crop type 1. 2. 3. 4.	Most important disease OR symptom if disease unknown.	Main productivity (yield) constraint mentioned by farmer.	Calendar time line

PU 15	Intensification constraints	Are there intensification constraints due to?		Reasons mentioned by farmers:	Calendar time line
		- not growing cash crops	YES/NO		
		- not using agro-chemicals	YES/NO		
		- plot not weeded or well maintained	YES/NO		

		- Insufficient labour force	YES/NO					
		Do all farmers have the same constraints? YES/USUALLY/NO. If no, why?						
PU 16	Value added	Basic production information	- Name of crop - Number of farmers interviewed - Average area cropped - Family labour spent on the crop	Crop 1: ……. ……. ……..…..ha …….man-day	Crop 1: ……. ……. ……..…..ha …….man-day	Crop 1: ……. ……. ……..…..ha …….man-day		Calendar time line Literature (WUA fee, market prices)
		Value of production *	- Yield - market price (average) Total market value at farm gate of: - production sold - domestic consumption **	….. kg ……USD/kg +……. USD +…….	….. kg ……USD/kg +……. USD +…….	….. kg ……USD/kg +……. USD +…….	* Average of all farmers interviewed ** Includes market value of forages consumed by farmer's own livestock	
		Cost of inputs *	- Seeds - Fertilizers - Pesticides - Water fee (include fuel and maintenance) - Casual wage labour - Production services ^ …….. ……. - Marketing services ^^…… …….	-……. USD -……. -……. -……. -……. -……. -…….	-……. USD -……. -……. -……. -……. -……. -…….	-……. USD -……. -……. -……. -……. -…….	^ Renting of farming equipment, oxen, etc. ^^ Transport, packing, broker, market fee, etc.	
		Gross value added *	Gross value of production – cost of inputs	=……. USD	=……. USD	=……. USD		

		For comparisons between farmers and schemes: - Yield # - Gross value added/ha # - Gross value added/man-day family labour##		…….kg/ha =……. USD =…….	…….kg/ha =……. USD =…….	…….kg/ha =……. USD =…….	# Indicator of intensification ## Indicator of labour productivity	
	(OPTIONAL)	Other expenses	- Taxes - Land rent / share cropping cost - Credit Interest	=……. USD =……. =…….	=……. USD =……. =…….	=……. USD =……. =…….		
		Net profit *	Gross value added – other expenses	=……. USD	=……. USD	=……. USD		

Farmers categories

PU 17

Try to divide the farmers into two to four categories
Start by making a matrix based on their total farm size (area in ha) versus practices (crop selection, use of inputs, cropping intensity).
If this does not produce different categories, also include production means (oxen, farming equipment, family size) and land tenure (own, rent, share crop).

Organization		ASPECTS OF THE ORGANIZATION THAT WILL BE ANALYZED ARE Structure (s), Objectives (O),Rrules& regulations ®, Capacities ©	
WUA			
Structure			
WU1	Structure	Organizational chart (Also include other organizations in charge of O&M tasks – contracted, Government responsibility). (Pay special attention to note if there is a distinction between the associative body and daily management).	literature interview
WU2	Roles	For each element of the organization: Role/responsibility, who are the members, how are they selected.	Interview

WU3	Members	How many members does the organization have? ……. Percentage water users who are members.....% Percentage land owners who are members.....% Percentage of women members ……% Do all members have equal rights? (Can all farmers vote if there is a general assembly?					Interview
Objectives							
WU4	Objective of the organization	Who is respon-sible to organize	Who is respon-sible to perform	How well is objective fulfilled	Task currently done for each objective	Current cost of task (USD, man-day/s)	Interview Map

Rules			
WU6	Organizational rules	Are there formal rules on the functioning of the organization? YES/NO Are there formal rules on the scheduling of water distribution? YES/NO How is knowledge of rules amongst farmers? WELL/ MODERATE/ POOR What formal mechanisms exist for conflict resolution?	Literature
WU7	Membership rules	What are the preconditions/criteria for membership? Are there rules governing the meetings of the general assembly? Frequency of general assembly meetings? Percentage of farmers attending general assembly meetings? Can farmers call extra general assembly meetings?	
WU8	Financial rules	Can farmers check if their contribution is well spent by the Board?	
Capacity			
WU9	Discipline	How often do farmers break rules? Are there penalties for breaking rules? Describe: How many times were these penalties applied last year? …… Are they always applied and are they the same for all people? Describe:	
WU 10	Culture/relations	Amongst farmers: -Are there often conflicts between farmers? Between farmers and WUA: -Do farmers feel free to complain with the WUA if they face problems in water delivery or drainage? -Do farmers feel that the WUA will help to alleviate their problems? -If not, why?	Mapping Venn Time line

WU 11	Gender-based differences	For women farm decision-makers, gender-based differences: (+) no difference, (+-) mild differences (-) large difference.	Gender-based difference analysis
		Concretised land rights / Membership rights / Participation in organization / Inclusion as leaders / Ability to function as leaders	
		+ +- -	
		Main performer: Government/local community/both through institutional arrangements.	
WU 12	Financial management	Is there a formal bookkeeping system? How much money is kept in the bank? Annual budget. Access to credit.	Interview books
WU 13	Farmers' contribution	Farmers who: -pay fees …....% (recovery rate) Fee: …… USD/year -provide labour …..% Average …..man-days/year -provide materials …..% ……	Books interviews
WU 14	Financial self-sufficiency (%)	**Cash cost borne by farmers x 100 = (Amount in $) x 100** Total O&M cost (Amount in $)	
WU 15	Skills	Kind of training received on running the organization?	Interview
WU 16	Assets	Financial reserves/ tools/ buildings:	Literature Interview
WU 17	Relations with external players	Organizations or people that interact with WUA Is there need for relations to be improved? if YES, how.	Venn
	Conclusion	Main cause of objectives that are not fulfilled well -according to farmer? -in your opinion?	Venn

Cooperative Society			
CS1	Existence	Is there a Cooperative Society? YES/NO (If no, go to Socio–economic environment). Is the Cooperative Society a separate organization of the WUA? YES/NO (If no, skip the following questions).	
CS2	Structure	Organizational chart (Also include other organizations in charge of O&M tasks – contracted, Government responsibility). (Pay special attention to note if there is a distinction between the associative body and daily management).	literature interview
CS3	Roles	For each element of the organization: Role/responsibility, who are the members, how are they selected.	Interview

CS4	Members	How many members does the organization have? …… Percentage water users who are members ……% Percentage land owners who are members ……% Can all farmers vote if there is a general assembly? YES/NO Do all members have equal rights? Is membership compulsory for all farmers in the scheme? YES/NO Are farmers outside the scheme also members? YES/NO. If yes, how many members are from outside …..%)					Interview
CS5	Objective of the Cooperative Society	Who is responsible to organize	Who is responsible to perform	How well is objective fulfilled	Task currently done for each objective	Current cost of task (USD, man-day)	Interview Map

CS6	Organizational rules	Are there formal rules on the functioning of the organization? YES/NO Are there formal rules on distribution of benefits/dividends? YES/NO How is knowledge of rules amongst farmers? WELL/ MODERATE/ POOR What formal mechanisms exist for conflict resolution:	Literature
CS7	General assembly	What are the preconditions/criteria for membership? Are there rules governing the meetings of the general assembly? Frequency of general assembly meetings? Percentage of farmers attending general assembly meetings? Can farmers call extraordinary general assembly meetings?	By-laws interview
CS8	Financial rules	Can farmers check if their contribution is well spent by the Board?	
CS9	Discipline	How often do farmers break rules? Are there penalties for breaking rules? Describe: How many times were these penalties applied last year? …… Are they always applied and are they the same for all people? Describe:	
CS 10	Culture/relations	Amongst farmers: -Are there often conflicts between farmers? Between farmers and WUA: -Do farmers feel free to complain with the WUA if they face problems in water delivery or drainage? -Do farmers think that the WUA will help to alleviate their problems? -If not, why?	Mapping Venn time line

<table>
<tr><td>CS 11</td><td>Gender-based differences</td><td colspan="5">For women farm decision-makers, gender based differences:
(+) no difference; (+-) mild differences; (-) large differences</td><td></td></tr>
<tr><td></td><td></td><td>Concretised land rights</td><td>Membership rights</td><td>Participation in organization</td><td>Inclusion as leaders</td><td>Ability to function as leaders</td><td></td></tr>
<tr><td></td><td></td><td>+ or +- or -</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td colspan="5">Main performer: Government agency/local community/both through institutional arrangements</td><td></td></tr>
<tr><td>CS 12</td><td>Financial management</td><td colspan="5">Is there a formal bookkeeping system?

How much money is kept in the bank?

Annual budget.

Access to credit.</td><td></td></tr>
<tr><td>CS 13</td><td>Farmers' contribution</td><td colspan="5">Farmers who:
-pay fees …....% (recovery rate) Fee: …… USD/year
-provide labour …..% Average …..man-days/year
-provide materials …..% ……</td><td></td></tr>
<tr><td>CS 14</td><td>Financial self-sufficiency</td><td colspan="6">Cash cost borne by farmers x 100 = (amount in $) x 100
Total O&M cost (amount in $)</td></tr>
<tr><td>CS 15</td><td>Skills</td><td colspan="5">Kind of training received in running the organization?</td><td>Interview</td></tr>
<tr><td>CS 16</td><td>Assets</td><td colspan="5">Financial reserves/ tools/ buildings:</td><td>Literature
Interview</td></tr>
<tr><td>CS 17</td><td>Relations with external players</td><td colspan="5">Organizations or people that interact with WUA

Is there a need for relations to be improved? if YES, how?</td><td>Venn</td></tr>
<tr><td>CS 18</td><td>Conclusion</td><td colspan="5">Main cause of objectives that are not fulfilled well:
-according to farmer?

-in your opinion?</td><td>Venn</td></tr>
</table>

Socio-economic environment				
Farmers' knowledge				
SE1	E'xtension service	Did the extension officer recommend a certain crop choice and management for the current irrigation season? YES/NO if yes, describe: Farmers following extension advice …. % Reasons mentioned by farmers not following advice:		Calendar time line
SE2	Information source	Sources of information on recently adopted agricultural practices or technology (Government agency, radio, NGO, CBO, newspaper,) 1……..…….. 2……..…….. 3……..……..	Describe the information received and reasons to adopt as mentioned by farmer(s): 1. 2. 3.	Time line
SE3	Training	Kind of training received by farmers on:	Irrigated farming systems (inputs, crop choice, pest and disease control). Field water management (on farm irrigation depth and frequency). Negotiation, contracting with external players (inputs suppliers, credit institution, traders).	

Agro inputs

SE4		Distance to sales location (km or hours travel))	Availability throughout the year	Quality	Calendar time line mapping
	1. Improved seeds	1.	1.	1.	
	2. Chemical fertilizers	2.	2.	2.	
	3. Pesticides	3.	3.	3.	
	4. ……..	4.	4.	4.	

Crop marketing

SE5	Location	Where do farmers sell cash crops? Name of village/town ……. Approximate size ……. Inhabitants Distance from scheme……km …….. hour	Time line Venn
SE6	Price	Graph of approximate price of most important irrigated food and cash crops throughout the year: AT FARM GATE (= LOCATION WHERE FARMERS SELL PRODUCT) IN THE NEAREST MAIN TOWN	
		→ price (USD) → Year → price (USD) → Year	

SE8		"Exploitation ratio"	- crop 1 …… = ……% - crop 2 …… = ……% - crop 3 …… = ……% 100% * town price / farm gate price	
SE9	Price distortion mechanisms	Food aid distribution …… ……	Number of recipients within the scheme ……% of households. Number of recipients outside the scheme (in same P.A.) ……% of households. Do farmers complain about impact of food aid on price levels?	Interview)
Land tenure				
SE 10	Have there been conflicts over land	Within the scheme: With people outside the scheme:		Interview
Relations with downstream upstream water users				
SE 11	Have there been conflicts with downstream upstream water users? If yes, explain causes, consequences and manner in which they were solved.			

Credit			
SE 12	Credit	Is credit available to farmers? YES/NO, If yes: Farmers using credit ……%) Organization providing credit: Name …….. Type of organization …….. (Government, NGO, bank) Conditions for credit (interest rate, duration of loan): Advantages/disadvantages mentioned by farmers using credit: Advantages/disadvantages mentioned by farmers not using credit:	Time ine
Labour			
SE 13	Labour availability	Are there labour shortages? YES/NO. If yes, during which month(s): Do farmers use external labour? YES/NO. If yes, during which month(s):	Timeline
External relations			
SE 14	Impact	Most important external organization or persons having a positive impact on irrigation productivity: Most important external organization or persons having a negative impact on irrigation productivity:	Venn

Venn diagram

- Most important organizations, individuals and categories of farmers.
- Give the elements with negative impact on irrigation productivity a red colour or dark shading.

Household wellbeing			
H1	Average household size		Literature
H2	Food availability	Do households face food shortages? YES/NO. If yes, during which month(s): Reasons for food shortage:	Interview
H3	Water-related diseases	Are incidences of the following diseases more than 50 percent higher than average in the P.A. (YES/NO) Malaria ……. Bilharzias ……. …… ……	Interview (Health Officer)
Future plans			
FP1	Scheme improvement	Are there concrete plans to improve the irrigated agricultural system amongst farmers or external organizations. YES/NO. If yes describe:	Interview
FP2	Scheme expansion	1. Is there a demand for scheme expansion amongst the surrounding population: YES/NO 2. Is it technically feasible/possible to expand the scheme (taking into account total water availability, topography and soil quality): NO/YES If yes, -approximate additional area …. ha. -Cost per hectare of relative construction of current scheme (MUCH MORE, EQUAL, MUCH LESS) 3. Are there concrete plans to expand the scheme? YES/NO. If yes, who is planning it ……	Interview Own opinion Interview
Data collection			
Spatial distribution		Number of farmers interviewed at the ……head = ……% of all farmers in this area total sample size = …….. ……middle = ……% of all farmers in this area ……tail = ……% of all farmers in this area	
Gender distribution		Number females interviewed ……..	
Reliability		Do you think that you have reliable information on the scheme's performance? YES/SOMEWHAT/NO Explain why:	

Summary

Are there major constraints in:				Mark the appropriate answer based on your own opinion			
Design and construction	YES	limited	NO	**Socio-economic environment**	YES	limited	NO
Scheme design				Road accessibility			
Irrigation scheme	YES	limited	NO	Access to agro-inputs			
Water availability at scheme level				Crop marketing			
Water scheduling/distribution/operation				Credit			
Drainage				Extension services			
Water handling at plot level				Land tenure (ownership or rules for use)			
Scheme maintenance				Labour availability			
Plot use	YES	limited	NO	Wildlife menace			
Productivity (yields)				**Household wellbeing**	YES	limited	NO
Crop choice				Food availability throughout the year			
Other agronomic practices (use of inputs, weeding, tillage)				Other			
Organization	YES	limited	NO				
Collection of water fees							
Cooperation between farmers							

SHEET 2c. Problem Identification Report

Name of irrigation scheme	Names of all team members

Community problem ranking
List problem ranking by groups of farmers and give a short description of the problem when needed.

Group 1	
Names of farmers – code # - head/middle/tail 1. 2. 3. 4. 5.	Names of farmers – code # - head/middle/tail 6. 7. 8. 9. 10.

Main problems (include farmers' own descriptions)

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

Group 2 Names of farmers – code # - head/middle/tail 1. 2. 3. 4. 5.	Names of farmers – code # - head/middle/tail 6. 7. 8. 9. 10.
Main problems (include farmers' own descriptions) 1. 2. 3. 4. 5. 6. 7. 8. 9. 10.	
Group 3 (females) Names of farmers – code # - head/middle/tail 1. 2. 3. 4. 5.	Names of farmers – code # - head/middle/tail 6. 7. 8. 9. 10.
Main problems (include farmers' own descriptions) 1. 2. 3. 4. 5. 6. 7. 8. 9. 10.	

Did most farmers agree on these problems 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 their problems openly? Or did some people dominate all discussions and rule out other farmers? If yes to the latter, what did you do to give voice to the other farmers?

Problem selection

Write down the problem or problems that you want to investigate further during the rapid diagnosis.

1.

2.

3.

Are these problems the same as the priorities of the farmers (Yes/No)?
Are they the same as your own priorities (Yes/No : see Basic Indicators report)?
If no, why did you select these problems?

SHEET 3a: Action Plan Report

Name of irrigation scheme	Name of team members

Audience at the presentation (Table B3)

Table B3. Audience at the presentation

How many times did you present your diagnosis?	
Number of people attending - Presentation 1: - Presentation 2: - Presentation 3:	Background of people attending (Committee members, females, local administration, etc.) - Presentation 1: - Presentation 2: - 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 solutions did you mention that could be implemented by the farmers themselves?

What possible solutions did you mention that could be implemented with external assistance?

Reaction to the presentation

Did farmers agree with your diagnosis of the scheme's positive and negative aspects?

Which of the possible solutions did farmers choose?

What additional solutions did they propose?

Was the reaction to all the presentation similar?

Action plan (Table B4)

Table B4. Action Plan

Selected outputs (AIM?)	Activities to implement (WHAT?)	Resources necessary (CASH? LABOUR?)	Responsible organization/ people (WHO?)	Time planning (WHEN?)
1.				
2.				
3.				
4.				
5.				
6.				

Follow-up by extension organization

Is the current extension service provided to the scheme addressing the needs of farmers according to the Rapid Diagnosis OR is there a need to change the current extension approach?

What part of this change can be made within the current staffing and budget of the extension organizations?
For which part is additional funding or staff required?

SHEET 3b: Monitoring and Evaluation Plan

(make example copy for each solution)

Name of irrigation scheme	Names of team members

Solution 1 (see Action Plan)

Description of solution

Indicators od progress (Table B5)

Table B5. Indicators of progress

Calendar showing implementation of all individual activities for solution			
Year	Month	Activity	How can it be checked whether each activity has been performed? (=indicators of progress)

Indicators of impact (Table B6)

Table B6. Indicators of impact

Intended impact of the solution on the irrigation scheme (WHAT DO WE THINK WILL CHANGE)	Performance indicators expected to change due to the solution (HOW CAN WE CALCULATE CHANGE)	Current value of the indicator (HOW WELL IS THE SCHEME DOING NOW)	Target value and target date for implementation (HOW WELL SHOULD THE SCHEME DO AND BY WHEN)	What data is needed to calculate the indicator (WHAT DO WE NEED TO MEAURE)	Who will collect this data and at what time? (WHO WILL DO THE MEASUREMENT AND WHEN)

Implementation of M&E

Describe farmers' involvement in developing activity planning and indicators

Do farmers agree with the M&E plan?

SHEET 4: Noticeable findings

Name of irrigation scheme	Names of all team members

Lessons learnt
What went "wrong" or could have been done better on the studied scheme during

A. Design

B. Construction

C. Handover to farmers

D. Current extension service to farmers

(Give a clear description and use drawings when necessary).

Policy Advice
What policy advice would you like to give to the Government of your Country/Region based on your observations in this irrigation scheme?

"Best practices"
What farmers' (or extension) practices did you see that (1) are special for this site, and (2) have a positive contribution to irrigation performance

1. Irrigation scheme

2. Plot use

3. Organization

4. Socio-economic environment

(Give a clear description and use drawings, chart, matrix when necessary)

Annex C
Brief presentation of PRDA Training in Ethiopia and Kenya

On-the-job training in PRDA was conducted as a component of the APPIA project between December 2003 and March 2004 in Ethiopia and Kenya. This presentation aims to give indications to institutions and projects that might be interested in organizing training courses in PRDA methodology.

The main focus of the training was to enable participants to do a PRDA. Participants were front line extension workers, engineers, agronomists, economists or other professionals (in the case of Kenya, educated farmers) who seek to improve their work by evaluating past projects. This on-the job training was based on "learning by doing" and "learning from each other". During training sessions, due attention was given to the knowledge and experience of participants by building in time for trainees to share ideas and experience or to appeal to their respective expertise. To stimulate "learning-by-doing" and make things practical, participants did a PRDA in groups of approximately four on a selected irrigation scheme between training courses. All groups presented a (realistic) action plan for their irrigation scheme during the last course. The application of participative methods during fieldwork enabled participants to learn from farmers and better understand their practices.

Partner organizations

Cooperation agreements were signed in both countries between the IWMI-APPIA project and regional institutions involved in irrigation development to select irrigation schemes for PRDA, identify trainers, organize training and select trainees. Working directly through local organizations facilitated the dissemination of results to higher levels of involved organizations.

Ethiopia

ORDA	Organization for Relief and Development of Amhara Region
Co SAERAR	Commission for Sustainable Agriculture and Environment Rehabilitation in Amhara Region.

BoA	Bureau of Agriculture
BoC	Bureau of Cooperative Promotion
DPPC	Disaster Prevention and Preparedness Commission
FSPC	Food Security Planning Commission
OIDA	Oromya Irrigation Development Authority
Bo C	Oromya Bureau of Cooperative Promotion

Kenya

KARI	Kenyan Agricultural Research Institute
MoWI	Ministry of Water and Irrigation
MoA	Ministry of Agriculture
NIB	National Irrigation Board
ApproTEC	Appropriate Technology for Enterprise Creation
JKUAT	Jomo Kenyata University of Agriculture and Technology, Department of Soil Sciences.
UoN/ISD	University of Nairobi/Institute of Social Studies for Development
TARDA	Tana River Development Authority

Trainers

Two types of trainers with complementary qualifications conducted the training:

- Irrigation professionals: irrigation engineer or agronomist, to provide the inputs and facilitate discussions on the four constituents of an irrigated agricultural system as described in Chapter 3 of the PRDA manual. Preferably, s/he would have some working experience with farmers' organizations.
- Specialists of Participative Rural Appraisal tools with some practical experience in monitoring and evaluation of development projects in rural areas: S/he would lead the sessions devoted to PRDA tools and their utilization; see chapters 4, 5 and annex A of the PRDA manual.

Most training sessions and discussions were attended by both trainers. Their presence is needed at the sessions to focus simultaneously on:

- Analytical skills and expertise, such as capacity to draw conclusions from data, quality and reliability of the diagnosis, relevance and feasibility of the action plan.
- Participants' attitudes towards farmers and colleagues during fieldwork and their skills in using the PRA tools.

Selected irrigation schemes

PRDA targets primarily group-based irrigation schemes where farmers are in charge of operation and maintenance. The size of a scheme is not a major criterium, but we recommended to keep it below 1 000 ha to have significant results in a short period of time. In Kenya, PRDA was also conducted on clusters of small individual irrigated farms and on the 6 000 ha Mwea Irrigation Scheme.

For practical reasons, we recommend to select one scheme close to the training venue in order not to waste time in organizing field exercises during training sessions. Another option is to rotate training venues for each session to carry out field exercises on several selected schemes.

Partner organizations selected 19 pilot irrigation schemes - nine in Ethiopia and ten in Kenya - to apply PRDA methodology and tools during training. A list of selected schemes is given on the following tables C1 and C2.

Table C1. Selected irrigation schemes in Ethiopia

Regions	Scheme names (cultivated area)	Type of scheme (1st year operational)	Main crops in dry season	Main crops in wet season
Amhara	Zenguene (508 ha)	Modern, diversion (1985)	Barley, potato, onion	Barley, teff
	Tilkit (45 ha)	Modern, diversion (2002)	Onion, pepper, chick pea	Teff
	Tembel (300 ha)	Modern, diversion (2001)	Maize, potato, coffee	Teff, millet, maize
	Tikurit (102 ha)	Modern, diversion (1979)	Tomato, onion, sugar cane, khat.	Sugarcane, khat
	Genet (15 ha)	Upgraded traditional scheme, diversion (1960)	Onion, garlic, pepper maize	Maize, onion, pepper
	Nillie (71 ha)	Modern, diversion (2004)	Chick pea, sorghum, teff	Teff, sorghum, chick pea
Oromya	Gohawork (150 ha)	Modern, diversion (2001)	Shallot, potato, tomato, sugar cane	Teff, wheat, sugar cane
	Dodicha (69 ha)	Modern, pump-fed (2001)	Onion, pepper, green beans	Tomato, maize
	Golegota (850 ha)	Modern, diversion (1969)	Onion, tomato.	Onion, tomato, maize

Table C2. Selected schemes in Kenya

Centrally Managed	Smallholder with Water Undertaker	Smallholder under water users associations	Individual owned systems
Mwea (6000 ha) gravity, rice	Yatta furrow (900 ha) gravity, horticulture	Hewani (200 ha) gravity, rice	Narumoru cluster (Total 120 ha) Treadle pump and drip irrigation, horticulture
West Kano (900 ha) pump, rice	South West Kano (530 ha) gravity, rice	Kibirigwi (480 ha) gravity Sprinkler-Horticulture	Awach Cluster (Total 300 Ha) Motorized pumps, horticulture
		Qahira (50 ha) Pump, horticulture	
		Nakwamoru (120 ha) Cereals	

Participants in the training

The partner organizations selected the participants for training. Approximately 25 percent of the 69 participants were senior staff of irrigation agencies, agronomists, irrigation engineers, economists and specialists of farmers' organizations. The remaining 75 percent were front line extension officers in Ethiopia and leaders of Water Users Associations and front line extension officers in Kenya. Classroom sessions were conducted in English, which is not spoken by Ethiopian farmers. However, we do not envisage any major difficulty in conducting training in local languages or in French in other African countries. During training, teams of three to four persons were formed and assigned to a particular scheme for fieldwork. Each team included at least one senior staff member.

Expected outputs

Expected outputs vary according to the institutional context of the training. If it is conducted only to benefit the participants, as individuals, and farmers of the selected irrigation schemes, only direct outputs will be attained.

Direct outputs:

- participants trained to apply PRDA tools and methodology;
- identification of the main limiting factors and their interaction for increased productivity and sustainability of selected irrigations schemes;
- evaluation of the extension and other supporting services provided to farmers in the selected irrigation schemes;
- action plans formulated to improve the performance of selected schemes;
- description and a set of indicators of the main characteristics of selected irrigated agricultural systems in order to enable more extensive monitoring of performance in the future.

When training is conducted to benefit extension or development institutions through their personnel, then possible indirect outputs are to be considered in addition to the direct ones.

Indirect outputs:

- a regular monitoring and evaluation system is established within the institution or the existing one is improved and made more effective;
- general recommendations are drawn from PRDA results on selected schemes;
- cooperation between staff of participating institution is intensified;
- insights in research and training needs of the participating institutions are increased.

Achieving indirect outputs depend largely on the management of extension or development institutions and little on the trainers. However, trainers can facilitate it by:

- preparing the training with the senior management and assessing the relevance of these indirect outputs to the institution's objectives, achievements, and human and financial resources;
- planning a workshop at the end of the training to present its results to an audience of decision-makers and potential donors;
- trying to minimize training costs to make repetition possible within the normal budget of extension and development institutions.

Learning goals

At the end of the training, front line extension workers and trained farmers:

1. have a better understanding of the four constituents of irrigated agricultural systems and their interactions and can independently detect major technical problems in the field;
2. are able, under the guidance of senior staff, to plan and conduct a rapid diagnosis together with counterparts;
    - have a basic knowledge of participatory methods for analysing performance, ranking problems, and identifying possible solutions;
    - are able to select suitable tools for rapid diagnosis;
    - have the skills and attitudes to use these tools effectively;
3. are able to process the collected information to identify and classify the main limiting factors and possible solutions;
    - can combine their own and others' knowledge/skills to identify possible solutions;
4. are able, with the assistance of senior staff, to use diagnostic results to formulate an action plan with farmers;
5. are more responsive to farmers' needs in schemes targeted during the training by:
    - being aware of the main problems or causes of poor irrigation performance;
    - knowing what assistance farmers expect from them to improve such performance.

In addition to the above, the senior participants

6. are able to design and coordinate a Rapid Diagnosis and Action Planning of irrigated agricultural systems;
7. can write a report that is accountable and reflects Rapid Diagnosis results and Action Planning in a way that is easily understandable to outsiders;
8. know the main problems faced by farmers and front line extension workers that can be associated with/attributed to design and turnover procedures of irrigation schemes.

Pedagogic principles

The pedagogic principles used were based on "learning-by-doing" and "learning-from-each-other." Classroom training is done before field work to provide guidance and after field work to capitalize on the lessons learnt. Both field work and classroom training aim to put participants in a position where they have to mobilize knowledge of trainers, farmers and key informants to carry out a job

instead of being passive recipients of information. Therefore, the classroom training sessions themselves favour pro-active training methods, such as workgroups and brainstorming. Due consideration is given to the knowledge and experience of the participants by building in time for them to exchange ideas and experience or to call upon each other's expertise (Figure C1).

Duration

Training course 1	6 days
Fieldwork 1	10 days
Training course 2	5 days
Fieldwork 2	5 days
Training course 3	4 days
Fieldwork 3	1 day
Total	**31 days**

Training materials

Participants were provided with copies of the "Manual on Participatory Rapid Diagnosis and Action Planning", which is a handbook containing a step-by-step overview of PRDA. Each training session refers to specific pages of the Manual so that participants do not have to take notes during classroom sessions. The Manual also contains a format for taking notes and analysing results in the field. In addition to the Manual, the following materials were made available for the activities during classroom training sessions and fieldwork:

- participant's handbook (see above);
- flip chart, markers, tape;
- notebooks and pens;
- pebbles or beans.

Budget

Training courses on PRDA do not have to be very sophisticated or expensive. The main costs are usually for per diems and transportation. The following tables contain guidelines for making a budget and a sample budget (for Ethiopia) assuming 20 participants, 5 schemes, 10 days training.

A good way to measure the effectiveness of your training is to calculate the Returns on Investment. For this you have to monitor annual productivity changes in the targeted irrigation schemes in the following years and compare them to the training costs (Table C3).

Figure C1. Overview of the training

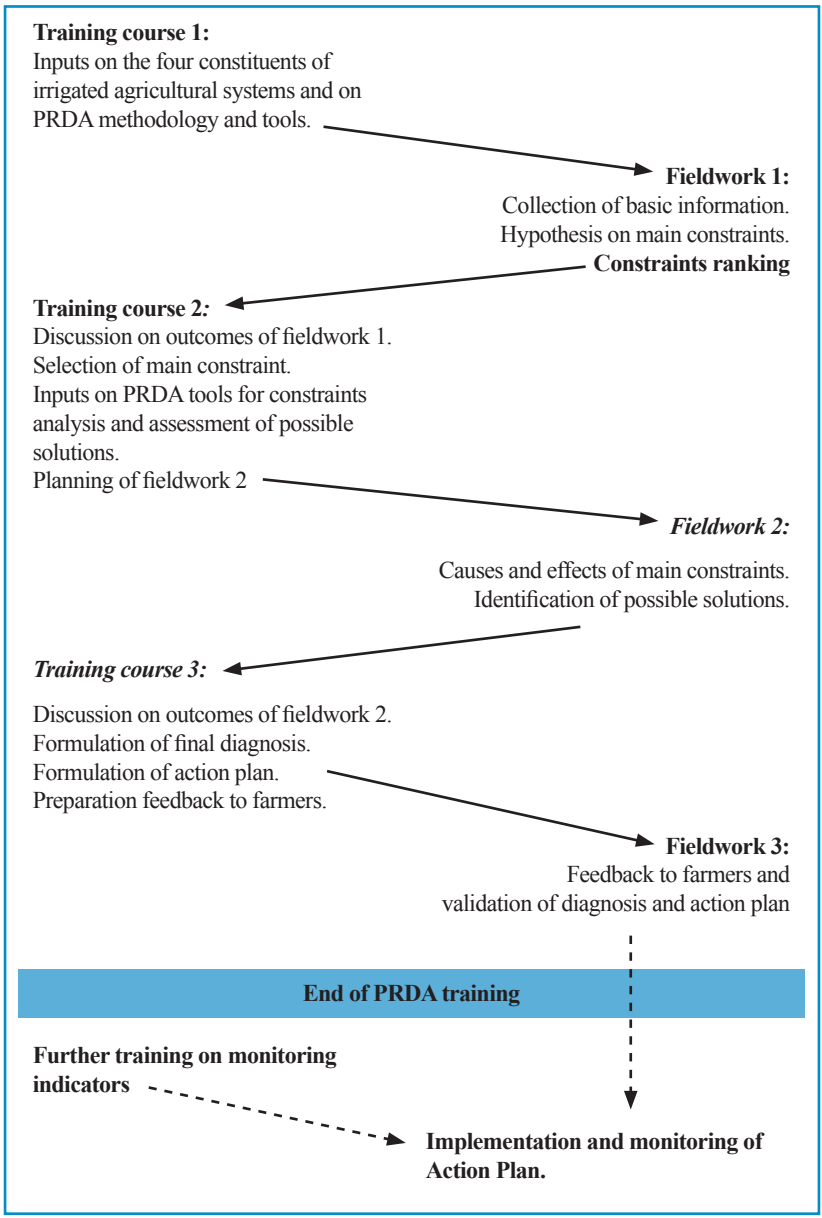


Table C3. Cash cost of the training courses, fieldwork and inkind contributions

Cash cost of the training courses	
Item	Calculation formula
Training materials (manuals, photocopies, flip charts, etc)	Number of participants * cost per participant
Venue (if renting external)	Daily rate * total days
Per diem	Participants * total days * daily rate
Lodging (if not covered by per diem)	Participants * total nights * daily rate
Food, drinks (if not covered by per diem)	Participants * total days * daily cost
Transportation to training venue	Number of courses * participants * average cost
Transportation during course to exercise site	Field days * vehicles required * daily vehicle cost
Trainers' fees (if using a consultant)	Number of trainers * total days * daily fee
Cast cost of fieldwork	
Item	Calculation formula
Transport to the site (for non-local staff)	Number of field-work * number of staff * cost per return trip
Transport at the site (if required)	Number of sites * daily vehicle cost
Per diem	Number of participants * number of field days * daily rate
In kind contributions	
Staff time	(Days training + field work) * participants

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IWMI, with the collaboration of the International Programme for Technology and Research in Irrigation and Drainage (IPTRID), is publishing, for the benefit of technicians of public services, NGOs and farmer organizations, this manual which offers a participatory and practical methodology based on practices, experience and thinking of many farmers and irrigation professionals in Ethiopia and Kenya.