PARTICIPATORY DIAGNOSIS OF THE IRRIGATION SCHEMES IN THE SAHEL: EXPERIENCES FROM BURKINA FASO AND NIGER

DIAGNOSTIC PARTICIPATIF DES PERIMETRES IRRIGUES AU SAHEL : EXPERIENCES AU BURKINA FASO ET AU NIGER

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ABSTRACT

This article presents the preliminary results of a multi-partner action-research project, funded by USAID and jointly implemented by the International Water Management Institute (IWMI) and the Permanent Interstate Committee for Drought Control in the Sahel (CILSS).The project is implemented in two pilot countries, Niger and Burkina Faso in partnership with the respective irrigation agencies, the national ICID committees and the national agriculture research systems.

The hypothesis behind the project is: farmers' participation in multidisciplinary performance analysis and diagnosis of their irrigation schemes will trigger a renewed awareness and enthusiasm to revitalize these schemes. The Participatory Rapid Diagnosis and Action Plan (PRDA) approach is used for this purpose, which is well-regarded in West Africa and many experts have been already trained through the regional association on irrigation and drainage (RAID/ARID). Professionals from ICID committees carried out the diagnoses together with farmers' representatives. Five medium size (70 to 500 ha) public irrigation schemes were assessed in Niger and Burkina Faso with this method.

The study revealed that farmers' involvement in the participatory diagnosis has raised their awareness about the strengths and weaknesses of the schemes; in most cases they were willing to take effective remedial action. However, poor knowledge about the functioning of the schemes was a constraint. Operation and maintenance of the irrigation facilities as well as administration and financial management of their organizations also pose major challenges for the farmers. The study has encouraged government to re-engage in these schemes with a

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view to improving their performance by undertaking repairs and rehabilitation of infrastructure and farmers' training.

Key words: *Participatory diagnosis of irrigation schemes, Farmers' training, Karfiguela irrigation scheme Burkina Faso, Dayberi irrigation scheme Niger.*

RESUME ET CONCLUSIONS

Cet article présente les résultats préliminaires d'un projet de recherche-action financé par USAID en réponse à la crise alimentaire de 2008 et mis en œuvre conjointement par l'International Water Management Institute (IWMI) et le Comité permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel (CILSS). Le projet est construit sur l'hypothèse que la participation active des agriculteurs à l'analyse de leur système d'irrigation va déclencher une prise de conscience et un enthousiasme permettant une revitalisation des performances et de la productivité du périmètre. Le « Diagnostic rapide participatif et planification des actions » (PRDA) conçu par l'IWMI dans les années 2000 et adapté en Afrique de l'Ouest par l'association régionale d'irrigation et de drainage (ARID) est mis en œuvre ici par les comités nationaux CIID sur deux pays (Niger et Burkina Faso). Cinq systèmes irrigués de taille moyenne (70 à 500 ha) ont été évalués avec cette méthode.

On peut en retenir plusieurs éléments : 1) une très mauvaise connaissance du fonctionnement des périmètres, notamment en matière de consommations en eau alors même que la ressource se raréfie (ensablement des réservoirs, compétition entre usagers); 2) un manque flagrant de maintenance et une mauvaise gestion reconnue par les producteurs eux-mêmes conduisant à des risques de rupture de la production (panne de pompes, risques d'inondations, effondrement du niveau de la nappe phréatique) ; 3) les diagnostics participatifs en eux-mêmes semblent avoir un impact immédiat sur la production en obligeant les producteurs et les services d'Etat à se réengager dans une meilleure gestion.

On note avec satisfaction que les agriculteurs semblent vraiment ouverts à la participation à l'identification de leurs problèmes : ils sont impatients d'écouter les conclusions positives comme négatives. Mais la prise en compte de mesures correctrices profondes sera une œuvre de plus longue haleine. Très souvent elle dépasse les limites des systèmes d'irrigation et il faut considérer la gestion de l'eau au niveau du bassin versant. En utilisant les plates-formes de gestion locales de l'eau ou les organismes de bassins transfrontaliers il convient d'obtenir des clarifications sur les droits d'eau et de mettre en œuvre des actions en termes de protection du bassin versant (limiter l'érosion et les risques d'inondations, augmenter la recharge en eau souterraine etc.).

Le projet confirme l'intérêt de l'implication des comités nationaux CIID, qui, associés aux services de l'Etat (ministères et centres de recherche) et aux organisations professionnelles agricoles, peuvent fournir des diagnostics pertinents. On peut imaginer alors une implication forte des pouvoirs publics pouvant prendre le relais des financements de recherche pour mettre en œuvre les plans d'action définis avec les producteurs. Dans ce contexte, il est urgent de rétablir chez les producteurs et les gestionnaires de périmètres irrigués une véritable «culture du suivi des performances des périmètres irrigués » leur permettant un monitoring permanent des problèmes et pour les responsables nationaux, permettant de

préparer avec des arguments étayés une capacité d'intervention sous forme de plans d'actions comprenant le cas échéant des réhabilitations légères, des renforcements de capacité ainsi que des soutiens ciblés sur les points faibles du système.

Mots clés : *Diagnostic participatif des périmètres irrigués, formation des fermiers, périmètre irrigué du Karfiguela au Burkina Faso, périmètre irrigué du Dayberi au Niger.*

(Traduction française telle que fournie par les auteurs)

1. INTRODUCTION

Irrigation investments in sub-Saharan Africa (SSA) have been declining since the 1980s (World Bank, 2007). The high unit costs of irrigation infrastructure and the perceived failures of many past irrigation projects are believed to be the main reasons for this situation. However, an analysis of 314 irrigation projects in 50 countries over a 40 year time period conducted by Inocencio et al. (2007) showed that under certain conditions, irrigation investment in SSA is not more costly than elsewhere.

But, as pointed out by the Comprehensive Assessment (2007), sound investment decisions can only be made if they are based on the knowledge of the performance of past investments and existing irrigation schemes. In Burkina Faso and Niger, such performance information is not readily available although several projects (IIMI, 1996; IIMI, 1997; IIMI, 1998; FAO BonnesPratiques (Rigourd et al), IWMI-APPIA (IPTRID 2008)) have been implemented during the past 20 years with a view to promoting a culture of performance assessment amongst irrigation managers and policy makers. Regular monitoring, maintenance and performance assessment of irrigation schemes assumes even greater importance in view of the ambitious plans to develop irrigated agriculture in the continent (NEPAD, 2003).

The West African Irrigation Project (WAIPRO) is a research-development initiative funded by USAID as part of its Global Food Security Response to the 2008 food crisis. It is founded on the premise that the performance and productivity of irrigation schemes in sub-Saharan Africa (SSA) falls short of expectations. The overall aim of the project is to improve the performance and productivity of selected irrigation schemes in two West African countries, namely Burkina Faso and Niger, through the identification and implementation of targeted interventions in these schemes and thereby contribute to increasing crop production and farm incomes.

The project is jointly implemented by the International Water Management Institute (IWMI) and the Permanent Inter-State Committee for Drought Control in the Sahel (CILSS) in collaboration with a consortium of organizations in the two countries including national agricultural research institutes, irrigation departments, irrigation management agencies, professional associations and NGOs. The institutional set-up of the project (Figure 1), entrusting specific implementation responsibilities to the national partners, is designed to favor buy-in to WAIPRO activities plus ownership and adoption of results. It is expected that the lessons learned would lend themselves to up-scaling and out-scaling not only within the project countries but also throughout the West Africa region.

The underlying hypothesis of the project is that the active participation of farmers in multidisciplinary performance analysis and diagnosis of their irrigation schemes and the setting of intervention priorities will be empowering them and will renew awareness and enthusiasm to revitalize these schemes. The project was also originally conceived to go beyond simple observation and diagnosis, but to also actively pilot-test different interventions that could quickly lead to increased cropping intensities and productivity, and thereby higher production and farm incomes.

This paper describes the results of the diagnostic analysis performed in the five study sites, two in Burkina Faso and three in Niger, including an overview of the methodology, the results obtained and the action plans drawn up to address the constraints identified.

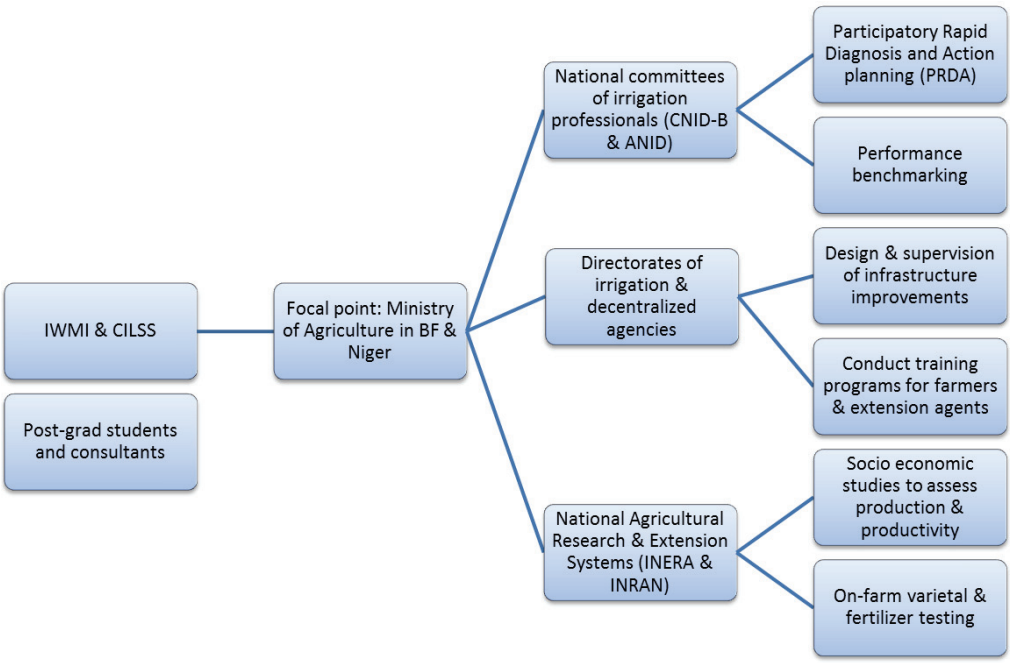

Fig. 1: WAIPRO–Project set-up and partners(WAIPRO-Montage et partenaires du projet)

STUDY SITES

Five medium size (70 to 500 ha) public irrigation schemes in Niger and Burkina Faso were selected for study by the national project partners in each country. The schemes were expected to be representative of the diverse sources and modes of extraction of irrigation water that prevail in the countries, ranging from reservoirs and river diversions to extraction from aquifers.

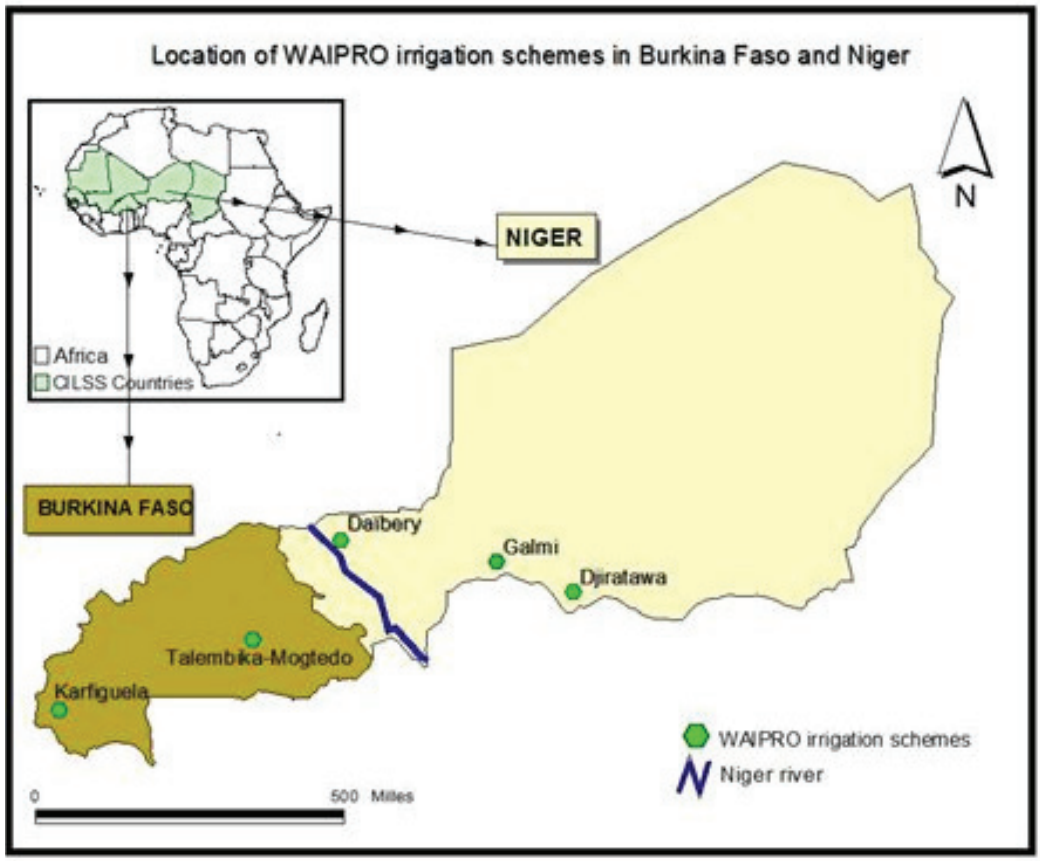

Fig. 2: Location of field sites(Localisation des sites d'étude)

The salient features of the five schemes are given in Table 1

Table 1: Characteristics of WAIPRO irrigation schemes(Caractéristiques des périmètres d'étude WAIPRO)

Sites	Area (ha)	Water source& distribution	No. of Producers	Crops
Karfiguéla (Burkina Faso)	350	Reservoir, gravity-fed, open canals	700	Rice
Talembika (Burkina Faso)	62	Pumping, upstream of reservoir, buried pipes	160	Vegetables
Daïbéry (Niger)	298	Niger river, pump, open canals	650	Rice
Galmi (Niger)	250	Reservoir, gravity, open canals	930	Cereals & Vegetables
Djiratawa (Niger)	512	Groundwater, pumps, buried pipelines	1014	Cereals & Vegetables

2. METHODOLOGY

The Participatory Rapid Diagnosis and Action Planning (PRDA) methodology developed by IWMI, IPTRID and FAO (van der Schans and Lempérière, 2006) was used for this purpose. This method was tested by IWMI in East Africa in the course of the APPIA (Amélioration des Performances des PérimètresIrrigués en Afrique) project jointly implemented by IWMI-IPTRID-FAO between 2003 and 2007.The result was very positive. "*Farmers have been able to raise their production levels simply because they were able to identify the limiting factors to increased output and marketing*" (Mwarasomba, 2006). In brief, PRDA is a tool that helps narrow-down the vision of problems and their solutions to a limited number of priorities.

Figure 3 shows the place of PRDA in the overall context of the project learning cycle aimed at improving irrigation performance.

A French version of the PRDA manual (IPTRID, 2007) was developed and employed in the sister component of APPIA, implemented in West Africa by the Regional Association on Irrigation and Drainage in West and Central Africa (RAID/ARID). Recent investigations demonstrate that PRDA has been widely used between 2003 and 2007 in West Africa with the specific objective of mobilizing resources for rehabilitation and repairs and for reactivating local associations (ARID, 2011). The tool has even been used for preparing urban planning projects.

The PRDA approach is well-regarded in the region and dozens of national experts have been already trained through the regional irrigation and drainage association (RAID/ARID). Professionals from the national committees of the ICID in the two countries[3] were engaged by the WAIPRO project to carry out the diagnoses, together with representatives of farmers.

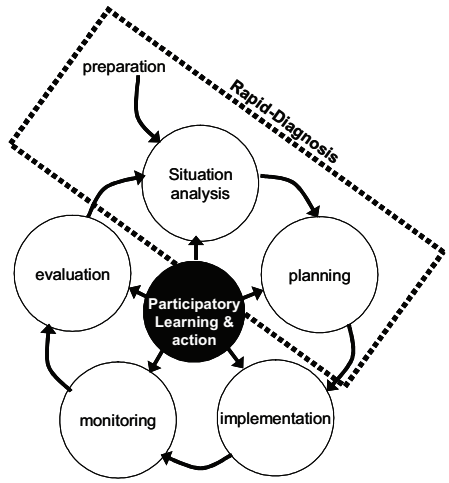

Fig. 3: PRDA in the context of the project learning cycle (*DPRPdans le contexte du cycle de projet*) (source:van der Schans and Lempérière, 2006)

Each team is typically composed of four members: an agricultural water engineer, an agronomist, an agricultural economist or a sociologist, and a NARS researcher, reflecting

3 Niger Association for Irrigation and Drainage (ANID) and the National Committee of Irrigation and Drainage-Burkina Faso (CNID-B)

the WAIPRO institutional set-up shown in Figure 1. An extension agent and a representative of the farmer organization are also associated with this team. The average time taken by the team to complete a diagnosis is 5 to 8 days[4]. The costs contracted with the respective national irrigation committees was around US$ 10,000 per scheme.

The PRDA comprises 5 main phases: (1) preparation and collection of available secondary data and information and choice of method of analysis, (2) field data collection, (3) performance analysis and diagnosis, including problem ranking by farmers, (4) solution identification and assessment, and (5) presentation of results, discussions with stakeholders and agreement on action plans. The relation of these steps to the overall project cycle is presented in greater detail in Figure 4.

Farmers must be involved from the very first stage of the preparation phase to ensure that they take ownership of the findings and do not perceive them as being imposed on them from outside.

The review of literature and collection of secondary data are important steps that allow one to get a historical understanding of the scheme under study. But generally speaking it was quite a frustrating exercise to look for past records in the different administrations and more so at farmer cooperatives where the storage of information is even more precarious. Technical and students' reports pertaining to some schemes are sometimes available in university libraries but it is not always easy to judge the reliability and value of information.

It is also very important that the PRDA team arrives at a consensus in regard to the choice of methods of analysis. In WAIPRO, the experts were free to use the tools of their preference from a range of options: e.g., semi structured interviews, transect walks, Venn diagrams, problems trees, or any combination thereof.

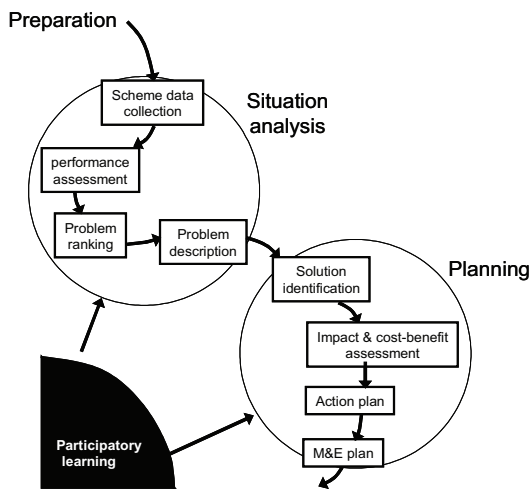

Fig. 4: PRDAdetail in projectlearning cycle (*Détail du DPRP dans le cycle de projet*) (source:van der Schans and Lempérière, 2006)

4 According to the PRDA Manual, the duration for a complete diagnosis of a 100 ha irrigation scheme is estimated to be 15 days; but for financial reasons it was agreed to limit the duration to one week.

The field data collection was satisfactory although conducted in a very short time. Even where the specialists of the PRDA team were familiar with the scheme, it was extremely important to cross-check information with farmers, in order to increase confidence in the results. And indeed, as stated above, these participatory diagnoses also aimed at giving a large responsibility to farmers in regard to determining and prioritizing their problems. The underlying idea was not to solve all the perceived problems but to start with a limited number of them and to prove to farmers that they can themselves play a major role in identifying, ranking and seeking solutions to problems. In this regard, the WAIPRO team observed a high level of enthusiasm and interest on the part of farmers. Three main domains were investigated: water, financial and organizational problems.

The action plans were prepared in two phases: A first phase where all possible theoretical actions were listed, followed by a more targetedsecondphase, taking into account agreed priorities,the associated costs of intervention, the WAIPRO budget and the possibility of co-funding by the farmers' organization.

3. DIAGNOSTIC RESULTS

This section is based on the reports of the diagnostic studies carried out in the five schemes, two in Burkina Faso (CNID-B, 2009 and CNID-B, 2010) and three in Niger (ANID, 2009; ANID, 2010a; ANID, 2010b). Supplementary data collection and analysis was conducted thanks to the research reports of four IWMI co-supervised Masters Students (Amadou-Sabra, 2010; Ballo, 2010, Mvondo-Ayissi, 2010; Ndanga-Kouali, 2010).

Karfiguela irrigation scheme, Burkina Faso

Three major problems were identified after the diagnosis: low yields, low cropping intensity and non-adherence to the cropping and water management calendar.

Average paddy yields over the past 5 years have been stagnant at around 3.5 to 4 t/ha, which are less than the 6 t/ha apparently obtained during the first few years of the scheme in the 1980s. The poor quality of seed used is a contributory factor, with only few farmers using certified seed. The water distribution infrastructure is also degraded due to lack of maintenance. Furthermore, the amount of water released to the scheme from the upstream reservoir is inadequate to allow cultivation of the full extent of land in the dry season, thereby adversely affecting the cropping intensity and production.

The scheme is divided into five irrigation blocks, each managed by an independent farmer cooperative. A key challenge facing these cooperatives is the collection of irrigation service fees from their membership; the fee collection rate is about 70%, indicating there is much room for improvement. On the other hand, the fees collected mainly go to pay salaries of cooperative employees; there is insufficient provision for repairs and renewals. In the event of repairs becoming necessary, funds are often raised by asking farmers to pay a specific fee for that purpose.

Talembika irrigation scheme, Burkina Faso

This scheme is located upstream of a reservoir from which water is pumped and then distributed to the farm via a system of underground pipe network. But since its construction in 2007-08 the scheme has not yet been in operation. The farmer-beneficiaries have refused to use it as they considered that the quality of the equipment (three motor pumps) and work were not good enough.

The farmers were not willing to accept the risk of moving away from their individualized irrigation practices (small motor pumps) to a larger collective system that could break down. Later investigations by IWMI brought to light serious competition, if not conflict, related to the control of the water resource in the reservoir. Rice farmers of the older and bigger Mogtédoirrigation scheme downstream of the dam have full control of the water resource and can easily open the sluice-gates to release water to their scheme, thereby limiting the possibility of the more recent Talembika farmers to pump water to not more than three months over the year.

Dayberi irrigation scheme, Niger

During the 25 years of its existence, the scheme has produced reasonably good rice yields (5 t/ha on average) with an assured double cropping. But the scheme now requires repair and rehabilitation. The demographic pressure in a very poor area has resulted in a large number of farmer families (about 500 initially, now close to 700) cultivating relatively small landholdings. The four pumps have functioned beyond their useful life (more than 44 000 hours against 25 000 hours of theoretical lifetime). The intake channel is heavily silted; due to this reason there was a period in April 2010 during which there was no water in the rice fields. The yields were very low that year. The scheme also faces the risk of flooding due to damaged protection dykes and drainage problems. Catastrophic flooding of the Niger River in the summer of 2008 resulted in the loss of production. However, on the organizational side, the situation is much better. Since the past five years a private farmer-support structure (CSPS) has been helping with administration and accounts, with impressive results.

Galmi irrigation scheme, Niger

This 250 ha scheme area is situated downstream of a small reservoir for 930 farmers producing vegetable and cereals. The poorly maintained infrastructures and the poor water management practices do not allow the scheme to achieve its full production potential compared with crop yields achieved elsewhere in the region. Some parts of the scheme do not receive enough water while other parts suffer from poor drainage. Better catchment management must be done to limit erosion and sedimentation of the reservoir. The financial situation of the scheme is unsatisfactory.

Djiratawa irrigation scheme, Niger

This 500 ha irrigation scheme is supplied by 43 boreholes and serves over 1000 farmers. But the groundwater is now showing clear signs of depletion. Flows in boreholes have reduced drastically, having lost from 14% to 70 % of their flow rate. This has led to abandoning some land area. Water management is near-anarchic. People have destroyed the water flow meters.

Energy accounts for 78% of the production costs. The over-intensive use of land and water (two to three cropping seasons) is not sustainable in the long run. Flooding also poses a permanent threat.

Summary and analysis of diagnostic findings

Table 2 summarizes the constraints identified in the five study schemes.

Table 2: Summary of constraints identified in the five WAIPRO schemes (*Synthèse des contraintesidentifiéessur les cinq sites d'étudeWAIPRO*)

Main constraints	Karfiguela	Talembika	Dayberi	Galmi	Djiratawa
Lack of/Competition for water resource	+++	++	+	+	+++
Degradation of infrastructures	++	++	+	++	+
Risk of flooding	+		++	+	+
Poor drainage	+		+	+	
Pumping problems (cost, condition of pumps)		++	++		+++
Degradation of catchment		++	+	++	++
Poor water management	++	+	+	++	+
Access to quality inputs	+			+	
Marketing difficulties	+	+		+	+

N.B. The number of + symbols used is a qualitative estimate of the magnitude of the relevant problem encountered in the particular scheme

It is observed that problems related to the availability and management of water (at the resource and at system level) predominate in all the schemes. The schemes also suffer serious infrastructure degradation due to poor maintenance.

The vulnerability of the schemes to the risk of flooding may appear to be somewhat of a paradoxical situation in an arid environment like the Sahel. But given the flat topography and the occurrence of intense rainfall events that may give rise to floods, the schemes have to be protected behind long dykes[5] (with the exception of the Talembika scheme, located upstream of its reservoir). But indifferent maintenance of these dykes (usually compacted earth bunds) makes them susceptible to rupture during heavy rains providing the opportunity for flood waters to invade the scheme, inundatefarmers' fields and damage crops.

The problems identified in the different schemes can be grouped into four main clusters (as shown in Figure 5):

- **Technical:** e.g. no performance assessment culture, inadequate O&M

5 These flood protection dykes add significantly to the costs of construction of these schemes

- **Environmental:** e.g. competition for water resource, poor water management, catchment management
- **Risk:** e.g. vulnerability to infrastructure degradation, crop failure
- **Social cohesion:** e.g. latent conflicts among stakeholders

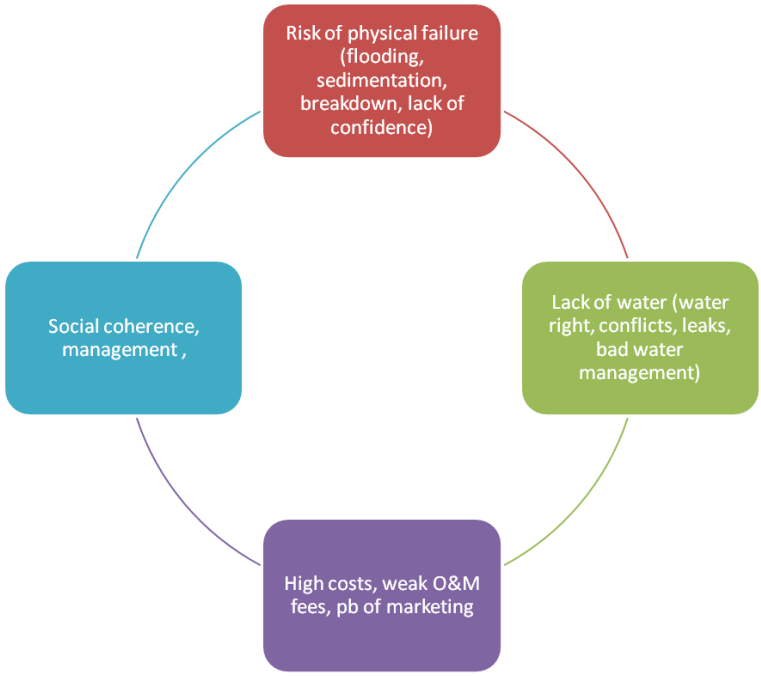

Fig. 5: Main problem areas identified in the diagnoses (*Problèmes principaux identifiés lors des diagnostics*)

One key finding is that there is an absence of systematic monitoring on all the schemes, resulting in poorly maintained infrastructure and limited actual performance information. There is usually some data about cereal production and yields but no measurements related to water use and water productivity. Moreover, performance assessment is complicated by the development of spontaneous informal irrigation around the schemes, with water being pumped or siphoned from the canals or the reservoir.

With increasing pressure on the available land and water, there is heightened potential for disputes and conflicts; between different water-users (e.g., livestock herders, farmers, fishers), and among farmers themselves (e.g., upstream vs. downstream, formal vs. informal).

In addition, the actual causes of difficulties in system management and general under-performance often lie outside the boundaries of the irrigation scheme. The importance of proper catchment management is hardly recognized. For example, there is no guarantee of water availability for the Karfiguéla scheme in spite of it being fed by a reservoir with a substantial storage capacity because control of the reservoir water has been handed over to a major privately-owned sugar company which depends on the reservoir water to irrigate about 4000 ha of sugar-cane. In the cases of Talembika and Galmi, the water resource is

under threat due to reservoir sedimentation. In the Daibery scheme, which derives its water through pumping from the Niger River, the main feeder channel has silted up. Water table depletion and poor aquifer recharge contribute to the water shortage in the Djiratawa scheme.

In general, the farmers were quite receptive to the findings of the PRDA even though the diagnostics were sometimes critical of the way their schemes were managed. The Karfiguéla farmers recognized that if they were better organized and more disciplined in managing water, this could strengthen their attempts to negotiate a bigger share of the reservoir water for the scheme. The farmers in Talembika accepted that they had missed an opportunity to make better use of the new irrigation facilities built for them. At Dayberi, the farmers were even willing to make a substantial financial contribution to the implementation of the action plans.

4. ACTION PLANS

Karfiguéla irrigation scheme, Burkina Faso

Following the PRDA diagnosis, a more detailed assessment of the physical rehabilitation works required was prepared by a consulting company (NK Consultants, 2010). The total estimated cost was US$162 000 including repairs of canals, replacement and repairs of missing and damaged devices such as control gates, and unblocking of the drainage system. It was also planned to install measurement devices to monitor water deliveries and thereby contribute to augmenting the efficiency of the system. In the long-run, better water management is expected to help the scheme secure a greater water allocation. Negotiations with other water users at basin level led to local decision makers undertaking to allocate more water to Karfiguéla for dry-season irrigation, but only if the scheme demonstrates its ability to make better use of its current allocation through adoption of sound water management practices. Moreover, given the rate of development of spontaneous irrigators outside the scheme, near the canals and the river, it is necessary to carry out a proper inventory of all irrigators in order that they harmonize their irrigation practices and share the costs of maintenance.

Talembika irrigation scheme, Burkina Faso

As pointed out earlier, this is a new scheme (built in 2007/08) which has never functioned, not having been accepted by the farmer-beneficiaries. The action plan was intended to repair and operate one-third of the scheme with the involvement of farmers as a pilot action to ascertain the associated strengths and weaknesses. This would also be the opportunity to make a reliable estimate of the water resource availability from the Mogtedo reservoir, which is shared among several uses and users. The estimated cost is US$ 120 000.

Daibery irrigation scheme, Niger

The proposed interventions were mainly aimed at limiting the risks arising from breakdown of the pumps, silting of the intake feeder channel, dyke damage and flooding. The cost of overhaul of the pumps (with their replacement as the preferred long-term solution), de-silting of the feeder channel, and repairs to canals, dykes and other facilities was estimated at US$ 150 000. The farmers offered to mobilize resources to cover 50% of the proposed works, which is quite remarkable.

Galmi irrigation scheme, Niger

The overall aim of the proposed action plan was to improve management of the scheme to enable an increase in the cultivated area, and hence higher production and farm incomes. The actual interventions will include repairs to the canal network and flood protection dykes. Actions to enhance catchment protection and water resource management would also be carried out. It is expected that implementation of the plan will make it possible to farm an additional 11 ha. The estimated cost is US$ 140 000.

Djiratawa irrigation scheme, Niger

The action plan involved pilot interventions to improve the performance of the crop production activities supported by four of the pump groups, one in each of the four farmer cooperatives. The aims would be to: (a) decrease the overall cost of production through reduction of energy costs of up to 28%, (b) increase production through cultivation of at least 50% of lands currently abandoned due to lack of sufficient water, and (c) improve horticultureproduction through the introduction of high-yielding crop varieties. At the same time, the water table would be carefully monitored to prevent undue drawdown and depletion. The cooperatives expressed willingness to cover 18% of the total costs of the pilot intervention of US$ 105 000. The nature and cost estimates of the action plans proposed forthe five study schemes, as well as an indication of their respective impacts, are summarized in Table 3.

Table 3: Possible interventions in the five study sites and indicative impacts (*Interventions possiblesdans les cinq sites et impacts indicatifs*)

Site	Proposed actions	Cost	Indicative impacts
Karfiguela (*B' Faso*)	• Flow Measurement • Repair of canals & cleaning of drainage network • Negotiate higher water allocation	$162 000 for 350 ha. i.e., $460/ha	• Yields & revenues +20% • Cropping intensity +30%
Talembika (*B' Faso*)	• Rehabilitation of part of the scheme • Calculating actual reservoir water availability& agreeing on share	$120 000 for 62 ha. i.e., $2000/ha	• Doubling of cropping intensity
Daïbery (*Niger*)	• Pump and canal repairs • Dyke repairs • Maintenance of drainage network	$150 000 for 300 ha. i.e. $500/ha	• Risk reduction • Yield +10% • Incomes +10%
Galmi (*Niger*)	• Dyke repairs • Canal rehabilitation • IWRM dialogue	$140 000 for 250 ha. i.e., $560/ha	• Risk reduction • Cultivated area +5% • Yield +10%, • Incomes +20%
Djiratawa (*Niger*)	• Cleaning/backwashing boreholes • Water table monitoring	$105 000 for 512 ha. i.e., $200/ha	• Risk reduction • Cultivated area +5%

At the time of the writing of this article, the action plans have not been implementedfollowing a change of policy from the donor, requesting the project to limit physical interventions. However the authors believe that the diagnostic reports and the action plans provide the national partners with useful material and justification to seek other sources of funding.

5. CONCLUSIONS

Several lessons emerge from the diagnostic studies carried out in the five pilot study schemes in Burkina Faso and Niger.

Firstly, farmers seem to be really open to participating in problem identification and they are eager to listen to both positive and negative conclusions. Indeed, when the diagnosesbring to light their weaknesses, they readily recognize the situation. However when it comes to taking remedial action, they appear to be less inclined to change such as paying fees on time.

Although the study sample is limited, the WAIPRO project confirmed that despite past efforts there is still poor knowledge about the actual functioning of the schemes, especially in regard to water use, due to absence of systematic monitoring by the managing agency and the farmers. This handicaps the ability and efforts to adequately address the twin problems of water scarcity (e.g., as reservoirs silt-up) and competition for water between different users, including booming informal irrigation. A major effort is therefore required to monitor performance and discuss water sharing at catchment level.

Farmers recognize that maintenance and water management pose major challenges for them. But they don't always have the capacity to deal with these issues. The transfer of management to farmers by the state appears to have occurred rather brusquely, without adequate efforts to train and empower farmers in this regard resulting in poorly maintained schemes with high risks of failure.

It also became evident that the search for the underlying causes of some of the under-performance observed should not be confined to the irrigation schemes themselves. It was often necessary to look beyond the boundaries of the irrigation schemes, to the catchment level, in order to get a good grasp of the situation.Given theincreasing pressure on land and water resources, local water management platforms such as the ComitésLocaux de l'Eau (CLEs) in Burkina Faso also need to be brought in to the debate. In Niger, transboundary river basin bodies would also have to come on board in order to prevent possible changes in water resources availability.

Finally, the simple fact of engaging with the farmers in carrying out such participatory diagnosis has already had a positive impact on scheme performance. The PRDA appears to have provided the opportunity for farmers' association to revisit and re-examine the management of their schemes. National irrigation agencies have been provided with tangible evidence of the constraints confronting irrigation schemes under their purview; the project has also provided them with the means to address some of them such as training on water management, administration and financial issues.NARS researchers have been actively engaged in providing guidance on crop management.

The diagnoses have also triggered the government to consider reengaging in these schemes with a view to improving their performance and achieving food security. There is a greater realization that efforts to revitalize the sector are enhanced when farmers participate in and share responsibility for these processes.

In conclusion it is useful to recall that WAIPRO was originally designed as an action research project with participatory diagnostic analysis in the pilot schemes being followed by practical interventions, including light repairs and rehabilitation, to quickly achieve impact in terms of increased production, productivity and incomes. However, a change in donor priorities has not allowed the project to fully implement the action plans.

Nevertheless, the diagnostic reports and action plans could still serve as useful bases for the WAIPRO partners, particularly the national agencies and farmer groups, to seek alternative sources of support to assist the practical implementation of the proposed action plans. In the context of continuing concerns about food insecurity, water scarcity and climate change several donors are renewing their interest in supporting investments in the agricultural water sector. Demonstrating awareness about and commitment to effective land and water management practices; systems operation and maintenance, and performance assessment are all key elements that could determine the engagement of potential investors.

It is hoped that WAIPRO interventions have helped to reestablish a “culture of performance monitoring” among the farmers, managers and senior administration officials using simple diagnostic tools, monitoring criteria and performance indicators.

ACKNOWLEDGMENTS

The funding support of the United States Agency for International Development (USAID), the excellent cooperation of the Permanent Inter-State Committee for Drought Control in the Sahel (CILSS) whereWAIPRO is hosted(http://waipro.iwmi.org/), and the wholehearted collaboration of WAIPRO’s partners in Burkina Faso and Niger are all gratefully acknowledged.

REFERENCES

Amadou Sabra. A. K. 2010. Analyse des contraintes hydrauliques du périmètre irrigué de Daibery (Niger) et mise en place d’un jeu d’indicateurs de performance. Mémoire pour l’obtention du Master en ingénierie de l’eau et de l’environnement. 2iE Ouagadougou, Burkina Faso.

Ballo, K. 2010. Evaluation des performances du périmètre irrigué de Karfiguela.Mémoire pour l’obtention du Master en ingénierie de l’eau et de l’environnement. 2iE Ouagadougou, Burkina Faso.

ANID.2009. Diagnostic rapide participatif et planification des actions du périmètre de Daibery (Niger).

ANID.2010a. Diagnostic rapide participatif et planification des actions du périmètre de Djirataoua (Niger)

ANID.2010b. Diagnostic participatif rapide et planification des actions du périmètre de Galmi(Niger)

ARID. 2011. Capitalisation de l'expérience du DPRP du projet APPIA. WAIPRO, Ouagadougou

CNID-B. 2009. Diagnostic participatif du périmètre irrigué de Karfiguéla (Burkina Faso)

CNID-B. 2010. Diagnostic participatif du périmètre irrigué de Talembika (Burkina Faso)

Comprehensive Assessment of water management in agriculture (CA). 2007. Water for food, water for life: A comprehensive assessment of water management in agriculture. Molden, D.J. (ed.). London, Earthscan, and Colombo: International Water Management Institute.

IIMI. 1996.Méthodologied'évaluation des performances et de diagnostic des systèmesirrigués (Methodology for performance assessment and diagnosis of irrigation systems), xvi+118 pp.

IIMI. 1997. Projet Management de l'Irrigation au Burkina Faso: Rapport final, 2 tomes et 3 appendices (Final report of the Burkina Faso irrigation management project, 2 volumes and 3 appendices).

IIMI. 1998. Projet Management de l'Irrigation au Niger: Rapport final de synthèse (Final synthesis report of the Niger irrigation management project), 196 p.

Inocencio, A., Kikuchi, M., Tonosaki, M., Maruyama, A.,Merrey, D.J., Sally, H., de Jong, I. 2007. Costs and performance of irrigation projects: A comparison of sub-Saharan Africa and other developing regions. IWMI Research Report 109

IPTRID. 2007. Diagnostic participatifrapideetplanification des actions d'amélioration des performances des périmètresirrigués. Application à l'Afrique de l'Ouest, FAO, Rome, 143p.

IPTRID. 2008. Évaluation du projet «Amélioration des performances des périmètres irrigués en Afrique (APPIA)» (FSP 2002-37), FAO, Rome, 143p.

Mwarasomba Lincoln L. 2006.Evaluation of the IPIA project in Kenya.

Mvondo-Ayissi S.J. 2010. Le développement de l'irrigation à Talembika :Analyse de l'échec d'un nouvel aménagement et de l'évolution de l'irrigation informelle. Mémoire pour l'obtention du Master en ingénierie de l'eau et de l'environnement. 2iE Ouagadougou, Burkina Faso

Ndanga-Kouali, G. 2010.Compétition entre périmètresirriguéspartageant la même ressource en eau : Cas de Mogtédo et Talembika. Mémoire pour l'obtention du Master en ingénierie de l'eau et de l'environnement. 2iE Ouagadougou, Burkina Faso

New Partnership for Africa's Development (NEPAD). 2003. Comprehensive Africa Agriculture Development Programme (CAADP). NEPAD.Midrand.South Africa.

NK Consultants.2010. Evaluation des travaux de réparation du périmètre de Karfiguela. WAIPROproject

Rigourd C., Hermiteau I., Nepveu de Villemarceau A., Vidal, A. 2002. La riziculture irriguée en Afrique sahélienne : rompre avec le pessimisme. CahiersAgricultures, Vol. 11, N° 1, pp. 59-64

van der Schans, M. andLempérière, P. 2006. Manual: Participatory Rapid Diagnosis and Action Planning for Irrigated Agricultural Systems (PRDA). IPTRID, IWMI, FAO.

World Bank. 2006. Reengaging in Agricultural Water Management: Challenges and Options

World Bank. 2007. Investment in Agricultural Water for Poverty Reduction and Economic Growth in Sub-Saharan Africa. Synthesis Report of the collaborative program of AfDB, FAO, IFAD, IWMI, and the World Bank.