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Manual of Good Practices in Small Scale Irrigation in the Sahel

Experiences from Mali

January 2014

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Soumaïla Samaké
National Director of Rural Engineering
Ministry of Rural Development

An introduction to the Manual of Good Practices in Small-scale irrigation

It is with great pleasure that I present this manual to all those involved in designing, installing and using irrigation infrastructure.

It was our desire when putting together this manual to provide you with a tool that would support you in your efforts to develop the potential of small-scale irrigation.

Thanks to your support, courage and perseverance, we have, since 2008, been able to draw upon a formulation document for the National Programme for Small-scale Irrigation (PNIP), in which the small-scale irrigation concept and the planning mechanism for the implementation of the scheme are defined.

As set out in the PNIP, our vision is ultimately that rural populations will 'exploit the economic potential of small-scale irrigation to increase incomes through productive and sustainable agriculture'. As this involves developing functional infrastructure that meets the needs of producers and local authorities, it was deemed necessary to offer guidance to stakeholders in the form of a handbook summarising tried-and-tested good practices in implementation, scheme development and produce value enhancement in the context of small-scale dams and other run-off water harvesting structures. This manual is the culmination of that process.

In addition to this good practice manual, we have also begun drawing up technical manuals on the minimum standards for each type of scheme, which will serve as indispensable tools.

Finally, I would like to take the opportunity to congratulate and thank all those who have contributed or lent their support to the planning and implementation of the PNIP in general, and to the production of this manual in particular.

I hope these good practices will prove widely informative and useful.

Table of contents

Abbreviations[1]

AMASSA	Malian Association for Food Security and Sovereignty
AOPP	Association of Professional Farming Organisations
APCAM	Permanent Assembly of the Mali Chambers of Agriculture
APEL	Support Programme for the Promotion of the Local Economy
AVAL	Programme for the Peaceful Management and Development of Areas and Farm Properties
CDDT	Centre for the Demonstration and Dissemination of Technologies
CIDA	Canadian International Development Agency
CIP	Interprofessional Committee
CIS	Controlled inundation scheme
CNAP	National Committee for the Approval of Projects
CPS/SDR	Planning and Statistical Unit for the Rural Development Sector
CPS/SEEUDE	Planning and Statistical Unit for the Water, Environment, Urbanism and State Sectors
CRA	Regional Chamber of Agriculture
CRAP	Regional Committee for the Approval of Projects
CROCSAD	Regional Committee for the Guidance, Coordination and Monitoring of Development Activities
CRRA	Regional Centre for Agricultural Research
CSA	Commissioner for Food Security
CSCRP	Strategic Framework for Growth and Poverty Reduction
DNA	National Directorate for Agriculture
DNGR	National Directorate for Rural Engineering
DNSI	National Directorate for Statistics and Informatics
DPD	Detailed preliminary draft
DRA	Regional Directorate of Agriculture
EWS	Early warning system
FaAO	Farmer apex organisation
FFS	Farmer field school
FMW	Farm maintenance workshop
FO	Farming organisation
FRP	Farmer resource person

1 the abbreviations used for Malian structures or initiatives have been kept in their French form, except where English equivalents are available and commonly used

GIS	Geographical information system
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German development cooperation)
GPS	Global positioning system
HAS	Hydroagricultural scheme
HLIW	Highly labour-intensive work
IER	Rural Economy Institute
IFAD	International Fund for Agricultural Development
IGA	Income generating activity
IICEM	Integrated Initiatives for Economic Growth in Mali
IPPM	Integrated Production and Pest Management
IPRO-DB	Small-scale irrigation in Dogon Country and the Bélédougou Region
ITD	Invitation to tender document
KfW	Kreditanstalt für Wiederaufbau (German Financial Cooperation)
LA	Local authority
MES	Monitoring and evaluation structures
MSP	Multi-stakeholder platform
NDVI	Normalised difference vegetation index
NGO	Non-governmental organisation
NSS	National security stock
OMA	Agricultural Market Observatory
OPAM	Office for Agricultural Production in Mali
PACT	Support Programme for Territorial Communities
PAIP	Support Programme for Small-scale irrigation
PASSIP	Support Programme for the Sub-Sector Small-scale Irrigation
PCDA	Agricultural Competitiveness and Diversification Programme
PDESC	Economic, Social and Cultural Development Programme
PLAR-IRM	Participatory Learning and Action Research for Integrated Rice Management
PMN/IPRODI	North Mali Programme/Small-scale irrigation in the Niger Inland Delta
PNIP	National Programme for Small-scale irrigation
PU	Pump unit
SADF	Sahel Areas Development Fund

SDD	Summary draft document
SI	Small-scale irrigation
SIB	Special investment budget
SRAT	Regional Scheme for Land-Use Planning
SRI	System of Rice Intensification
STD	Sexually transmitted disease
TC	Territorial communities
TFP	Technical and financial partners
VIS	Village irrigation scheme
WARF	West Africa Rural Foundation
WFP	World Food Programme

656 West African CFA francs = approx. 1 EUR

1 Capitalising on good practice

The small-scale irrigation sub-sector in Mali comprises dozens of projects/programmes funded in different ways by the Government of Mali, several technical and financial partners (TFPs) and numerous non-governmental organisations (NGOs). This wealth of programmes/projects generates a wide range of useful experience, knowledge and expertise each year that is not fully captured and exploited and is consequently often lost.

According to WARF/IFAD (2009), capitalisation is a process that aims to draw capital from the information and knowledge existing within an organisation (or country) and to increase their value by making them available to other institutions or actors. To capitalise on outcomes and lessons learned in the small-scale irrigation (SI) sub-sector, an initiative was launched in 2012 with the aim of:

- cataloguing the techniques and procedures that have delivered demonstrable positive outcomes to stakeholders;
- identifying techniques and procedures that constitute promising innovations and have the potential to become future 'good practice';
- kick-starting an exchange process among different stakeholders applying the same good practices but in different ways to ensure they are harmonised and adapted to different contexts;
- providing a concise and easily accessible directory of existing successful approaches that includes contact details of the organisations and resource persons able to provide more detailed information and supplementary documentation;
- focusing programme/project follow-up on areas where little information is curently available;
- acting as a bank of experiences that can inspire the development of training institution modules and curricula.

Good practices are not fixed concepts; rather, they must constantly be adapted to new socio-economic, political and environmental requirements. The intention is therefore to revise this good practice manual every five years to ensure it remains up-to-date and valid.

The manual is targeted at small-scale irrigation actors – particularly technical services, projects and programmes with the potential to develop their own good practices for use by others in the sector. The manual offers guidance to newcomers, helping them to identify existing successful practices. It will also serve to guide state and TFP services in their development of new programmes and projects. Lastly, this good practice manual will enable Malian actors to share their know-how with other countries within and beyond the sub-region.

2 Methodology

Good practices were identified during visits, carried out in 2012 by a team of two consultants, to governmental and non-governmental programmes/projects, technical services, research institutions and TFPs. Initially, the implementing bodies briefly wrote up the series of identified practices using a standardised template.

Each good practice description below provides details on the activity's objectives, implementation and operation, and interested readers can find out more about beneficiary localities. Information on the scope and duration of application indicates the practice's reach and level of maturity, while an overview of success factors and constraints highlights areas requiring particular attention. A description of the actors involved sets out the division of tasks among these parties. Information on effects and impacts, as well as on costs and cost effectiveness, provides greater insight into the benefits and negative outcomes of the practices. Where the relevant figures were not available, we have included a qualitative evaluation of these two elements. Each good practice entry also provides information on the sustainability of the project and the contact details of relevant resource persons.

At a national workshop held on 6 February 2012 in Bamako, representatives from programmes/projects and SI-related organisations carried out the selection process for the good practices. Selections were based on a range of criteria (scope of application, duration of application, costs and cost effectiveness, outcomes and sustainability) and on the extent of the workshop participants' experience.

3 Updating and disseminating the manual

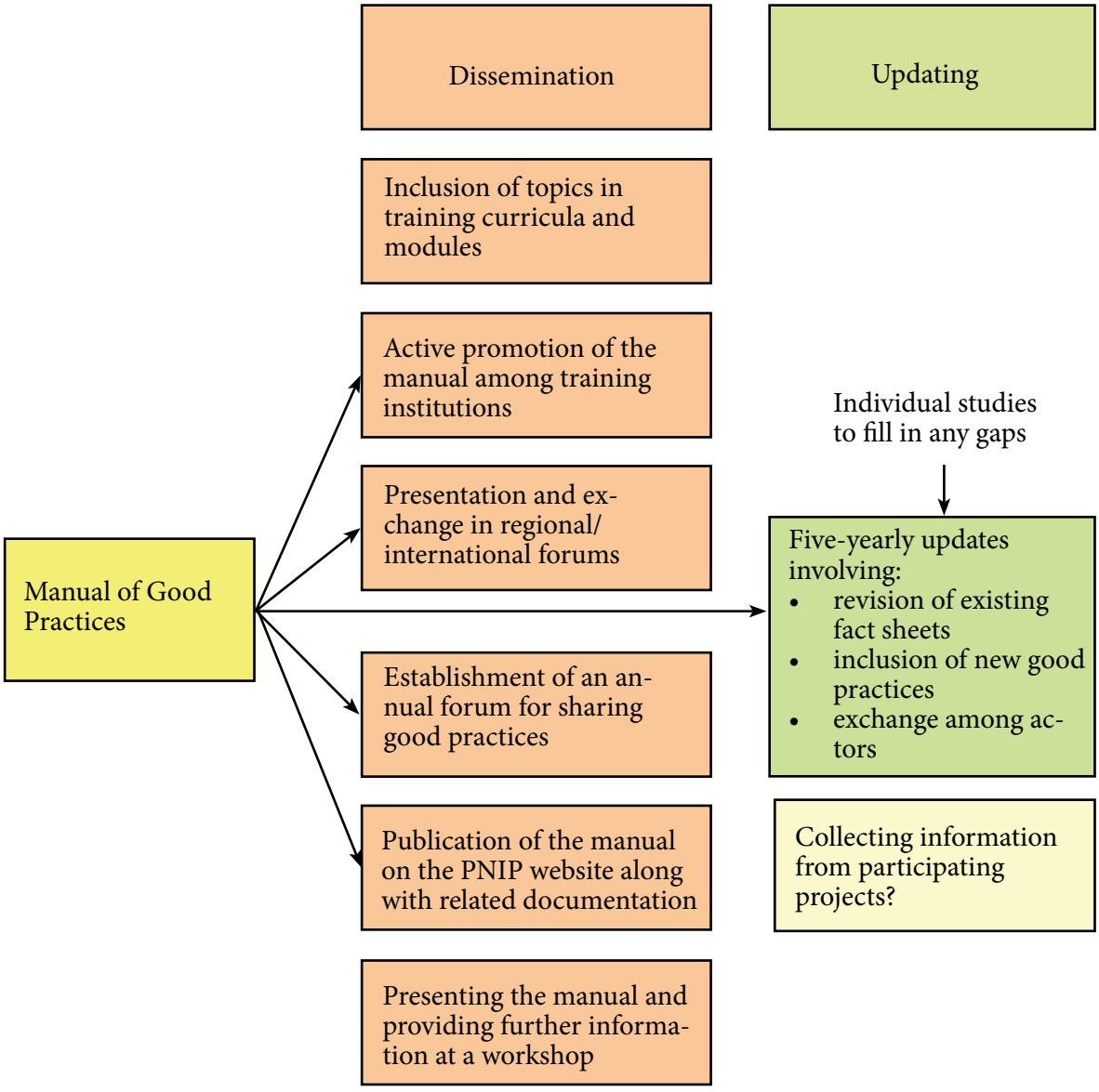
This is the first edition of the manual. Certain good practices have been described by a single organisation, although several organisations are adapting and applying them. It will therefore be necessary to specify requirements before drawing up more general descriptions in the next edition of the manual. The aim is to provide useful and clear descriptions that reflect the application of the good practice by different parties and offer possible options for use. The objective is not, however, to lay down a rigid, standardised structure for good practices, given that each practice must be adapted to local conditions.

The effects and impacts as well as the costs and cost effectiveness have, in most cases, been described qualitatively due to a lack of data. To take forward the initial capitalisation process and to ensure a broad reach and regular updating of information, the following stages are recommended:

- Follow up the capitalisation stage with a dissemination stage. Proposals for doing so include: (i) organising an information workshop involving all the actors to communicate the content, the contact details of persons with expertise in specific good practices, the means of accessing the manual, and the updating procedures; (ii) publishing the manual and all related documentation in a downloadable format on the websites of PNIP and other SI actors; (iii) establishing an annual exchange forum that brings together actors interested in good practice (this forum can be held prior to the PNIP Technical Committee Meeting at which the outcomes of the forum will be communicated); (iv) presenting the manual at regional and international workshops to share Mali's experiences with those of other countries; (v) approaching training institutions and investigating ways of including good practices in their training modules and curricula in order to promote good practice in profesional development.

- Update the manual every five years by revising the description of existing practices and investigating whether any new practices have been taken up in the sector. In order to prevent the loss of information relating to good practices when programmes/projects come to an end, it is recommended that a lead unit be designated within PNIP's monitoring and evaluation service that will take charge of uploading the capitalisation documents, guides, manuals and other documents relating to each programme/project onto the PNIP website.

Figure 1: The process of finalising, disseminating and updating good practices



4 Good practices

According to the PNIP, good practices can be classified according to four categories (Table 1):

1. practices related to the planning of irrigation schemes prior to implementation;
2. scheme implementation;
3. the development of schemes using agronomical techniques, management systems
   and production financing practices;
4. the preservation, processing and marketing of products derived from the SI scheme.

It should be remembered that PNIP's end goal is the sustainable exploitation of irrigation schemes to improve nutrition, food security and revenue growth. Naturally, this improvement goes hand in hand with the application of good practices at each stage of implementation, namely from planning and implementation to development and marketing.

This being the case, a good practice technique (installing a micro-dam, for example) is not an end in itself; it must be accompanied by a participatory planning approach, which means all key actors must be involved in the development, management and maintenance of the infrastructure from the outset.

In order to ensure the sustainability of irrigation schemes, it is important to combine inclusive planning with joint implementation to deliver a system that empowers beneficiaries and makes their participation at each stage of the scheme's development worthwhile.

Table 1 lists the good practices according to the four categories mentioned above. At the end of this document, the good practices are tabulated according to the actors responsible for their implementation in order to facilitate contact with resource persons able to provide further information.

Table 1: Summary of validated good practices

1) Planning	2) Installing small-scale irrigation infrastructure	3) Developing small-scale irrigation schemes	4) Preserving, processing and marketing
1. Participatory approach to small-scale irrigation 2. Geographic concentration of small-scale irrigation schemes 3. Identifying and prioritising scheme sites using a territorial, multi-stakeholder approach 4. Delegated cooperation between donors 5. Creating scale models for the development of lowland areas and the participation of the farming community 6. Using modern technologies in the design of small-scale irrigation schemes and in their monitoring and evaluation	7. Lining irrigation channels 8. Village irrigation schemes devel oped using the PMN/IPRODI approach 9. Earth embankment dams 10. Dams with water-spreading weirs 11. Masonry micro-dams 12. Cyclopean concrete micro-dams 13. Diversifying women's income streams through market gardening 14. Deepening the channels supplying water to lakes and ponds 15. Administering the process of implementing a small-scale irrigation scheme	16. System of rice intensification 17. Developing lands adjacent to small-scale irrigation schemes 18. Using organic fertilisers on small-scale irrigation plots 19. Integrated Production and Pest Management (IPPM) 20. Introducing tomato varieties through succession planting 21. Promoting bourgou growing 22. Combining agroforestry and gardening to rehabilitate lands that have been left barren 23. Irrigation using a Californian network 24. Fish farming as a way of adding value to dam schemes 25. Participatory Learning and Action Research for Integrated Rice Management (PLAR-IRM) 26. Delegating the management of facilities to users 27. Developing professional standards in the installation, maintenance and management of pump units 28. Centre for the Demonstration and Dissemination of Technologies (CDDT) 29. Local agreements on the management of small-scale irrigation facilities 30. Public audits as a civil oversight mechanism for project implementation 31. Meeting the differing needs of farmers in a given lowland area: local-level agreements and conventions 32. Locally sourced farming trainers: the farmer resource persons system 33. Awareness raising on sexually transmitted diseases 34. Guaranteeing loans taken out by growers 35. Agricultural credit and start-up funding for small-scale irrigation cooperatives	36. Ventilated storehouses for highly perishable produce 37. Using gas dryers to process animal and vegetable products 38. Feeder roads to transport produce 39. Establishment and support of coordination platforms for commune and private sector collaboration 40. Deploying technology as a means of providing economic support to producers 41. Temporary buying-in system for rice 42. Warrantage (inventory credit system) 43. Bulk sales approach for farmer apex organisations (FaAO) 44. Grain exchanges

4.1 Good practices in planning

4.1.1 Participatory approach to small-scale irrigation

Mamadou Gallo KONE, Ralf SCHNEIDER, Abass OUOLOGUEM – IPRO-DB

Objectives

The participatory approach to small-scale irrigation (SI) ensures skills and expertise are transferred to scheme beneficiaries and other stakeholders. This enhances the value of investments and the sustainability of installations..

Definition and description of the good practice

Direct beneficiaries (villagers) and indirect beneficiaries (technical services, communes) are involved before, during and after the installation of irrigation systems in order to ensure the sustainability of the schemes and a long-term return on investment.

Implementation and operation

Firstly, all the actors involved in the schemes are identified. Beneficiaries' concerns are taken into account and the participation of relevant actors is ensured throughout the process.

Implementation locations

IPRO-DB pursued the approach in the following locations:

- Sonikegny village, Kambila Commune (third-level, local administrative unit);
- Nonkon village, Nonkon Commune;
- Kénékolo village, Nossombougou Commune;
- Sognébougou village, N'Tjiba Commune;
- Tienko village, Nonkon Commune;
- Tiembougou village, Kolokani Commune;
- Korkabougou village, Kolokani Commune;
- Bamabougou village, Tioribougou Commune

Scope of application

The approach was implemented in eight villages with a combined population of around 9,240 people. The schemes cover a total area of around 766 hectares of farmland.

Duration of application

Since 2005

Success factors and constraints

The following factors are essential when applying this approach:

- the commitment of beneficiaries to engage in the project approach;
- an explicit request made by beneficiaries for the scheme in question;
- an agreement to relay the content of meetings to all beneficiaries;
- an awareness of potentially significant constraints such as property issues, a lack of villagers available to provide labour, and the payment of financial contributions.

Roles of the actors involved

- **The support structure (IPRO-DB)** offers assistance in identifying the actors to involve, organises meetings, monitors information events for villagers (known as restitution sessions) and provides financial support.
- **The village committee** participates in all meetings, keeps villages informed, acts as an intermediary between associations, support structures and the community, and organises meetings.
- **Farmers' associations** constitute sources of information, identify needs, draw up bylaws, contribute labour and funds to activities and participate in decision-making in village councils.
- **Technical services** provide advisory support and constitute sources of information.
- **The commune** provides information, raises the awareness of the actors involved, invites beneficiaries to the exchange meetings, identifies the actors involved and approves villagers' requests.

Effects and impacts

The participatory approach facilitates understanding among the communes and the quick delivery of schemes requested by the commune. The labour and financial contribution provided reduces the investment costs of schemes. The likelihood of possible conflicts is reduced.

Costs and cost effectiveness of the good practice

The only costs incurred relate to catering and venue charges for the training workshops and study trips. The cost of participating in study trips remains very low, except in cases where there is no local village with expertise in the subject in question.

Assessment of investment cost per unit:	Low	☒	Average	☐	High ☐
Rating of cost effectiveness:	Low	☐	Average	☐	High ☒

Sustainability

The participatory approach enhances the sustainability of investments, while the cost of participation remains low. The prevention and management of conflicts, the commitment of beneficiaries to schemes and the uptake of construction and management techniques by beneficiaries are all factors that contribute to sustainability.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
IPRO-DB Bélédougou	Mamadou Gallo KONE	gallokone@yahoo.fr
IPRO-DB Bélédougou	Ralf SCHNEIDER	ralf_schneider5@hotmail.com
IPRO-DB Bélédougou	Abass OUOLOGUEM	ouologuemabass@yahoo.fr

Reference documents

None

4.1.2 Geographic concentration of small-scale irrigation schemes

Huub MUNSTEGE, Matthias KLIEWE, Pierre GUIROU, Yehia Ag Mohamed ALI / PMN/IPRODI

Objectives

The objectives of the method are:

- to ensure the sustainability of investments;
- to attract goods and services (inputs, mechanical services);
- to deliver economies of scale;
- to attract major rice-procuring clients;
- to facilitate the propagation of good practices;
- to reduce project operation costs (travel, logistics);
- to select and adapt technologies according to the environmental, socio-cultural and economic contexts of localities and sites.

Definition and description of the good practice

Geographically concentrating schemes requires the identification of more or less homogenous production areas. Scheme development is then concentrated in these areas over a given period in order to generate economies of scale: buying in large quantities of inputs secures a better price, large-scale wholesalers are more interested in buying the produce, maintenance services can operate economically, and trade among producers is intensified ('positive jealousy'). Measures to open up these areas (ferries, landing strips, etc.) become more cost effective, as do project operations.

Implementation

- Set up a study looking at the area's potential.
- Hold a meeting to plan schemes.
- Draw up a list detailing the areas where schemes will be concentrated, with programmes in two-year phases (around 50-200 small-scale irrigation schemes in an area of concentration).
- Ensure each area is entrusted to a single planner

Operation

Not applicable

Implementation locations

- Implementation in the circles (second-level administrative units) of Youwarou, Niafunké, Timbuktu, Goundam, Diré and Gourma-Rharous

Scope of application

Five areas of concentration

Duration of application

Since 2000

Success factors and constraints

- The availability of financial means
- The mobilisation of local people, elected representatives and persons of note
- The availability of planners
- The opening up of areas (ferries)

Roles of the actors involved

- ***The project*** is responsible for the coordination of planning activities.
- ***Persons of note and elected representatives*** undertake planning activities.
- The ***beneficiaries*** carry out the highly labour-intensive works.
- ***The planner*** guides the beneficiaries and implements the schemes.

Effects and impacts

- Reduction in project costs (travel, etc.)
- More attractive goods and services (merchants, maintenance, inputs)
- Greater cost effectiveness of measures to open up areas

Costs and cost effectiveness of the good practice

Assessment of investment cost per unit:	Low	☒	Average	☐	High ☐
Rating of cost effectiveness:	Low	☐	Average	☐	High ☒

Sustainability

The concentration approach contributes to the sustainability of investments.

Organisation, resource person and contact details

Nom de la structure	Nom de la personne	Contact email
PMN/IPRODI	Yehia Ag Mohamed ALI	yehia@afribonemali.net
PMN/IPRODI	Matthias KLIEWE	yehia@afribonemali.net
PMN/IPRODI	Pierre GUIROU	pierreguirou@yahoo.fr
PMN/IPRODI	Huub MUNSTEGE	hmunstege@yahoo.com

Reference documents

None

4.1.3 Identification and prioritisation of scheme sites using a territorial, multi-stakeholder approach

Safiatou DIALLO / HELVETAS - Swiss Intercooperation

Objectives
The desired objectives are to identify the priority actions for investment that have been agreed by local actors within the framework of the pastoral scheme, and to develop lowland areas. This joint approach ensures investments are more relevant and well founded.

Definition and description of the good practice
The approach aims (i) to ensure that all actors involved in developing lowland areas participate in the planning process and (ii) to prepare the ground for the self-management of the lowland scheme from the outset of the process. The goal is to gear the identification and prioritisation processes for schemes being carried out by local authorities (regional council, intermunicipal body, circle) towards the actual needs of local people. This is achieved by preparing actors and organising multi-stakeholder meetings so that the visions of the different parties can be aligned in an inclusive way.

Photos 1a and 1b: Elected representatives and the active stakeholders from the circle prioritise investments using an inclusive approach.

Source : HELVETAS – Swiss Intercooperation

Implementation
At the beginning of the process, the terms of reference (ToR) and data collection sheets are drawn up and presented to all the actors to ensure they are equally informed and to demonstrate the relevance of the approach across the regional council. The first workshop promotes a common understanding of the objectives and outcomes of the good practice.
Data on actual investment needs is collected by the commune (using data collection sheets) from actors in each village.

An initial proposal for the identification and prioritisation criteria for scheme sites is put together by the regional council and its staff. The criteria are submitted for the approval of local actors in forums organised at the circle level with the support of the technical services. On this basis, the actors from each circle identify the sites that offer the greatest potential from among the development projects undertaken by communes in the area in the context of their development programmes. Local authorities are then tasked with ensuring the supervision of the development process and the management of works and developed land.

At the prioritisation workshop, each commune in the circle takes turn presenting and making the case for its completed data sheet to the plenary group, followed by a Q&A session. A select committee is then set up that completes the matrix project-by-project and then carries out the prioritisation in accordance with the agreed criteria. A moderator facilitates the exchanges between participants.

Operation

Actors are mobilised under the leadership of the circle council. A commitment to communicate and provide information about the objectives and results of the prioritisation process helps ensure all actors buy in to the process. Each commune is tasked with gathering in its community's investment requirements. Communes are issued with data collection sheets for use in villages that have requested schemes. A facilitation team then collects the data and completes the sheets, which are forwarded to the commune prior to the circle workshop.

The two-day workshop brings together representatives from the communes benefiting from investment projects, socio-professional apex organisations, the circle council, technical services, the supervisory body and certain supporting organisations.

The summary data sheets are forwarded to the prioritisation process select committee. Following a first sift based on predefined criteria, the select committee judges the commitments and budgets of each and allocates scores for each criteria ranging from zero to five.

Example: Koutiala Circle

Compulsory criteria (initial selection stage)

1. Absence of land ownership disputes
2. Membership of PDESC
3. Opening up the area – distance to a road or track that is accessible in all seasons
4. The number of beneficiaries
5. Farming of lowland areas – area of farmed land in relation to the possible farmable area

Optional criteria (second-stage sift for projects that have cleared the initial stage)

1. Diversification – number of products or farms
2. Gender – number of women in relation to men
3. Capacity of actors to contribute

Implementation locations

This practice was implemented in the four circles participating the AVAL programme: Kadiolo, Sikasso, Yorosso and Koutiala.

Scope of application

The practice led to the identification of around 10 priority investment sites in each of the four circles concerned. The sites are agricultural (dams, ponds) or pastoral (rangeland, cattle market, route marking).

Duration of application

The practice has been in operation for four years (since 2009).

Success factors and constraints

It is essential to prepare thoroughly before beginning work: criteria must be clear and relevant; communes must describe and document their scheme propositions and back them up with appropriate arguments; and moderation teams must be objective.

Ensuring actors are informed is a major factor for success: all parties have the right to timely information. Elected representatives must have a good understanding of their roles within the context of decentralisation and rural sector development; communities must be closely involved in the process. Inclusive participation requires the involvement of actors across the board.

A major constraint in delivering this practice is the requirement that territorial communities (TCs) contribute their own funds, as this forms part of the selection criteria

Roles of the actors involved

- **The regional council** initiates the process, defines the identification and prioritisation criteria, undertakes the regional consolidation of projects for delivery at the local level and acts as mediator between communities.
- **The circle councils** organise the information and consultation workshops and the decision-making/prioritisation workshop, and they set up the moderation team with the support of technical services.
- **Communes** pre-select projects at the commune level, assessing them in terms of their relevance to PDESC and the criteria put forward; they ensure data collection sheets are completed in collaboration with beneficiaries, and they take part in the prioritisation process by making the case for their projects.
- **The support structure** (AVAL) provides training and advisory support to actors.
- **Technical services** provide technical support and make sure activities are coherent and in line with national programmes.
- **Consultants** facilitate the process and train the actors.

Effects and impacts

Each actor comes to understand their importance as part of the implementation of the investment programme. Moreover, strong levels of community engagement are seen to arise. Investment decisions and funding awards are not carried out in secret deliberations or project offices. The links between the different levels in local authorities are reinforced and a shared development vision is jointly owned by all actors.

Costs and cost effectiveness of the good practice

A two-day workshop with 75 participants costs approximately 1,500,000 CFA Francs (including consultant fees and workshop organisation costs).

Costs and cost effectiveness of the good practice

Assessment of investment cost per unit:	Low	☐	Average	☒	High ☐
Rating of cost effectiveness:	Low	☐	Average	☒	High ☐

Sustainability

The planning capacity of local authorities is strengthened, and this expertise in the planning process can be applied to other sectors. The inclusive approach and the local availability of facilitation skills are factors that make the practice sustainable. When outcomes are accepted by all actors, the uptake and sustainability of the practice become more likely. The moderate costs also help towards making this practice sustainable. The results of the initiative are used for three years by the programme.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
HELVETAS Swiss Intercooperation/ AVAL Programme	Safiatou DIALLO	safiatou.diallo@helvetas.org

Reference documents

HELVETAS Swiss Intercooperation (2009), Rapport du forum de priorisation des investissements hydro-agricoles et pastoraux. [Report of the hydro-agricultural and pastoral investment prioritisation forum]

HELVETAS Swiss Intercooperation (2010), Convention du partenariat local des cercles de Kadiolo, Sikasso, Koutiala, Yorosso. [Local partnership agreement between the Kadiolo, Sikasso, Koutiala and Yorosso circles]

4.1.4 Delegated cooperation between donors

Jan JAKOBIEC, Simon BOIVIN, Mamadou DIARRA – CIDA

Objectives

Delegated cooperation can reduce transaction costs in development cooperation (pooling funds) and improve aid effectiveness. In effect, it enables each of the development bodies to better exploit their own comparative advantage. This approach is equally advantageous for the beneficiary who then has fewer contacts to manage.

Definition and description of the good practice

The term 'delegated cooperation' describes the process whereby a development body (the 'agent') is authorised to act on behalf of one or more other bodies (the 'principals'). The nature and extent of delegated functions vary and can just as well relate to a single component in a project cycle (for example, a review process) as to an entire sector programme, or even to the whole programme for a particular country.

This delivery approach is in line with the new modalities (Paris Declaration) that aim to make aid more effective.

In Mali, this approach is also consistent with the common country assistance strategy that, in particular, specifies the main levers that the TFPs operating in Mali use to support the implementation of government development priorities, such as the Framework for Strategic Growth and Poverty Reduction (CSCRP). Canada, like Germany, subscribes to this approach, as it encourages the alignment and harmonisation of aid in accordance with the comparative advantages of each partner.

Implementation

Following consultations with the Government of Mali and TFPs operating in the farming sector in general and the small-scale irrigation sector in particular, German cooperation devised a project which was put forward to Canadian cooperation and then approved by the respective competent authorities. Parties then negotiated the terms of the funding in accordance with the administrative practices of Canadian and German cooperation.

Project activities are implemented in line with German cooperation practices and areas of expertise. Meetings and regular communications, as well as joint follow-up missions, have also featured in the project's implementation.

Operation

Bilateral aid bodies are increasingly using this delegated cooperation method. It is important to use this approach only when the expected benefits outweigh the costs of its application and in ways that foster, rather than hinder, partner governments' ownership of the development process.

Delegated cooperation methods must be compatible with the partner's strategy on combating poverty or any other equivalent framework of reference. Furthermore, they must foster, rather than hinder, the capacity building of partner countries and strengthen government accountability to its citizens. The level of preparation required for a delegation mechanism must be proportional to its scope and nature. To be effective, delegation mechanisms must be carefully designed; however, the level of detail required will be based on the nature and scope of the mechanism.

Full advantage should be taken of each bilateral donor's individual strengths. Donors and partner countries can considerably reduce costs and often make savings by delegating responsibilities to lead donors that possess a comparative advantage in a country or sector, or in certain areas of work. Delegation options can vary from one donor group to another depending on the partner country in question.

Implementation locations
The regions of Timbuktu and Mopti (Dogon Country) in Mali

Scope of application
The initiative itself – the Support Programme for Small-scale irrigation (PAIP) – has benefited from a financial contribution of 20 million Canadian dollars or approximately 14 million euros. The resources allocated have made it possible to fund specific activities with the aim of developing knowledge and tools, coordinating the development of small-scale irrigation and strengthening the Ministry of Agriculture (section 1), as well as building production and marketing infrastructure (section 2). To ensure activities are appropriately implemented, financial resources are also earmarked for management and technical training (section 3).

The main section (part 2) allowed the following activities to be carried out:

- In the Timbuktu region, in conjunction with other planned German cooperation activities, 77 village irrigation schemes (VISs) with an average area of 40 hectares (totalling 2,720 hectares) were built, 17 floodplain-depression ponds known as mares (each averaging 200 hectares, making a total of around 3,400 hectares) were created and four storage facilities with capacities of 50 tonnes per unit were also built.
- In the Mopti region, six micro-dams were built and 68 kilometres of rural road were rehabilitated.

The populations of these two regions, particularly women and young people, will benefit from increased production and improved accessibility. More than 1,700 families – a total of more than 25,000 people – have been directly affected by the project.

Duration of application
Four years: from 2009/10 to 2012/13

Success factors and constraints

For the lead donor

Principal donors must have the opportunity to examine the policies, procedures and systems involved in the framework of a delegated cooperation mechanism. The expectations of principal donors must be fully understood and respected by the lead donor. The lead donor must thoroughly evaluate the feasibility of meeting these expectations. Having considered potential external constraints, each party (lead donor and principal donors) must demonstrate the highest possible degree of flexibility in order to adopt the procedures of partner countries or, failing that, procedures common to all donors.

Partner countries must be involved in the decision-making process for any envisaged delegated cooperation mechanism. Partner countries and other interested parties, particularly other donors, must be informed about the nature of these mechanisms. Existing agreements, particularly provisions agreed between donors on consultation and notification, must be respected. The principles of transparency, trust and flexibility have made it possible to adapt to Mali's changing circumstances in recent years and to achieve the project's desired outcomes.

For a principal donor

It is necessary to evaluate the lead donor's policies, systems and procedures when they are considered to be key to the success of the delegated cooperation mechanism under consideration. Realistic expectations of the lead donor must be clearly set out with regard to their role in discussions on what measures to undertake and on reporting, monitoring and consultation. The

principal donor must demonstrate the highest possible degree of flexibility, in consideration of the external constraints faced, in order to adopt the procedures of partner countries or, failing that, procedures common to all donors.

Partner countries must be consulted on any envisaged delegated cooperation mechanisms. The principal donor must inform partner countries and other interested parties, particularly the other donors, of the nature of these mechanisms. They must respect existing agreements and, more specifically, communicate with the partner country via the lead donor on matters for which competence has been delegated.

The principles of transparency, trust and flexibility have made it possible to adapt to Mali's changing circumstances in recent years and to achieve the project's desired outcomes.

Roles of the actors involved

The form and intensity of this kind of cooperation can vary substantially depending on the context and the organisations already operating in the sector. In the present example (PAIP), the implementation of the Canadian financial contribution was wholly managed by the German party (GIZ). As far as the management was concerned, it was agreed that, for the technical aspects of this project, GIZ would act as CIDA's representative in dealings with the Malian authorities. A consultation mechanism was developed so that CIDA could monitor the progress of GIZ's Support Programme for the Sub-Sector Small-scale irrigation (PASSIP), which PAIP has signed up to.

With regard to political dialogue, CIDA and German cooperation are both participating in sectoral and thematic groups on development aid coordination in Mali. This includes different sectoral and thematic groups linked to the farming sector. The two actors work independently on all activities relating to large- and medium-scale irrigation schemes, just as they do in the rural development sector in general. However, they are committed to and actively participate in efforts to coordinate, consult on and reach common ground with the positions of TFPs and with the Government of Mali.

Effects and impacts

It is still too early to be able to discuss results.

Costs and cost effectiveness of the good practice

These will be evaluated at the end of the project.

Sustainability

Difficult to evaluate at this stage of the project

Organisation, resource person and contact details

Organisation name	Contact name	Email address
Canadian cooperation	Jan JAKOBIEC Simon BOIVIN Mamadou DIARRA	jan.jakobiec@international.gc.ca simon.boivin@international.gc.ca mamadou.diarra@uapmali.org
German cooperation	Hilke ROEDER	hilke.roeder@giz.de

Reference documents

DAC-OECD, Harmonising Donor Practices for Effective Aid Delivery – Good Practice Papers

4.1.5 Creating scale models for the development of lowland areas and the participation of the farming community

Maïga Rosaline DACKO, Lassana KEITA, Idrissa GUINDO – HELVETAS Swiss Intercooperation (San Hub)

Objectives

The purpose of creating three-dimensional models when developing lowland areas is to encourage the different actors involved to enter into negotiations and participate in decision-making on the design and farming of a lowland area, taking into account the different interests involved.

Definition and description of the good practice

Scale models are an instructional tool that can be used to ensure a common understanding of the characteristics of the lowland area to be developed, give concrete expression to the baseline scenario, and facilitate discussion of the different technical options for the development. Depending on the case at hand, the model shows flooded areas, forested areas, housing, areas given over to pasture or cultivation and the type of scheme that has been chosen with the beneficiaries. Ultimately, a wooden 3D version of the model is produced that is around 80 x 120 centimetres in size.

The model is a visual aid that improves communication between the different actors involved and the technical designers during the planning process and development of the lowland area (communities, design agencies and businesses tasked with implementation, etc.). The model is a tool that helps to foster the actors' ownership of the process, the creation of a shared future vision of the development, and the collaborative management of schemes. It must, however, form part of an overall facilitation approach

Photo 2: Building a model

Photo 3: Discussing the model in the village

Source : HELVETAS – Swiss Intercooperation

Implementation

The model is one tool in the toolkit of lowland planning approaches. The process begins with the request by a community and/or local authority for a scheme. A brief for the development scheme is then drawn up jointly by those involved. The project itself starts with a socio-economic study carried out in accordance with the ToR submitted to the community. Approval for the choice of site is obtained in the course of the socio-economic study, which leads into a technical study based on the findings and the summary draft document (SDD). Study findings are fed back to villagers along with the selected scenario. A 3D wooden model is then produced on the basis of the findings and scenario. The other scheme implementation stages are carried out following approval (summary draft document – SDD, drafting of the tender documents – ITD, choice of contractor, works, approval of works completed). The model is subsequently used to move the farming and facility maintenance strategy forward. Two or three village facilitators, who are members of the management committee, are trained in how to handle the model during facilitation sessions.

Stages in creating a model

- Sketch mapping (involving farmers) and a topographical survey of the area
- Precise order placed with the model maker (specification)
- Provision of a quote by the model maker setting out the costs of the materials and services required (if necessary, a site visit is carried out with the model maker to work through the paper maps of the lowland area)
- Conversion of the paper maps to the actual scale of the model
- Production of the base unit with the basic relief (boards, plywood)
- Positioning of the technical features to be installed (facilities, roads, irrigated plots, ponds, etc.) and the addition of decorative elements (houses, trees, livestock)
- Production of a protective shipping case for the model

Operation

The model enables stakeholders to interpret the landscape and thus helps them in the decision-making process. It is used in consultation exercises to ensure transparency and consensual management in the implementation and evaluation of the scheme.

To use the model, all that is required is for it to be transported to the meeting/facilitation space, removed from its case and placed at table height or even on the ground. The facilitator then introduces the project, indicating the landmarks and cardinal directions. This serves as the basis for discussion.

Implementation locations

This tool has been used in the regions of Sikasso (Sikasso, Koutiala, Kadiolo and Yorosso) and Ségou (San and Tominian) for all the schemes delivered by HELVETAS Swiss Intercooperation.

Scope of application

In total, more than 25 models have been made.

Duration of application

To date, seven years

Success factors and constraints

Local people need to get to grips with the landscape and know how to orientate themselves in the space. The model maker must be well trained and have expertise in concepts of scale, contours and 'scale exaggerations'. They must have an artist's eye.

The approach must be participatory; it should not exclude any sector of society. In this respect, young people and women prove to be very good facilitators, with the model helping them to present the subject matter in a lively and engaging way.

Difficulties

Some experts from technical consultancies have the tendency to take over from the beneficiaries. Other public sector experts move things forward as quickly as possible and fail to take into account villagers' contributions. To ensure that people are not left frustrated and, as a result, participate less in the process, it is important to give them the opportunity to express their views.

Modifications may be required once the model is completed. Integrating these corrections can prove difficult (engaging the same provider and carrying out alterations without diminishing the appearance of the model).

Roles of the actors involved

- ***Beneficiaries*** formulate the request, describe and draw sketch maps of the landscape, and use the model in consultation exercises.
- ***The consultancy*** supports the design process, ensures the quality of on-paper designs for use in constructing the model, and acts as intermediary between the beneficiaries and the woodworker, particularly in terms of converting scales and proportions.
- ***The woodworker*** creates the model according to the plan.

Effects and impacts

The results are immediate and manifest as:

- reduced conflicts over farming the land in question;
- the immediate visibility of the land pattern and spatial issues;
- the involvement and motivation of local people in the design process;
- more inclusive decisions and the initiation of social dialogue on the scheme;
- an approach that is more engaging and accessible to all – even the shyest people are able to express themselves.

Costs and cost effectiveness of the good practice

Each model costs between 200,000 and 250,000 CFA francs.

Assessment of investment cost per unit:	Low ☐	Average ☒	High ☐
Rating of cost effectiveness:	Low ☐	Average ☐	High ☒

Sustainability

The model is tangible, durable and helps reduce social conflict. It also serves as a support for meetings with visitors. It is facilitated by villagers themselves.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
HELVETAS - Swiss Intercooperation	Maïga Rosaline DACKO	rosaline.dacko@helvetas.org
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HELVETAS - Swiss Intercooperation	Célestin Dembélé	celestin.dembele@helvetas.org

Reference documents

Intercooperation, Délégation au Sahel (n.d.): Capitalisation d'éxperience. Eau, terre, communautés. La maquette pédagogique transportable dans l'aménagement des bas-fonds. Un outil pour les practiciens. [Delegation to the Sahel (n.d.): Capitalising on experiences. Water, land, communities. The portable instructional model for developing lowland schemes. A tool for practitioners.]

Intercooperation, Délégation au Sahel (2009): Gestion des ressources naturelles: les acteurs s'engagent pour une gestion concertée et pacifique de leurs resources. [Delegation to the Sahel (2009): Management of natural resources – actors engage in the collaborative and peaceful management of their resources.]

4.1.6 Using modern technologies in the design of small-scale irrigationcultural schemes and in their monitoring and evaluation

Huub MUNSTEGE, Matthias KLIEWE, Pierre GUIROU, Yehia Ag Mohamed ALI – PMN/IPRODI

Objective

There is a common misconception that village irrigation schemes (VISs) and floodplain depression ponds (controlled inundation schemes – CISs) are rudimentary and, as such, only simple studies are required. This might be due to the fact that responsibilities for scheme planning, construction, exploitation and management are generally handed over to beneficiaries. In most cases, the community takes the lead in drawing up the scheme request and proposing a suitable site. In the construction phase, much of the work – namely, irrigation canal and drain excavation, and unskilled labour – is undertaken by the beneficiary community. The village also, of course, takes charge of managing farming in the area. Although this high level of farmer participation tallies with the objective of fostering ownership and empowering beneficiaries, it is nevertheless necessary to seek professional input and expertise in scheme design and works implementation to ensure they meet professional standards and deliver efficient and effective water management.

The VIS concept has been circulating in Senegal since the 1970s and in Mali since the 1980s (see Chapter 4.2.2 on VISs). The technologies described in that section were, of course, not available for the first generation of VISs some 30 or 40 years ago, or even in subsequent years. It was, however, possible to design, build and farm a fair-sized, efficiently irrigated scheme that would provide healthy rice yields. The technologies covered in the VIS chapter are tools for refining scheme design so as to make it more rational, efficient and effective. The impact of the proposed technologies manifests on two levels: firstly, they allow the team to handle 40 to 50 sites per year; secondly, the technologies are important tools for maximising the quality of the scheme while, at the same time, factoring in its very modest nature (in comparison with other schemes controlled outright). A high-quality scheme is a prerequisite for making water management efficient and reducing production costs. The aim of this chapter is to share with the readership the technologies that have been developed, deployed and partially validated by PMN/IPRODI over the 2010 to 2013 period.

Definition and description of the good practice

This practice involves applying modern technologies in the design, monitoring and evaluation of VISs and floodplain depression ponds. To summarise, it involves the following technologies and procedures:

- The application of total stations for topographical studies, which enables:
  - the creation of a digital model of the study area to facilitate the study of topographical characteristics, differences in levels, depressions, mounds, etc.;
  - georeferencing, which makes it possible to integrate the site and the proposed design into a geographic information system (GIS). This means other information sources like satellite imagery and aerial photography become available for use in the analysis.
- The use of a high-precision global positioning system (GPS) for installation works.
  Once the scheme's study and design are approved, the use of high-precision GPS means that work to install the scheme will be

particularly precise and will adhere to the irrigation and drainage network configuration as designed and approved in the scheme studies.

- The use of georeferenced photography for monitoring and inspection. The programme has begun using georeferenced photographs to enable teams to inspect and supervise installations in situations where conditions for accessing sites are unfavourable. These photographs show the installations and display the data recorded for each shot, allowing dates and locations to be checked.
- The use of satellite imagery (Landsat).
  A primary application of Landsat is to monitor and evaluate the farming activities of sites. Using the images, the value of the normalised difference vegetation index (NDVI) can be determined. With this indicator, it is possible to verify in which areas VISs are operational. Furthermore, the Landsat images improve analyses during the design stage, providing information on specific events such as heavy flooding or very low water levels.

In the following paragraphs, we present each of these procedures or technologies.

Total stations

The total station, also called an electronic tacheometer, is an electronic theodolite that measures angles and distances with precision laser beams. A station is also equipped with sufficient memory to run programmes and record measurements, coordinates, and points and lines. It requires a reflector to measure distances. Total stations have replaced traditional theodolites and optical levels.

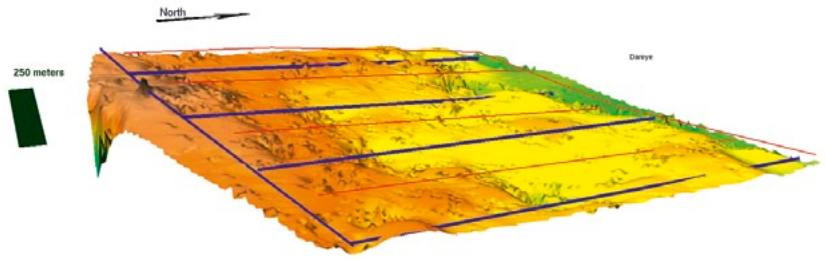
A total station can take a reading in less than five seconds and measure a distance of up to three kilometres. This stands in contrast to taking readings with optical levels, which can easily take over a minute and are limited to less than 150 metres of measurable distance. Nearly all total stations can be integrated into a GPS system. This opens up the possibility of generating georeferenced data. The x and y coordinates of a topographical survey are thus compatible with a GIS coordinates system (be it UTM or WGS-84). It is therefore possible to integrate the data from a topographical survey.

Since 2011, 80% of development surveys under PMN/IPRODI have been conducted with the support of a total station and the programme has drawn up a manual on how to use the software. In the following figures, we will demonstrate the new opportunities this offers in the context of scheme design analyses.

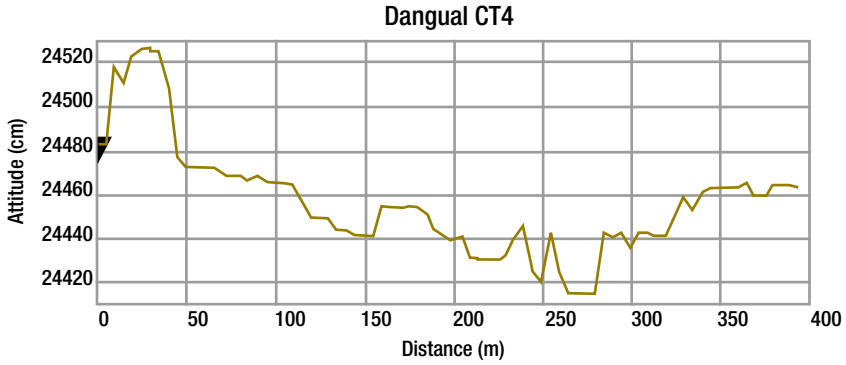
Photo 4: Topographical survey of a village irrigation scheme

The topographical survey of Saka VIS integrated in the GIS using the QGIS software package. The background 'Bing Aerial' image makes is possible to assess certain land characteristics.

Contour lines on the topographical survey of Ewet VIS



The 3D visualisation of the site and the proposed design for Dareye VIS



The topographical survey makes it possible to generate a digital model of the terrain (see the previous figure's 3D visualisation). Quite detailed longitudinal profiles can be created on this basis, and the work sites and excavations can be set up precisely.

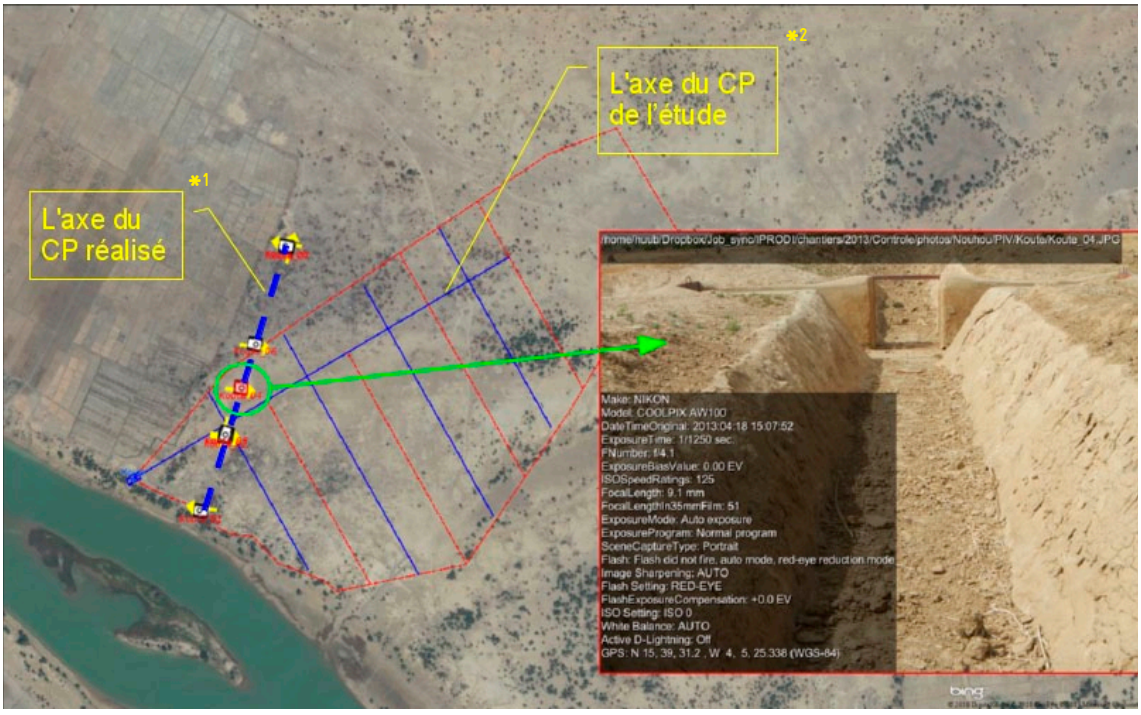
The above graph profiling the Dangual tertiary canal is taken from the digital model of the terrain generated using the Grass software package. Importing the data (CSV format) into a spreadsheet package (such as Calc or Excel) makes it possible to precisely determine the different measurements (water, floor of the canal, scheme threshold, etc.).

Source : Mali-Nord / IPRODI

The role of GPS in installation

The precision achieved by using the total station for design work is worthless if the installation of the scheme is not carried out precisely. Checks using georeferenced photographs have, in some VISs, revealed major gaps between the approved design and its actual installation. In the figure below, we can see that the axis of the main canal dug (represented by the line between the yellow symbols) differs substantially from the axis of the canal in the plan.

Photo 5: Imprecise installation



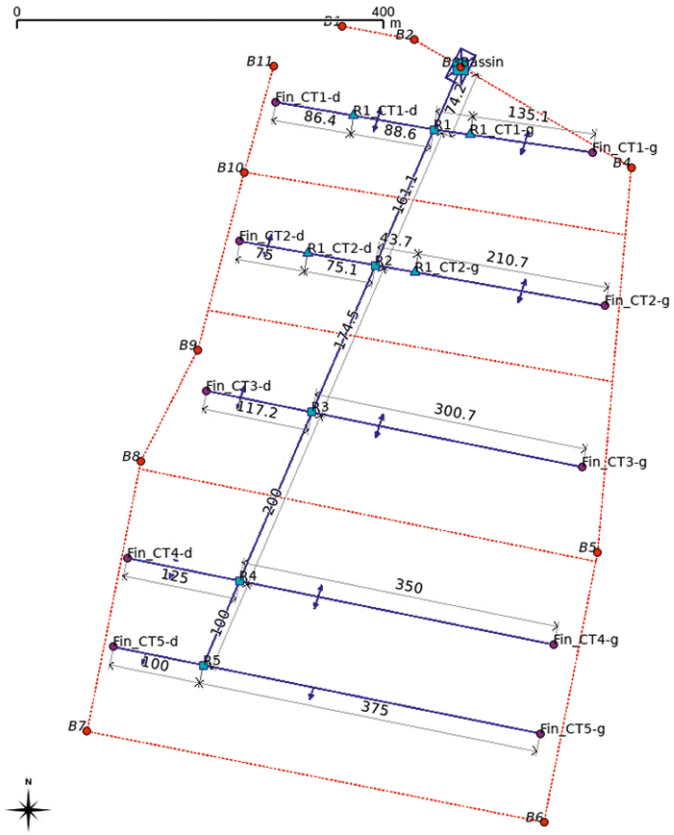
*1 The axis of the installed main canal

*2 The axis of the planned main canal

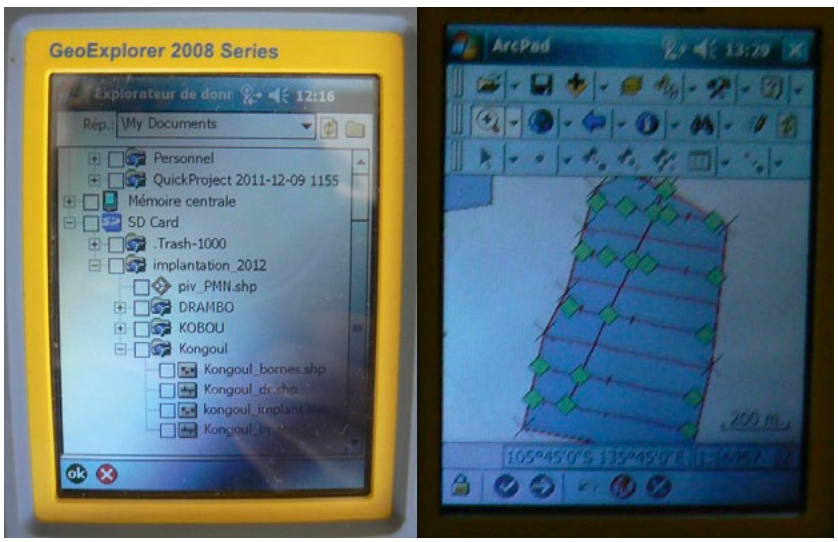
These kinds of inaccuracies are generally the result of either (a) on-the-ground changes or improvisations or (b) imprecise installation due to failures to locate ground markers or a lack of precision equipment. In order to ensure installations comply with their approved designs, the programme has begun testing high-precision GPS equipped with a GIS device, which allows all the relevant installation positions to be included. In this way, it is possible to install schemes without having to rely on ground markers and with the precision offered by GIS (discrepancy of less than 0.5 metres).

Photo 6: Using high-precision GPS

The Trimble GeoXM, running the ARCPAD software package and with SD memory card



GIS visualisation (using QGIS) of a scheme and the siting of works. It comprises different layers representing the irrigation system, the drainage system and the structures.



The different layers can be imported into the ARCPAD software on the Trimble.

Source : PMN/IPRODI

It was impossible to test this technology on the ground in Mali because of the violence that broke out in 2012.

Georeferenced photographs

Previously in this chapter we discussed one application of georeferenced photographs. Given the impossibility of undertaking missions on the ground in Mali, the programme used and tested other means of monitoring and supervision. Although these approaches cannot take the place of field visits, they do make it possible to undertake a minimum level of monitoring, even in the currently difficult conditions prevailing in Mali.

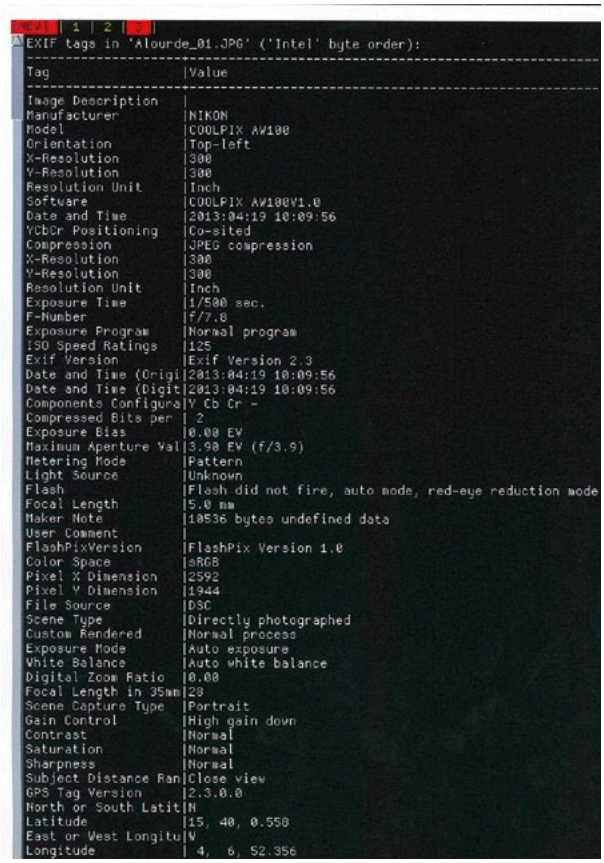
Using a digital camera equipped with a GPS device, it is possible to record the coordinates of the camera when the shots are taken. The coordinates are saved on an 'Exif' file (see the example of an Exif file output below) together with all the camera functions and settings enabled at the time the shot was taken.

PMN/IPRODI has developed a procedure that integrates the photos into GIS. The different stages in this process are set out in the following figures.

Photo 7: Adding georeferenced photographs to a GIS

The model used by the programme.

It is important to ensure the GPS function is activated.



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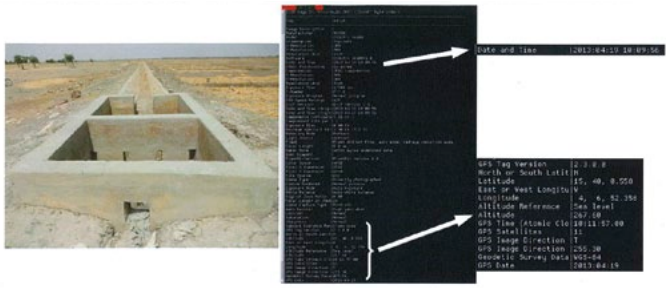
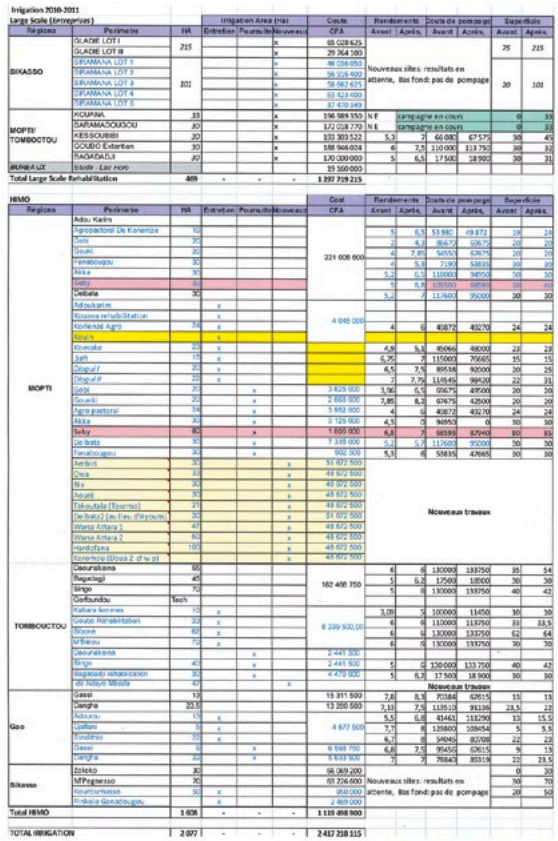
EXIF tags in 'Alourde_01.JPG' ('Intel' byte order):
-----------------------+--------------------------------------------------------
Tag                    |Value
-----------------------+--------------------------------------------------------
Image Description      |
Manufacturer           |NIKON
Model                  |COOLPIX AW100
Orientation            |Top-left
X-Resolution           |300
Y-Resolution           |300
Resolution Unit        |Inch
Software               |COOLPIX AW100V1.0
Date and Time          |2013:04:19 10:09:56
YCbCr Positioning      |Co-sited
Compression            |JPEG compression
X-Resolution           |300
Y-Resolution           |300
Resolution Unit        |Inch
Exposure Time          |1/500 sec.
F-Number               |f/7.8
Exposure Program       |Normal program
ISO Speed Ratings      |125
Exif Version           |Exif Version 2.3
Date and Time (Origi|2013:04:19 10:09:56
Date and Time (Digit|2013:04:19 10:09:56
Components Configura|Y Cb Cr -
Compressed Bits per  | 2
Exposure Bias          |0.00 EV
Maximum Aperture Val|3.90 EV (f/3.9)
Metering Mode          |Pattern
Light Source           |Unknown
Flash                  |Flash did not fire, auto mode, red-eye reduction mode
Focal Length           |5.0 mm
Maker Note             |10536 bytes undefined data
User Comment           |
FlashPixVersion        |FlashPix Version 1.0
Color Space            |sRGB
Pixel X Dimension      |2592
Pixel Y Dimension      |1944
File Source            |DSC
Scene Type             |Directly photographed
Custom Rendered        |Normal process
Exposure Mode          |Auto exposure
White Balance          |Auto white balance
Digital Zoom Ratio     |0.00
Focal Length in 35mm|28
Scene Capture Type     |Portrait
Gain Control           |High gain down
Contrast               |Normal
Saturation             |Normal
Sharpness              |Normal
Subject Distance Ran|Close view
GPS Tag Version        |2.3.0.0
North or South Latit|N
Latitude               |15, 40, 0.550
East or West Longitu|W
Longitude              | 4,  6, 52.356
```

All digital images are saved in an Exif file that contains all the configuration data for the camera at the time the shot was taken.



PMN/IPRODI uses the following procedure: extract the required data and then import this into GIS using a spreadsheet file (CSV format).



Once imported, it is possible to inspect the installation and the configuration of the irrigation system.

Satellite imagery

In 2012, PMN/IPRODI continued its activities despite Mali experiencing its worst ever crisis. The programme zone was located right in the centre of an area occupied by different armed groups. Maintaining programme activities was not easy either for the team or for decision-makers at KfW, GIZ and CIDA. A broad range of interests and risks had to be taken into account: the lack of safety of programme staff and property, the impossibility of conducting close monitoring of works due to the security situation, and the need to provide support to local people following mediocre harvests in 2011.

With the intervention area out of bounds due to the general insecurity, the management team were forced to seek out other monitoring approaches and tools. The programme team, with the support of its partners, has always sought to carry out operations responsibly in order to protect programme staff and property from risk.

Following the analysis of reports on farming outputs that showed record production levels in spite of the difficult context, it was considered necessary to review the production figures meticulously, going so far as to question whether the areas mentioned in the report had been farmed at all.

For the case in point, NDVI based on the satellite imagery serves as an excellent tool. This constitutes an index calculated using images in two bands provided by Landsat 7:

1. Band 3, 'red' (wavelength 0.63 – 0.69 micrometres): vegetation heavily absorbs waves in this band, meaning the resulting value is low.
2. Band 4, 'infrared' (wavelength 0.77 – 0.90 micrometres): in contrast to band 3, the waves in this band are nearly all reflected, meaning the resulting value is high.

The NDVI is defined as:

$$NDVI = \frac{(Band\ 4 - Band\ 3)}{(Band\ 4 + Band\ 3)}$$

The NDVI value is between -1 and 1, depending on the degree of absorption and reflection that are characteristic of the material in question.

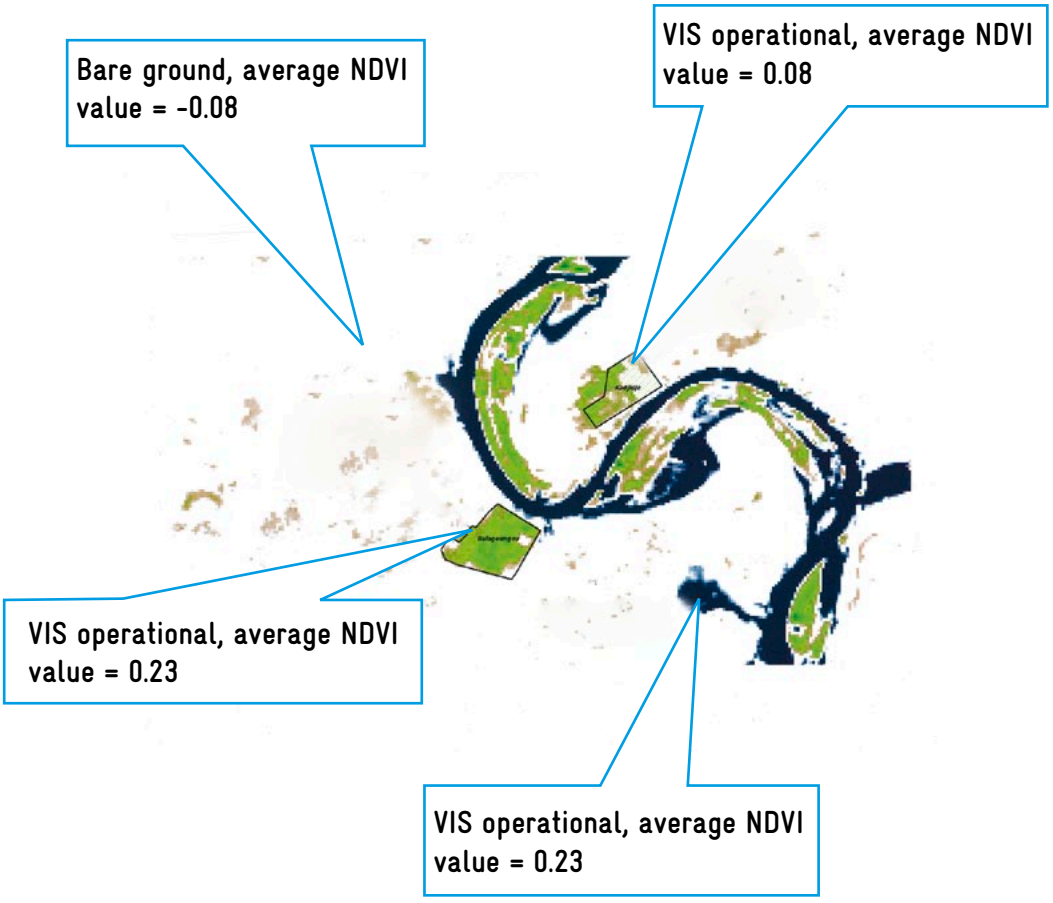
Ground cover	Infrared (band 4) (λ= 770 – 900 nm)	Red (λ= 630 – 690 nm)	NDVI
Water	Low	Low	< 0,3
Bare ground	High	High	≈ 0
Vegetation	Very high	Low	0,2 – 1,0

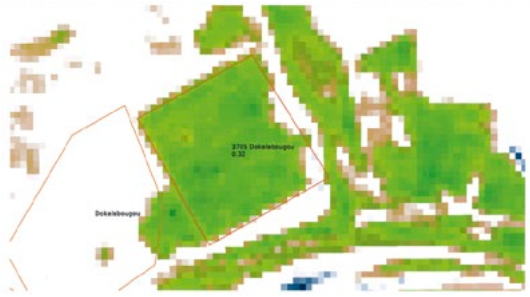
A daily source called Rapid Response MODIS is available; however, the resolution is too large (250 metres) to be able to clearly distinguish the vegetation (only six pixels for a 40 hectare scheme). The Landsat 7 images, on the other hand, are quite precise (with a resolution of 30 metres, with one band with a resolution of 15 metres). In this case, a 40-hectare site would be displayed in around 440 pixels.

These images can be downloaded free of charge from the following websites: http://landsat.usgs.gov/Landsat_Search_and_Download.php and http://earthexplorer.usgs.gov/. The kind of images we require are not instantly accessible but can be obtained by simply signing up and sending an email. Following receipt of the online request, the images become available in less than 24 hours and are thenceforth available on the server. The analysis of the Landsat images is carried out using the Grass 6.4.3 and QGIS 1.8 (open source) software packages, which come with very powerful modules. Once the required spectral bands (bands 3 and 4) have been imported, the

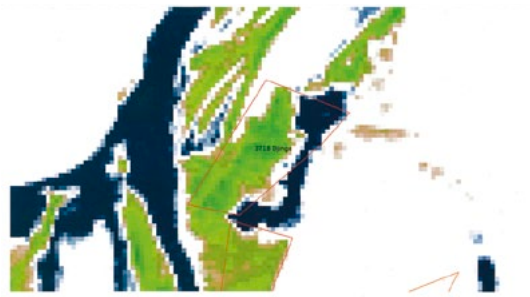
raster representing the NDVI for the date in question is calculated using a 'raster calculator'. The import, NDVI calculation and creation of a single raster that solely covers the programme intervention area are all performed in Grass 6.4.3. Supplementary information at the end of the chapter shows the different procedural steps to follow:

Figure 2: Changes in NDVI according to different land uses

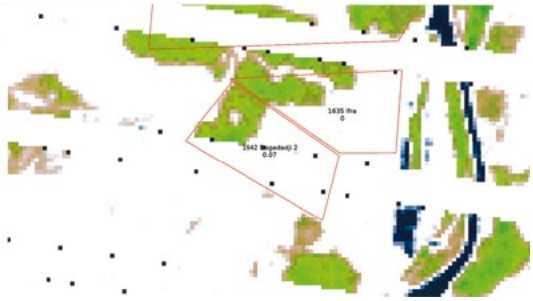




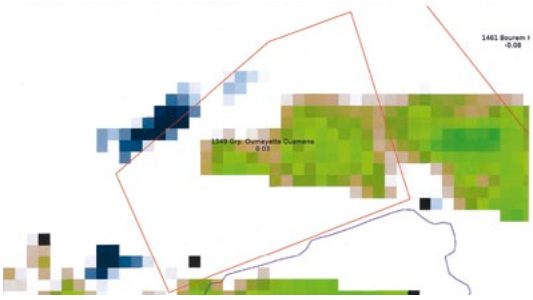
The polygon corresponds very closely to the VIS area. In October, the NDVI value stands at 0.26 and in November at 0.31. It is also possible to see the vegetation in the depression. The VIS to the east seems to be cultivated to the same extent.



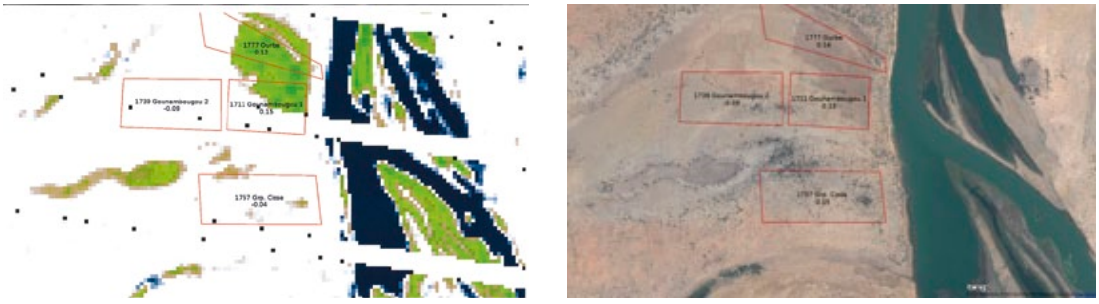
The polygon also includes surface water, which diminishes the NDVI value (0.11). For this reason, the polygon shows, in October and November, a layer of vegetation that one can assume is the result of farming activities. The scheme shown here dates from 2012, which is why the network is not visible on the Bing image.



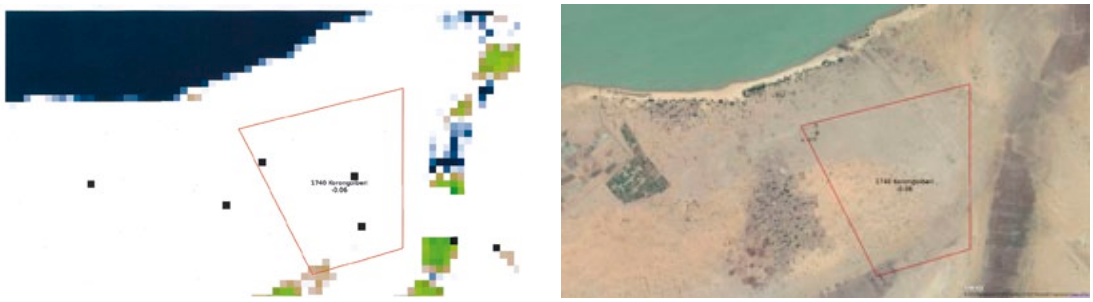
The VIS polygons are very poorly placed (particularly in the Diré and Binga sectors). For this reason, the NDVI value reaches just 0.07 (across the whole polygon). At the plot level, values reach up to 0.38. The stripe on the Landsat image (data loss) does not affect the average figure as it is considered as 'NoData'.



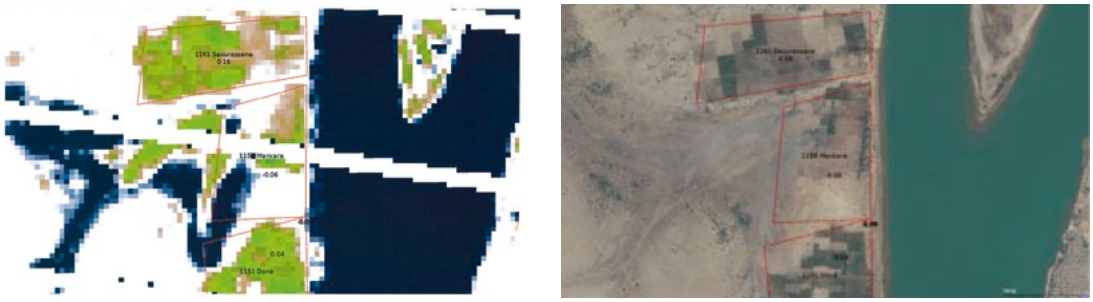
In October, the average NDVI value is only 0.03 despite the presence of vegetation. The stripe on the Landsat image makes it impossible to precisely calculate the area of farmed land. The Bing image therefore only shows a 17-hectare scheme.



Groupe Cissé's VIS has a value of -0.04 because of natural vegetation. In the Bing image no network is visible. The location of the Groupe Cissé VIS is not clear (installed in 2007). According to the reports provided, the four VISs that can be seen in this image produced 765 tonnes on a 140-hectare area. The Landsat images show only a 45-hectare area of vegetation.



In October and November, the average NDVI value of Korongoiberi VIS stands at -0.06. In fact, we know that the planting took place on 30 July. The polygon is poorly placed, but the network is visible on the Bing image.



In October and November, Mankara VIS has an average value of -0.06. This low figure can be explained by the presence of an inundated area (the NDVI value of water is around -0.30). The farmed zone measures just 11 hectares. A yield of six tonnes per hectare on a 30-hectare site was reported, along with a planting date of 4 August. The stripe on the Landsat image doesn't affect the interpretation

These examples demonstrate the importance of conducting individual analysis (on a case-by-case basis) to ensure interpretations are conclusive and unequivocal. This was impossible for many of the 499 sites active during the 2012 winter growing season (source: oversight team). Due to the large quantity of data, the treatment of the recorded results needs to be automated.

To carry out the analysis, Bing or Google Earth images, along with the NDVI rasters for October and November, need to be reviewed. Where possible, the following factors need to be determined:

- Initially, the Google Earth or Bing Maps image will show whether the polygon for the area in question is correctly placed over the network visible in the image.
- Then, the NDVI rasters for October and November are analysed to verify the presence of vegetation on plots by quantifying the area of vegetation and the area of VIS affected by flooding or submersion.

Implementation locations

The programme intervention area, the coordination office in Bamako, and Berlin Technical University (which provided mapping support)

Scope of application

The PMN/IPRODI intervention area. There is no limit to the area in which these technologies can be applied.

Duration of application

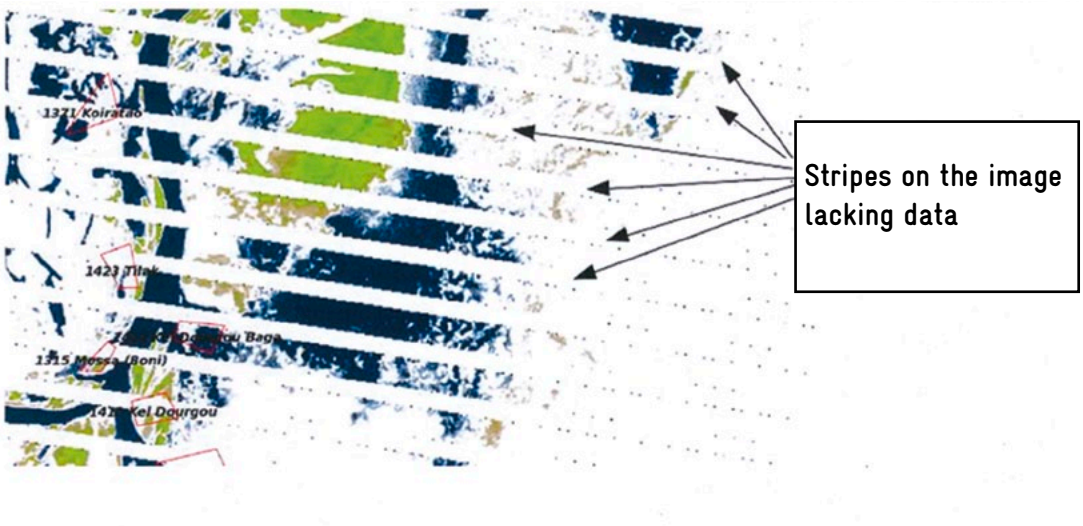
Since the end of 2011

Success factors and constraints

Landsat

Since 2003, Landsat images have displayed stripes or horizontal bands (running west to east) with no data (see the figure below). This, of course, complicates the analysis of VIS polygons as much of their area falls under these stripes. Indeed, most VIS polygons situated in data-loss stripe areas (such as Diré) fall partially within a data loss area and partially without. It is possible to verify the presence of vegetation for these VISs, but it is not possible to estimate the area of cultivated land. However, we hope that Landsat 8 will provide fault-free images, just as Landsat 7 did from 1999 to 2003.

Figure 3: Landsat 7 image with stripes



A second problem arises if the polygons fail to correspond with the VIS on the image (see below).

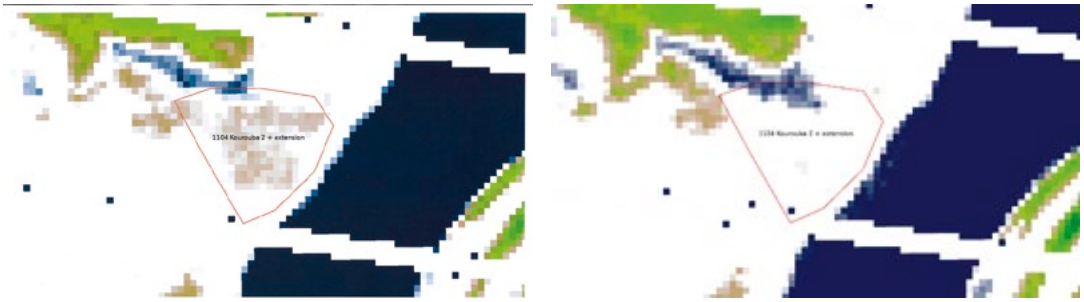
An example of a poorly placed polygon in the Soungalore VIS. The polygons are based on GPS data recorded in the field. However, the polygons for many VISs do not in any way match the reality displayed on the Landsat images.

The flaws in the VIS polygons were the greatest obstacle to achieving accurate and quick analyses. The PMN/IPRODI programme has always preferred GPS data for sites, usually recorded by planners using satellite imagery. The analyses carried out on the Landsat images have exposed the poor reliability of many of the polygons. It would be best to prioritise digitising the polygons using satellite imagery and then undertake checks using the GPS measurements recorded on the ground. The exercises using Bing Maps and Google Earth proved beneficial for correcting polygons in cases where there was an indisputable mismatch between the networks and schemes and their respective images.

Correcting polygons 'on the fly' during NDVI analyses. Improving polygons makes it possible to automate NDVI analyses. Tackling all 400 or so VISs is an immense task.

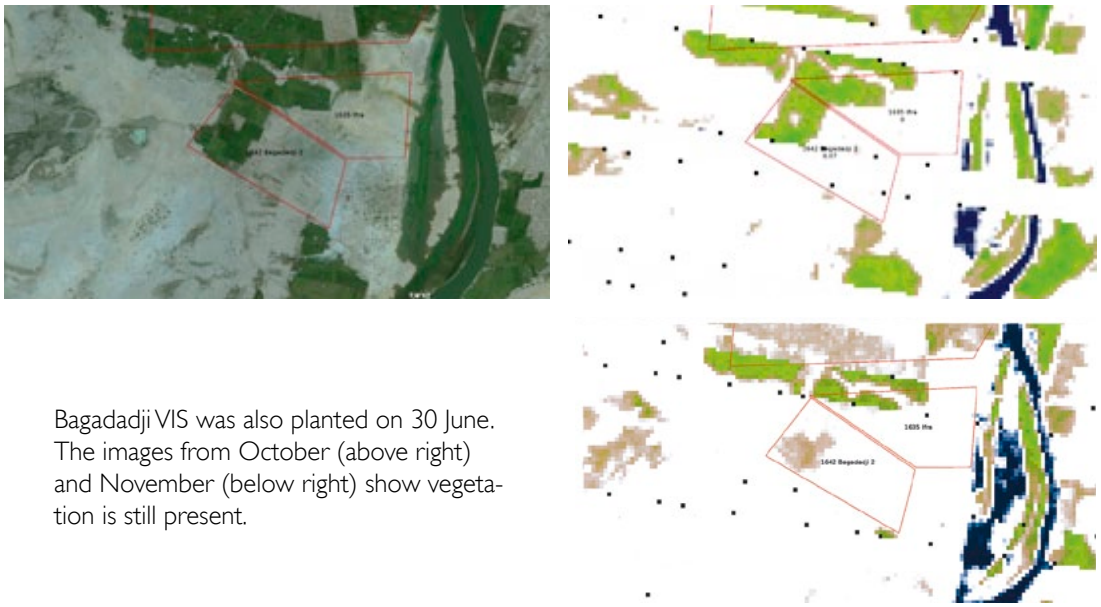
We then come across another problem: there are no Landsat images available for the months of August or September. Between 24 June and 24 October there are no images for the Landsat scenes containing a high concentration of VISs (197-049 and 196-048). Given that seedbeds are not as easily recognisable as a full VIS, it is theoretically possible that a VIS sown just after 24 June 2012 could have been harvested before 14 October. Some images may suggest that the year's crop was fully grown prior to 14 October.

This situation is shown in the figure below:



The left-hand image shows the NDVI value for October. The VIS shows traces of vegetation that have completely disappeared in the right-hand image (showing the situation in November). The area of vegetation cover shown in the October image could be a field of ripening crops (following drainage) or post-harvest stubble.

The oversight team marked the date of transplanting and/or date of seedbed sowing for each PIV. In the above case, the report mentions the date of the 30 June. By comparing the vegetation with that of other VISs with a similar sowing date, it is possible to see that vegetation is more clearly present in October and November. The figure below provides an example of this situation.



Bagadadji VIS was also planted on 30 June. The images from October (above right) and November (below right) show vegetation is still present.

In spite of the above-mentioned difficulties, the NDVI rasters clearly match up with the Google Earth and Bing layers. The automated analysis based on the average NDVI value in the attributes table is particularly reliable when the polygon matches up well with the cultivated area. The below figure provides a good example. Even the zones with a high level of natural vegetation and containing inundated depressions become visible. It should also be noted that there is a clear contrast between VISs growing rice and their environs, which usually comprise bare ground or scant natural vegetation. This is why analyses are difficult when the VIS is located adjacent to submerged plains.

Roles of the actors involved

Currently, only PMN/IPRODI are using this practice. The planning service providers were given introductory training on applying the technologies and set themselves up to provide sufficient data in their invoices and reports to allow coordinators to apply the modern technologies. The programme's coordination team is ready to share these technologies with its partners and has already delivered presentations to parties expressing an interest.

Effect and impacts

Landsat

One important impact/effect was that the consultant on site was able to persuade donors of the feasibility of carrying out minimum-level monitoring despite the difficult security situation. This was crucial as the donors were faced with a difficult choice: on the one hand, the lack of security made it impossible to access the zone in order to carry out monitoring and supervision missions, which seriously threatened the continuity of the programme; on the other hand, donors were obviously very sensitive to the plight of the communities suffering occupation and armed conflict.

Total stations and GPS

These two technologies allow users to ascertain the specific features of sites more accurately than is possible with 'traditional' approaches, which are more basic and less refined. The technologies enable the design of good-quality schemes by facilitating water management. It is important to highlight the fact that a good-quality irrigation scheme (which is well configured and laid out in terms of its irrigation network and facilities) reduces production costs (less pumping time needed).

Costs and cost effectiveness of the good practice

Assessment of investment cost per unit:	Low	☐	Average	☒	High	☐
Rating of cost effectiveness:	Low	☐	Average	☐	High	☒

Sustainability

There are two levels of sustainability to be considered:

- Firstly, the effects of successfully deploying these technologies contribute to creating good-quality schemes with few water management problems and moderate production and maintenance costs.
- Secondly, there is the matter of how the technologies presented will continue to be applied within a team. To ensure sustainability, appropriate IT capacities and, more specifically, expertise in GIS software packages are necessary. It is important for these capacities to be embedded institutionally, rather than held by certain individuals.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
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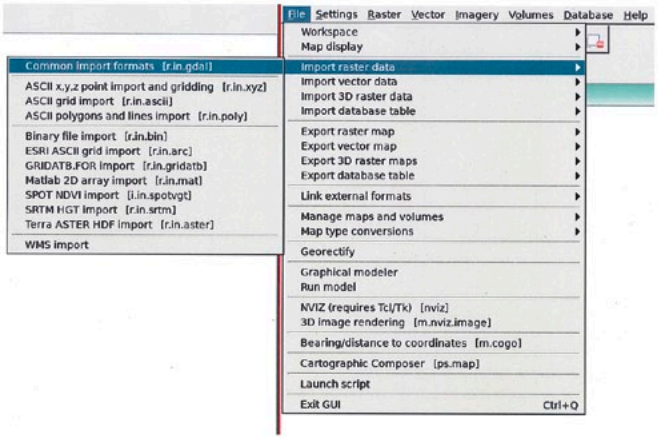
Reference documents

A range of internal technical guides

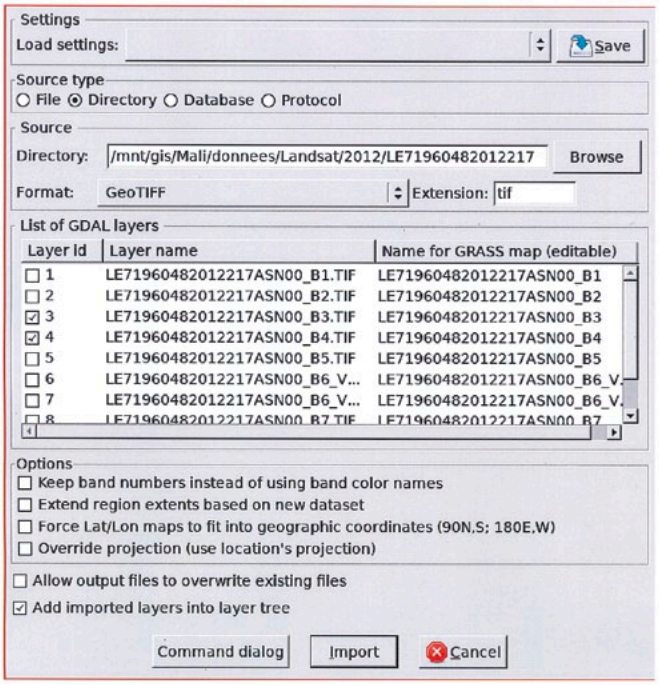
Supplementary information

Using Grass and QGIS software

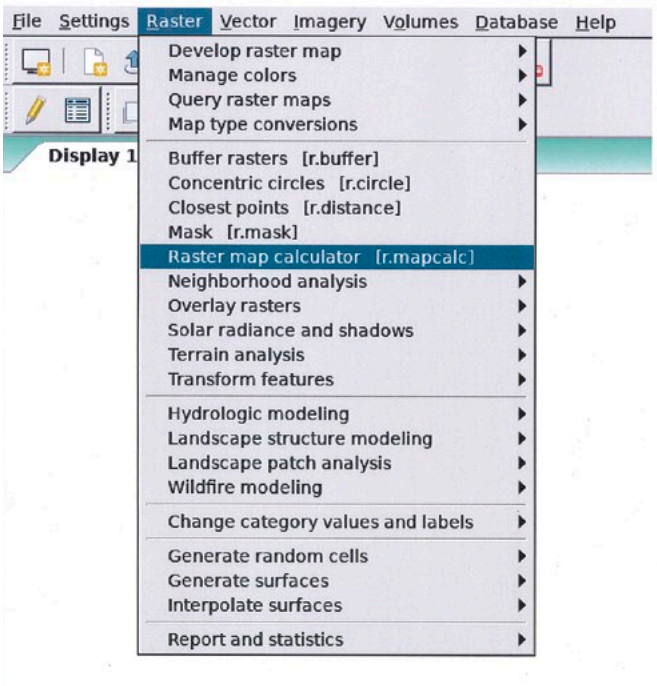
Grass is capable of importing a vast range of raster types.
In Grass, the coordinate system must be set.
To be compatible with Landsat format rasters, the setting 'WGS84/UTM zone 30N' must be selected.



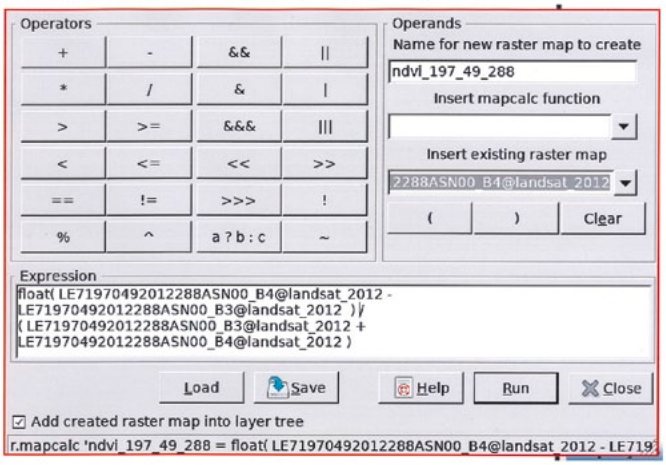
To perform an analysis, one need only import bands 3 (red) and 4 (infrared). A Landsat scene comprising all eight bands compressed in a .zip file takes up around 200 to 250 megabytes.
Decompressed, a full Landsat scene takes up more than 0.6 gigabytes.



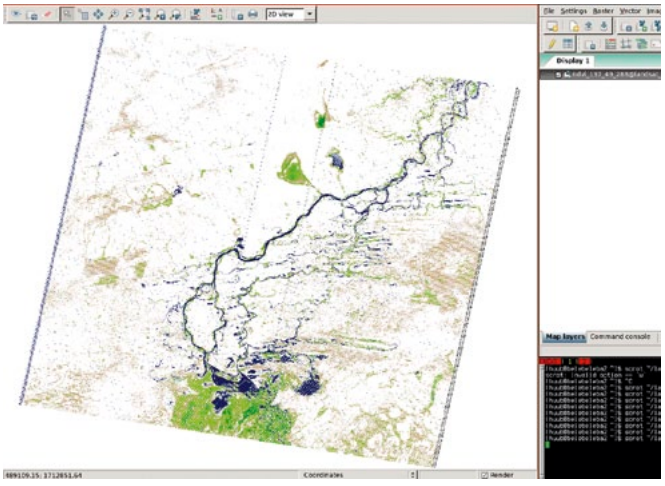
Once the bands are imported, the 'raster map calculator' tool is selected in the Raster menu.



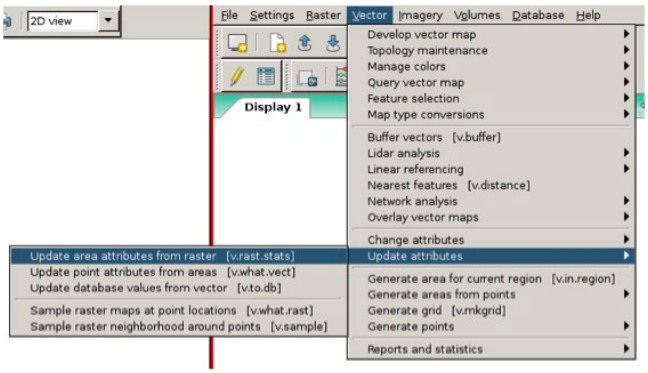
In the raster calculator, a unique name is created corresponding to the path and row of the image's raster and its date (according to the Julian calendar). The following formula is therefore applied:



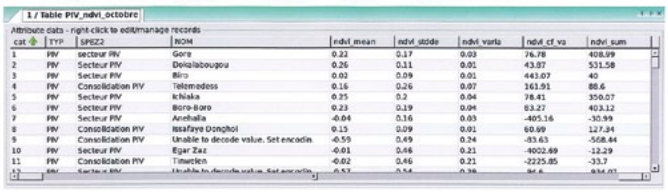
The result of the NDVI calculation.
The colour scheme, adapted to the index, is predefined (the value of -1 is dark blue => water; and the value of 1 is dark green => healthy vegetation).



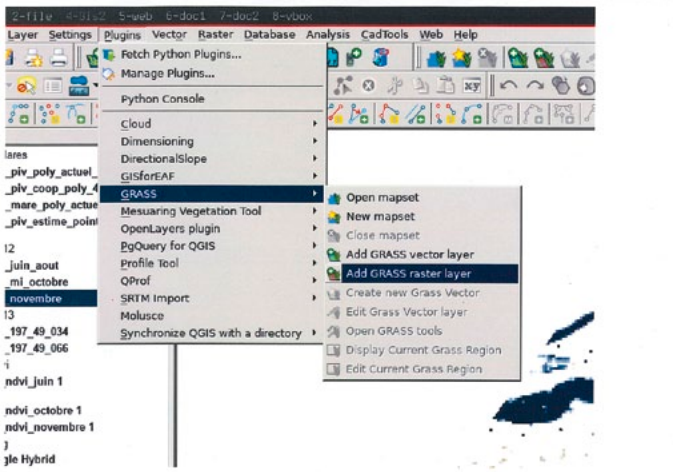
After converting to WGS84/ UTM 30N and importing the vector pmn_piv_poly_4326_final, it is possible to enter the NDVI characteristics of the VIS's polygon area into the attributes table. To do this, select 'Update area attributes from raster'.



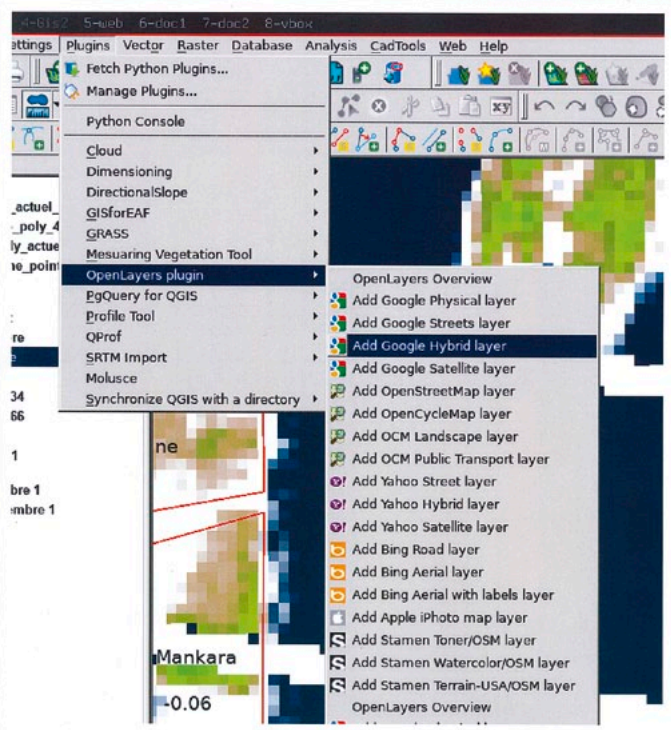
The 'r.stat.raster' tool inserts statistical data for the raster that relates to the polygon area (number of pixels; minimum, maximum and median NDVI value; etc.).



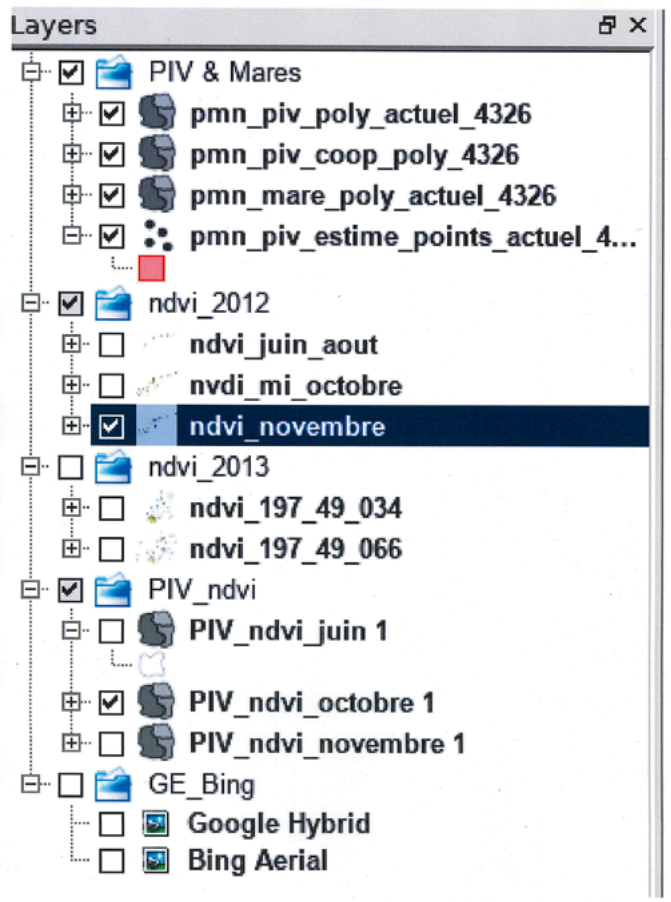
QGIS can upload layers created in Grass 6.4.2 directly.



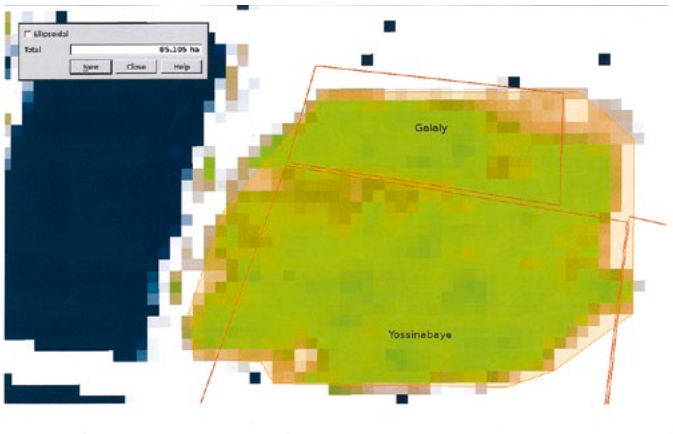
A large number of plugins are available for QGIS. The 'Open-Layers' plugin makes it possible to load Google Satellite and Bing Aerial layers.



The different layers loaded



QGIS provides a tool for quickly measuring areas.



4.2 Good practices in installing small-scale irrigation infrastructure

4.2.1 Lining irrigation canals

Minamba TRAORE / IICEM

Objectives

Lining canals is a powerful way to save irrigation water by minimising seepage losses. Pumping time and costs are also greatly reduced through the speedy distribution of irrigation water supplies, and reducing the use of motorised pumps lowers maintenance costs.

Definition and description of the good practice

The irrigation area's main earthen canals have their inverts lined in concrete and their sides lined with solid cement blocks. Concrete support posts are set at intervals and capped in concrete. Each lined main canal should be no longer than two kilometres. The main canal's turnouts into the secondary canals are built in cement and are equipped with gates that can be opened and closed as required.

Photo 8 : The connection of the discharge pipe to the delivery basin

Photo 9 : Delivery basin and energy dissipation structure

Photo 10 : Lined main canal

Photo 11: Turnout from a main canal into a secondary canal

Source of photos 8 to 11: Minamba Traore, IICEM

Each turnout's outflow area is protected by a rockfill structure that is built right up to the top of the canal wall to prevent the canal banks at the head of the secondary canals from becoming degraded. Lining is mainly used to improve the efficiency of existing irrigation systems.

Implementation

Together with the growers, a memorandum of understanding was drawn up with IICEM and then signed by the mayor. The memorandum describes all the activities that form part of the collaboration between IICEM and the various beneficiaries. The works were carried out either in-company or constituted part of the highly labour-intensive work (HLIW).

a) Work delivered in-company (turnkey basis)

Works are carried out in several stages:

1. Identifying the sites requiring lining
   This involves locating the sites to develop and, very often, making contact with the NGOs that represent the project in the region, as well as regional directorates of rural engineering and economic operators working with the farming organisations in question.
2. Launching the invitation to tender for the technical studies
   The delimited sites chosen for development must undergo technical studies, which are entrusted to engineering consultancies recruited through an open tender process in accordance with the terms of reference for the studies to be conducted.
3. Performing the technical studies
   The technical feasibility studies comprise topographical, geotechnical, soil and environmental studies, as well as the creation of a development plan and quantification of materials required for the construction work.
4. Drawing up the invitation to tender (ITT) documents and communicating the tender process to businesses
   In lieu of a ToR, an ITT is created by the project according to the requirements of the site. It is then published so that interested consultancies can put forward their bids.
5. Delivery of works under the supervision of the oversight office
   Works are carried out under the control and supervision of the oversight office to ensure they adhere to professional standards.

b) Highly labour-intensive work

1. Identifying sites
   Same as point 1 in paragraph (a) above
2. Undertaking topographical surveys to calibrate schemes
   Topographical surveys are carried out by IICEM specialists to calculate the calibration of the canals to ensure they are able to submerge plots over a large area.
3. Quantifying building material requirements
   After calibrating the schemes (energy dissipation basin and division box, main canal and secondary canal turnout, channel), a works plan is drawn up. This uses the measurements calculated to quantify construction material and equipment requirements.
4. Recruitment of masons, bricklayers and reinforcing ironworkers
   Teams of (preferably local) builders are recruited to line the canals. The teams comprise master builders, reinforcing ironworkers, bricklayers and surveyors.
5. Invitation to tender for the provision of materials and equipment
   The materials and equipment required for each site are provided by an appropriate supplier recruited through a tendering process.

6. Provision of labour and farmer participation
   Only the building contractors are paid for working on the project. Labour is supplied by the local community who are provided with lunch to maintain motivation and to prevent lost time caused by workers going off-site.
7. Training workers from the local community in building site conduct
   In villages where schemes are proposed, teams of shift workers from the local community are set up and trained in proper conduct for working on a canal lining project and in the keeping of a con struction project log book.

Operation

Once the canal lining works are complete, IICEM provides a pump unit and subsidises the required fuel and consumables for one growing season. Training in how to run and maintain pump units is provided for the local beneficiaries tasked with their upkeep. Furthermore, training in the management and maintenance of irrigation schemes is delivered to the farming organisations' steering committee.

Implementation locations

Irrigation system canals in Mopti, Timbuktu, Gao and Sikasso have been lined.

Scope of application

Around 50 sites covering approximately 1,200 hectares have had their canals lined. The table below gives further details on some of these sites.

Duration of application

This kind of practice has been carried out by IICEM since 2009.

Success factors and constraints

Good quality technical studies are a prerequisite for success. For this reason, IICEM's irrigation specialists check and approve technical studies prior to the commencement of works. Ensuring linings are impermeable is of the utmost importance because water penetrating through micro-cracks as it flows through the network can lead to rapid and major water loss. Consequently, the structure becomes degraded and more pumping time is required, which, in turn, raises pumping costs and, ultimately, reduces yields. Once the works are completed, it is therefore absolutely essential to ensure that producers can maintain installations and repair cracks themselves in line with the methods taught in training sessions.

Roles of the actors involved

IICEM handles the identification of sites and the surveys. Irrigation experts from IICEM or the engineering consultancy delimit the sites and undertake the surveys. Local farmers participate in the highly labour-intensive work to help the builders complete the installation within a reasonable time frame.

If the works are to be carried out by a contractor, consultants are recruited to carry out the technical feasibility studies, and then companies are brought in to carry out the construction work.

Effects and impacts

Once the canal has been lined, yields increase by between 35% and 80%. This is because crops receive the water they need to ripen as and when it is required. Often, lining also makes it possible to extend the irrigated area (see the table below). Pumping hours per hectare are considerably reduced (by 25% in the rainy season) because the canals ensure the correct distribution of irrigation water. Consequently, irrigation costs per tonne of produce drop due to the reduction in pumping hours and the costs of periodical maintenance and increases in yields.

Table 3: Results achieved on selected sites with lined canals

IRRIGATION - 2009-2010										
Region	Village	Irrigation Area (ha)		Cost	Yields		Pumping costs		Area	
		Rehabilitated	Extended	CFA	Before	After	Before	After	Before	After
SIKASSO	KOUROUMASSO		50	48 925 236	New site. Results forthcoming.				15	50
	FINKOLO		70	29 963 132					17	70
	GLADIE DAM #2		200	48 037 500					75	215
	NIENA	130		16 900 000					130	100
	SUBTOTALS	**130**	**320**							
Total for Sikasso			**450**	**143 825 868**						
MOPTI	KOUIN		30	83 122 615						
		20		6 221 260	3,78	5,6	107 000	123 000	20	50
	SAH	40		47 394 321	6,75	7	11 500	76 665	40	45
	KORIENTZE	30		48 573 227	4	6	49 872	49 270	30	34
	DIOGUI - SARE	20		34 854 800	6,5	7,5	89 538	92 000	20	25
	DIOGUI - OURO	50		18 500 000	7	8	114 545	98 420	50	51
Subtotals		160	30							
Total for Mopti			**190**	**238 676 223**						
TIMBUKTO	KABARA RIZ		10	49 864 198	4	5	111 000	100 000	10	17
	KONDI		12	107 919 726	4	5,5	110 000	81 500	32	44
		32								
	NIANFUNKE/ GOUBO	334		148 099 911	6	7	130 000	110 000	328	332
	SIBONEY	63		10 164 289	6	7,5	130 000	130 000	30	62
	M'BETOU	70		48 387 718	5	7	130 000	130 000	70	70
Subtotals		**508**	**22**							
Total for Timbuktu			**527**	**364 435 842**						
GAO	DJEFILANI	10		27 000 000	7	6,95	129 800	120 727	10	11
	ADOUROUROU	11		27 500 000	6,29	5,99	111 272	124 411	11	15,3
	TONDIHIO	5	10	12 325 000	6,7	0	55 046	51 737	15	25
Subtotals		21	10							
Total for Gao			**31**	**66 825 000**						
Total Irrigation		**819**	**382**	**813 762 933**						

Costs and cost effectiveness of the good practice

Each canal lining scheme costs in the region of 1.5 to 2 million CFA Francs per hectare.

Assessment of investment cost per unit:	Low	☐	Average	☒	High ☐
Rating of cost effectiveness:	Low	☐	Average	☒	High ☐

Sustainability

The lifespan of a canal lining ranges from 10 to 20 years if small repairs are regularly undertaken. The main reason for lining a canal is to ensure the sustainability of the irrigation scheme. This is particularly important if the lining contributes directly to making the canal watertight; something that can only be achieved by lining with concrete.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
IICEM	Minamba TRAORE	tbaminan@gmail.com

Reference documents

For more information, visit: www.iicem.net.

4.2.2 Village irrigation schemes developed using the PMN/IPRODI approach

Huub MUNSTEGE, Matthias KLIEWE, Pierre GUIROU, Yehia Ag Mohamed ALI – PMN/IPRODI

Introduction, definition and objectives

Village irrigation schemes (VISs) are a concept and a development typology created in the 1970s and 80s; first in the Senegal valley (Matam), then in the zone lacustre (lakeland area) around Timbuktu and in the Niger River delta in Mali. Using a relatively simple development concept, it was possible to create production units that were built and managed by local people in areas seriously affected by drought and a sharp decline in inundation events in the 1970s and 80s. Instead of being dependent on food aid, local people operating a VIS were able to guarantee sufficient rice production to cover their village's food needs. With one pumping facility and one canal network installed, it is possible to control the water supply for an area of at least 20 hectares, thus creating the required conditions for intensive rice growing.

Photo 12 : Pump unit

Source: PMN/IPRODI

During the last 30 years, numerous projects and programmes have recognised the potential of VISs – first, as a structural response to the food crises of the 1970s and 80s, and then as a tool for economic growth from the 1990s onwards. Many characteristics of the VIS approach align perfectly with objectives on self-determination: villagers participate in the planning, construction and farming of the scheme; part of the rice crop is secured in an environment where traditional agriculture often falls victim to the unpredictability of the climate; and, given their modest scale, the farming of schemes requires management capacity that is usually present in villages displaying high levels of social cohesion.

Farming a VIS (intensive rice growing) is fundamentally different to other, more traditional production systems to which farmers are accustomed (extensive rice growing in floodplains and millet growing in non-flooded areas). VISs require the purchase of inputs and the sale of at least part of the produce. Farming a VIS requires the development and good functioning of a value

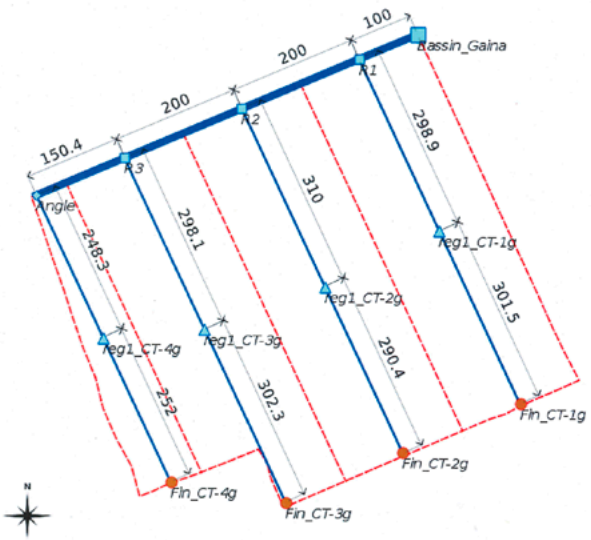
chain with many more links upstream and downstream of production and beyond the confines of the village than would be found in a traditional system. Although the VIS was initially conceived as a drought response mechanism in the 1970 and 80s, VIS farming encourages farmers to become more integrated in the rural and regional economy. Since the 1990s, VIS development programmes have focused much more heavily on economic robustness than they did in the case of the first generation of schemes.

VIS sustainability is not limited solely to achieving positive outcomes for farmers; it equally depends on the sustainability of the links upstream and downstream of farming activities. Certain services are crucial for the good functioning of a VIS: the provision of inputs (fertilisers and diesel), pump unit maintenance, access to credit, agricultural advisory services, the processing and marketing of produce. These services have a much greater chance of success when a critical mass of VISs is concentrated in a given area.

On the technical side, numerous scheme configurations have been observed. The most common involves a limited number of small-scale distribution control structures and a network of open, earthen canals. This type of scheme requires an investment in the order of between 1 and 1.5 million CFA francs per hectare. It also fosters the large-scale participation of villagers in all the building works, particularly excavation work and the installation of plots. At the other end of the spectrum are the VISs that have lined canals throughout their entire irrigation network. These require much more substantial investment (up to 7 or 8 million CFA francs per hectare) and building works (including plot installation) are generally carried out by contractors. As yet, no study has indicated that the yields and technical lifespan of such high-cost 'sophisticated' schemes are greater than those of 'basic' schemes.

In the 1990s, in the first few years following the Tuareg rebellion, PMN/IPRODI carried out a number of emergency response activities to consolidate the return to peace (April 1992), such as building and fitting out camps, administrative offices, town halls, etc., and also distributing food aid. Following this three-year emergency period (1994 to 1997), the programme entered a new phase focusing on the creation of livelihoods and the improvement of living conditions in the context of the reintegration of returnees. The most important instrument in achieving this aim was the development of irrigable lands along the Niger River using VISs. The programme also created floodplain depression ponds called mares.

Figure 4: Layout plan of the irrigation network (in blue) and the drainage network (in red)



Source: PMN/IPRODI

Description of the good practice

The VIS concept can be described in different ways: it is possible to set about rehabilitating existing infrastructure and, in so doing, manage water resources for crop growing. The description might also focus on the management of a scheme that is, in the main, managed by a farmers' organisation from a single village. Finally, it is possible to detail the key events occurring in the building phase.

a) Infrastructure

A VIS comprises a pumping station, small-scale facilities infrastructure, and irrigation and drainage networks. The pumping station consists of a pump unit (see photo) fitted with a diesel motor with two or three 28 to 38 horse-power cylinders and a centrifugal pump with a capacity of 350 to 480 cubic metres per hour. The pump is positioned right alongside the water source (river, lake) and is mounted on a mobile chassis so it can be repositioned as and when required and depending on the situation of the water source, which can vary considerably during the winter growing season. At the end of the growing season, the pump unit can be stored in a secure, weather-proof location (out of the sun, rain, etc.).

Water is then pumped through a flexible hose of reinforced polyethylene (the lengths generally being multiples of 50 metres, but no longer than 150 metres) up into the delivery basin where the energy carried in the turbulent pumped water is dissipated to prevent erosion damage and where the flow is calmed from turbulent to laminar.

From the delivery basin onwards, the system makes use of gravity to feed its open canal network. The majority of the network is comprised of earthen structures, with only a section of the main canal being lined (usually a length of between 150 to 300 metres leading from the delivery basin outflow). The secondary and/or tertiary canals are supplied with water through a division box that apportions supply using a system of ('all or nothing') gates. Plots are watered from the tertiary canal by turning on the PVC hose.

The area of schemes developed by PMN/IPRODI ranges from 30 to 40 hectares. Initially, the programme installed 30-hectare schemes supplied with two-cylinder pump units. Since 2004, it has only developed 40-hectare schemes supplied with three-cylinder pump units. All the schemes are divided up into 0.25-hectare plots, making a total of 160 plots. The maximum distance from the sprinkler to the drain on the other side is 100 metres.

b) VIS management and farming

The VISs overseen by the programme are all managed by a management committee that is elected at a general meeting – i.e. a meeting of all the farmers. The remit of a VIS management committee is to ensure the good functioning of the scheme. Its principal objectives are:

- to organise the general meeting;
- to calculate charges/fees;
- to provide inputs and organise bulk purchases of inputs (by using the income from fees);
- to ensure the good functioning of the pump unit by hiring dedicated staff and operating maintenance contracts with the relevant mechanics/providers;
- to ensure the upkeep of the irrigation network (canals and facilities) and oversee the distribution of water;
- to provide mediation in the case of conflicts between producers;
- to act as the contact for all dealings with external parties;
- to ensure scheme-related information is shared.

On the back of over 15 years' work and major investments, the programme has been able to develop 489 VISs across an intervention area that covers six circles (second-tier government structures).

While most of the VISs grow in-season rice (July to December), 10% grow rice off season and 20%, located mainly in the Diré area, grow wheat (October to March). A small percentage of VISs (around 2%) grow two crops a year. The reasons for this low percentage are the risks involved and clashes in the growing calendar. Many of the pump units are, however, used several times over (on different sites for different crops).

Implementation

Initially, villagers are able to express their need for a VIS through a village diagnostic exercise. This installation request is then taken up by the communes' PDESC. A formal request is then referred to the mayor and drawn up by the community.

The support structure (PMN/IPRODI) reviews the request and carries out a preliminary feasibility study. Decisions are then taken in a planning workshop on which schemes to prioritise. Following this, private planning consultants are commissioned to conduct feasibility studies. In parallel, technical and financial analyses are carried out by the programme's planners, who also validate the studies.

A meeting is held to inform and raise the awareness of the beneficiary communities about the development approach. The community is then requested to contribute their labour as part of the HLIW measures. The financial contribution required for the pump unit is up to 30% of its cost.

Operation

- Organisation of workshops by the support structure
- Delivery of work by local planners
- Establishment of management committees
- Allocation of plots by the management committee in collaboration with the support structure
- Donation of inputs (seed, fuel, oil, filters, fertilisers, etc.) for the first year by the support structure
- Purchase of tools for the schemes
- Agricultural advisory support and monitoring of crops by the technical services

Photo 13: Delivery basin

Photo 14: Division box

Implementation locations
Five communes in the Mopti region and 38 communes in the Timbuktu region

Scope of application
Installation of 489 VISs in at least 43 communes
Farmable land: 16,832 hectares
Approximate number of beneficiaries: 335,200 people

Duration of application
Since 1997

Success factors and constraints

- Having access to the local authority
- Having quality topological and soil surveys, which are verified using GIS
- Building more sustainable and less costly schemes through the careful configuration of irrigation canals
- Privileging those who participated in development works when allocating plots
- Regularly maintaining the facilities and networks
- Making operating and maintenance funds available
- Keeping promises made to the community
- Using local persons of note to prevent and manage conflicts
- Making sure that scheme areas do not become a source of conflict
- Developing a tailored and participatory approach that aims to deliver the good management and farming of schemes (see section 4.1.1 on participatory approaches) in order to ensure the sustainability of the IPRODI-version VIS ('technical' solution)

Roles of the actors involved

- **The support structure** (PMN/IPRODI) provides financial and technical assistance, contracts planners, offers advisory support, and researches the most up-to-date technologies.
- **The management committee** allocates plots, collects fees, and organises the provisioning of inputs and the marketing of produce. The committee also ascertains the results achieved in the growing season.
- **Planners** analyse feasibility studies, oversee the development process and carry out agricultural monitoring.
- **The commune** ensures that schemes are embedded in commune planning and will intervene where necessary to help manage conflicts.
- **Persons of note** participate in planning work, in managing conflicts, and in raising the awareness of the local community.
- **Technical services** provide advisory support, constitute information sources, and participate in provisionally accepting schemes. They are tasked with monitoring the scheme's compliance with national guidelines.
- **Beneficiaries** contribute to schemes with their labour and financial inputs, ensure the development of scheme sites and handle production and marketing.

Effects and impacts

VISs create rice-growing areas. Prior to the installation of the scheme, the sites are not suitable for rice growing. Yields significantly increase as a result of the work carried out. An average harvest of six tonnes per hectare increases incomes. With an average price of 125 CFA francs per kilo of paddy, the rate of sales reaches 750,000 CFA francs per hectare. The surplus per hectare is estimated at 300,000 CFA francs.

Costs and cost effectiveness of the good practice

The development costs are estimated at 1.3 million CFA francs per hectare.

Assessment of investment cost per unit:	Low ☒	Average ☐	High ☐
Rating of cost effectiveness:	Low ☐	Average ☐	High ☒

Sustainability

- Low investment costs
- Uptake of planning techniques by local experts
- Existence of 15-year-old schemes that are still productive and in good condition
- Possibility for beneficiaries to replace spent pump units using their own savings
- Option for scheme extensions to be undertaken by the beneficiaries themselves
- Sustainability dependent on the use of a participatory approach to launching and managing the project

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Reference documents

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4.2.3 Earth embankment dams

Célestin DEMBELE, Jacques TAMINI, Moussa DOUMBIA – HELVETAS Swiss Intercooperation

Objectives

Embankment dams are built to retain rainwater without totally blocking the flow of water. They enable part of the plain to be irrigated; they retain water in the basin for several months after the end of the rainy season, which can be used for watering livestock and crops off season; and they help raise the water table, which makes well water more easily accessible (at a depth of one to five metres). These dams are used for both controlled and free submersion.

Definition and description of the good practice

The installation of earth embankment dams in lowland areas comprises the following elements:

- a compacted earth embankment, 100 to 450 metres in length;
- a side spillway built with rubble or cyclopean concrete, 40 to 75 metres in length and connected to the embankment with lock walls;
- a spillway stilling basin of loose stones;
- dam height of up to five metres and a crest width of up to four metres;
- a pond upstream of the embankment dug up to three to four metres deep for storing water throughout the dry season and, thereby, ensuring supplies for watering animals, market gardening and fish farming

Photo 15: Earth embankment dam in Dioumantène (Kadiolo)

Photo 16: Reservoir in N'Gala (Bougouni)

Source : HELVETAS – Swiss Intercooperation

Implementation

A development project begins with a request being made by the community following a local diagnostic exercise. The request to develop lowland areas is then integrated into the commune development plan (PDESC). The commune's request is reviewed (in consultation with those making the request) in order to ascertain the socio-economic gains, the strengths and development potential of the area, and the level of motivation among the actors involved. The terms of reference are approved by the community and the local authority before being submitted to the contractor tasked with carrying out the studies.The local diagnostic exercise gives communities the opportunity to put forward their own thoughts on the social, economic, cultural and physical situation of the site and its environment. Training local facilitators is crucial at this stage. The diagnostic exercise is validated with a report on the ideal development scenarios put forward by local people. Results from the diagnostic process are fed back to the community at a public meeting.

The technical diagnostic exercise is undertaken by a contracted consultant who examines the issues and scenarios raised in the local diagnostic exercise more deeply. The consultant carries out the topographical survey and examines the technical functioning of the lowland area, draws up an inventory of current and future economic activities, produces an estimate of costs and looks at environmental issues. They also take into account the methods for farming and maintaining installed facilities. The findings of the technical diagnostic exercise are developed as a 3D model and fed back (see section 4.1.5 on creating scale models). Following the feedback process, the agreement on the technical choices is finalised. The consultant then moves on to performing economic and financial analyses, which will confirm the cost effectiveness of the scheme. An invitation to tender document for the delivery of works is provided to the commune. A funding agreement is signed by the commune, farmers and project team. This agreement stipulates the responsibilities and commitments of each party during each stage of installation and farming. A commission – comprising representatives from the local authority, client community, project team and public body in charge of development schemes, and supported by the consultancy handling the invitation to tender – is set up under the authority of the deputy mayor to sift and evaluate offers and select the winning bidder/s. The process adheres to the procedures for the award of public contracts (Decree No 08-485/P-RM of 11 August 2008 establishing the Procedures for the Awarding, Executing and Regulating of Public Contracts and Public Service Concessions).

The design consultancy conducts ongoing supervision of works to ensure that the standards laid down in the technical dossier are adhered to. It is contractually bound to the commune through a monitoring and supervision contract. In addition to this, the engineering team engaged in the project undertakes sporadic inspections to ensure relevant laws are respected. The users are divided up into management and maintenance teams and their respective responsibilities are clearly defined prior to the interim and final acceptance of works, which brings this stage to a close.Farming and management rules are laid down in a local agreement. The following socio-professional groups may figure in this depending on the type and functionality of the lowland area: rice growers, market gardeners, fishers, tree growers, livestock farmers, hunters, etc. Schemes can begin operation once the interim acceptance has been received.Les règles d'exploitation et de gestion figurent dans une convention locale. Les groupes socioprofessionnels suivants peuvent intervenir en fonction du type et de la fonctionnalité des bas-fonds : riziculteurs, maraîchers, pêcheurs, arboriculteurs, éleveurs, chasseurs, etc. Les ouvrages peuvent être mis en exploitation dès la réception provisoire.

Table 4 : Preparatory phases for the installation of a scheme

PHASE	CONTENT	VALUE ADDED BY THE APPROACH
Preparation and design	Farming community programme Integration into PDESC Diagnostic exercise and locally provided scenarios 3D model Technical studies by contractors Development plans Invitation to tender document	Locally based programme carried out in conjunction with lowland users Farm community representative is a stakeholder in the initial design process (village facilitators) Large study area that extends beyond the range of the topographical map Multifunctional nature of the 'lowland system': in-season and off-season farming, fishing, livestock rearing
Installation	Co-financing Recruitment and contracting of services Organisation and regulation Transfer of management Acceptances	Supervision of works by the service provider and contracting of the monitoring of outsourced services Management agreement for scheme areas and the catchment area
Development	Technical training according to types of use Occupancy and management of sites Management and maintenance bodies Follow-up on outcomes	Delegation of powers to user organisations (concession contract between the commune and the users' association) Development plan with a multi-stakeholder platform

Operation

During the rainy season, water collects behind the embankment over time, creating a reservoir. The side of the embankment is about one metre higher than that of the side spillway. When the water level reaches the height of the side spillway, water flows down through the structure and continues along the riverbed on its normal route downstream. In-season rice growing is carried out both upstream and downstream of the dam. Upstream growers farming areas peripheral to the reservoir are advised to use varieties of floating rice or those that can withstand prolonged flooding. The seedlings for this kind of rice must be sown before the reservoir fills with water.

At the end of the growing season, the water is retained in the reservoir for watering animals and for fishing. Market gardening activities are carried out along the entire length of the river, with water being extracted from dug wells (sumps two to six metres deep).

Implementation locations

In the Sikasso region; in 15 or so communes within the circles of Kadiolo, Sikasso, Bougouni and Yanfolila.

Scope of application

This type of scheme works best in southern areas of Mali with 1,100 to 1,200 millimetres of precipitation per year. It has been successfully adopted in northern Côte d'Ivoire.

In Mali, there are around 15 schemes in place in the circles of Sikasso, Kadiolo, Bougouni and Yanfolila, covering more than 1,000 hectares and benefiting 1,500 rural families. In these areas, more than 60% of rice growers are women. More than 100,000 head of cattle are watered each year from the reservoirs. The very large quantity of stored water considerably increases the potential to use land for vegetable and tree growing.

Duration of application

Since 2003

Success factors and constraints

This type of scheme is effective in areas with good rainfall levels and in lowland areas where the water table is not very low. It is important to select lowland areas with the potential to store a substantial volume of water (topographic basins).
The works are not overly complex from a technical point of view and can be delivered at a reasonable cost. It is important to monitor the functioning of the spillway or weir to ensure that downstream areas are not left without water supplies when rainfall levels are low. Installation requires the use of bulldozers and compactors, equipment that is not always available from local companies. During the first few years, the earthen section of the embankment must be protected from animal intrusion. The initial request for a scheme is sometimes drawn up by a specific group of users who may not take into account the full range of functions offered by the scheme: indigenous livestock rearing, transhumant livestock rearing, rice growing, tree growing, market gardening, fishing, brickmaking, etc. It is essential for regulatory and arbitration mechanisms to provide support in these areas throughout the process.

Roles of the actors involved

- Local people formulate the requirement and negotiate with the commune on the investment programme; they identify the rules of access and set up the farming cooperatives and management bodies.
- The commune plans investments and assumes overall control of the construction work, delegates management to users, and validates the farming rules and oversees their correct application.
- Consultancies carry out the socio-economic, environmental and technical studies (scheme design, plans, models), draw up the invitation to tender document and support the tender selection process, and monitor and inspect works.

- Technical services oversee the application of technical and environmental standards and participate in ensuring sound financial practices (collection, financial control, public service concessions).
- Contractors carry out the construction work.
- The project team provides training (planning, social engineering, studies involving farmers, etc.), advisory support (organisation of users, formulation and validation of rules, area development plan, plan to develop and exploit value chains, selection of suitable crop varieties, management delegation procedures, procedures for securing land titles, etc.) and co-financing.

Effects and impacts

The scheme has enabled irrigable areas to be rehabilitated and extended. Farming yields have doubled, or even tripled, due to the availability of water supplies and the technical support that continued up until the end of works. The water table has risen and rises to the surface at times. The wells located in the lowland basin no longer dry up.
Several operational scenarios are being implemented and agricultural intensification is possible year round, providing several harvests. High-added-value vegetable crops have been produced. Watering livestock is not difficult and the pastures in the catchment basin are larger because of the dam. Grazing animals stay in the area longer and produce manure. Moreover, fees are collected for the watering of livestock. There has been a five-fold increase in the volume of fishing activities, catches and trade. At the community level, larger revenues are being generated. Greater levels of biodiversity and vegetation have been observed in the vicinity of schemes.

Costs and cost effectiveness of the good practice

The cost of a scheme stands at around 40 million CFA francs for between 10 to 80 hectares (0.5 to 4 million CFA francs per hectare).

Assessment of investment cost per unit:	Low	☐	Average	☒	High ☐
Rating of cost effectiveness:	Low	☐	Average	☐	High ☒

Sustainability

The technique has now been mastered by a number of local companies. No dam has failed in the last eight years. The excavated ponds have retained water supplies throughout the whole year. Vegetation appears in the vicinity of schemes. Fish have returned, along with crocodiles; both having previously disappeared from these village areas. There were no accidents either during or after the installation of schemes, although, from now on, it will be important to guard against any safety issues arising from the presence of caimans and large reptiles.

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4.2.4 Dams with water-spreading weirs

Célestin DEMBELE, Jacques TAMINI, Moussa DOUMBIA – HELVETAS Intercooperation, AVAL and APEL

Objectives

The role of small dams with weirs is to raise the water table, expand rice growing areas and extend the availability of water in lowland areas to complete the agricultural cycle of lowland areas (rice and vegetable growing). It is used for free submersion or relatively controlled submersion.

Definition and description of the good practice

Small dams are installed on minor river beds and are connected up to the riverbanks. Their above-ground dimensions are small, but trench depths can be quite substantial in the case of a subterranean dam two to three metres deep. Plastic sheeting is placed in the trench to stop the water flowing underground.

Weirs are low-level structures built in flat valleys as extensions of small dams. Dam walls are low in height, standing from 0.1 m to 1 m above ground level.

Photo 17: Small dam in Bafaga village, Kebila Commune

Photo 18: The mayor of Zantiébougou (centre) takes part in the works on Mamissa dam

Source : HELVETAS – Swiss Intercooperation

Implementation

It is in community-led planning initiatives that the request for a lowland development scheme takes shape. This is then incorporated into the commune's PDESC. The request is analysed (in consultation with the client community) to ascertain the socio-economic gains for the beneficiaries, the strengths and development potential of the area, and the motivation levels of the actors involved. The terms of reference for studies are validated by the community and the local authority before being submitted to the service providers (consultancies).

The local diagnostic exercise gives communities the opportunity to put forward their own thoughts on the social, economic, cultural and physical situation of the site and its environment. Training local facilitators is crucial at this stage. The results from the diagnostic are summarised in a report on the ideal development scenarios put forward by local people. Results from the diagnostic process are fed back to the community at a public meeting.

The technical diagnostic exercise is undertaken by a consultant to examine the issues and scenarios raised in the local diagnostic exercise more deeply. The consultant carries out the topographical survey and examines the technical functioning of the lowland area, draws up an inventory of current and future economic activities, produces an estimate of costs and looks at environmental issues. He/she also takes into account the methods to be used for farming and maintaining installed facilities. Before being approved, the findings of the technical diagnostic exercise are developed as a 3D model and fed back.

The consultant then moves on to performing economic and financial analyses, which will confirm the cost effectiveness of the scheme. An invitation to tender document for the delivery of works is provided to the commune.
A funding agreement is signed by the commune, farmers and project team. This agreement stipulates the responsibilities and commitments of each party during the installation and farming stages.

The tender process for the installation works is carried out by the commune. A commission – comprising representatives from the local authority, client community, project team and public body in charge of development schemes, and supported by the consultancy handling the invitation to tender – is set up under the authority of the deputy mayor to sift and evaluate offers and select the winning bidder/s. The process adheres to the procedures for awarding public contracts (Decree No 08-485/P-RM of 11 August 2008 establishing the Procedures for the Awarding, Executing and Regulating of Public Contracts and Public Service Concessions).

The design consultancy conducts ongoing supervision of the works to ensure that the standards laid down in the technical dossier are adhered to. It is contractually bound to the commune through a monitoring and supervision contract.

At the same time, public administration undertakes sporadic inspections to ensure relevant laws are respected. The users are divided up into management and maintenance teams and their respective responsibilities are clearly defined prior to the interim and final acceptance of works, which brings this stage to a close. Farming and management rules are laid down in a local agreement. The following socio-professional groups may figure in this, depending on the type and functionality of the lowland area: rice growers, market gardeners, fishers, tree growers, livestock farmers, hunters, etc. Schemes can begin operation once the interim acceptance has been received.

Tableau 5: Preparatory phases for the installation of a small dam

PHASE	CONTENT	VALUE ADDED BY THE APPROACH
Preparation and design	Local farming community programme Integration into PDESC Diagnostic exercise and locally provided scenarios 3D model Technical studies by contractors Development plans Invitation to tender document	Locally based programme carried out in conjunction with lowland users Farm community representative is a stakeholder in the initial design process (village facilitators) Large study area that extends beyond the range of the topographical map Multifunctional nature of the 'lowland system': in-season and offseason farming, fishing, livestock rearing
Installation	Co-financing Recruitment and contracting of services Organisation and regulation Transfer of management Acceptances	Supervision of works by the service provider and contracting of the monitoring of outsourced services Management agreement for scheme areas and the catchment area
Development	Technical training according to the types of use Occupancy and management of sites Management and maintenance bodies Follow up on outcomes	Delegation of powers to user organisations (concession contract between the commune and the users association) Development plan with a multi-stakeholder platform

Operation

The underground section of the dam retains upstream waters. As a result, the ground absorbs water and moisture throughout the entire area affected by the dam. The above-ground section (a watertight wall equipped with outflow gates) discharges the upstream water. It has a weir running along the marigot. Downstream, a stilling basin is installed to prevent erosion caused by the falling water. Using the weir and outflow gates, the water level can be adjusted to the requirements of each rice growing stage.

The water retained by a dam equipped with a weir cannot be conserved for long periods. The structure's main role is to provide water to meet the needs of the rainy-season crops. Even though the trenches are deep and the plastic sheeting prevents underground water dissipation, weirs can help to ensure ground waters are well recharged. This is why farmers should wait before digging wells to extract water for vegetable growing.

Implementation location

Sikasso Region: more than 100 communes in the circles of Yorosso, Koutiala, Sikasso, Kadiolo, Kolondiéba, Bougouni and Yanfolila
Ségou Region: six communes in the San and Tominian circles

Scope of application

More than 120 schemes with an average area of 20 hectares were built between 1998 and 2012. These schemes cover an area of more than 2,400 hectares and directly benefit over 15,000 families.

Duration of application

Since 1998

Success factors and constraints

These schemes are simple and low cost. Most local contractors are fully competent in the installation techniques and hi-tech equipment is not required.

The effect on rice-growing areas is immediate: the retained water allows the agricultural crop cycle to be completed more easily. It is beneficial to combine this structure with an excavated pond sited around 30 to 50 metres away in order to provide supplies for watering livestock after the harvests. It is important to make it clear to farmers that the water held in these small dam schemes cannot be stored throughout the dry season. To avoid misunderstandings, users should be heavily involved in the design of the scheme.

Roles of the actors involved

- Local people formulate the requirement and negotiate with the commune on the investment programme, identify the rules of access and set up the farming cooperatives and management bodies, provide materials and unskilled labour during construction, and undertake small-scale maintenance work.
- The commune plans investments and assumes overall control of the construction work, delegates management to users, validates the farming rules and oversees their correct application, and under takes major repairs.
- Consultancies carry out the socio-economic, environmental and technical studies (scheme design, plans, models), draw up the in vitation to tender document and support the tender selection process, and monitor and inspect works.
- Technical services oversee the application of technical and environmental standards, and participate in ensuring sound financial practices (collection, financial control, public service concessions).

- Contractors carry out the construction work.
- The project team provides training (planning, social engineering, studies involving farmers, etc.) and advisory support (organisation of users, formulation and validation of rules, area development plan, plan to develop and exploit value chains, selection of

Effects and impacts

The scheme has enabled previously irrigable areas to be rehabilitated and extended. Farming yields have doubled, or even tripled, due to the availability of water supplies and the technical support delivered post-build. The water table has risen (wells no longer dry up).

Several operational scenarios are being implemented (a second and, in some cases, a third growing cycle has been made possible). Sizeable vegetable crops have been produced. Watering livestock is now easier and the lowland pastures are more abundant.

At the community level, larger revenues have been generated. The local population is busier throughout the year, which reduces outmigration, particularly among young people.

Costs and cost effectiveness of the good practice

The cost of installing these schemes ranges from 5 to 25 million CFA francs. With this sum, it is possible to irrigate between 2 and 50 hectares. The cost per hectare stands at around 0.5 to 2 million CFA francs.

Assessment of investment cost per unit:	Low	☒	Average	☐	High ☐
Rating of cost effectiveness:	Low	☐	Average	☒	High ☐

Sustainability

The scheme can remain functional for up to 20 years provided it is rigorously maintained. These structures can also be installed in dry areas. In these areas, it is essential from the outset that anti-erosion measures are put in place to manage the risk of sand encroachment.

The low cost combined with quick returns makes this type of intervention suitable for poor communities and local authorities.

Organisation, resource person and contact details

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Reference documents

Intercooperation (2008): Les aménagements de bas-fonds dans le bassin cotonnier de Sikasso. Expérience du programme Jékasy. [Developing lowland areas in the Sikasso cotton-growing basin. The Jékasy programme's experience]

Rapport collecte de données sur la valorisation des ouvrages réalisés dans le Pôle de Bougouni sur le financement APEL [Data collection report on developing the value of APEL-funded schemes carried out in the Bougouni Hub] – Bougouni, April 2013

4.2.5 Masonry micro-dams

Mamadou Gallo KONE, Ralf SCHNEIDER, Abass OUOLOGUEM – IPRO-DB

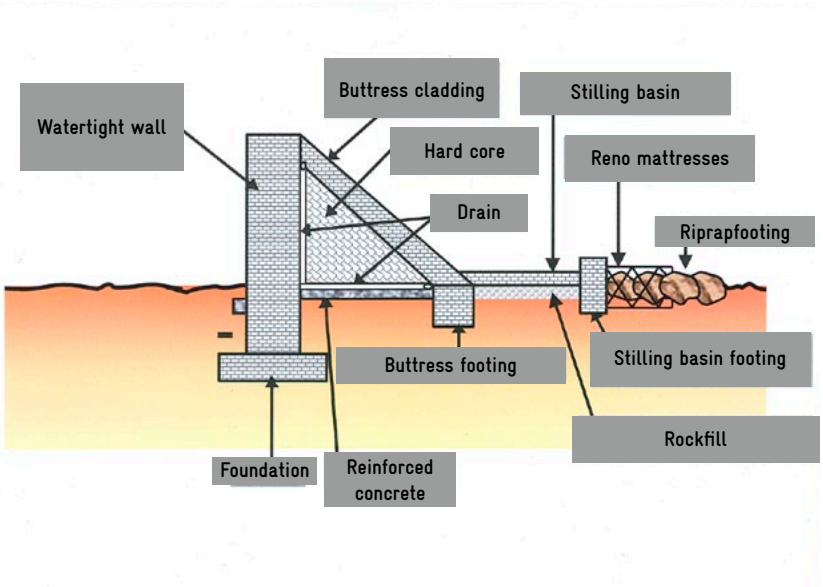
Objectives

The role of masonry micro-dams is to raise the level of the water table so as to supply wells and create water reserves for off-season farming activities. This results in increasing the farmland area as well as yields and production. A second growing season is made possible.

Definition and description

A masonry micro-dam is a structure built of dressed stone pointed with cement mortar. The width of the crest is 0.75 metres. The length generally ranges from 100 to 200 metres depending on the site. The height varies between two and four metres. The dam creates a water reservoir upstream covering an area of around 5 to 15 hectares. Micro-dams are equipped with buttresses and a stilling basin. Each dam has a sluice fitted with a stoplog gate for draining away sediment during the first rains of the season and to regulate water levels. Farming is carried out upstream and downstream in the rainy season and off-season.

Figure 5: Masonry dam



Source: IPRO-DB

Implementation

- An information and awareness-raising workshop is organised on the IPRO-DB approach at the commune level, involving the villages affected by the project.
- A general meeting is held to secure the support of the whole village for the development request.
- The village chief and commune mayor sign off the request.
- The project team carries out a scoping study and socio-economic surveys.
- If the outcomes of the scoping study phase and socio-economic sur veys are positive, the terms of reference are drawn up for working with consultancies.
- Consultancies are selected through tender processes to carry out the technical studies (summary draft document and detailed preliminary draft) and create the invitation to tender document.
- The project team monitors the consultancies' delivery of the technical studies.
- The village pays its financial contribution towards the project.
- The management committee is set up and organisational and technical training is provided to beneficiaries (site foreperson, warehouse person and assistant mason from the community).
- Exchange visits are organised with villages that have experience in installing these schemes.
- The project team, village, mayor and company sign the memorandum of understanding.
- Stone breaking gets underway.
- Landowners sign the transfer deeds for the site.
- The invitation to tender for the building works is published and the contractor selected.
- The invitation to tender for works supervision is published and the supervisory consultancy selected.
- The building contractor and supervisory consultancy are intro duced to the village and begin the building work.
- Local labour is employed in building the scheme.
- Partial acceptance of the building works (for example, foundations, wall, buttresses, stilling basin, gabion reinforcements, etc.) is granted.
- The project team monitors the building works.
- Payment for activities is made on a unit-price basis.
- Interim acceptance is granted.
- Final acceptance is granted after one year.

Operation

The dam increases the amount of available surface water during the rainy season and groundwater during the off-season. Its effect on the water table depends on the depth of the scheme's foundations: the deeper the foundations, the greater the recharge of ground water.

During the rainy season, the lands are used for rice growing. The wells used for irrigating market gardens are fed from the water table, meaning vegetables can be grown off-season. The water is also used for watering livestock, fish farming and, sometimes, domestic purposes.

A management committee takes charge of opening and closing stoplog gates, organises the maintenance of the scheme and institutes additional measures to protect the scheme (gabions, stone bunds, etc.). It collects and manages maintenance fees, ensures the committee's rules of procedure are adhered to and organises meetings of local producers.

Implementation location

Implemented throughout the Bélédougou area; in the villages of Kenekolo, Nonkon, Tiembougou, Tienko, Korokabougou and Bamabougou in Kolokani Circle; Sonikegny and Sognebougou in Kati Circle

Scope of application

Around 60 masonry dams have been built or rehabilitated in the Bandiagara and Bélédougou areas.

Duration of application

This type of dam has been built since the 1990s.

Success factors and constraints

- The use of stoplog gates is recommended instead of sluice gates, as the latter are more technically sophisticated and require more maintenance.
- If the scheme is built in the form of a dam bridge, railings must be incorporated.

Bandiagara area

- Costs are reduced as a result of the availability of local materials and the fact that local masons and contractors are well versed in this type of technology.
- The geological situation must be suitable (no fissures in the rock).
- Land ownership issues can have an influence on productive farming and management.
- Beneficiaries occasionally fail to monitor and maintain schemes.

Bélédougou area

- There is an occasional lack of quality rubble.
- Beneficiaries occasionally fail to monitor and maintain schemes.
- There are no land ownership issues as there is sufficient land available.
- The sustainability of this kind of dam ('technical' solution) can only be ensured through the adoption of a participatory, tailored approach that aims to ensure the good management and farming of schemes (see section 4.1.1 on IPRO-DB's participatory approach).

Roles of the actors involved

- **Beneficiaries** provide labour and financial resources, and monitor and maintain the scheme.
- **The project team** provides funding, training and beneficiary support, carries out studies, and capitalises on project data.
- **The commune** signs off the village request and repairs damage (an activity that has so far been undertaken by the project team).
- **Consultancies and contractors** conduct surveys, carry out building work and are responsible for oversight.
- **Rural engineers:** Quarterly inspections are carried out by the Regional Directorate of Rural Engineering and the Regional Directorate of Agriculture.

Effects and impacts

Micro-dams increase farmland area, yields and production, and generate employment throughout the year. Seasonal outmigration is reduced. Better levels of production increase producers' incomes and improve living conditions.

Costs and cost effectiveness of the good practice

Each dam costs between 100 and 140 million CFA francs.

Assessment of investment cost per unit:	Low ☐	Average ☒	High ☐
Rating of cost effectiveness:	Low ☐	Average ☒	High ☐

Sustainability

With minimum levels of maintenance, a scheme will remain functional for at least 20 years. Sustainable farming and management depend directly on employing a participatory approach.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
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Reference documents

IPRO-DB (2007): Fiches techniques des barrages individuels. [Data sheet on individual dams]

IPRO-DB: Module de formation pour la préparation des aménagements [Training module on preparing schemes] (available in French and Bambara)

IPRO-DB: Module de formation sur l'entretien des ouvrages [Training module on scheme maintenance] (available in French and Bambara)

IPRO-DB: Approches du projet de l'irrigation de proximité au Pays Dogon et dans le Bélédougou [Small-scale irrigation project approaches in Dogon Country and in the Bélédougou region], (O. Fritz, Technical Assistant, GIZ, December 2011)

4.2.6 Cyclopean concrete micro-dams

Mamadou Gallo KONE, Ralf SCHNEIDER, Abass OUOLOGUEM – IPRO-DB

Objectives

Raising the water table will feed wells. Creating a reservoir of water for growing off-season will increase the farmed area, yields and production. A second growing season thus becomes possible.

Definition and description of the good practice

A cyclopean concrete micro-dam is built using dressed stone pointed with concrete. The width of the crest is 0.75 metres. The length generally ranges from 150 to 250 metres depending on the site. The height varies between two and four metres. Micro-dams are equipped with buttresses and a stilling basin. The dam can be built in the form of a dam bridge. Each dam is has a stoplog sluice for draining away sediment during the first rains of the season and to regulate water levels. The dam creates a water reservoir upstream covering an area of between 4 and 15 hectares. Farming is carried out upstream and downstream in the rainy season and off-season.

Photo 19 : Tiembougou dam bridge in cyclopean concrete

Photo 20 : Sounikéyni micro-dam in cyclopean concrete

Source : IPRO-DB

Implementation

Initially, an information and awareness-raising workshop on the IPRO-DB approach is organised at the commune level, involving the villages affected by the project. Following this, a general meeting is held to secure the support of the whole village for the development request. The village chief and commune mayor then sign off the request.

The project team carries out a scoping study and socio-economic surveys. If the outcomes of the scoping studies and socio-economic surveys are positive, the project team draws up the terms of reference for working with the consultancies. This stage is followed by the selection of consultancies through tender processes to carry out the technical studies (summary draft document and detailed preliminary draft) and produce the invitation to tender document, all of which will be overseen by the project team. The village then makes its financial contribution towards the project, the management committee is set up, and organisational and technical training is provided to beneficiaries (village foreperson, warehouse person and assistant masons).

This is followed up with:

- exchange visits organised with villages that have experience in installing these schemes;
- the project team, village, mayor and company signing the memorandum of understanding;
- stone breaking;
- landowners signing the transfer deeds for the site;
- the publishing of the invitation to tender for the building works and the selection of the winning contractor;
- the publishing of the invitation to tender for works supervision and the selection of winning oversight consultancy;
- the introduction of the building contractor and supervisory consultancy to the village and the commencement of building work, with local labour employed in building the scheme.

The final stages comprise the partial acceptance of the building works (for example, foundations, wall, buttresses, stilling basin, gabion reinforcements, etc.), the monitoring of scheme building works by the project team, payment for activities on a unit-price basis, and interim acceptance leading to final acceptance after one year.

Operation

The dam increases the amount of available surface water during the rainy season and ground water during the off-season. Its effect on the water table depends on the depth of the scheme's foundations: the deeper the foundations, the greater the recharge of ground water.
During the rainy season, the areas are used for rice growing. The wells used for irrigating market gardens are fed from the water table, meaning vegetables can be grown off-season. The water is also used for watering livestock, fish farming and, sometimes, domestic purposes.
A management committee takes charge of opening and closing the stoplog gates, organises the maintenance of the scheme and institutes additional measures to protect the scheme (gabions, stone bunds, etc.). It collects and manages maintenance fees, ensures the committee's rules of procedure are adhered to and organises meetings of local producers.

Implementation locations

Implemented in the Kolokani Circle (Tiembougou, Bamabougou, Korokabougou, Tienko)

Scope of application

Four dams built so far. Others are currently being planned.

Duration of application

Since 2010

Success factors and constraints

- Cyclopean concrete is stronger than rubble stone masonry.
- The use of stoplog gates is recommended instead of sluice gates, as the latter are more technically sophisticated and require more maintenance.
- If the scheme is built in the form of a dam bridge, railings must be incorporated.
- The practice is recommended for areas lacking the right kind of stone for dressing (dolerite).
- There is an occasional lack of monitoring and maintenance.
- As with any technical solution, dams require a participatory, tailored approach to ensure the good management and sustainable farming of schemes (see section 4.1.1 on IPRO-DB's participatory approach).

Roles of the actors involved

- **Beneficiaries** provide labour and financial resources, and conduct monitoring and the small-scale maintenance of the scheme.
- **The project team** provides funding, training and beneficiary support, carries out studies and capitalises on project data.
- **The commune** signs off the village request and repairs major damage (an activity that has so far been undertaken by the project team).
- **Consultancies and contractors** conduct surveys, carry out building work and are responsible for oversight.
- **Rural engineers:** quarterly inspections are carried out by the Regional Directorate of Rural Engineering and the Regional Directorate of Agriculture.

Effects and impacts

- Increased farmland areas
- Increased yields
- Increased production
- Generation of year-round employment
- Reduction in seasonal outmigration
- Increased farming revenues
- Improved living conditions

Costs and cost effectiveness of the good practice

Each dam costs between 100 and 140 million CFA francs.

Assessment of investment cost per unit:	Low	☐	Average	☒	High ☐
Rating of cost effectiveness:	Low	☐	Average	☒	High ☐

Sustainability

With minimum levels of maintenance, a scheme will remain functional for at least 20 years. Sustainable farming and management depend directly on employing a participatory approach.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
IPRO-DB Bélédougou	Mamadou Gallo KONE	gallokone@yahoo.fr
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IPRO-DB: Approches du projet de l'irrigation de proximité au Pays Dogon et dans le Bélédougou [Small-scale irrigation project approaches in Dogon Country and in the Bélédougou region], (O. Fritz, Technical Assistant, GIZ, December 2011)

4.2.7 Diversifying women's income streams through market gardening

Joseph DIASSANA, Sourakata COULIBALY – BØRNEfonden Mali

Objectives

Establishing vegetable plots for women enables them to increase their incomes and improve their health by increasing and diversifying agricultural production and improving the nutritional quality of their food. Market gardening also enables women to set up savings funds through their associations, builds their capacity to organise and manage market gardens and improves their cultivation techniques.

Definition and description of the good practice

Market gardens set up by women's associations are usually sited adjacent to lowland areas or rivers so as to facilitate access to water, which is extracted from wells. The areas of these market gardens range from 0.5 to 1 hectare depending on the size of the association and the opportunities for selling produce locally.

Allotment sizes range from 80 to 120 square metres per woman. The number of growers per market garden is no greater than 70 women per hectare and 35 women per half-hectare. Women receive a grant in the form of equipment and agricultural inputs.

The wells created for the market gardens are 1.4 metres in diameter, have 60-centimetre-high well heads and 30-centimetre-wide footpaths from which to water crops. Eight wells are installed per hectare across the site.

Photo 21 : Growing vegetables in a women's market garden

Photo 22 : Wide wells for watering crops

Source : BØRNEfonden

Implementation

The new key stages of implementation are as follows:

1. A women's association puts forward its needs.
2. The BØRNEfonden Development Unit carries out a scoping study.
3. Women are organised into an association.
4. The women contribute their share of the costs (10% of the investment costs).
5. A site with guaranteed access to water (i.e. close to the water table) is enclosed.
6. The market garden's wells are dug.
7. Financial support is provided during the first growing season to pay for equipment and agricultural inputs.
8. The association undertakes a self-assessment and draws up a training plan.
9. BØRNEfonden's Development Units provide time-limited advisory support, the duration of which depends on capacity-building needs and ranges from three to five years per village. A four-month period of advisory support is allotted to service providers (technical ser vices and consultancies).

Operation

In order to achieve the best outcomes, it is important to define rules and requirements upfront. These requirements are met by developing an internal control system and nominating an internal control committee. The beneficiaries draw up the management procedures for their site, setting out how it is accessed and how women farmers are selected through internal regulation. Selected committee members receive training in organising and managing the site. Management tools are put in place for this purpose.

A plan for the growing season is drawn up with women growers, which means needs can also be evaluated. BØRNEfonden provides the funding. The production costs of sold crops are evaluated and the required funds are then reimbursed by growers through the payment of subscription fees, using a payment system that they have collectively defined. Subscriptions paid by the women farming the site are safely set aside in the savings fund created by the association in order to ensure repayments can be made on the equipment paid for by BØRNEfonden.

Implementation locations

- Schemes were installed in 27 communes across the three circles of Yanfolila, Bougouni and Dioïla in the regions of Koulikoro and Sikasso.
- 26 villages benefited from the installation of market gardens in 12 rural communes in the Koulikoro Region.
- 31 villages benefited from the installation of market gardens in 15 communes in the Sikasso Region

Scope of application

Since 2008, 21 development units have supported the installation and management of 57 market gardens, 14 nutrition gardens (based on strip-farmed food crops and jujubes), and 286 wells across a total area of 32.3 hectares. The total number of women farmers involved stands at 2,752.

Duration of application

The activity has been operating since 2008 with increasing success.

Success factors and constraints

The success factors are: the commitment of beneficiaries, local monitoring carried out by BØRNEfonden's field agents (advisors to families tasked with income generating activities – IGA), the involvement of local technical services (agricultural services), a good harvest and better marketing of vegetable produce, and a satisfactory level of funding.

The constraints to report relate to: low-rainfall periods (drying up of wells), pests attacking crops, and problems selling crops (poor sales, low sale prices).

Roles of the actors involved

- **The women's association** makes a suitable site available and prepares the soil (clearing, grubbing and ploughing). It also contributes a 10% share of the investment and opens a bank account to provide for the repayment of the investment.
- **BØRNEfonden** undertakes site development works (laying out, well digging, fencing), carries out crop planning, buys in equipment and agricultural inputs, installs nurseries, establishes and allocates plots, prepares seedbeds, transplants seedlings, and deploys plant health products and fertilisers. BØRNEfonden supports scheme farmers with the growing, harvesting and sale of produce.
- **Local authorities** sign the service contracts established between BØRNEfonden and the private contractors hired when the market garden activities got underway (well digging and site fencing).
- **Government and consultancy technical services** are involved in performing studies, delivering training in cultivation techniques and monitoring vegetable growing plots.

Effects and impacts

- Women's takings from their vegetable crops range from 35,000 to 125,000 CFA francs, depending on the production scenario and location. We have recorded sales of between 7.5 and 8 tonnes of potato resulting from 25 crates of seed potato. Sold at a rate of 225 CFA francs per kilogram, this generates a total of between 1,687,500 to 1,800,000 CFA francs.
- Dietary diversification resulting from the communities' (and particularly children's) access to vegetables and the introduction of certain crops like potato and French beans.
- The consumption of vegetables and having the financial means to buy different kinds of foods improve the nutritional quality of diets.
- Environmental impacts: a sharp drop in the overcutting of trees to make charcoal, and a sharp drop in traditional gold mining activities and their negative environmental impacts

Costs and cost effectiveness of the good practice

	One-hectare site	Half-hectare site
Wells	2 290 000	1 130 000
Fencing	1 700 000	1 250 000
Equipment	831 000	451 500
Agricultural inputs	385 000	178 500
Total	**5 206 000**	**3 010 000**

Note that the costs of preparing the soil (clearing, grubbing and ploughing) are not factored into the above as this is carried out by the community members themselves.

Assessment of investment cost per unit:	Low	☐	Average	☒	High ☐
Rating of cost effectiveness:	Low	☐	Average	☒	High ☐

Sustainability

Strengthening the capacities of women vegetable growers ensures the sustainability of this good practice. Indeed, the women are now able to reproduce the same approaches. With BØRNEfonden's support, they have the funds to buy good quality agricultural inputs, which guarantees good production. The savings held in their bank accounts help with equipment repayments.

Market gardening is now being carried out at times when women would traditionally have been without work and lacking money and food. This new occupation deters women from taking up traditional practices that involve deforestation or environmental damage (gold mining). In light of these very encouraging levels of income, women producers will be more interested in sustaining and continuing their market gardening activities. Some of these women have already been able to capitalise on their incomes by buying livestock (cows, small ruminants). Ensuring women are well organised across the market garden site, promoting good management and increasing the purchasing power of producers are equally important factors in achieving sustainability.

Organisation, resource person and contact details

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Reference documents

Procedures and technical specifications for market garden schemes, BØRNEfonden – Mali

4.2.8 Deepening the channels supplying water to lakes and ponds

Bakary Sékou COULIBALY, Mamadou NADIO, Bakary DOUMBIA – IFAD, Zone Lacustre Development Project, Niafunké, Phases I and II (ZLDP/NKE I and II)

Objectives

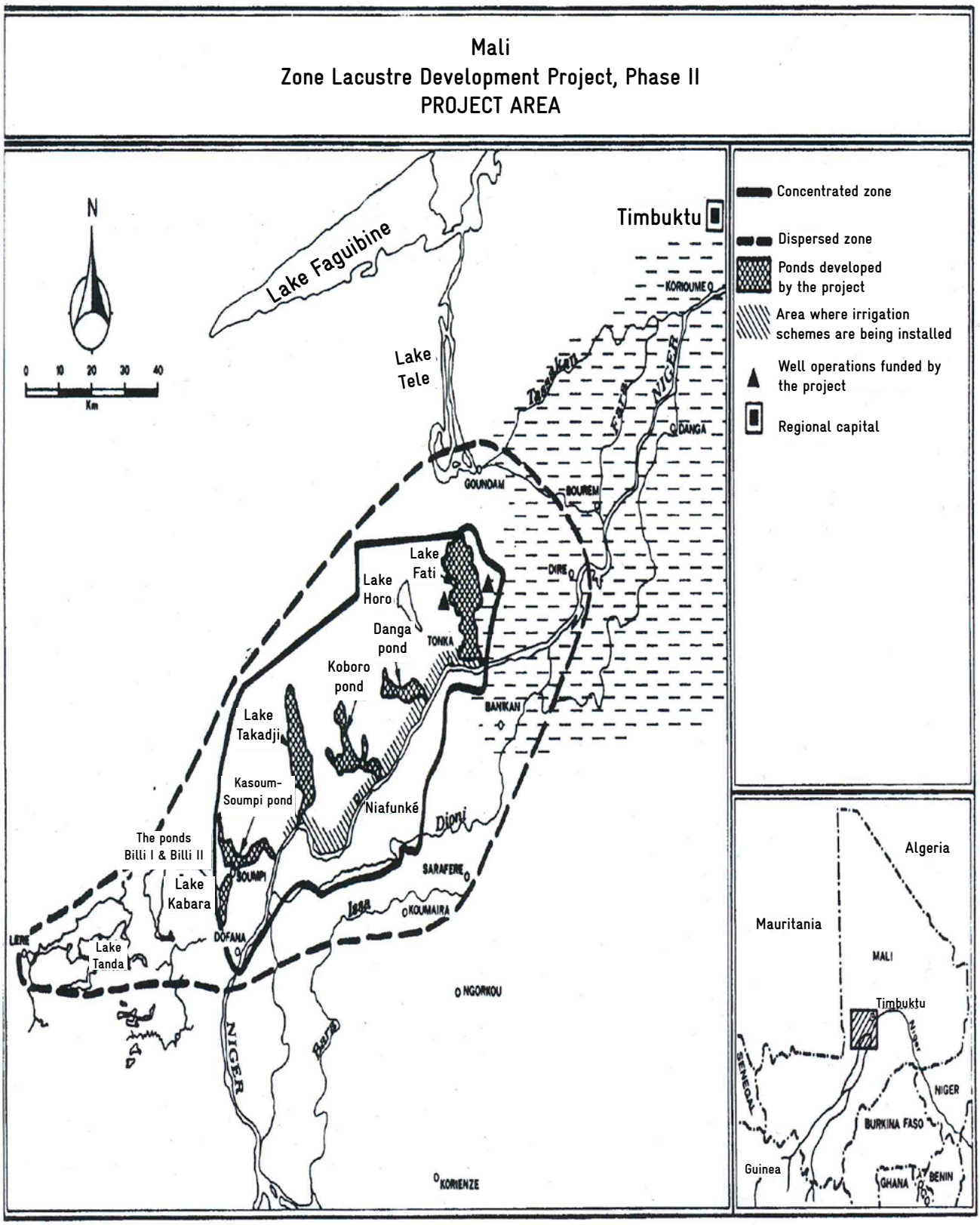
In relation to the building of control structures and the deepening of channels supplying water to ponds and lakes, the projects main objectives are to:

- restore water supplies to the lakes and ponds previously fed by the Niger River;
- regularise water supplies to the ponds and lakes;
- increase the area under cultivation;
- restart the growing of flood recession crops and other activities in the areas around ponds and lakes;
- restore the environment and biodiversity around ponds and lakes;
- raise the water table around the ponds and lakes.

Definition and description of the good practice

The water for the lakes and ponds in the lakeland area ('zone lacustre') alongside the Niger River is supplied when the Niger is in spate by means of a system of natural channels. As the water height of the annual flood wave of the Niger has decreased, some lakes and ponds receive little water. The disadvantages of this natural system are: the loss of harvests due to the flooding of fields before the crops have time to mature, and the rapid retreat of waters that inhibits the capillary effect across large areas.

The deepening of the channels has made it possible to recharge lake and pond basins. It is the reason why we are now seeing the resumption of farming, market gardening, animal husbandry and fishing around the lakes and ponds. By building control structures and large dykes it is possible to control pond and lake recharge, optimise yields and crop growing, and increase the area under cultivation.



Source: Appraisal report

Figure 7: Map of the ZLDP/NKE intervention area, phases I and II

Photo 23 : Installation at Dabi on Lake Takadji

Source : IFAD

Implementation

The stages of initiating, planning and implementing works and installations are based on the studies (soil, topographical and socio-economic) carried out by a consultancy and private company recruited through a tender process to deliver the works according to a well-defined timetable. An oversight and control office undertakes the monitoring and control of works quality and the meeting of agreed deadlines.

In principle, works are carried out during low-water periods when most of the floodplains are dry. The swampy nature of the area makes any intervention in the rainy season impossible. Furthermore, the planning of activities must respect the constraints imposed by nature. The Dabi installation on Lake Takadji is a good example of the application of technical standards.

Operation

- The application and modus operandi of this good practice involve the following:
- the water inlets for the lake and pond basins alongside the Niger River are reopened by deepening the feeder channels;
- the high waters of the Niger River feed the ponds and lakes;
- water supply is controlled using a cement structure fitted with gates to prevent:
  - the water flow from reversing when the Niger's water levels are low;
  - water flowing into the ponds and lakes before harvesting is complete;
- flood gauges to measure annual high water levels

Implementation locations

The practice has been implemented in the lakeland area (zone lacustre), particularly in:

- Timbuktu Region;
- Niafunké, Diré and Goundam circles;
- the communes of Soboundou, Soumpi, Tonka and Tindirma.

Scope of application

To provide a clear picture of the results achieved, we will attempt to provide information on the scope of application. The figures will indicate: the approximate number of beneficiaries affected by the good practice; the number of units installed, VISs and processing centres; and, possibly, the areas involved.

In terms of the ponds and lakes, the following objectives were achieved:

- Six large ponds were rehabilitated:
  - Fati (13,000 hectares), Takadji (9,000 hectares) and Ganga (3,000 hectares), making a total of 25,000 hectares
  - Koboro (4,000 hectares), Kassoum-Soumpi (1,000 hectares), Billi I and Billi II (2,000 hectares), the Nounou-Dien go causeway on Lake Takadji (an additional 1,200 hectares), making a total of 8,200 hectares
- Area involved: 33,200 hectares
- Number of beneficiaries: 190,000 producers

Duration of application

This good practice has been used for around 20 years (since 1990) in IFAD projects in the 'zone lacustre' (lake zone).

Success factors and constraints

The success factors are:

- a favourable environment – restoration of the environment and bio diversity around lakes and ponds, the raising of the water table around ponds and lakes, increases in agro-sylvo-pastoral production, increases in local people's incomes and standard of living;
- the diversification of production and incomes through the farming of small family units and market gardening plots in the lake and pond areas.

Difficulties arising from the natural water supply system are:

- the loss of harvests due to the flooding of fields before crops have matured, and the rapid retreat of waters that inhibits the capillary effect across large areas;
- the upkeep and maintenance of facilities.

Photo 24 : A market garden located alongside the Nounou installation (Lake Takadji's second installation)

Source : IFAD

Roles of the actors involved

Various actors are involved in delivering this practice. Their roles are as follows:

- **Beneficiaries** are not required to participate in works delivered by contractors (works involving large pond and lakes), but they take charge of the development of VIS plots with support from the World Food Programme (WFP) in the form of supplies.
- **External support from the project/programme** finances the installation of facilities, the pump units and the first season's inputs.
- **Consultancies** undertake feasibility studies, produce project specifications and plans, and carry out the monitoring and oversight of works.
- **Local authorities**, as a general rule, are involved in the planning of activities or, alternatively, make provision for activities in the PDESC. They also handle the upkeep and maintenance of installations.

Effects and impacts

The physical, socio-economic, institutional/organisational and environmental effects and impacts are measured using data on increases in yield or incomes or any other relevant data:

- Increases in areas under cultivation: the installation of water control schemes has led to increases in the size of areas under cultivation. In Lake Takadji's case, the installation of a second facility opened up a further 1,200 hectares of land for farming. The number of farmers working the lakeland areas has risen from 6.8% in 1998 to 18.5% in 2006, which is due to the growth in land area developed under the scheme and the high concentrations of people living in these areas. This underlying trend in production systems trans lates as increased agricultural productivity on the ground: per-hectare productivity has grown by 3.8 tonnes over the last eight years in areas using the irrigation and flood recession systems.
- The use of new farming technologies: research carried out with the support of the project team has enabled the development of new farming technologies that have subsequently been provided to households (cropping patterns, improved crop varieties), thereby increasing yields and production.
- Opening up the region: the installation of bridge crossings with causeways running across marshlands have helped to open up the area and, as such, facilitate the transport of farm produce, the provisioning of local communities and the circulation of road traffic. The development of the dual road/ferry scheme (the Sarafé ré-Niafunké road and 40-tonne motor ferry) has revived an economic and human activity that was dying out due to extremely high levels of male outmigration, which left women running households and highly vulnerable.
- Improved food security (availability of cereals): the percentage of households that are vulnerable to food insecurity has dropped from 20.4% in 1997 to 5.8% in 2006. The food security index has risen by 2.6 on a 25-point scale for all the households with access to the irrigation schemes.
- Reduced levels of migration: migration dropped by 30% between 2001 and 2006.
- Environmental restoration through reforestation: plantations growing around 100,000 plants have been developed over the lifetime of the project.
- Increases in local people's incomes: rice production on a quarter-hectare VIS can increase family income by around 80% (from 79,000 CFA francs to 142,000 CFA francs per year) compared to traditional means of production involving 1.5 hectares of floating rice grown on the river.

Costs and cost effectiveness of the good practice

The average cost of large ponds is around 300,000 CFA francs per hectare.
The VIS installation works were conducted using a participatory approach. The project contributed 780,106 CFA francs towards the VIS installation, or 65%, whereas the farmers' contribution was 429,079 CFA francs per hectare, or 35%.

Assessment of investment cost per unit:	Low	☒	Average	☐	High	☐
Rating of cost effectiveness:	Low	☐	Average	☐	High	☒

Sustainability

The following points indicate the sustainability of this good practice:

- The creation of management councils for each lake:
  - the management council oversees the good management of the lake or pond;
  - it fixes the per-hectare fees to be paid and collects them (with a part of the funds being used to pay for the basic maintenance of facilities, such as oiling gates);
  - council members receive literacy and infrastructure management training.
- User agreements are drawn up to regulate the management of the scheme (lake or pond) including:
  - annual consultations to fix the date for the first lake recharge (for customary reasons) and the practical arrangements for managing the scheme;
  - the agreement of all users to accept the decisions made by the majority of the lake management council;
  - making the management council more effective by formalising it and monitoring to ensure it undertakes regulatory meetings.
- The transfer of installations to local authorities:
  - local authorities are tasked with maintaining the causeways and levying tolls on the passenger or goods vehicles using it.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
FIDA	Bakary Sékou COULIBALY	b.coulibaly@ifad.org
National Coordinator for IFAD In-Country Programmes (CNPPF)	Mamadou NADIO	mamadou.nadio@cnppf-mali.org
Northern Regions Investment and Rural Development Programme (PIDRN)	Bakary DOUMBIA	dbakary57@yahoo.fr

Reference documents

Completion report for the Zone Lacustre Development Programme – Niafunké Phase II, July 2006

4.2.9 Administering the process of implementing a small-scale irrigation scheme

Mamadou Gallo KONE, Ralf SCHNEIDER, Abass OUOLOGUEM – IPRO-DB

Objectives
The objective of this approach is to: involve all those affected by the development works; deliver a fault-free planning process; install and manage a scheme; and ensure national regulations and standards are respected.

Definition and description of the good practice
The practice involves the planning, installation, development and management of a scheme and steps to involve actors and put contracts in place.

Implementation
Implementation is broken down into different stages:

An information and awareness-raising workshop on the IPRO-DB approach is organised at the commune level, with the participation of the villages affected by the project.

Should a village request a project, a general meeting is held to ensure the support of all villagers for the initiative. The request is signed by the village chief and the mayor of the commune.

With this stage complete, a scoping study and socio-economic surveys are carried out by the project team and, if the results are positive, the terms of reference for collaborating with consultancies are drawn up. Consultancies are selected through a tender process to carry out the technical studies (summary draft document and detailed preliminary draft) and create the invitation to tender document. The consultants' technical studies are overseen by the project team. The village provides its financial contribution to the project and a management committee is put in place to conduct organisational and technical training with the beneficiaries (site foreperson, warehouse person and assistant mason from the community). The training also includes exchange visits with other villages. A memorandum of understanding (MoU) is signed by the project team, village, town hall and contractor. Once the MoU is signed, the following stages occur:

- Stone breaking gets underway.
- Landowners sign the transfer deeds for the site.
- The invitation to tender for the building works is published and the contractor selected.
- The invitation to tender for works supervision is published and the supervisory consultancy selected.
- The building contractor and supervisory consultancy are introduced to the village and begin the building work.
- Local labour is employed in building the scheme.
- At the beginning of works, local people are informed about STDs.
- Partial acceptance of the building works (for example, foundations, wall, buttresses, stilling basin, gabion reinforcements, etc.) is granted.
- The project team monitors the scheme building works. Tasks are paid for on a unit-price basis.
- Interim acceptance is granted at the end of building works, followed by final acceptance one year later.
- Beneficiaries are trained in how to maintain the scheme.

- Annual maintenance costs are determined (for example, stoplogs must be changed every 25 years, repointing work must be carried out every 10 years, stoplogs must be painted every year, small cracks must be filled annually) in order to set the annual contribution required of producers.
- Beneficiaries allocate plots in consultation with the public and local authorities (sub-prefect, mayor, local agricultural service).
- Support is provided in purchasing rice seed and tree seedlings for arboriculture.
- The project team takes charge of deploying mechanical conservation measures (stone bunds and gabions) and biological measures to protect scheme soils, in collaboration with the beneficiaries (who provide manual labour).
- The project team works to build producers' capacities in scheme management and good practice.
- Support is provided in devising and applying internal regulations on scheme management.
- Dam reservoirs are stocked with fish.

Operation

The process is rolled out as follows:

Year 1	October/November: scoping and selection of sites November: the terms of reference for working with consultancies are drawn up December: consultancies are selected, contracts are signed and technical studies get underway
Year 2	January to April: the studies are conducted May to July: information and training/awareness raising for beneficiaries August: the invitation to tender for building contractors is published November: stone breaking commences December to January (Year 3): the contractor begins works
Year 3	Works complete by the beginning of June at the latest Care and maintenance of the installation and lowland development activities begin from June onwards, lasting for three years

Implementation locations

The Bélédougou and Bandiagara area

Scope of application

More than 80 micro-dam schemes

Duration of application

Approach used and repeatedly refined since the 1990s

Success factors and constraints

- A well-planned preparatory cycle of around 15 months between scoping and the commencement of works
- Strict quality control, which is essential for ensuring the quality of studies and works
- Ongoing activities to raise beneficiaries' awareness

Roles of the actors involved

- **The project team** carries out information/awareness-raising, scoping, study initiation, invitations to tender, monitoring and financing, and the acceptance of works.
- **Beneficiaries** formulate the request, provide manual labour and funds, participate in training, support works oversight and participate in accepting works.
- **The commune** signs the request and the tripartite agreement, encourages beneficiaries, participates in accepting works and allocates plots.
- **The contractor** builds the scheme.

Effects and impacts

- The efficiency and clarity of the process
- The use of standard model contracts and agreements in accordance with national regulations and standards

Costs and cost effectiveness of the good practice

The process has increased works efficiency and the working capacity of teams.

Assessment of investment cost per unit:	Low ☒	Average ☐	High ☐
Rating of cost effectiveness:	Low ☐	Average ☒	High ☐

Sustainability

Not applicable

Organisation, resource person and contact details

Organisation name	Contact name	Email address
IPRO-DB Bélédougou	Mamadou Gallo KONE	gallokone@yahoo.fr
IPRO-DB Bélédougou	Ralf SCHNEIDER	ralf_schneider5@hotmail.com
IPRO-DB Bélédougou	Abass OUOLOGUEM	ouologuemabass@yahoo.fr

Reference documents

Standard model terms of reference and contract for working with consultancies

Standard model invitation to tender document and contract for contractors in line with the administrative rules and procedures currently in force

Standard model tripartite memorandum of understanding (village, project team and contractor)

Standard model land transfer deed

4.3 Good practices in small-scale irrigation scheme development

4.3.1 System of rice intensification

Minamba TRAORE / IICEM

Objectives

The objective of a system of rice intensification (SRI) is increased yields. This can be achieved when rice plants are provided with sufficient air and space for their ripening process. Irrigation water supply requirements are lower, which means the approach can be deployed in low-rainfall areas or the rice growing areas can be extended using the same quantity of water (climate change adaptation). The technique requires less seed and fertiliser.

Definition and description of the good practice

SRI optimises the soil-water-plant relationship. It increases the plants' potential for production by correcting disadvantageous practices. In practical terms, this involves growing rice on lowlands and plains using fewer seeds (with the rice variety selected according to the water regime) and less fertiliser.

The system of rice intensification proves that rice is not strictly speaking an aquatic crop. Rice growing simply requires a very humid environment. The water level is maintained considerably lower down the rice stalk than it is in traditional rice paddies, where water levels range from 10 to 25 centimetres.

Photo 27 : SRI plot with the required water level

Photo 28 : Ears of rice grown in an SRI

Source : GIZ, Lea Klarmann

Implementation

Firstly, the growers are sensitised and informed about the principles and benefits of SRI in terms of yields and production costs, and are given the opportunity to sign up for technical training in SRI. IICEM takes charge of monitoring the proper application of the SRI methods over the growing season. Seedlings are planted out individually to ensure each plant has sufficient space to grow.

The rice plants are grown individually in rows, which reduces the number of seeds required and makes weeding easier.

Operation

- Selecting rice varieties according to the water regime
  The most appropriate varieties are chosen according to the water regime of the area in question (rainfed rice and lowland rice). SRI rice crops adapt well to flood and recession waters, meaning rising and falling water source levels can be managed.
- Respecting the irrigation cycles developed with the planner
  An irrigation cycle is drawn up with a planner. Training is then provided to the growers managing the irrigation system to ensure they adhere strictly to the cycle. It is important for growers in the same hydraulic area to plant out at the same time so their irrigation supply needs correspond. This ensures that the water requirements of the rice crops are met and reduces pumping costs.

Implementation locations

The practice was rolled out in the Mopti, Timbuktu and Gao regions of northern Mali and in Sikasso in the south.

Scope of application

Two very small-scale rice fields were installed: one in Deibata in Youwarou Circle and one in Mopti. Farmer organisations supported by IICEM are benefiting from the technique.

Duration of application

The practice has been carried out since 2009 by IICEM. It was deployed in Madagascar prior to its introduction in Mali.

Success factors and constraints

SRI growers are strongly advised to use organic fertilisers to supplement soil nutrient levels. Organic fertiliser is not, however, available.

Growers need to be well organised in how they approach the cropping calendar, particularly with regard to respecting sowing and transplanting periods. Good yields depend on having level plots, which requires the use of levelling bars. Other items of small equipment like hoes make work easier.

Roles of the actors involved

IICEM delivers training to raise awareness about SRI and provide the relevant skills. Conscious of the need to increase yields, IICEM ensures that this learning is applied in the field. Sometimes local NGOs are tasked with providing training and monitoring.

Growers apply the SRI approach and monitor inputs and yields so that operations can be effectively evaluated.

Effects and impacts

SRI makes it possible to increase yields by around 35% compared to average yields. It has been possible to cut costs given the shorter growing season (90 days). Growers reduce seed use by 8 to 10 kilograms per hectare. Water use drops by around 35%, given that the rice is not constantly submerged and water levels in the paddy are low.

Costs and cost effectiveness of the good practice

Assessment of investment cost per unit:	Low	☒	Average	☐	High	☐
Rating of cost effectiveness:	Low	☐	Average	☐	High	☒

Sustainability

Growers who have been trained in SRI continue using the technique as they value its effects; namely, achieving higher productivity without incurring excessive costs related to inputs, pump unit consumables, etc.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
IICEM	Minamba TRAORE	tbaminan@gmail.com
IICEM	Djiguiba KOUYATE	

Reference documents

Farmer Returns to Rice, IICEM

IICEM leaflet on SRI

4.3.2 Developing lands adjacent to small-scale irrigation schemes

Jean Parfait DAKO / Direction Nationale de l'Agriculture (DNA)

Objectives
The objective of this practice is to ensure the optimum exploitation of flood recession areas around bodies of water in order to improve agricultural production. This involves using water wisely by choosing suitable crops for the strips of adjacent land.

Definition and description of the good practice
With this method, it is possible to manage the different water levels around reservoirs. Crops are chosen according to the water level: floating rice for areas where water is deeper; erect rice for moderate depths; and maize, vegetables and trees where surface-water levels are low.

Photo 29 : Moderate water level for rice growing

Photo 30 : Water body with deep water for growing floating rice

Source : Jean Parfait DAKO

Implementation
Before the site is developed, farming advisors from the National Directorate of Agriculture (DNA) provide training to growers on benefits, constraints, possible land uses and the operating plan for the land. While the scheme is being built, rural engineering agents inform growers about how to maintain the scheme. Once the scheme is built, the rural engineering service provides training to growers and farming advisors on how to operate the scheme.

A village committee is set up to manage the scheme. Committee members must be available and prepared to work in the interest of the community. Crop layouts and land allocations are formalised in an operating plan created consensually with growers. Areas around the reservoir are catalogued and the village council – with the support of technical experts (farming and rural engineering) – then allocate the lands in accordance with the three sections established: the deep section, the moderate-level section and the low-water section.

Operation
In collaboration with the growers, the farming advisors set the farming calendar (ploughing, sowing, weeding, etc.) for each of the three sections around the reservoir. The calendar must be adhered to by everyone concerned. The advisors carry out regular monitoring of farming activities and propose corrective measures.

The scheme management committee monitors the provision of agricultural inputs, compliance with the operating plan, adherence to the agricultural calendar and the condition of the scheme, and it undertakes repairs when required.

Implementation locations

The practice has been applied in Sikasso Circle (two communes), Kita Circle (two communes) and Kati Circle (one commune).

Scope of application

The practice has been applied in over 35 schemes.

Duration of application

The practice has been used for around 10 years.

Success factors and constraints

Three essential success factors for managing a reservoir have been identified:

- the organisation of growers around the scheme to ensure all aspects (infrastructure, lands, water) are well managed;
- the maintenance of the scheme and reservoir banks (if the banks degrade, the adjacent land may erode or be lost);
- adherence to the agricultural calendar, which is key for getting the best results from installations.

Roles of the actors involved

- **Village councils** participate in the allocation of land to prevent conflicts and ensure compliance with the conditions of the land allocation and the rules in place for the scheme.
- **The management committee** ensures the upkeep of the scheme and the supply of agricultural inputs through bulk purchasing.
- **Growers** must comply with the agricultural calendar and correctly apply the recommended cropping techniques.
- **Farming advisors** train growers, monitor the farming of the site and recommend high-performing and suitable varieties.
- **Rural engineering experts** provide training on scheme maintenance, management and monitoring.

Effects and impacts

Once good land and water management are assured, the first notable effect is the safeguarding of agricultural activity. As a result of this, agricultural production increases in the villages.

Costs and cost effectiveness of the good practice

Assessment of investment cost per unit:	Low	☒	Average	☐	High ☐
Rating of cost effectiveness:	Low	☐	Average	☐	High ☒

Sustainability

When growers demonstrate a strong desire to develop the scheme in this way, its sustainability is guaranteed. Farming advisors are on hand to support growers in the sound exploitation of lands adjacent to reservoirs.

Organisation, resource person and contact detail

Organisation name	Contact name	Email address
National Directorate of Agriculture (DNA)	Jean Parfait DAKO	parfaitdako@yahoo.fr

Reference documents

Exploitation des petits aménagements hydro-agricoles [Farming small-scale irrigation schemes] (DNA 2011)

4.3.3 Using organic fertilisers on small-scale irrigation plots

Jean Parfait DAKO – National Directorate of Agriculture (DNA)

Objectives
The objective of using organic fertiliser is to enhance productivity by improving the structure and fertility of the soil, as well as its capacity for infiltration and water retention.

Definition and description of the good practice
Smallholding farmland lends itself to market gardening and rice and maize growing. Applying five tonnes of organic fertiliser per hectare for cereal growing and 20 tonnes per hectare for vegetable growing significantly improves soil fertility in small-scale irrigation schemes. The most commonly used organic fertilisers are:

- compost;
- straw pen manure with litter or household waste.

Photo 31 : A composter

Photo 32 : Straw pen manure

Source : Jean Parfait DAKO

Implementation
Farming advisors provide producers with training on techniques for preparing and applying the different types of organic fertiliser.

Composting

The actions required are:
- digging the composting pit;
- filling the pit;
- looking after the pit;
- applying the compost to the land.

The composting pit

- The collection and stockpiling of straw pen manure
- The application of the manure to the land

Household waste

- The collection and stockpiling of household waste
- The application of the household waste to the land

Operation
Farming advisors monitor how growers produce and apply organic fertiliser.

Implementation locations
The practice is being popularised throughout the areas in and around irrigation schemes.

Scope of application
Throughout Mail

Duration of application
Ongoing for around 10 years

Success factors and constraints
The main constraints are producers' lack of equipment for collecting organic matter and water shortages in the dry season. The main success factor in applying organic fertiliser is the cost compared to chemical fertilisers. In some schemes, particularly in semi-arid areas, not enough biomass is available to systematically provide the quantities required to cover all the land being farmed. Compost is therefore often reserved for cash crops.

Roles of the actors involved
The farming advisors provide growers with training and also monitor the production and application of the organic fertiliser.

Growers dig the composting and slurry pits, transport organic matter to fill the pits, and manage the upkeep and oversight of the pits.

Effects and impacts
Organic fertiliser maintains soil fertility and improves its structure. It stimulates biological activity in the soil and increases yields and production. Increasing the level of organic matter in the soil (humus) enhances its capacity to store nutrients (cation-exchange capacity) and water.

Costs and cost effectiveness of the good practice
Production costs are low given that the local materials involved are available freely or at very low cost. This activity requires basic equipment (cart, wheelbarrow) to transport the organic matter.

Assessment of investment cost per unit:	Low ☒	Average ☐	High ☐
Rating of cost effectiveness:	Low ☐	Average ☐	High ☒

Sustainability
The frequency of organic fertiliser application varies from once a year to every three years and depends on its quality and quantity.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
National Directorate of Agriculture (DNA)	Jean Parfait DAKO	parfaitdako@yahoo.fr

Reference documents

Technical fact sheets on organic fertiliser (DNA)

4.3.4 Integrated Production and Pest Management (IPPM)

Jean Parfait DAKO, National Directorate of Agriculture (DNA)

IPPM objectives
Integrated Production and Pest Management (IPPM) curbs the environmental degradation caused by current farming practices (intensive and extensive), reducing the negative impact wrought by pesticides on the environment (wildlife, water, soil) and on humankind. IPPM promotes the adoption of farming practices that are as respectful of the environment as they are productive and profitable.

Definition and description of the good practice
IPPM works with all available techniques for combatting pests, while keeping pesticide use at economically justified levels. It reduces risks to human and animal health and to the environment. It is put into practice in farmer field schools (FFSs).

Photo 33 : Studying plant disease in an FFS

Photo 34 : Discussing the results with growers

Source : Jean Parfait DAKO

Implementation
Men and women farmers are informed about the harmful effects of pesticide use. A group of local farmers are offered the opportunity to form a farmer field school led by a facilitator (with 25 farmers in each FFS group). The weekly sessions of the FFS focus on studying the presence of insects and diseases and the condition of plants. The results are recorded in a study-findings logbook. Biopesticides like neem extract are used and their effectiveness is studied.

Operation

- Setting the critical thresholds for pest infestation of crops and evaluating the treatments required
- Composing and applying pesticides according to the level of infestation

Implementation locations
All regions throughout Mail

Scope of application
All farmed basins

Duration of application
On going for around 12 years

Success factors and constraints

The village facilitators and farmers participating in the FFS must be literate. The IPPM approach requires inputs from plant-disease and insect experts.

Roles of the actors involved

- **Producers** participate in the FFS and apply the techniques on their lands.
- **Technical services** provide training in good farming practices and link up the plant-disease and insect experts with the FFS facilitators.
- **Research institutions** make their plant-disease and insect experts available and train up the technical services.

Effects and impacts

Reduction in pest control costs. Farm production is healthier and the environment is better protected. The use of pesticides for safeguarding production in rural areas is now very low.

Costs and cost effectiveness of the good practice

Assessment of investment cost per unit:	Low	☒	Average	☐	High ☐
Rating of cost effectiveness:	Low	☐	Average	☐	High ☒

Sustainability

This technique is particularly popular with farmers. Trained facilitators and farming advisors are available.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
National Directorate of Agriculture (DNA)	Jean Parfait DAKO	parfaitdako@yahoo.fr

Reference documents

Annual reports for 2010, 2011 and 2012 – IPPM/DNA

4.3.5 Introducing tomato varieties using succession planting

Jean Parfait DAKO – National Directorate of Agriculture (DNA)

Objectives

The specific objectives of growing off-season tomatoes are:
- promoting market garden production during the off-season;
- reducing the scarcity of tomatoes in the off-season;
- increasing the revenues of growers.

Definition and description of the good practice

Tomato production in the off-season is restricted by the prevalence of insects and disease at that time. To mitigate these difficulties, it is important to find sustainable, non-polluting solutions that are accessible to producers. These solutions are: good tomato growing practices, the use of resilient and suitable tomato varieties, and biological control. Some varieties of off-season tomatoes have produced well and shown a certain resilience to diseases and other pests (nematodes and aphids). Growing tomatoes off season also means the market can be supplied when such produce is lacking.

Photo 35 : Tomato growing

Photo 36 : Mixed cropping

Source : Jean Parfait DAKO

Implementation

a) Preparing the nursery

Select a site for the nursery that is near to a water source. Clean and turn the soil in the plot. The insects and weeds in the soil often pass on disease to young nursery plants. It is therefore necessary to disinfect the soil. Manure must be worked into the soil or compost prior to disinfection. In the week prior to treatment, the nursery soil must be kept sufficiently moist. Growers can disinfect their soil in several ways:

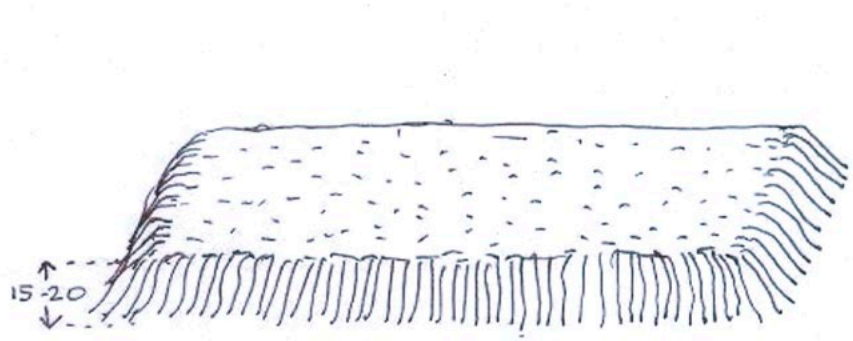
- **Fire**
  Heating the ground to between 60 to 100 degrees Celsius destroys pests. Take a flat metal sheet and raise its edges. Place the metal sheet on two small brick walls. Light a fire under the metal sheet and then cover it with very wet soil to a depth of 15 centimetres. As the water evaporates it kills the germs. Stir the soil with a shovel to ensure the steam penetrates throughout the soil. After 20 minutes, the earth is left disinfected. Use this to cover sown seeds or for the seed trays.

- **Hot water**
  Prior to sowing, pour boiling water over the beds. A one-square-metre bed needs around 10 litres of water – i.e. one full watering can. Next, cover the earth with old sacks, tarpaulin or plastic sheeting to limit heat loss through evaporation.
- **Chemical products**
  Some chemical products can be used to disinfect the soil prior to sowing. They must only be handled by an experienced market gardener.

b) Seasonally determined nursery beds
The way a bed is prepared depends on the season:

- In the dry season, the nursery bed is sunk into the ground so that it holds water better.
- In the rainy season, the nursery bed is raised (mounded) to prevent waterlogging and promote good drainage once the rains have abated.

Figure 8: Raised bed (15 to 20 centimetres high)



Source: DNA

c) Seed requirement
Two to three grams for each 100-square-metre plot

- Fresh market tomatoes: 300 grams per hectare
- Industrial tomatoes: 400 grams per hectare

d) Nursery fertiliser
Fertilisers are optional. During sowing, they can be applied in small quantities in soluble form. Alternatively, three kilogrammes of well-rotted manure can be applied per square metre.

e) Protecting plants
Combat leafminers and prevent damping off by applying authorised plant health products. Cover the nursery with a mosquito net until the seedlings are planted out.

f) Nursery seedlings
Seedbeds are laid out in rows 15 to 20 centimetres apart. The seeds are sown along one-centimetre-deep furrows or simply scattered. Seed density should be 100 per linear metre, i.e. 500 per

square metre. The seeds are then covered over with earth or fine sand. The beds are covered over with straw, which is removed as soon as the seedlings sprout. Duration of nursery stage: three to four weeks.

g) Transplanting

Healthy and strong plants with at least six proper leaves are planted out. The distance required between plants varies according to the season, growing conditions and varieties in question: 80 x 60 cm; 80 x 40 cm; 60 x 60 cm; 60 x 40 cm. When transplanting plants, compact the earth around the roots. Each plant must be carefully extracted along with the clump of earth its roots are embedded in. Dig a hole in the bed and insert the plant. Plants are planted in raised beds or mounds in the rainy season and in the beds or flat ploughed ground outside of the rainy season.

Transplanting should be carried out at the end of the day, when it is cooler. Water plants immediately after planting them out. Whatever the growing season, it is best to cover young, freshly transplanted plants with a straw cover providing adequate shade. If some plants die, replace them with others held in the nursery.

h) How to prune tomato plants

Remove buds growing between the leaf and the stalk. Retain only one or two thick stalks with their leaves and their flowers. Pruning should be carried out once or twice a month. Prune tomato plants whose fruit will be used for industrial purposes or canned (determinate tomatoes may not be pruned). From time to time, remove suckers (a side shoot from an axillary bud) when weeding and hoeing. For fast-growing varieties, retain just one thick stalk.

i) Fertilisation

The quantities of chemical fertiliser to apply vary as follows: 40 to 120 kilograms of nitrogen per hectare, 30 to 90 kilograms of phosphate per hectare, and 30 to 90 kilograms of potash per hectare. Never spray fertilisers on young or wet plants as this will burn them. An alternative is 20 to 30 tonnes of organic fertiliser per hectare.

j) Plant care

Plants must be watered regularly (morning and evening), particularly during fruit formation. The water quantities are then reduced towards the end of the growing cycle. Weed and hoe regularly, especially in the early stages of planting. Stake the tomato cultivars before they begin forming fruit. This will stop the fruits touching the ground. Using mulch provides better quality fruit.

Operation

- Identify the varieties of tomato with a different growing cycle.
- Choose the plot well, making sure water sources are nearby for supplementary watering.
- Stagger your tomato planting (succession planting) so as to meet the needs of the market.
- To promote year-round tomato growing, four tomato varieties for off-season growing were distributed during the 2010/11 and 2011/12 growing seasons: C-20-5, Caraibo, Carioca and SF 61-83.

Implementation locations

The succession planting programme for the 2010/11 and 2011/12 growing seasons covered a total of 40 circles in six regions (Kayes, Koulikoro, Sikasso, Ségou and Mopti and Bamako District).

Scope of application

Farming advisors cascaded training to 1,200 producers who own succession-planted plots. Each succession plot is 400 square metres in size. In total, 75 hectares have been sown by producers.

Duration of application

Ongoing for three years

Success factors and constraints

Farming advisors are on hand to support and train up producers. The possibility of selling tomatoes during the winter season is very useful for restarting and increasing production. Growers are very enthusiastic about the technology.

Roles of the actors involved

- **Farming advisors** train the growers.
- **Growers** commit to growing produce in compliance with the growing calendar.
- **Tomato traders** buy growers' produce and sell it on to consumers.

Effects and impacts

The average yield obtained from each crop is around 15,500 kilograms per hectare, with yields peaking at 35,500 kilograms per hectare in some places.

Costs and cost effectiveness of the good practice

Economic analysis of off-season tomato production from 2012 to 2013:

Total area sown with off-season tomato	175 hectares
Quantity of off-season tomatoes grown	4,300 tonnes
Price of tomatoes grown in season	170 to 200 CFA francs per kilogram
Price of tomatoes grown off season	600 to 800 CFA francs per kilogram

Each grower produces an average 650 kilograms on a succession plot, with some producing up to 1,400 kilograms.

Produce from the plots has earned growers between 300,000 and 630,000 CFA francs (gross) over the winter season, with 75% of production sold at 600 CFA francs per kilogram.

Assessment of investment cost per unit:	Low ☒	Average ☐	High ☐
Rating of cost effectiveness:	Low ☐	Average ☐	High ☒

Sustainability

Key factors for the sustainability of this technology include:

- growers' overwhelming enthusiasm for off-season tomato growing;
- the availability of inputs and farming advisors for carrying out the practice;
- the growing number of farming schemes in rural areas.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
National Directorate of Agriculture (DNA)	Jean Parfait DAKO	parfaitdako@yahoo.fr

Reference documents
DNA (2012): Data sheet on growing off-season tomatoes
DNA (2013): Detailed report, West Africa Agricultural Productivity Program (WAAPP)

4.3.6 Promoting bourgou growing

Bakary Sékou COULIBALY, Mamadou NADIO, Mamadou TIERO – IFAD, Sahelian Areas Development Fund (SADeF)

Objectives

This activity focuses on several objectives, namely:
- increasing forage production by regenerating bourgou;
- restoring the environment and biodiversity around lakes and ponds;
- improving the diet and reproduction of local livestock;
- producing plant extracts for beverage making;
- increasing producers' incomes;
- extending bourgou growing into the Niger River's inland delta.

Definition and description of the good practice

Bourgou (Echinochloa stagnina) is an essential food for livestock in the Niger River's inland delta region. Given the lack of forage and pastureland for livestock, farmers have taken to re-planting and cultivating bourgou in order to improve the availability of forage for animals.

Photo 39: Animals in a bourgou pasture

Source: Malian Ministry of the Environment and Sanitation

Implementation

The regeneration activities are carried out under the supervision of the Korientzé forestry officer and the local SADeF facilitator. Regeneration is possible from the month of January and can be carried out as soon as the waters recede.
The regeneration techniques used are the layering and transplanting of bourgou cuttings or divisions.

Operation

The access of animals to growing sites is regulated and reserved for working oxen, calves, dairy cattle, sheep, goats, donkeys and horses. Cow, horse and donkey access costs 500 CFA francs per head, while other animals are charged at 250 CFA francs per head. A 15% share of the earnings is paid to the Korombana commune authority for the benefit of the community. The remaining funds are allocated to areas that contribute to developing the cooperative's activities.

The commune authority plays an institutional support role, making officers available to the co-operative. Furthermore, it oversees the correct application of the local agreement on managing bourgou pastures. The Deputy Prefect, through the commune authority, makes security officers

and technical service officers available to the cooperative. A rotation system is adopted for farming plots.

Implementation locations

Sites are located to the north of Gouloumbo village, to the south of Korientzé and Kéra villages, to the east of the three Diamadoua villages (Mousocouraré, M'Bessana and Tiécouraré) and to the west of Sangui.

Scope of application

The main beneficiaries are the 200 members of the organisation and other livestock farmers from the villages of Korientzé, Bagui and Kéra. An area totalling 310 hectares has been regenerated.

Duration of application

Regenerating bourgou by directly sowing seed goes back to the 1970s. However, regeneration using cuttings began in 1984 with the development of a demonstration plot. From 1999, the Near East Foundation (NEF) became interested in the activity, going on to provide financial support for the Korombana livestock farmers' cooperative to regenerate seven hectares.

Success factors and constraints

Organisationally, there are several weaknesses:

- failure to respect meeting times and poor attendance;
- noticeable confusion between the roles of the management board and the monitoring commission when carrying out the practice;
- the lack of strategies for coping with lean periods, such as fodder storage;
- insufficient knowledge among the parties to Mali's 'Pastoral Charter'.

Roles of the actors involved

- **The commune** provides institutional support and monitors the application of regulations.
- **The Deputy Prefect** makes security officers and technical service officers available.
- **The project team** provides funding and training.
- **The cooperative** implements the regulations and participates in works, management and farming.

Effects and impacts

Bourgou pastures can produce up to 3,101 tonnes of dry matter per hectare in the first year. The pastures can support between 782 and 885 tropical livestock units from the March to June period. Fauna and flora (biodiversity) reappear. A cow feeding on green bourgou gives milk all year round and a cow that has spent a season in a bourgou pasture produces one calf per year. Steamed and macerated bourgou stalks produce a highly prized sweet juice. Bourgou seed is incorporated into human diets. Bourgou helps to increase incomes.

Costs and cost effectiveness of the good practice

The total investment cost for 310 hectares is 22,144,465 CFA francs, which equates to 71,400 CFA francs per hectare (see table). The fees charged during the first season of bourgou pasture farming in June 2009 brought in 3,142,500 CFA francs. The price of a bale of bourgou ranges from 50 to 250 CFA francs depending on the time of year. The second season (April 2010) brought in 2,241,000 CFA francs. Some 687 kilograms of bourgou seed were collected, which served to provision other localities.

Breakdown of costs

Actors	Nature of input	Cost in CFA francs	Season
SADeF	Financial support	9 400 000	2008-2009
Livestock farmers' cooperatives	Evaluated labour	6 000 300	
	Financial support	1 045 220	
	Subtotal I	**16 445 520**	
SADeF	Financial support	2 765 945	2009-2010
Livestock farmers' cooperative	Evaluated labour	2 625 000	
	Financial support	308 000	
	Subtotal II	**5 698 945**	
	Grand total		**22,144,465 CFA francs**

Assessment of investment cost per unit: Low ☒ Average ☐ High ☐
Rating of cost effectiveness: Low ☐ Average ☐ High ☒

Sustainability

The Korombana livestock farmers' cooperative is now passing on its experience to others in the West African sub-region and, in so doing, is promoting its replication.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
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SADeF	Mamadou TIERO	tieromamadou@gmail.com

Reference documents

SADeF (n.d.): Les bourgoutières régénérées par la cooperative des éleveurs de Korombana [The bourgou pastures regenerated by the Korombana livestock farmers' cooperative]

4.3.7 Combining agroforestry and gardening to rehabilitate barren lands: the case of the Benkadi cooperative of Syn village

Bakary Sékou COULIBALY, Mamadou NADIO, Mamadou TIERO – IFAD, Sahelian Areas Development Fund (SADeF)

Objective

The main objective of this activity is to improve women's production of trees and vegetables, while ensuring infertile lands are restored.

Definition and description of the good practice

An irrigation scheme for market gardening is installed on barren lands and agroforestry tree species are planted. The aim is to restore degraded lands by planting endemic trees like the baobab and néré, whose leaves and fruit are very commonly used for food and medicinal purposes.

The plot measures 100 by 100 metres. The planted and living species are:

- 60 baobab saplings (Adansonia digita)
- 120 papaya saplings (Carica papaya)
- 43 néré saplings (Parkia biglobosa)
- 26 lemon tree saplings (Citrus lemon)
- 2 tamarind tree saplings (Tamarindus indica)
- 21 grafted jujube saplings (Zizyphus sp)

The vegetable beds are created in between the lines of trees. The vegetable growing site measures 105 by 100 metres (an area of 10,544 square metres). It is provided with farm equipment and machinery, including wells, distribution basins and wire fencing around the entire perimeter. It also contains: 9 Acacia albida saplings, 156 baobab saplings and 78 papaya saplings. Market gardening also contributes to (i) raising farmers' incomes through the production of peppers, okra and shallots, (ii) developing the shallot sector, and (iii) building farmers' capacities.

Photo 40: Land at the outset

Photo 41: First plantings

Photo 43: Creating the planting beds

Photo 44: Okra, pepper and papaya crops

Source: Bakary Coulibaly

Photo 45: Vegetable plots intercropped with agroforestry species

Source: Bakary Coulibaly

Operation

The vegetable growing season runs all year round and is divided into three crop productions. During the cold season from October to March, shallots are planted; in the hot season from March to June, okra is grown; and in the rainy season peppers are grown. Women work 100% of the site. There is a 90% adoption of the growing calendar. Okra and peppers benefit from fertiliser inputs and the techniques used for growing shallots.

Implementation

Located in the urban commune of Djenné, the 'Benkadi' cooperative was a beneficiary of SAD-eF funding in 2009/2010 (for its micro-project to develop a one-hectare market garden scheme). This cooperative was the product of the transformation of Syn women's collective, which undertakes individual and collective activities, and focuses on the sustainable management of natural resources. It was set up on 22 May 1998 and its headquarters are located in Syn.

Scope of application

More than 130 women aged between 18 and 50 make up the cooperative, and nearly 30 co-operative members work the site. The main collective activities undertaken by the Syn-based 'Benkadi' cooperative company are:

- farming a biodiverse market garden plantation;
- operating a market garden;
- implementing a tontine (investment plan);
- fattening up livestock.

Concerns exist regarding enlarging and enhancing the site's dewatering system to improve women's accessibility to the developed land. Members are willing to provide at least 30 women to work the site each day.

Duration of application

The village authority agreed to cede the collective's biodiversity plantation made up of baobabs to enable the initiative to get underway. The tasks of cooperative members are highly diverse, and include running the tontine, market gardening, growing ground nuts, tree growing, handicrafts and livestock fattening.

Success factors and constraints

Critical issues requiring attention are women's poor access to the developed land and the scarcity of equipment, particularly for processing okra and shallots.

Roles of the actors involved

SADeF funded site works to the tune of 18,212,000 CFA francs. The labour contributed by beneficiaries to the installation works is estimated to represent 5% of this, i.e. 910,600 CFA francs. The village authority ceded the site (around a hectare) for the plantation.

Effects and impacts

The cooperative began as a group of 25 women, and a further 105 women have since joined the group. SADeF's installation of the market garden has enabled more than 100 women to take part in income-generating activities.

The women have produced and traded:

- 20,069 kilograms of shallots per year;
- 150 x 100-kilogram sacks of peppers per year;
- 429 sacks of dry baobab leaves;
- 6,090 papaya fruits;
- 15,700 kilograms of okra.

Costs and cost effectiveness of the good practice

The output from the 2011 growing season made a profit of 12,242,620 CFA francs.

Assessment of investment cost per unit:	Low	☐	Average	☒	High ☐
Rating of cost effectiveness:	Low	☐	Average	☐	High ☒

Sustainability

The following factors impact on sustainability:

- training in tree care and mosquito net dipping provided for neo-literates;
- thorough knowledge of the production schedules for shallots, peppers and okra on the part of farmers;
- the existence of a flat rate for renewing investments repaid in kind (rice and onion).

Organisation, resource person and contact details

Organisation name	Contact name	Email address
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SADeF	Mamadou TIERO	tieromamadou@gmail.com

Reference documents

Plan d'affaires du micro-projet de maraîchage de la Société Coopérative "Benkadi" de Syn [Business plan for the market gardening micro-project of the 'Benkadi' Cooperative Company in Syn], Djenné Commune, GADC, July 2011

4.3.8 Irrigation using a Californian network

Oumar ASSARKI – Agricultural Competitiveness and Diversification Programme (PCDA)

Objectives
The technical objective is to use water more efficiently and increase yields.

Definition and description of the good practice
A Californian network is a micro-irrigation system developed in California. The system, which is adapted to work with Malian irrigation systems, uses a pump unit that feeds in water from a river or borehole. The Californian system uses PVC sanitation piping with a diameter of 63 millimetres, sunk 50 centimetres underground.

Technical characteristics of the irrigation system:
- Pumping: a 3.5-horse-power pump unit with a lifespan of five years and throughput of 36 cubic metres per hour at an average height of 30 metres
- Fuel consumption: 1 to 1.3 litres of petrol per hour
- PVC sanitation piping
- Two hydrants functioning as water intakes and equipped with Φ50 hose couplings
- Connection parts (tees, elbows, couplings, reducers)
- Distribution using water jets

Implementation
Identification of sites either by (i) identifying a demonstration plot in a controlled environment or (ii) identifying plots and developers in the rural environment. In a controlled environment:

- developers come and visit a demonstration scheme;
- interested parties submit applications to PCDA;
- applications are reviewed (conditions: be an actor in a relevant sector, be able to provide staff, have at least three years direct professional experience, and be keen to adopt the innovations put forward by PCDA);
- PCDA visits sites to assess whether the land is suitable;
- consultants (study and oversight structures) are contracted to draw up project plans (PCDA funds the consultancy);
- projects are submitted for approval to the Regional Committee for the Approval of Projects, comprising the governor, banks, consultants, inter-branch organisations;
- following the Committee's approval, SME or large company projects must then be approved by the National Committee for the Approval of Projects in Bamako – very small businesses are not affected by this step;
- selected developers are informed and must then pay their contribution;
- the individual plots are developed – for small projects (5 to 15 million CFA francs) 75% of the investment is given in the form of a PCDA grant; mid-size projects (15 to 50 million CFA francs) receive 50% of PCDA grant, the remainder is provided through bank loans. Large companies receive 75% of the consultancy work (maximum 30 million CFA francs) as PCDA subsidy;

- a partnership agreement is set up with the Regional Directorate of Agriculture and the Rural Economy Institute to monitor the project;
- the Rural Economy Institute draws up the demonstration protocols and conducts the monitoring of demonstrations (data collection);
- PCDA and the consultancies deliver training, provide support and carry out monitoring.

Operation

- An agricultural calendar is drawn up.
- The consultancies provide support throughout the project.
- Consultancies deliver their monitoring reports.
- Local craftspeople are trained in upkeep and repair.

Implementation locations

Sikasso region (Bamadougou, N'Goroudougou, etc.)

Scope of application

Five schemes in place in Sikasso town and ten more in the vicinity

Duration of application

Since 2005

Success factors and constraints

It is essential for developers to have funds available for their contribution. The cost of projects is often underestimated, which leads to delays in implementation.

Roles of the actors involved

- **PCDA** promotes innovation, subsidises funding, provides support and conducts evaluation activities.
- **Consultancies** conduct studies, take charge of monitoring and reporting, and support developers.
- **Banks/microfinance organisations** provide co-financing and loans, and train up developers.
- **Developers** part-fund training activities and implement the project.

Effects and impacts

The technique is already used by other developers without the support of PCDA. Yields increase – for example, demonstration plots produce 15 tonnes of potato per hectare compared to 10 tonnes per hectare on control plots. Water consumption is reduced along with pumping costs. The system requires less person-hours and generates higher revenues.

Costs and cost effectiveness of the good practice

Potato:

- production value – 300,000 CFA francs
- cost of production – 161,125,000 CFA francs
- profit – 146,125 CFA francs

Assessment of investment cost per unit:	Low ☐	Average ☒	High ☐
Rating of cost effectiveness:	Low ☐	Average ☒	High ☐

Sustainability

- The piping has a lifespan of five years.
- There has been a good level of replication of the Californian net work.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
Agricultural Competitiveness and Diversification Programme (PCDA	Oumar ASSARKI	assarki@yahoo.fr

Reference documents

Technical and economic reference document: Irrigation de la pomme de terre par aspersion à partir d'un réseau californien [Irrigating potato crops using sprinklers fed by a Californian Network], April 2009

4.3.9 Fish farming as a way of adding value to dam schemes

Mamadou Gallo KONE, Ralf SCHNEIDER, Abass OUOLOGUEM – IPRO-DB

Objectives
The objective of stocking reservoirs with fish is to add value to dam schemes through artisanal fish farming and an increase in fish production. This helps to improve the quality of local people's diets and increases incomes. The technique combines fish farming and agriculture.

Definition and description of the good practice
Introduction of fish species suited to dam reservoirs

Implementation

- Organise an exchange visit between a village with experience operating this type of scheme, and the beneficiary village.
- Train beneficiaries in artisanal fish farming.
- Stock reservoirs with fish.
- Care for and feed the fish.
- Provide training on techniques used to catch and process fish (smoking and drying).
- Construct breeding ponds.
- Maintain a stock of fingerlings for the next season.

Photo 50: Training on fishing techniques

Photo 51: Training beneficiaries in fishing and fish smoking techniques in Korokabougou

Source: IPRO-DB Bélédougou

Operation
The beneficiaries are guided through the process of setting up a fish farming management committee. The committee is tasked with the internal monitoring of activities to implement artisanal fish farming, while the project team takes care of external monitoring.

Implementation locations

- Sonikegny village, Kambila Commune
- Nonkon village, Nonkon Commune
- Tiembougou village, Kolokani Commune
- Korokabougou village, Kolokani Commune

Scope of application

5,000 people

Duration of application

Since 2009

Success factors and constraints

- Water availability for at least six months from September
- Beneficiaries' motivation to engage with the activity
- Maintaining a stock of fingerlings in breeding ponds following fish harvesting
- Selecting fish suited to both rice growing environments and fish farming
- Few species of fish are suited to both rice growing environments and fish farming

Roles of the actors involved

- **The support structure (IPRO-DB)** helps with the purchase of fingerlings, builds the capacity of producers, carries out monitoring, connects technical services with traders, equips associations with fishing materials and monitoring tools, and provides support in the presentation of results at village meetings.
- **The village committee** monitors implementation (feeding, caretaking and sales) and reports on results following activities.
- **Private sector fish farming specialists** provide advisory support (fish stocking, controlling parameters, training) and monitor implementation.
- **Merchants** buy the output.
- **The commune** conducts external monitoring and provides advisory support.

Effects and impacts

The technique increases fish production, improves beneficiaries' diets and raises incomes.

Costs and cost effectiveness of the good practice

Assessment of investment cost per unit:	Low	☒	Average	☐	High	☐
Rating of cost effectiveness:	Low	☐	Average	☐	High	☒

Sustainability

The low investment costs and high profitability of the activity are very attractive. The juvenile fish are available prior to each forthcoming season and local management of the scheme is easy.

Organisation, resource person and contact details

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Reference documents
Fish farming report and accounts
Monitoring report for the 'Boubacar DIALLO' fish farm

4.3.10 Participatory Learning and Action Research for Integrated Rice Management (PLAR-IRM)

Maïga Rosaline DACKO, Lassana KEITA, Idrissa GUINDO – HELVETAS Swiss Intercooperation

Objectives

The two main objectives of the technique are:

- to develop farmers' capacities to observe and analyse their rice management and growing practices;
- to identify major constraints, then test, adapt and innovate with ways to improve integrated rice management.

Definition and description of the good practice

Participatory Learning and Action Research for Integrated Rice Management (PLAR-IRM) is an educational approach for farmers, based around training groups of 20 to 25 adults and drawing on the experience of the farmers participating in the group. Farmers undertake their own analyses of the problems at hand and find their own solutions.

Photo 52: Carrying out observations in the field

Photo 53: Documenting the results

Source: HELVETAS Swiss Intercooperation

Implementation

- Evaluate the relevance of the PLAR-IRM approach.
- Train the PLAR-IRM field teams.
- Devise projects for rolling out the PLAR-IRM approach more widely.
- The PLAR-IRM approach calls for the intervention of specialist technical agents or technicians trained in PLAR-IRM, known as animators/facilitators, who help farmers to find their own solutions to problems and, in so doing, increase their capacity for managing rice growing endeavours.
- Training sessions with farmers are very practical and are held in farmers' fields. The facilitator prompts farmers to share their experi ences and keeps (unnecessary) lectures to a minimum. This stimu lates farmers' capacities to observe and interpret actions and to decide on the steps to take.
- Training sessions take place once a week. They begin around one month before the rice season starts and continue throughout the entire rice growing season, until after the harvest.

- Each session lasts one to two hours. Once the problem areas have been identified (constraints), farmers can decide to try out new ideas. The facilitators help the farmers conduct simple trials to com pare one or several new practices to their current techniques.
- To do this, farmers agree among themselves on their objectives and the protocols to draw up. Practical sessions based around visits to field test sites give them the opportunity to carry out observations and adapt the new practices to their existing rice growing management context.
- The method is described in a manual (consisting of around 30 modules).

Operation

The PLAR-IRM approach comprises the following stages:
Farmers start out by exchanging their knowledge, opinions, experiences and practices with each other and then observe crop behaviours. Finally, they compare, interpret, analyse and understand the causes for the differences observed.Next they weigh up the actions to be taken, testing new ideas and then putting them into practice. Farmers organise themselves (individually and as a group or community) to undertake the activities.
Following this, functional networks are created with other farmers, extension/research services and any other support service. During the process, farmers' learning and understanding is facilitated so that they can make better and more informed decisions, with the end goal of more productive and sustainable integrated rice management. This facilitation is made possible by a team of animators/facilitators who use the learning tools provided in the PLAR-IRM training modules. These tools have been developed primarily to encourage farmers to exchange their experiences and to observe, reflect, analyse, conceptualise and test as a group. Many of the tools are based on the visualisation of phenomena and, as such, bring aspects to light that beneficiaries were previously unaware of. The 11 PLAR-IRM learning tools are:

- the agricultural calendar;
- the lowland area map;
- the transect;
- the plenary exchange session;
- the PLAR-IRM team's introduction of new ideas;
- field observation in sub-groups;
- observation synthesis/feedback;
- the IRM plot;
- trials;
- the monitoring sheet;
- the evaluation of gains.

Implementation locations

- 10 PLAR-IRM centres in Sikasso and 5 centres in Ségou
- AGAKAN projects
- Regional Centre for Agricultural Research of the Rural Economy Institute in Sikasso
- The Sikasso lowland rice programme

Scope of application

Village communities from the places mentioned below have been involved. PLAR-IRM has been rolled out in Mali, Benin, Togo, Guinea, Côte D'Ivoire, Ghana and the Gambia. In Mali, the practice has been applied in the regions of Sikasso, Kayes, Ségou and Mopti.

Duration of application
The approach was developed between 2001 and 2003 and has been implemented since 2003.

Success factors and constraints
Motivating the teams of farmers is absolutely essential. Learning modules based on observation must be comprehensible and practical and delivered by competent deliverers and trainers. PLAR-IRM requires decisions made to be practical and immediately applicable. Researchers who are open to and respectful of local knowledge can facilitate the process.

Roles of the actors involved

- **The lowland management committee** organises teams and session calendars, and identifies plots.
- **PLAR-IRM trainers** plan modules and sessions, mobilise researchers, devise training content, conduct practical observation exercises, take notes and produce syntheses, and deploy evaluation tools for participatory learning.
- **Farmers** take part in the learning modules, apply the module learning in the field, carry out observations, contribute to decision-making, act on decisions made, perform monitoring and evaluation, and share their experience and expertise with others.
- **The project team** offers support, strategic organisation and co-ordination, liaises with local people, introduces the trainers, and contributes to the evaluation and capitalisation processes.

Effects and impacts
Increases in rice yields of between 25% and 40% can be achieved in lowland areas. Farmers' rice-growing capacities are strengthened in terms of seeds, nurseries, plant care, irrigation, weed management, plant disease, harvesting, etc.

Costs and cost effectiveness of the good practice

Assessment of investment cost per unit:	Low	☐	Average	☒	High ☐
Rating of cost effectiveness:	Low	☐	Average	☒	High ☐

Sustainability
The approach reinforces farming organisations' endogenous capacities. A core of farmers master each session's content and the PLAR-IRM modules. The method used is participatory and inclusive. Sessions are practical and take place in the field schools, which is particularly appealing to the farmers.

Organisation, resource person and contact details

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Reference documents

Defoer, T, Wopereis, M.C.S., Idinoba, P. and the PSSDRI/AKR team (2008): Curriculum d'apprentisage participatif et recherche action (APRA) pour la gestion intégrée de la culture de riz de bas-fonds (GIR) à Madagascar : Manuel du facilitateur [Participatory learning and action research (PLAR) curriculum for the integrated management of lowland rice growing (IRM) in Madagascar; Facilitator's manual]. Africa Rice Center, Cotonou, Benin and the Aga Khan Foundation, Geneva, Switzerland. http://www.africarice.org/publications/PLAR/madagascar/preface.pdf

4.3.11 Delegating the management of facilities to users

Moussa DOUMBIA, Jacques TAMINI – HELVETAS Swiss Intercooperation/AM-Eau, APEL Bulonba

Objectives

The objective of the practice is to promote the sustainability and cost effectiveness of schemes by setting up management delegation systems that enable local authorities to entrust infrastructure owned by the territorial community to groups of local farmers. The transfer of powers is undertaken by means of a mutually agreed contract between parties.

Definition and description of the good practice

The basic economic infrastructure is usually provided through state or decentralised-authority funding. The building phase of the project is entirely managed by the territorial community (TC). A delegation process ensures that responsibility for managing this infrastructure is transferred to beneficiary actors organised in user associations. Agreements are concluded between the TCs and communities with the aim of guaranteeing the sustainability and economic viability of facilities. This agreement makes it possible to extend the ownership of schemes beyond that of the traditional management committee model. It can also increase local tax revenues and prolong the lifespan of facilities when they are well run.

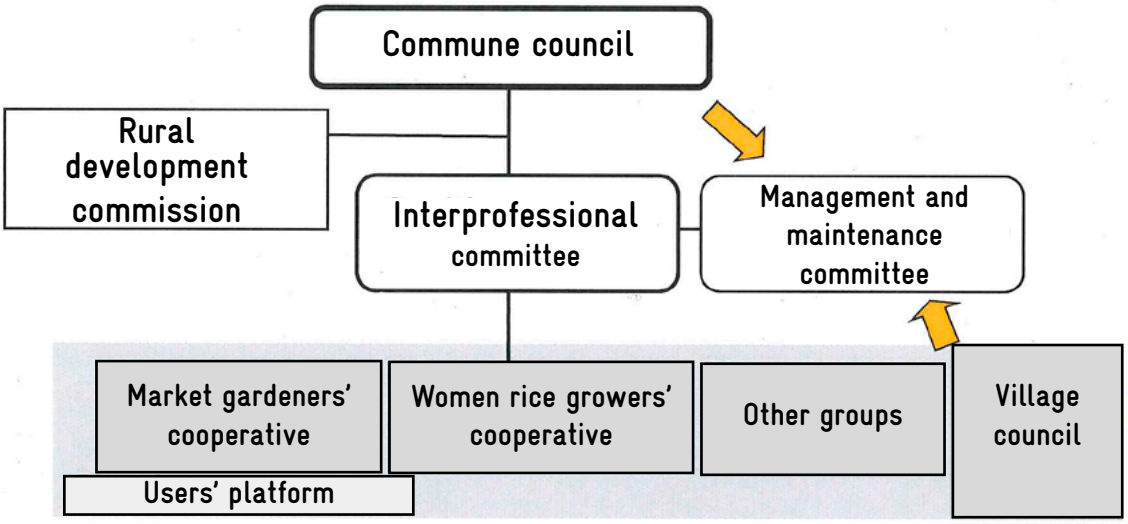
Implementation

From the start of installation works, the commune supports the project in setting up a management system. The outlines for such a system have already been laid down in the feasibility study. Installation works are co-funded by the technical and financial partners (TFP), communes and beneficiary villages. In small-scale irrigation projects, for example, the project provides up to 85% of the funds; the village 5% and the commune 10%. The beneficiaries contribute either in-kind or financially.

It must nevertheless be highlighted that the infrastructure remains the property of the commune and beneficiaries must pay a fee for its upkeep. The commune selects the consultancy (project manager) and chooses the contractor. The commune also monitors scheme installation and accepts works. A second consultancy is tasked with giving producers guidance on farming and management techniques. The different user groups (market gardeners/planters, women rice growers, livestock farmers, etc.) are formed into interprofessional committees or farming committees.

The commune draws up the draft delegated management contract with the interprofessional committee or the cooperative. To this end, it evaluates the potential of the resources that can be mobilised and discusses with its partners the rules for farming the scheme and the methods for its maintenance and repair. Following this, the contract is signed.

The measure relies on the direct actors shown in the diagram, who are supported by other stakeholders (see ‘Roles of the actors involved’ below).



Operation

The commune is the owner of the scheme but delegates its management to a user group (an interprofessional farming committee for lowland development projects) by means of a management delegation contract. Member subscription fees and upkeep fees are paid into a bank account opened by the community. The commune has the right to oversee the administrative and financial management of the delegatee and ensures the application of access and farming rules in the scheme. Group managers regularly report on activities to other members and the commune.

Implementation locations

The method has been applied in the Sikasso region in the Bougouni, Kolondiéba and Yanfolila circles.

Photo 55: Women growers take pride in their work

Photo: HELVETAS Swiss Intercooperation

Scope of application

The system was first initiated and developed at 34 commercial infrastructure trade fairs. Today, it involves 15 farming sites.

Duration of application

The practice has been applied since 2008.

Success factors and constraints

The commune authorities must be willing to promote transparency in communications on works procurement and accept requests for clarification (public audits). The community must have leaders in place who are prepared to lead frank public discussions among key players that are also courteous and respectful. This also applies to the management committee.

Monitoring and evaluation of the delegation contract is essential between the commune and platform. It is important to undertake an annual review, the conclusions of which will also be shared with the wider community. To do this, the management committee must be in a position to draw up a balance sheet. The village must be prepared to contribute (with their labour or funds) towards installing the scheme, prior to registering it in the PDESC.

It is essential to remove any ambiguity from bylaws for the scheme belonging to the commune. If it is true that actors rarely challenge the old, established rules for accessing rice growing sites, the same cannot be said for market gardens, where the plot allocation rules fall easily into place. Growers must pay the amounts/fees agreed with the commune.

Roles of the actors involved

The direct actors are the commune council, the council's rural development commission, the interprofessional committee and the management committee. The other stakeholders involved are actors providing support.

The commune council undertakes the overall project management of the installation works, contributes to funding the developments, provides key guidance on farming matters, delegates the management of the infrastructure to the interprofessional committee (IPC), adopts the farming code, supports the IPC in recovering fees, and ensures the monitoring and development of the project.

The rural development commission of the commune council exists within each council. Its role is to catalogue the issues actors face and propose solutions to the commune council, support cooperatives in their search for partners together with the IPC, research the land titles for schemes on behalf of the council (registration), validate the development plan, support IPC in managing conflicts between cooperatives, and carry out any other tasks that are required of it by the commune council.

The interprofessional committee brings together representatives from different cooperatives, associations and groups and takes on the delegated management role. Its role is to: maintain communications between users, the town hall and partners; coordinate activities that affect several local-level cooperatives; ensure the rational use of lowland resources; secure the agreement of the different user groups on the rules for accessing and dividing up the scheme site; assess and validate the cooperatives' farming plans (individual needs analysis in terms of production capacity); monitor the use of inputs, seed and equipment obtained by the cooperatives; receive the fees collected by each cooperative from its members; manage renovation and maintenance funds; and prevent conflicts of interest arising among the cooperatives (users).

The management committee is a sub-committee within IPC and is tasked with managing water supply (opening and closing the distribution gates), carrying out small-scale maintenance and alerting the IPC to any failures to respect the farming code.

Consultancies facilitate the process, support the institutional and organisational strengthening of actors and provide training on management tools.

Technical services ensure the application of technical and environmental standards and ensure sound financial management (fee collection, financial controls, delegated public procurement).

The project team provides advisory support, organises users structurally and delivers training, tools, coordination and monitoring.

Effects and impacts

Subscription fees are collected more easily: 84% of members pay their subscription fees for the area in question. Consensually agreed farming codes and rules are instituted and monitored. In the Bougouni area, 552 hectares are being farmed by 1,671 rice growers, 80% of whom are women. Production has increased for 70% of growers. The principle of a maintenance fund has been accepted and is now operational, with deposits ranging from 75,000 to 300,000 CFA francs per year.

Costs and cost effectiveness of the good practice

Setting up this system requires ongoing support for two to five years to allow beneficiaries to take ownership of the scheme.

Assessment of investment cost per unit:	Low	☐	Average	☒	High ☐
Rating of cost effectiveness:	Low	☐	Average	☒	High ☐

Sustainability

Many repairs are already being handled by the delegated management structures. These structures ensure that the consensually agreed rules are appropriately applied. A new kind of partnership has been created between the local authorities and village communities.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
Intercommunalité de Bougouni 'Bulonba'	Moussa DOUMBIA	douballa03@yahoo.fr bulonbasecom@yahoo.fr
ADEPE MALI	Moussa DOUMBIA	mtdoumbia@yahoo.fr
HELVETAS - Swiss Intercooperation	Jacques TAMINI	jacques.tamini@helvetas.org

Reference documents

Rapport appui à la valorisation des ouvrages hydroagricoles [Report on supporting the development of small-scale irrigation schemes], GSAD, June 2012

Annual report: Monitoring lowland areas, BEACIL, June 2012

4.3.12 Developing professional standards in the provision, maintenance and management of pump units

Huub MUNSTEGE, Matthias KLIEWE, Pierre GUIROU, Yehia Ag Mohamed ALI – PMN/IPRODI

Objectives
The objective of the approach is to ensure the sustainability of schemes and continuity of production, and to reduce production costs.

Definition and description of the good practice
PMN/IPRODI-DB provides producers with pump units. In collaboration with the equipment manufacturers, a workshop team was given training in pump unit maintenance and upgrading, ensuring the participants will be able to look after them going forward. In each project area, a central shop sells spare parts. This is now becoming a profitable venture. Local mechanics have been trained and have concluded maintenance contracts with producers. In each VIS, two trained pump technicians ensure the pump units are operated correctly.

Implementation
The project provided a consignment of pump units adapted to the conditions prevailing in the area, which were upgraded in collaboration with the manufacturers (Hatz and Rovatti). The units must be installed on time to make it possible to farm the scheme the year it is developed, as this represents an important confidence-building measure for beneficiaries. Prior to accepting the pump units, the farm maintenance workshop (FMW) carries out pumping tests on behalf of the company Hatz. Defective pump units are replaced by the manufacturers. The beneficiaries contribute the equivalent of 30% (approximately 3 million CFA francs) towards the purchase. This constitutes a high enough figure to impart a sense of the pump units' worth. This sum is paid by all the beneficiaries together, meaning the pump unit is the property of all the beneficiaries.
Local capacities have been strengthened: (i) a pump unit was upgraded through the construction of housing and the provision of adapted tools; (ii) the workshop mechanics were trained in Germany by Hatz and in Italy by Rovatti, and (iii) every two years, trainers from the manufacturers come over to Mali to deliver updated training. A spare parts stockroom has been set up for the pump units, which will supply quality spare parts to ensure the good functioning of pump units. For each VIS, at least two pump technicians receive training from the FMW in maintaining and operating the pump units. At the start of each growing season, PMN/IPRODI organises training for new pump unit technicians and training updates for those previously trained. We feel this is an important experience as it allows the pump unit technicians to properly master the training content. During the growing season, an experienced mechanic is stationed in each sector to deal with potential breakdowns that pump unit technicians cannot repair themselves.

Operation
The pump units must be ordered eight months before the start of the growing season. Each pump unit is looked after by a pump unit technician who has received training in its operation and basic maintenance. Every 250 hours, the filters and oil are replaced with materials recommended by the manufacturer. Stocks are held locally to the VIS to prevent any resourcing issues. Local mechanics in each project area have signed contracts with the VISs (remuneration of a 100,000 CFA franc lump sum per growing season) and are on hand to fix any problems and carry out regular maintenance. VISs buy spare parts and oil from the workshop and the mechanics who control the stock. After each growing season, the FMW's head mechanic tours and inspects each sector's pump installation. He or she then advises on what maintenance and repairs are required.

Implementation locations
The system has been rolled out across IPRODI's zone of operations, namely the circles of Timbuktu, Diré, Goundam, Rharous, Youwarou and Niafunké (regions of Timbuktu and Mopti).

Scope of application

The system has been applied in around 550 locations. A central storage facility (with around 150 motors and 50 pumps in stock) and five small stockrooms of spare parts have been set up in satellite locations.

Duration of application

The system was introduced in 2000 and has been able to build on its experience since then.

Success factors and constraints

- Availability of cash for making foreign purchases
- Very well-trained stock management staff (ordering the correct parts)
- Pump units ordered in good time (eight months before the growing season)

Roles of the actors involved

- **The project team** designs and implements the system, runs the accounts, conducts monitoring, makes up orders and carries out auditing.
- **FMW** carries out maintenance and repairs, tests pump units, ensures the availability of local mechanics, advises on which parts to buy in, sells parts to beneficiaries, and advises the manufacturers on how they can improve the technology.
- **Beneficiaries** purchase pump units and spare parts, conduct maintenance and contract the mechanics.

Effects and impacts

Less than one per cent of the pump units have broken down in spite of their age (some pump units date back to 1996). Production in the area is increasing, and is now secure and more efficient.

Costs and cost effectiveness of the good practice

Providing the stock costs around 300 million CFA francs. The net profitability of selling stock is substantial, at up to 10%.

Assessment of investment cost per unit:	Low	☒	Average	☐	High ☐
Rating of cost effectiveness:	Low	☐	Average	☐	High ☒

Sustainability

The system has been operating since 2000. The structures are well established, with well-trained staff and a good division of labour.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
PMN/IPRODI	Yehia Ag Mohamed ALI	yehia@afribonemali.net
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PMN/IPRODI	Pierre GUIROU	pierreguirou@yahoo.fr
PMN/IPRODI	Huub MUNSTEGE	hmunstege@yahoo.com

Reference documents

Project reports. Report on the trust fund (see www.mali-nord.de)

4.3.13 Centre for the Demonstration and Dissemination of Technologies (CDDT)

Oumar ASSARKI – Agricultural Competitiveness and Diversification Programme (PCDA)

Objectives

The objectives of the Centre for the Demonstration and Dissemination of Technologies (CDDT) are to:

- demonstrate, disseminate and promote technical and technological innovations in irrigation;
- provide services;
- serve as a centre of reference;
- showcase PCDA's irrigation schemes.

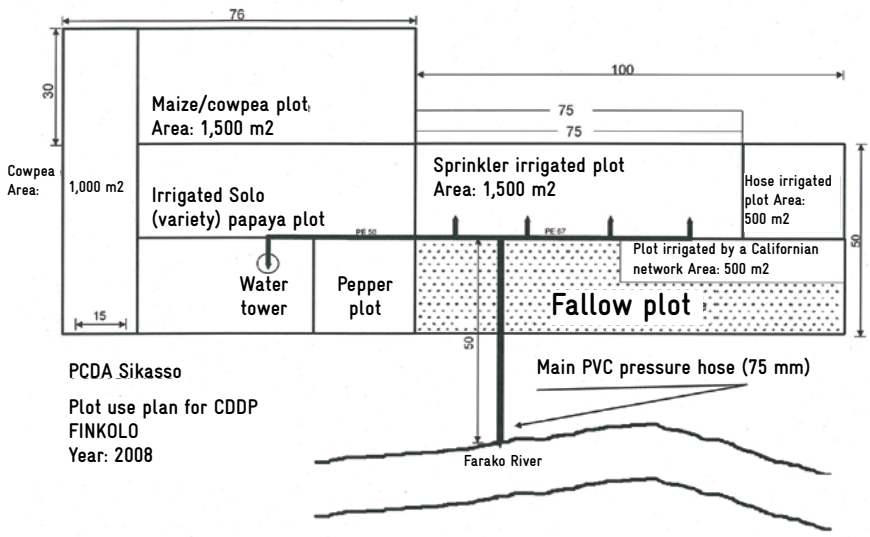
Definition and description of the good practice

The CDDP is a centre for demonstrating, documenting and delivering technical and technological innovation. Irrigation CDDPs exist in Bamako, Sikasso, Niono and Mopti; processing CDDPs are located in Bamako and Ségou.

Photo 56: Drip feed irrigation

Source: Oumar ASSARKI

Figure 9: The Sotuna-Bamako CDDP



Implementation
The centre has been built by the PCDA (regional coordinator for Koulikoro–Bamako) covering a total area of three hectares. It comprises accommodation for the site warden, a large-diameter well, a small-diameter well, an open-air toilet, a borehole with a submersible pump capable of pumping seven cubic metres per hour, 14 irrigation demonstration plots that are installed and operational, a storage hut, storage racks for grains, and two composters.

The partners are the Rural Economy Institute (IER)/Regional Centre for Agricultural Research (CRRA) and the Koulikoro Regional Directorate of Agriculture.

Operation
The centre is visited by developers and disseminates information about the technologies.

Implementation locations
Sikasso, Bamako, Ségou and Mopti

Scope of application
Five centres

Duration of application
Since 2005

Success factors and constraints

- Attention must be paid to agricultural factors that should corre_ spond with the soil and the technologies used.
- Information must be actively disseminated (communications strat- egy to attract promoters).

Roles of the actors involved
The **Rural Economy Institute (IER)** draws up demonstration protocols and collects data.
The **National Directorate of Agriculture/Regional Directorate of Agriculture** looks after the institutional and administrative aspects of the CDDP and provides farming advice.
The **Agricultural Competitiveness and Diversification Programme (PCDA)** delivers funding, implementation and support.

Effects and impacts
All PCDA-funded projects were identified through the CDDP.

Costs and cost effectiveness of the good practice

Assessment of investment cost per unit:	Low ☐	Average ☐	High ☒
Rating of cost effectiveness:	Low ☐	Average ☐	High ☒

Sustainability
The centre has been transferred to the IER. The institutional sustainability is strong.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
Agricultural Competitiveness and Diversification Programme (PCDA)	Oumar ASSARKI	assarki@yahoo.fr

Reference documents
CDDP presentation sheet

4.3.14 Local agreement on the management of small-scale irrigation facilities

Godihald MUSHINZIMANA – Support Programme for Territorial Communities (PACT

Objective
Local agreements aim to prevent and consensually manage conflicts on a site and to manage natural resources to ensure they are used rationally and sustainably.

Definition and description of the good practice
A local agreement is a mutual agreement covering the ways in which shared natural resources are exploited in order to ensure their fair and sustainable use. As the national methodological guide puts it: 'All agreements, written or otherwise, between two or more local actors and particularly social groups (socio-professional groups, village associations or communities, or factions), technical services and NGOs set the rules for accessing and using the resources in a way which ensures their conservation and their responsible and sustainable exploitation'.

Description of the good practice
The local agreement is the fruit of a series of consultation and negotiation forums involving local farmers and managers of a shared natural resource and is delivered with the support of local authorities and their technical services. These consultation and negotiation forums make it possible for all the actors involved to evaluate the status of the resource, identify problems and put forward possible solutions. The forums create a climate of trust among user groups who, despite the difficulties of living side-by-side, remain willing to come together around the same table. The management ideas resulting from the discussions and negotiations are laid down in the form of consensual management rules, collectively called the 'local agreement'.

Photo 58: Consultation meeting attended by a village's shared natural resource users

Source: PACT

Process of drawing up a local agreement

The process of drawing up a local agreement involves the following key stages:

- Information and identification of key actors in the process of drawing up a local agreement. As it is not possible for everyone to participate in the consultation exercise, the process is based on delegation.
- Natural resource diagnostic exercise: this diagnostic exercise first involves taking a snapshot of the current state of the resource using tools like resource maps, Venn diagrams and matrices categorising producers by product. Next, problems arising from resource exploitation and management, and possible solutions to these problems, are identified.
- The results are fed back to actors who have not been involved in the diagnostic process in order to gather their inputs.
- Drawing up the draft local agreement: this stage involves analysing reaction to the diagnostic feedback in order to (i) take on board the most relevant inputs and (ii) flesh out and refine the ideas for regulatory solutions (concrete management rules and their associated sanctions – this constitutes the 'draft local agreement') without losing sight of the national legislation relating to the resource. It is during this stage that the mechanism for monitoring the implementation of the agreement is developed.
- Feedback and validation of the draft local agreement: in order to refine the terms of the draft local agreement, the select committee instituted by all those participating in the process feeds back the results of its work and then debates them. Once the terms of the draft local agreement are agreed by all parties, it is considered validated. Select committee members must not misrepresent the terms of the agreement as actors need to be clear about these terms to be able to validate them.
- Signature and dissemination of the local agreement: the draft local agreement is signed by the local managers of the resource and it is then considered by the territorial community and approved by the supervisory authority, where required. Hardcopies of the signed agreement are subsequently given out to key actors and it is disseminated through discussions in general meetings and on local radio.
- Monitoring bodies are set up to monitor local agreement implementation at the village and commune levels and to deliver training on the roles and responsibilities required at these levels.
- Monitoring and evaluation is carried out with regard to the implementation of the local agreement and the functioning of bodies tasked with monitoring the implementation.

Implementation locations

The regions of Sikasso, Mopti, Koulikoro, Timbuktu and others

Scope of application

Local agreements on managing developed lands and facilities are drawn up for the majority of hydro-agricultural schemes.

Duration of application

A local agreement for managing natural resources usually applies for between three to five years. At the end of this period, the agreement must be evaluated in order to take account of new developments. PACT has been using these local agreements since 2004.

Success factors and constraints

- The diagnostic process must reflect reality, as expressed by the beneficiaries themselves.
- During the diagnostic process, beneficiaries must be given guidance but must not be directly influenced.
- The solutions put forward must come from the beneficiaries.
- There must be continuity in terms of key actor representation.
- The results from consultation exercises must be fed back into the process.
- Local authorities, supervisory bodies and technical services must be involved.
- A set of technical measures must be implemented based on the results of the diagnostic process. These measures must reinforce the management rules.
- Once the scheme starts developing lands (increasing yields), new conflicts can arise (jealousy).
- Getting remote farmers – such as those in localities outside the scope of the local agreement – to respect the rules laid down in the local agreement can be problematic.
- There must be a system in place to take action against those breaking the terms of the convention (committees and technical services)

Roles of the actors involved

Territorial communities request technical and financial support from a support structure, request technical support from decentralised technical services, support the organisation of the consultation forums, disseminate the terms of the local agreement, monitor the implementation of the agreement, carry out measures to reinforce the local agreement's impacts, and adopt the draft local convention upon the request of the actors involved.

Farmers and managers of the natural resource provide the information required in the consultation forums, identify the management rules and their associated sanctions, validate the terms of the draft local agreement, circulate the terms of the agreement, respect the terms of the agreement, report those breaking the terms of the agreement, monitor the implementation of the agreement, and sign the validated draft local agreement.

Technical services support the process technically, provide training and information on national legislation, ensure that the terms of the local agreement do not contravene national law, disseminate the local agreement, and monitor and train up the local agreement implementation bodies.

The support structure provides technical and financial support in the process of drawing up the agreement.

Effect and impacts

- Reduction and prevention of conflicts
- Consultative management of the shared resource
- Fairer access to developed lands
- More rational and sustainable exploitation of resources

Costs and cost effectiveness of the good practice

Technical services' travel expenses are included in the costs. The total estimated cost stands at between 100,000 and 300,000 CFA francs per lowland area. The cost of a local agreement at the commune level stands at around 3,000,000 CFA francs (subsistence expenses, bearing the cost of the decentralised technical services, facilitators' fees), not including teaching materials.

Assessment of investment cost per unit:	Low ☒	Average ☐	High ☐
Rating of cost effectiveness:	Low ☐	Average ☐	High ☒

Sustainability

The sustainability of the local agreement depends on the level to which its terms are taken up by those who developed it and who are responsible for implementing it. It also depends on the relevance of the regulatory and technical solutions taken forward for resolving the major issues identified in the diagnostic process.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
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Reference documents

Guide méthodologique national, élaboration d'une convention locale de gestion des ressources naturelles [National methodological guide – Drawing up a local agreement to manage natural resources], MEA (Ministry of Environment and Sanitation), June 2011

Full-cost accounting of local agreements, PACT, October 2006

www.pact-mali.org

4.3.15 Public audits as a civil oversight mechanism for project implementation

Jacques TAMINI, Moussa DOUMBIA – HELVETAS Swiss Intercooperation/APEL

Objectives
The objective of the practice is to improve local governance relating to investment projects. It helps to foster trust between elected representatives and the public, to improve public participation in commune initiatives and to facilitate the mobilisation of local resources.

Definition and description of the good practice
Public audits are periodic public discussion meetings where elected members of the commune, local organisation managers and the community can publically discuss the implementation and management of a project to iron out problem areas and find home-grown solutions. The requirement to conduct these audits is laid down in the funding agreement signed by the local authority, socio-professional organisations (SPO) and funding partner.

Implementation

Currently being undertaken as part of infrastructure projects, the audits occur in three stages:

1. The public hearing for the funding agreement comprises a presentation in the village benefiting from the project and mutual commitments laid down in the funding agreement between the commune, the village (through the SPO), and the funding partner. It is organised by the commune and formalised through a public signing ceremony in the village.
2. The public review constitutes an intermediate evaluation stage occurring during the investment implementation phase, which provides the opportunity to take stock of the process (How have the tender processes gone? What is the status of the project's financial execution? Are all parties delivering on the commitments laid down in the funding agreement?).
3. The end-of-project audit is a meeting that brings the implementation phase to a close and provides an opportunity to communicate and discuss the final accounts, lessons learned and measures to take to ensure the project continues

Operation
The local authority is responsible for the logistical organisation of the different sessions. The sessions take place in the village benefiting from the project. A site visit is arranged for the end of each session.

Implementation locations
The tool has been applied in the circles of Bougouni, Kolondiéba and Yanfolila.

Scope of application
In total, more than 50 sessions (on average three sessions per project) have been organised in the 15 communes that signed funding agreements with the APEL Programme (Support Programme for the Promotion of the Local Economy).

Duration of application
Ongoing for five years

Success factors and constraints

Decision-makers must be made fully aware that the exercise is not pitched against them; rather, its aim is to encourage public engagement in the project. It is important to ensure the requirement for public audits is included in the project's funding agreement. Funds must be set aside to cover the costs of organising the sessions (paying for meals).

Roles of the actors involved

SPO managers ensure the mobilisation of their members at the village level.
The commune sets session dates, ensures the materials are prepared and provides the administrative and financial documents.
The partner provides methodological support.

Photo 60: The audit promotes community participation in works

Source: HELVETAS Swiss Intercooperation

Effects and impacts

The outcomes of the audits translate as:

- improved relations between decision-makers and the community;
- greater public participation in the works (contributing labour and local materials);
- improved monitoring and management of the project by the mayor and the commune council;
- a stronger role for community representatives with regard to their local management of the project (social mobilisation);
- relevant measures to ensure the sound exploitation of the infra structure.

Costs and cost effectiveness of the good practice

The outgoings cover the cost of meals for the audit day and come to 25,000 CFA francs per session.

Assessment of investment cost per unit:	Low ☒	Average ☐	High ☐
Rating of cost effectiveness:	Low ☐	Average ☐	High ☒

Sustainability

The approach creates a sustainable social foundation for the project and reduces misunderstandings and conflicts among actors. Elected members are skilled communicators, which means they have the ability to engage and inspire those involved.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
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Association for the Development and Protection of the Environment in Mali (ADEPE Mali)I	Moussa DOUMBIA	mtdoumbia@yahoo.fr

Reference documents

Presentation of the APEL Programme's experiences running public audits, March 2011

4.3.16 Meeting the differing needs of farmers in a given lowland area: local-level agreements and conventions

Mamadou Moustapha DIARRA, Célestin DEMBELE – HELVETAS Swiss Intercooperation/AVAL Programme

Objectives

This practice aims to establish a consensual agreement on the access to and management of schemes and developed lands among the farmers of a given site. Through the facilitation process, it is possible to transfer management responsibility and ensure the peaceful farming of schemes. The social engineering approach focuses on developing the diversifying potential of agro-sylvo-pastoral systems by involving all actors concerned, guarantees the sustainability of investments and prevents farming-related conflicts from arising on scheme sites. The establishment and support of multi-stakeholder platforms fosters a collective dynamic in hydro-agricultural schemes.

Definition and description of the good practice

The multi-stakeholder platform (MSP) brings stakeholders together and involves them in analysing the location assessment and determining any changes required to respond to environmental constraints and the diverse needs of the social group.

The approach centres on creating MSPs and then strengthening their organisational and institutional capacities to ensure that collaborative and best-fit infrastructure management is delivered by the different user groups, whose interests in the scheme's easement area may diverge. The management standards and regulations and the roles and responsibilities of all social and user groups are determined by the actors collectively.

The first stage involves initiating an internal and critical reflection and discussion process with the different scheme user groups. In the second stage, a consensual agreement is reached on accessing and managing the scheme and lands developed under it.

Associations or cooperative structures are set up for each economic sector involved in the scheme's easement area.

Région de Sikasso
Cercle de Yorosso
Commune de Yorosso

République du Mali
Un-peuple-Un but Une foi

DELIBERATION N° 10/ CM... CR-YSO

Le conseil comminal de Yorosso, réuni en session extraordinaire dans la salle de délibération de la Mairie au cours de sa séance du 27 septembre 2010, après en avoir délibéré décide :

D'adopter la convention/Accords de gestion de la Zone d'servitude de l'aménagement hydro-agricole de Nampanie

Votants : 17
Pour : 17
Contre : 0
Abstention : 0

*

Sikasso Region
Yorosso Circle
Yorosso Commune

Republic of Mali
One people – One goal – One faith
****

Resolution No 10/ 011 CR-YSO

Yorosso Commune Council, meeting in an extraordinary session in the meeting room of the Council during its sitting on 27 September 2010 and following deliberation decides:
to adopt the management convention/agreements for the easement area of the xxx lowland scheme.
Voters: 17
For: 17
Against: 0
Abstentions: 0

* Translation

Operation

This practice makes it possible to bring actors with differing interests around the same table to discuss the ways in which the scheme's facilities and lands will be accessed and exploited. The different scheme user groups discuss the delivery of the process and determine the different roles and responsibilities. In light of the issues and sensitivities involved (land tenure, authority and governance issues, etc.), the commune must ensure that delivery is strategic and that operational duties are delegated to the MSP, which is, itself, governed by the traditional village authority. A facilitator leads the process.

The commune ensures the participation of the whole population in analysing the existing situation. Social groups begin thinking about the modes of accessing lowland plots and study the relationships between different groups; they consider practices that are detrimental to the sustainability of the scheme and those that could trigger conflict among farmers; they think about ways to prevent and manage conflicts among farmers and about the practices that need to be regulated; and so on. In this way, the instrument enables the relevant actors to assess the overall management of the lowland scheme in a way which takes each stakeholder into account.

A prospective analysis approach is developed comprising: (i) a review of current drawbacks and advantages, (ii) the historical context and traditional factors, (iii) desired and realistic changes, and (iv) a consensual solution and rules that must be respected. The coming together of diverse, sometimes complementary and sometimes contradictory viewpoints generally produces results that are particularly useful in reaching an open and complete consensual agreement on access and exploitation in the context of developing the scheme.

Implementation

The approach is implemented in the following stages:

- The process is launched in the communes in question.
- Workshops are prepared for drawing up agreements on the management and exploitation of resources in the scheme's easement area
  - it is important to ensure information is provided in a timely manner and that it reaches the widest possible audience.
- Workshops for drawing up agreements on the management and exploitation of the scheme's easement area are held, involving:
  - a workshop of at least two days;
  - an general meeting to open the event held in plenary (delivered in the local language);
  - an initial round of sub-group workshops;
  - a second round of group work mixing two or three groups to tease out potentially conflicting interests;
  - the provision of clear instructions in plenary prior to the group work sessions and of spatial support materials (maps and current and future occupancy charts);
  - clarification of the rights of former occupants and the plot allocation quota for women;
  - summarising proceedings during the general meeting.
- Organisational structures are formalised.
- The management/development plan for the scheme is drawn up.
- The agreements and rules settled upon are formalised (in writing) and then deliberated by the commune council.
- A mid-term evaluation of the implementation of local agreements on scheme management and exploitation is carried out along with an assessment of the implementation of the management/development plan for the scheme easement area.

Implementation locations

This approach has been used in all 30 of the agropastoral scheme sites that the AVAL Programme has been supporting in the Yorosso, Sikasso and Kadiolo circles. The same process has been rolled out in 14 APEL Programme sites in the Yanfolila, Bougouni and Kolondiéba circles.

Scope of application

At the AVAL programme level, 50 associations and/or cooperatives have been set up for the 30 sites in question. It has been possible to reach more than 6,500 producers through the user organisations (rice growers, market gardeners, fishers, livestock farmers, etc.). The area of farmland developed and governed by local agreements is estimated at nearly 2,500 hectares for both programmes.

Duration of application

The approach was developed between 2006 and 2009 and implemented from 2010 to 2012.

Success factors and constraints

The facilitation plan must take into account local people's agricultural calendar (June, July, August and September are not recommended for process facilitation activities). Carrying out initial processes of reflection in interest groups serves to enhance future negotiations. This method enables the specific issues for each type of use to be clarified. The subsequent process of finding consensus is made possible through the involvement of local and traditional authorities, in addition to moderation.

The level to which farmers' objectives for the scheme are satisfied engenders strong interest in the process, so the facilitator must be constantly available to listen to and deal with individual requirements and constraints.

Social divides within village communities can cause major problems. Land tenure, authority and governance issues must be considered and analysed throughout the process to ensure that the resulting propositions are relevant.

Roles of the actors involved

- **Farmers and village authorities** participate in workshops and express their interests and they set out the traditional rules and social mechanisms that should be considered.
- **The commune** organises the workshop and participates in the diagnostic exercise by taking part in the discussions. It also deliberates the final agreements established by the actors.
- **Service providers and technical services** facilitate the process of drawing up an agreement on the access to and management of the scheme easement area and on the scheme development plan. They organise users into formal associations and support the formalisation of collaboration between the association, users and commune in terms of management delegation.
- **The programme** establishes the approach and trains service providers. It contributes to developing the visual aids required for communicating information and for spatial visualisation, and co-funds development action plans by sector.

Effects and impacts

Observed effects include:

- the promotion of local government and the good management of scheme easement area resources;
- the reduction of site-related conflicts and the setting of a benchmark for the local resolution of such issues;
- the development and strengthening of a spirit of partnership among MSP members;
- increased participation in activities that contribute to the area's socio-economic development;
- the maintenance of soil fertility, along with the prevention of environmental degradation.

Costs and cost effectiveness of the good practice

Covering the consultation and meeting costs can be an issue. However, these costs are relatively low (750,000 to 900,000 CFA francs per site) considering the benefits.

Assessment of investment cost per unit:	Low	☐	Average	☒	High	☐
Rating of cost effectiveness:	Low	☐	Average	☐	High	☒

Sustainability

Involving actors from different sectors of society can lend the project a strong dynamic. Setting up formal relationships between the commune and professional groups helps ensure the sustainability of public-private partnerships. Agreements must, however, be closely monitored; indeed, it is essential to review their implementation and functioning regularly. Agreements can be challenged and modified so that they adapt to changing contexts.

Organisation, resource person and contact details

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Reference documents

HELVETAS Swiss Intercooperation/BACIL, Rapports de prestation de services et d'accompagnement [Reports on service provision and support activities] 2010, 2011, 2012

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4.3.17 Locally sourced farming trainers: the farmer resource persons system

Maïga Rosaline DACKO, Lassana KEITA and Idrissa GUINDO – HELVETAS Swiss Intercooperation

Objectives
This approach aims to promote a sustainable and inexpensive advisory support model for farming by training up a pool of expert farmers to spearhead the dissemination of agricultural innovations. This involves establishing local resources in places where public technical services are lacking or non-existent.

Definition and description of the good practice
Farmer Apex Organisation (FaAO) identify local experts who possess relevant know-how and then develop their capacities for teaching and facilitation. A network of farmer resource persons (FRPs) is then gradually built up to provide advice and training according to the on-the-ground needs of farmers working in different areas such as farm management, rice growing, nurseries and transplanting, compost making, contour farming, combatting erosion, shea management, creating a ridge-furrow system, seed production, conserving produce, market gardening techniques, water management, fish farming, etc.

Photo 62: Local on-the-ground support

Source: HELVETAS Swiss Intercooperation

Implementation
The apex organisations nominate their resource persons. With the support of technical partners, they then categorise FRP s according to their qualifications, expertise and communication skills. The support structure strengthens the capacities of FRP s according to their needs. These resource persons set themselves up as experts, offering their services to other farmers. PRPs benefit from group capacity building exercises in advocacy and facilitation, and their technical capacities are built according to individual needs and the requirements of the market.

Operation
Once trained, FRP s can organise themselves (into economic interest groups, cooperatives, etc.) and then provide services as requested by farms, local authorities, apex organisations and support partners.

Service provision is remunerated in several ways and in accordance with the means of the client: in kind, lump sum, fee-based payment, compensation, etc.

Implementation locations

- Sikasso Region: Koutiala and Yorosso
- Ségou Region: Bla, San and Tominian

Scope of application

FRP s provide services to their FaAO members and others. In 2011, two groups of experts (UFROAT and Cèsiri) earned more than 7,000,000 CFA francs in service provision (training) takings. FRP s are employed by other organisations, such as the Rural Community Support Project (PACR), World Vision, LuxDev and the Agricultural Sectors Support Programme (PAFA).

Duration of application

Since 2007

Success factors and constraints

Individuals selected as potential FRP s already have a wealth of talent and know-how. This practice aims to further add to this knowledge and expertise and ensure it is disseminated effectively. The system aims to install a local support system, building on existing competencies. It is also important to control the costs of FRP service provision – the fact that FRP support is inexpensive is one of the principal reasons for setting up such a system and for procuring FRP services. FRP s must be accessible – high levels of demand from outside the locality can lead to FRP s being unavailable for local farmers.

Roles of the actors involved

The apex organisation identifies, categorises and mobilises the FRP s and participates in monitoring and evaluating the implementation of the system.
The support structure supports the process of identifying and categorising the FRP s for training. It organises thematic training and monitors and evaluates implementation.
The territorial community promotes the scheme and mobilises FRP s.
Technical services build the capacities of FRP s through the provision of training and advisory support.

Effects and impacts

- Availability of low-cost local experts
- Consideration of local knowledge when resolving local problems
- Local advice
- Service provided outside of home villages: 7,000,000 CFA francs income for UFROAT and Cèsiri in 2011
- Improved agricultural productivity
- Development of local businesses' capacities for processing and marketing
- Mitigation of shortfall in agricultural extension and lack of decentralised technical services

Costs and cost effectiveness of the good practice

The cost of identification, training and monitoring and evaluation is 125,000 CFA francs per FRP .

Assessment of investment cost per unit:	Low ☒	Average ☐	High ☐
Rating of cost effectiveness:	Low ☐	Average ☐	High ☒

Sustainability

The income offered by FRP service provision motivates expert farmers. Their services are appreciated by the client and are more readily understood. The availability of expertise is sustainable given that the FRP s are based in farming areas and continue to work as farmers. Sourcing an expert is quick and easy.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
HELVETAS - Swiss Intercooperation	Maïga Rosaline DACKO	rosaline.dacko@helvetas.org
HELVETAS - Swiss Intercooperation	Lassana KEITA	lassana.keita@helvetas.org
HELVETAS - Swiss Intercooperation	Idrissa GUINDO	idrissa.guindo@helvetas.org

Reference documents

Reports on: identification, categorisation, training and evaluation

Intercooperation/Dori Expertise (2011): Rapport de capitalisation du dispositif de personnes ressources paysannes [Capitalisation report on the farmer resource persons system]

4.3.18 Awareness raising on sexually transmitted diseases

Mamadou Gallo KONE, Ralf SCHNEIDER, Abass OUOLOGUEM – IPRO-DB

Objectives

The objectives of this awareness-raising work are:
- to raise people's awareness and provide information about the dangers of sexually transmitted diseases (STDs), in particular HIV/AIDS;
- to educate people with the aim of modifying sexual behaviours;
- to reduce the spread of STDs across the intervention area.

Definition and description of the good practice

The aim is to reduce the risk of contracting STDs in the intervention zone through awareness-raising and information activities for beneficiaries and contractors.

Implementation

- STD prevention is included in the tripartite agreement on installing schemes.
- Villages affected by the arrival of external operators in their locality are provided with information.
- Service providers deliver STD awareness-raising activities to villages that focus in particular on HIV/AIDS.
- Awareness-raising activities are undertaken together with all the organisations that have signed the protocol (businesses, suppliers, consultancies, supervisory bodies).
- Target groups are supplied with condoms.
- Village awareness-raising committees are set up.

Operation

Awareness-raising and training road-shows and drama performances tour beneficiary villages and contractor companies.

Implementation locations

- Sonikegny village, Kambila Commune
- Nonkon village, Nonkon Commune
- Kénékolo village, Nossombougou Commune
- Sognébougou village, N'Tjiba Commune
- Tienko village, Nonkon Commune
- Tiembougou village, Kolokani Commune
- Korkabougou village, Kolokani Commune
- Bamabougou village, Tioribougou Commune

Scope of application

Eight villages with a population of around 9,240 inhabitants

Duration of application

Since 2005

Success factors and constraints

- Awareness among the population of the existence of HIV/AIDS and other STDs
- Incorporation of aspects of STD awareness-raising into the scheme installation agreement
- Involvement of private health care providers in the awareness-raising work
- Availability of the financial means to carry out activities

Roles of the actors involved

- **The support structure** procures condoms and monitors information and awareness-raising activities.
- **Private health care providers** carry out awareness-raising and information activities and provide advisory support. They also distribute condoms.
- **Contractors** raise the awareness of their teams about STDs and monitor staff conduct in the intervention area.
- **The commune** raises awareness and provides information.
- **Awareness-raising committees** raise awareness, provide information and distribute condoms.

Effects and impacts

- Reduction in the number of infections in the intervention area
- Awareness among local people of the ways in which they can protect themselves from STDs
- No cases of STD infection recorded in the intervention area

Costs and cost effectiveness of the good practice

The cost for these activities stands at around 1,750,000 CFA francs per village.

Assessment of investment cost per unit:	Low	☒	Average	☐	High	☐
Rating of cost effectiveness:	Low	☐	Average	☐	High	☒

Sustainability

The knowledge gained in the information and awareness-raising sessions is well assimilated by the beneficiaries.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
IPRO-DB Bélédougou	Mamadou Gallo KONE	gallokone@yahoo.fr
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Reference documents

Awareness-raising report

4.3.19 Guaranteeing loans taken out by growers

Minamba TRAORE, Moussa BAGAYOKA – IICEM

Objectives

Guaranteeing loans enables producers to access credit. In this practice, IICEM acts as a facilitator, supporting the process through activities ranging from monitoring loan repayment to forwarding applications to banks following validation. Cooperatives and agribusinesses are developed and their activities are monitored by IICEM and its NGO partners in order to re-engage with the banks and repay awarded loans. Subsequently, supply chains are set up on the back of training delivered by marketing specialists and business development agents, which helps connect up the key players (processing companies, merchants, cooperatives, suppliers, credit services). IICEM remains responsible for maintaining this relationship by providing advice on processing (quality), trade (cost calculation) and supply (quality).

Definition and description of the good practice

The loan guarantee allows producers to better manage their production costs when they first begin operating a scheme. The project acts as guarantor to the bank for the sum of the loan requested by producers.

Implementation

The producers register their need for a loan to safeguard their crops, detailing the parameters to take into account. The loan application is then forwarded to IICEM and its NGO partners. IICEM analyses the loan application in terms of the irrigated area and the yields involved to ascertain the producer's capacity to repay the loan and to determine whether the producer can meet the farming costs required to see through the growing season (Tables 5 and 6). After analysing the loan application, IICEM writes a letter of recommendation that the producers attach to their application for sending to the bank.

The project acts as guarantor to the bank for an equivalent amount that it always keeps available. The bank will not access these funds without prior authorisation. Neither, however, is it obliged to award loans to producers holding a letter of recommendation from the project. Once the loan is granted, the project supervises producers to ensure loan repayments to the bank are well managed. When loans are not repaid in full, the project provides a detailed report on the crop yield for the season in question to enable producers to take out further loans to compensate for the poor yields of that season. If the bank declines a loan extension (in the case of a default), the project then fulfils its role as guarantor, repaying any shortfall.

Table 6: Indicative figures for deciding on the viability of a loan application

Irrigation 2010-2011

Large-scale (businesses)			Irrigation area (Ha)			Costs	Yields		Pumping costs		Area	
Regions	Scheme	Ha	Maintenance	Ongoing	New	CFA francs	Before	After	Before	After	Before	After
SIKASSO	GLADIE LOT I	215			x	65,028,625	New sites – awaiting results. Lowland area: no pumping.				75	215
	GLADIE LOT III				x	29,764,100						
	SIRAMANA LOT 1	101			x	46,036,050					20	101
	SIRAMANA LOT 2				x	56,916,400						
	SIRAMANA LOT 3				x	58,662,625						
	SIRAMANA LOT 4				x	63,423,400						
	SIRAMANA LOT 5				x	37,470,349						
MOPTI/ TIMBUKTU	KOUANA	33			x	196,989,350	N/A	growing season underway			0	33
	BARAMADOUGOU	30			x	172,018,770	N/A	growing season underway			0	33
	KESSOUBIBI	30			x	193,303,522	5.3	7	66,080	67,575	30	45
	GOUBO Extension	30			x	188,946,024	6	7.5	110,000	113,750	30	32
	BAGADADJI	30			x	170,000,000	5	6.5	17,500	18,900	30	31
Consultancies	Lake Horo study					19,160,000						
Total large-scale rehabilitation		469	-	-	-	1,297,719,215						
HLIW						Cost	Yields		Pumping costs		Area	
Regions	Scheme	Ha	Maintenance	Ongoing	New	CFA francs	Before	After	Before	After	Before	After
MOPTI	Adou Karim					221,008,600						
	Agropastoral De Korientze	19					5	6.5	53,980	49,872	19	24
	Gobi	20					2	4.3	86,670	69,675	20	20
	Gouki	20					4	7.85	54,550	67,675	20	20
	Fanabougou	30					4	5.3	7,190	53,835	30	30
	Akka	30					5.2	6.5	118,000	94,950	30	30
	Seby	80					5	6.8	108,500	80,593	80	80
	Deibata	30					5.2	7	117,600	95,000	30	30
	Adoukarim		x			4,045,000						
	Kouana rehabilitation		x									
	Korienzé Agro	24	x				4	6	49,872	49,270	24	24
	Kouin		x									
	Kamaka	23	x				4.9	5.1	45,066	48,000	23	23
	Sah	15	x				6.75	7	115,000	76,665	15	15
	Diogui I	20	x				6.5	7.5	89,538	92,000	20	25
	Diogui II	22	x				7	7.75	114,545	98,420	22	31
	Gobi	20		x		3,625,000	3.96	6.5	69,675	49,500	20	20
	Gounki	20		x		2,668,000	7.85	8.2	67,675	42,500	20	20
	Agro pastoral	24		x		3,952,000	4	6	49,872	49,270	24	24
	Akka	30		x		3,125,000	4.3	0	94,950	0	30	30
	Seby	80		x		1,806,000	6.8	7	68,593	87,940	80	85
	Deibata	30		x		7,335,000	5.2	5.7	117,600	95,000	30	30
	Fanabougou	30		x		902,500	5.3	6	53,835	47,665	30	30
	Ambiri	30			x	51,627,500	New works					
	Owa	33			x	48,627,500						
	Bia	30			x	48,627,500						
	Aouré	30			x	48,627,500						
	Takoutala (Tourmo)	21			x	48,627,500						
	Deibata 2 (in lieu of Ayoumi)	30			x	51,672,500						
	Warsa Attara 1	47			x	48,627,500						
	Warsa Attara 2	50			x	48,627,500						
	Hardofana	100			x	48,627,500						
	Koromou (Doua, compare WP)				x	48,627,500						
Timbuktu	Daounakeina	55				182,468,750	6	6	130,000	133,750	35	54
	Bagadagji	45					5	6.2	17,500	18,900	30	30
	Singo	70					5	6	130,000	133,750	40	42
	Gorfoundou											
	Kabara Women	10	x			8,339,500	3.09	5	100,000	11,450	10	10
	Goubo Rehabilitation	33	x				6	6	110,000	113,750	33	33.5
	Siboné	62	x				6	6	130,000	133,750	62	64
	M'Bétou	70	x				6	6	130,000	133,750	70	70
	Daounakeina			x		2,441,500						
	Singo	40		x		2,441,500	5	6	130,000	133,750	40	42
	Bagadadji Rehabilitation	30		x		4,479,000	5	6.2	17,500	18,900	30	30
	de Ndaya Mbada	47			x				New works			
Gao	Gassi	13				15,311,500	7.8	8.3	70,384	67,615	13	13
	Dangha	23.5				13,280,500	7.13	7.5	113,510	91,136	23.5	22
	Adourou	13	x				5.5	6.8	41,461	111,290	13	15.5
	Djeflani	5	x			4,577,500	7.7	8	129,800	103,454	5	5.5
	Tondithio	22	x				6.7	8	54,045	80,708	22	23
	Gassi	9		x		6,598,750	6.8	7.5	99,456	67,615	9	13
	Dangha	22		x		5,633,500	7	7	78,840	85,319	22	23.5
Sikasso	Zoloko	30				66,069,200	New sites – awaiting results Lowland area: no pumping				0	30
	M'Pegnesso	70				63,226,600					30	70
	Kouroumasso	50	x			950,000					20	50
	Finkolo Ganadougou		x			2,489,000						
Total HLIW		1,608	-	-	-	1,119,498,900						
TOTAL IRRIGATION		2,077	-	-	-	2,417,218,115						

Operation
(See implementation section)

Implementation locations
The process of facilitating loan awards is being implemented in the Mopti, Timbuktu, Sikasso and Gao regions.

Scope of application
Loan guarantees are available for all sites developed and overseen by the project.

Duration of application
Ongoing since the launch of IICEM in 2009

Success factors and constraints
To secure a high level of loan repayment, it is necessary to closely monitor the producers benefiting from loan guarantees.

Roles of the actors involved

- Producers declare their loan requirements to safeguard their crops.
- NGO partners act as intermediaries relaying requests, provide training and carry out monitoring.
- IICEM analyses loan requests and then draws up a guarantee certificate for the bank's consideration.
- The bank assesses the farming organisation's loan request.

Effects and impacts
This practice enables farming organisations to improve on how they repay their loans and, thereby, increase their creditworthiness with the banks. Besides the IICEM guarantee, projected levels of production serve as an additional guarantee for the bank.

Costs and cost effectiveness of the good practice
The costs are set out in Table 7.

Assessment of investment cost per unit:	Low	☒	Average	☐	High	☐
Rating of cost effectiveness:	Low	☐	Average	☒	High	☐

Sustainability

Organisation name	Contact name	Email address
IICEM	Minamba TRAORE	tbaminan@gmail.com
IICEM	Moussa BAGAYOKA	

Reference documents

No documents

Table 7: Cost breakdown of the operating accounts

Farming org.	Area (ha)	Amount (CFA francs)					Depre-ciation	Financial fees	Pump techni-cians	Wardens	Upkeep/ repairs	Transport	Other costs	Total costs
		Seed	DAP	Urea	Diesel	Oil								
1	21	225 000	525 000	1 050 000	2 760 000	42 000	350 000	90 000	100 000	0	250 000	83 000	181 875	5 656 875
2	25	300 000	600 000	1 200 000	3 000 000	87 500	800 000	495 017	30 000	20 000	50 000	100 000	50 000	6 732 517
3	31	387 500	930 000	1 860 000	4 200 000	350 000	700 000	1 137 077	40 000	25 000	150 000	155 000	200 000	
4	30	315 000	600 000	1 200 000	3 690 000	280 000	900 000	639 853	37 500	25 000	200 000	200 000	15 035	
5	35	750 000	1 550 000	3 100 000	6 500 000	420 000	1 000 000	651 485	30 000	20 000	0	350 000	20 000	
6	30	450 000	900 000	1 800 000	3 600 000	262 500	550 000	804 402	25 000	0	125 000	405 000	134 500	
7	24	264 000	720 000	1 350 000	3 240 000	350 000	475 000	709 637	0	0	1 564 050	273 500	65 700	
8	30	450 000	900 000	1 800 000	3 600 000	350 000	1 000 000	812 850	30 000	20 000	100 000	304 500	0	
9	45	675 000	1 350 000	2 700 000	5 490 000	375 000	1 000 000	14 48 480	25 000	0	200 000	630 000	101 345	
10	40	500 000	1 200 000	2 400 000	4 800 000	262 500	1 000 000	860 722	20 000	20 000	315 000	123 450	50 000	
11	45	337 500	500 000	1 620 000	3 420 000	80 000	5 000 000	1 100 000	120 000	75 000	270 000	100 000	375 000	
....														
....														
....														
....														
....														
32														
TOTAL	**855**	**10.477.250**	**29.986.350**	**44.000.000**	**95.292.580**	**4.821.070**	**25.864.000**	**18.149.048**	**2.000.000**	**1.298.855**	**7.734.700**	**5.593.000**	**7.641.075**	**253.065.278**
Ratio per cost centre		4 %	12 %	17 %	38 %	2 %	10 %	7 %	1 %	1 %	3 %	2 %	3 %	100 %

4.3.20 Agricultural credit and start-up funding for small-scale irrigation cooperatives

Célestin DEMBELE, Moussa DOUMBIA, Jacques TAMINI, Moussa DOUMBIA – HELVETAS Swiss Intercooperation and APEL/Bulonba Bougouni Intermunicipal Body

Objectives

The objective of this practice is to provide lowland farmer cooperatives with self-managed, self-renewing financial resources for the purpose of facilitating members' access to farming inputs. Following the granting of an initial 'seed fund', the financing mechanism grows and becomes sustainable on its own. It is important to point out that, for a very long time, the credit system was based solely on cotton production, putting it out of reach of many growers producing other crops that bankers chose to ignore.

Definition and description of the good practice

Once the infrastructure has been put in place, cooperatives are supported in drawing up their cropping plans (rice and vegetable growing). This support is provided in the context of value enhancement. The cropping plans include forecasting in relation to sites and the input needs of member farmers. The funds provided by the project are targeted towards supporting the empowerment of cooperatives and constitute non-repayable grants. Cooperatives use these financial resources to provide their members with loans to grow crops. When these crops are sold, the loans are repaid to the cooperatives along with a small percentage of interest to renew the loan facility. The loan awarding system, interest rates and repayment deadline are clearly defined by the cooperative. Women have access to gender-specific mechanisms, such as a facility to access credit without providing any personal contribution.

The grant is awarded following a capacity-building process focusing on the management and governance of the cooperative. Following negotiations, the programme funds the cooperative's cropping plan on the basis of a collaboration agreement. Support with managing the funds is delivered by a consultant. The grant is paid into the cooperative's bank account. The cooperative organises the procurement of inputs, in collaboration with the service provider. Loans are provided in kind (seed, fertilisers, pesticides, etc.) rather than as cash.

Those tasked with managing the cooperative are given training in how to use a range of management tools (drawing up cropping plans; keeping stock inventory, loan and repayment records; managing removal and delivery receipts; etc.). At the end of the growing season, the loans are repaid in kind (seed) and in cash (fertilisers and fungicides) in accordance with a predetermined timetable, thus replenishing the fund.

Operation

The funds provided to the cooperative are used to buy inputs on the basis of the cropping plan. The start-up fund granted by the programme pays for the initial stock. Once this stock has been procured, the inputs are distributed to members according to their stated requirements. The repayment schedule and the amount of interest that must be paid are communicated. Growers' production activities are supported and monitored by the consultant and the management committee.

Following the harvesting and sale of crops, in accordance with the deadline set, the loans are recovered along with their interest payments and the fund is replenished for the following growing season. During the different implementation stages, the cooperative holds public audits in the presence of the commune authorities to report on how the cooperative is being managed; the aim being to build trust between the cooperative and its members.

Photo 63: Daughter of a woman farmer of N'Gala who benefits from cooperative loans

Photo 64: The village chief of Guéléguétiguila (Gouanan Commune) meeting with a cooperative member

Source: HELVETAS Swiss Intercooperation

Implementation

The structuring, organisational strengthening and management capacity building activities are delivered by the consultant from the outset of the scheme's implementation phase. Groups of actors are encouraged to organise themselves as cooperatives (women and men rice growers, vegetable and other kinds of growers, etc.). These cooperatives, with the support of the consultancies, act as the representative for managing funds. They draw up their cropping plans (list of member producers and their farmland, and evaluation of the input requirements requested by producers) and define the system for awarding loans (the access conditions, repayment methods, timetables and interest levels are set by the cooperatives).

An agreement setting out the ways in which the programme will provide support through a contracted service provider is signed. Funds are paid into the relevant bank account and the cooperative then procures the inputs. The cooperative managers, using the management tools at their disposal, distribute the inputs to producers. A public audit is organised to inform members about the status of loans. The recovery of loans with interest makes it possible to replenish the fund (with payments paid into the cooperative's bank account). The public audit into the loan repayment situation is a medium for deploying coercive measures to recover unpaid loans.

Implementation locations

The system has been applied in 19 sites across 15 communes in the circles of Bougouni, Kolondiéba and Yanfolila.

Scope of application

The system has been applied in 19 sites across 15 communes. In total, 2,150 producers – 81% of the farmers identified in the production areas – have benefited from the loan scheme.

Duration of application

The approach has been in use since 2008.

Success factors and constraints

Institutional and organisational strengthening plays a key role in achieving a successful outcome. Cooperatives are empowered to manage the funds. It must be clearly communicated that the funds belong to the cooperative and are only granted once. The granting of in-kind (inputs) rather than cash loans curbs any attempts to stray from the objectives. A local farming advisory mechanism active in the first few years of the scheme ensures high levels of productivity, which, in turn, facilitates the repayment of loans. Holding public audits to report on accounts ensures that the system is transparent.

Evaluation meetings bring together actors from all the sites (commune authorities, cooperatives), consultancies and the programme team, serving to motivate actors and offering the opportunity to share experiences.

Roles of the actors involved

The cooperatives catalogue needs, coordinate the preparation of the cropping plan, set the access conditions for loans, undertake procurement and ensure the recovery of loans from members.
The communes participate in debriefings, facilitate the settlement of misunderstandings between producers and cooperatives, and monitor technical support provision.
The intermunicipal body facilitates communication and negotiation between communes and the programme.
Consultancies deliver management training and advisory support on technical aspects of farming, and facilitate the procurement of inputs suited to the farming conditions of each site.
Technical services participate in evaluation meetings and act as advisors to the service providers and programme team.

Effects and impacts

Since the programme began in 2008, the cooperatives have managed to achieve recovery rates of between 80% and 100%, and, with the system in place, 70% of the beneficiaries have improved their production levels. This management experience enables farmers to operate as entrepreneurs and to accurately assess their profitability.

Costs and cost effectiveness of the good practice

Assessment of investment cost per unit:	Low	☒	Average	☐	High ☐
Rating of cost effectiveness:	Low	☐	Average	☒	High ☐

Sustainability

After five years, the cooperatives are managing to renew the fund each year.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
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HELVETAS Swiss Intercooperation – APEL Project	Jacques TAMINI	jacques.tamini@helvetas.org
Intercommunalité de Bougouni	Moussa DOUMBIA	douballa03@yahoo.fr bulonbasecom@yahoo.fr

Reference documents

2011 report: Accompagnement à la valorisation des ouvrages hydro-agricoles sur les sites de Blakala, Ména, Bafaga, Mamissa, Bogodougou, Nèrèkoro, Koloni et Mogoyafara [Support to enhance the value of hydro-agricultural schemes in Blakala, Ména, Bafaga, Mamissa, Bogodougou, Nèrèkoro, Koloni and Mogoyafara] (GSAD – Sahelian Development Support Group)

2011 report: Accompagnement à la valorisation des ouvrages hydro-agricoles sur les sites de Niakobougou, Blendougou, N'Gala, Banko, Faradiélé, Sibirila, Solona, Farababougou [Support to enhance the value of hydro-agricultural schemes in Niakobougou, Blendougou, N'Gala, Banko, Faradiélé, Sibirila, Solona and Farababougou] (BEACIL – Consultancy and Advisory Support for Local Initiatives)

2013 report: Collecte de données sur la valorisation des ouvrages hydro-agricoles réalisés dans le Pôle de Bougouni sur le financement APEL – Bougouni [Data collection on the development of schemes installed in the Bougouni Hub with APEL-Bougouni funding]

4.4 Good practices in preserving, processing and marketing

4.4.1 Ventilated storehouses for highly perishable produce

Oumar ASSARKI – Agricultural Competitiveness and Diversification Programme (PCDA)

Objectives

The aim of this practice is to improve the preservation and storage of potato tubers in rural areas.

Definition and description of the good practice

Ventilated storehouses are designed to store cash-crops and seed potatoes in conditions suitable for minimising damage and to hold back stock until market prices rise. The facilities are mud-brick, thatched outbuildings with external dimensions of 7.5 metres long by 5.9 metres wide.

Photo 65: Ventilated storehouse for storing seed potato

Source: Oumar ASSARKI

Operation

- No plant-health treatments used
- Stock quantity: 5,000 to 10,000 kilograms
- Checking for damaged tubers every two weeks (to control rot)

Implementation

PROJECT SCOPING STAGES			
Steps	**Tasks involved**	**Tools**	**Leads**
I. Drawing up the request			
Proposing project ideas	• Register the request	• Funding request template	• Promoter
Identifying the project	• Define and review the project • Draw up terms of reference (ToR) for the research and oversight body (ROB) to prepare the project • Select ROB • Contract ROB • Provide advance payment to ROB	• Eligibility criteria • Model ToR • ROB register • Model contract	• Promoter • C1/RC and C3/RC • Coordinator-RC • C3 and PCU
II. Preparing the application			
Feasibility study	Prepare the project application: • technical and environmental aspects (C1 validation) • commercial aspects (C2 validation) • financial aspects (C3 validation)	• Project presentation software and template • RTE and KIT	• ROB
Application evaluation	• Analyse the project application • Validate the project application • Validate the financing plan	• Eligibility criteria (project parameters, profitability, market, impact, etc.)	• C1/CR • C2/CR • C3/CR
III. Approving the application			
Approval	• Review financing application	• Project application data sheet	• CRAP / CNAP
	• Approve financing applications • Pay balance due to ROB	• Approval grid	• CRAP / CNAP • CR, C3 and UCP
IV. Mobilising resources			
Mobilising resources/ commitment	• Sign agreements	• Co-funding agreement • Tripartite agreement among consultants	• Coordinator – RC • Promoter • Consultant
	• Justify self-funding	• Estimates and pro formas • Bank statement (balance)	• Promoter • C1/RC and C3/RC
	• Release the subsidy in line with the financing plan	• Funding plans • Established agreements	• C3/RC and C3 • PCU
V. Project delivery			
Project implementation	• Monitor delivery • Provide technical assistance • Produce assistance reports • Validate the reports • Pay expert providers	• Delivery timetable • ToR • Reports	• C1/RC, C3/RC • Service provider • C3 and PCU

PCU = programme coordination unit

CRAP = regional committee for the approval of sub-projects
CNAP = national committee for the approval of sub-projects

NB: C1, C2, C3 etc. = components 1, 2 and 3 of the PCDA
RC = regional coordinator for the PCDA

Implementation locations

- Zignasso 1 site, Sikasso Circle
- Zignasso 2 site, Sikasso Circle
- Bamadougou site, Sikasso Circle

Scope of application

Village development services in Zignasso and Bamadougou

Duration of application

Since 2007

Success factors and constraints

- Lack of available straw for thatching
- Growing techniques not being mastered
- Capacity to cover outgoings without selling the potato stocks in storage
- Lack of thermometers or hygrometers

Roles of the actors involved

- The PCDA funds, monitors and provides support.
- The promoter owns the site and provides a 25% personal contribution.
- The research and oversight bodies (ROBs) provide advisory support, monitor activities on the ground and deliver reports.

Effects and impacts

Preservation period: six months, compared to three months using a traditional system
Loss rate: less than 20%

Costs and cost effectiveness of the good practice

- Investment costs: 584,000 CFA francs
  - crates – 400,000 CFA francs
  - storehouses – 184,000 CFA francs
- Preservation costs: each kilogram of stored potato will incur an extra cost of 53 CFA francs.
- Break-even point in terms of revenue: once turnover moves beyond 105,510 CFA francs, the conservation activities begin to become profitable.
- Break-even point in terms of quantity: a minimum stock of 313 kilograms must be stored for the activity to be profitable.

Assessment of investment cost per unit:	Low ☐	Average ☒	High ☐
Rating of cost effectiveness:	Low ☐	Average ☐	High ☒

Sustainability

Given its economic benefits, most promoters have adopted this storage system. Others have built storehouses of this kind without any subsidies from the PCDA.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
Agricultural Competitiveness and Diversification Programme (PCDA)	Oumar ASSARKI	assarki@yahoo.fr

Reference documents

Agricultural Competitiveness and Diversification Programme (PCDA)/Rural Economy Institute (IER): Référentiel technico-économique conservation de la pomme de terre en cases aérées [Technical and economic reference document on preserving potatoes in ventilated storehouses]

4.4.2 Using gas dryers (Atesta-Sikasso) to process animal and vegetable products

Oumar ASSARKI – Agricultural Competitiveness and Diversification Programme (PCDA)

Objectives

The objectives of using a dryer are:
- to improve productivity and the quality of dried mango;
- to demonstrate the technical and economic benefits of the system;
- to promote the use of Atesta dryers among processing outfits.

Definition and description of the good practice

This multipurpose dryer is used to dry animal and vegetable products (mango, tomato, coconut, ginger, meat, etc.). It comprises: 2 compartments, 2 thermometers, 4 burners, 20 trays and 4 baffles. The drying process is natural (natural convection). Moving produce around the unit (top to bottom, back to front) every two hours helps homogenise the drying process.

Photo 66: Operational gas dryer

Photo 67: Unfilled gas dryer

Source: Oumar ASSARKI

Implementation

The dryer is on show at Ségou demonstration centre where promoters come and express their interest. Interested parties then apply to PCDA. These applications are reviewed by the Regional Centre for the Approval of Sub-Projects (CRAP), which comprises the governor, banks, research and oversight bodies (ROBs) and inter-branch organisations. Once approved by CRAP, the project must subsequently be approved by the National Centre for the Approval of Sub-Projects (CNAP) in Bamako. Successful promoters are informed and then pay their contribution. PCDA and the ROBs provide training and support, and carry out monitoring. Part of the training involves exchange trips to visit promoters outside the region.

Operation

- Source and quantity of energy used: 12 kilograms of gas in 24 hours
- Duration of machine operation: 20 hours per production cycle
- Drying temperature: 70 to 80°C
- Water content of end product: 15%
- Duration of activities: 24 hours
- Type of raw material: fresh mango
- Receipt/sorting/weighing of raw material: 100 kilograms of mango pulp per production cycle
- Cleaning and preparing the raw material: washing in chlorinated water (3 to 5 drops per litre), peeling, stone removal, and cutting into slices one to five millimetres thick
- Processing operations
- Packaging the final product in plastic sachets of 100, 200 and 500 grams, and one kilogram

Implementation locations

Sikasso town, Bougouni, Koutiala, Bamako and Ségou

Scope of application

Around 20 units installed

Duration of application

Since 2005

Success factors and constraints

- Material constraints: sourcing gas and appropriate packaging (availability, airtightness, etc.)
- Gas supply problems: large gas bottles not subsidised by the state (only small bottles are)
- Need for a certain level of technical know-how (regulating temperatures, following technical procedures, etc.)
- Need for the process of identifying potential promoters to be carried out with the utmost rigour

Roles of the actors involved

- PCDA promotes innovations, subsidises financing, provides support and undertakes evaluation.
- ROBs carry out studies, monitoring and reporting, and support promoters.
- Banks/microfinance institutions provide co-funding and loans, and train up promoters.
- Promoters contribute financially to their training and implement the project.

Effects and impacts

- Reduced drying times: 100 kilograms of pulp in 20 hours
- Improved product quality: good colour and taste
- Total output quantity from each production cycle: 14 kilograms of dried mango from 100 kilograms of mango pulp / output quality: 10 kilograms prime quality, 4 kilograms secondary quality
- Creation by promoters of a 'drying school' in Sikasso

Costs and cost effectiveness of the good practice

Investment costs: 1,760,000 CFA francs.

Table 8: Operating accounts (for April to July 2008)

Costs	Amount	Outputs	Amount
Variable costs: purchase and transport of 20 tonnes of fresh mango (at 30 CFA francs per kilogram)	600 000	Sale of 1,250 kg of prime-quality dried mango at 3,000 CFA francs per kilogram	3 750 000
200 gas bottle refills	600 000	Sale of 150 kg of secondary-quality dried mango at 1,500 CFA francs per kilogram	225 000
Water and electricity (10,000 CFA francs per month)	40 000		
Labour (workers)	600 000		
Rent and upkeep	240 000		
Secretary's salary	80 000		
Security costs	180 000		
Packaging	48 000		
Communication and misc.	40 000		
Total variable costs: Depreciation Atesta dryer Development Small equipment Total fixed costs	2 428 000 460 000 160 000 120 000 180 000 460 000		
Returns	**1 087 000**		
Total	**3 975 000**	**Total**	**3 975 000**

- Turnover = total production x unit price = 3,975,000 CFA francs
- Production cost (CFA francs/kilogram) = (variable costs + fixed costs) / output quantity = (2,428,000 + 460,000) = 2,888,000 CFA francs / 1,400 kilograms = 2,063 CFA francs
- Net return = turnover - total cost of production = 3,975,000 - 2,888,000 = 1,087,000 CFA francs
- Contribution margin = turnover - variable costs = 3,975,000 - 2,428,000 = 1,547,000 CFA francs
- Contribution margin rate = contribution margin / turnover = 1,547,000 / 3,975,000 CFA francs = 39%
- Production costs: each kilogram of processed dried mango incurs a cost of 2,063 CFA francs
- Break-even point in terms of quantity: a minimum quantity of 524 kilograms must be produced to make the activity profitable

Assessment of investment cost per unit:	Low	☐	Average	☒	High ☐
Rating of cost effectiveness:	Low	☐	Average	☒	High ☐

Sustainability

Five-year lifespan

Organisation, resource person and contact details

Organisation name	Nom de la personne	Contact email
Agricultural Competitiveness and Diversification Programme (PCDA)	Oumar ASSARKI	assarki@yahoo.fr

Reference documents

Agricultural Competitiveness and Diversification Programme (PCDA) (2008): Référentiel technico-économique. Séchage de la mangue au séchoir à gaz, Atesta-Sikasso [Technical and economic reference document: Drying mango with a gas dryer (Atesta-Sikasso)]

4.4.3 Feeder roads to transport produce

Mamadou Gallo KONE, Ralf SCHEIDER, Abass OUOLOGUEM – IPRO-DB

Objectives
The main objective is to transport produce grown around dams to market. Secondary objectives are to improve: the road network in rural areas, the supply of villages, transport for the sick and access to education.

Definition and description of the good practice
Roadways and other key sites are comprehensively developed to provide vehicles with year-round access to production zones. The transport routes link up with the hydro-agricultural schemes.

Implementation
Local people lodge a request with the project team that has been previously signed off by the mayor. The project team prioritises requests according to the annual intervention area and carries out a scoping study of the site in question. If the results of the study are positive, terms of reference are drawn up by a consultancy that has been previously selected in a tender process. The consultancy draws up the summary draft document, the detailed preliminary draft and the invitation to tender document.

A management committee is set up in the village and beneficiaries are provided with organisational and technical training. The works begin with stone breaking to produce the materials required for protecting the roadway (erosion control) and building water crossings.

An invitation to tender is issued and a contractor selected, who is then introduced to villagers at the start of works. Works are accepted at the end of each intermediate stage (e.g. the marking out of the roadway, the installation of earthworks, etc.). Each task is paid for on a unit-price basis. Provisional acceptance takes place at the end of the works. Beneficiaries are trained in how to maintain the scheme and an annual maintenance cost is set. Final acceptance is given after one year.

Operation
The roadway management committee collects contributions for maintenance and organises maintenance works. Management teams collect tolls from users at tollgates.

Implementation locations
Works have been implemented in the Bandiagara region (treatment of key areas) and are planned for Bélédougou.

Scope of application
Around 570 kilometres have been made accessible in Bandiagara.

Duration of application
Since the 1990s

Success factors and constraints

- Maintenance is sometimes difficult.
- The main objective of facilitating the transport of produce to market is often supplanted by the secondary objective of making villages more easily accessible.

Roles of the actors involved

- **The villages involved** participate by providing their labour and maintaining roadways.
- **The project team** funds the studies and works, and undertakes monitoring.
- **The roadway management committee** organises works, inspects the road's condition and collects maintenance contributions.
- **The consultancies and contractor** carry out studies, inspections and installation.

Effects and impacts

- Facilitation of produce transportation
- Reduced journey times
- Increased competition among commercial buyers
- Increased prices for local produce
- Reduced costs of supply
- Social effects (access to education, health, communication)

Costs and cost effectiveness of the good practice

Projected costs for 41 kilometres in Bélédougou:

- Full-scale development: 26 million CFA francs per kilometre
- Development of key areas only: 17 million CFA francs per kilometre

Assessment of investment cost per unit:	Low	☐	Average	☒	High ☐
Rating of cost effectiveness:	Low	☐	Average	☐	High ☒

Sustainability

With regular maintenance, a scheme will last around 10 years; without maintenance, a maximum of three years.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
IPRO-DB Bélédougou	Mamadou Gallo KONE	gallokone@yahoo.fr
IPRO-DB Bélédougou	Ralf SCHNEIDER	ralf_schneider5@hotmail.com
IPRO-DB Bélédougou	Abass OUOLOGUEM	ouologuemabass@yahoo.fr

Reference documents

None

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4.4.4 Establishment and support of coordination platforms for commune and private sector collaboration

Dieneba CISSE – PACT

Objectives

Consultation frameworks aim to facilitate dialogue between commune representatives and sector players in order to direct investments and commune services towards the real needs of professionals in the sectors in question.

Photo 69: Consultation meeting of actors

Photo 70: Presenting the results

Definition and description of the good practice

The approach involves instituting a consultation framework for local authority actors and professionals from economic sectors in order to identify these economic actors' needs vis-à-vis community investments, to factor these needs into local and regional authority planning, and to promote trust and collaboration between actors.

Implementation

The commune identifies two or three high-growth sectors that are a priority for the commune and also identifies the actors (groups, cooperatives, associations) operating in these sectors. It then puts a consultation framework in place that brings together the municipality, sector actors, local technical services, representatives from technical and funding partners, and NGOs appropriate to or operating in the sectors in question. The decision to establish a framework is made on the back of commune council deliberations.

Prior to the first consultation framework meeting, sector professionals identify their needs in terms of investments and measures to improve the business environment. During these periodic meetings, attendees negotiate and agree on priority actions and write these up in a very short-term (three-month) action plan. The consultation framework group then moves to install an inclusive monitoring committee to oversee the implementation of the action plan. The committee's mandate is defined and evolves in accordance with the results that are achieved over time and with new needs arising. The successive nature of the consultation framework meetings means that progress can be measured, required adjustments made and new activities programmed to move the sectors forward.

Operation

- Quarterly meetings between the municipality and professional organisations, with other actors providing input as required and according to the topics covered in the meeting
- Joint identification of needs (investments and capacity building of actors)
- The planning (re-planning) of activities (action plan) in order to strengthen capacities and install schemes, as demonstrated by the example below of an action plan drawn up at the second consultation meeting of the Dioro municipality with cooperative companies of women market gardeners

Example action plan

Actions	Partners (the commune + POs* as a minimum)	PDESC– registered or to be registered	Financing	Deadline	Lead
Install water points for market gardening (specify the quantity)	Municipality + Dioro women POs + Millennium Village (PCDA)	Registering in 2008	PO: 15% Millennium Village: 75% Municipality: 10%	June 2008	Bata COULIBALY – Cooperative President
Install an irrigation scheme to distribute water	Municipality + Dioro women POs + Millennium Village (PCDA)	Registering in 2008	PO: 15% Millennium Village: 75% Municipality: 10%	June 2008	Naini SANOGO – Member
Set the rules for water management (sustainability)	Municipality + women POs + Millennium Village ORS (PCDA)		PO: 100%	May 2008	Nana TOURE – Assistant Secretary
Seek a partner for fencing off the market garden site	Commune + POs + Millennium Village	Registering in 2008	Commune: 100%	June 2008	Issa DOUMBIA - Mayor

*Professional organisations

Implementation locations

- Ségou Region: Ségou Circle (communes of Dioro, Sansanding, Togou, Markala and Farakou Massa) and Macina Circle (communes of Boky-Wèrè, Kokry, Souleye, Saloba and Kolongo)
- Koulikoro Region: Koulikoro Circle (communes of Sirakorala, Koula Togouni, Nyamina and Doumba) and Kati Circle (communes of Ouélessébougou, Dialakoroba, Sanankoroba, Dio-Gare and Yélékébougou)

Scope of application

The approach has been applied in 20 communes in two regions and four circles. On average, each commune has two cooperatives, which are professional organisations representing between 60 and 120 members.

Duration of application

Since 2007

Success factors and constraints

The most important factor in ensuring success is a willingness to collaborate on the part of the municipality (whose revenue is based on taxes paid by economic actors) and economic actors who have expectations with regard to the installation of infrastructure/community facilities for trade and to business opportunities that the municipality can facilitate. Levels of success are strongly linked to the support provided to the two main actors, namely:

- training and support for the municipality in managing the local development, mobilising resources, and negotiating and developing partnerships;
- training and support for economic actors in formalising the cooperative or company, mobilising and securing financial resources, setting up and managing projects, and negotiating and implementing partnerships.

Progress can potentially be restricted by the low-levels of resources that both the territorial communities (rural communes) and local economic actors can invest in infrastructure and the fact that PACT cannot make capital investments. This lack of investment can sap the desire of actors to continue with the consultation process.

Roles of the actors involved

PACT provides technical support (methods and tools for work, moderation and training) and contributes financially to consultation workshops.

The commune formalises the framework, organises the logistics of meetings (invites, meeting rooms, chair hire, accommodation), contributes to implementing the action plan (registering its designated actions with PDESC, financing), provides incentives (supporting the training of cooperatives; land access; linking up actors; acting as intermediary in negotiations among cooperatives, technical and financial partners and NGOs).

Professional organisations mobilise and train their members, cover the costs of their designated activities (radio reports, member travel arrangements, opening accounts, etc.), identify and negotiate within each individual profession the required actions for inclusion in the action plan, and contribute to the cost of building infrastructure.

Technical services provide technical support to the two main parties (municipality and professional organisations).

The monitoring committee helps ensure the action plan is implemented on schedule, identifies obstacles to implementation and communicates these to consultation framework actors so they can find solutions and move forward with a new action plan.

Effects and impacts

- An increased awareness in the municipality of the need to include economic factors in planning
- Commune water-use planning that takes into account commercial (e.g., small-scale irrigation schemes) as well as drinking water purposes
- The formalisation of professional organisations and steering of these towards economic goals
- A collaborative relationship between the municipality and private sector (better mutual understanding of local authority and professional sector actors)
- Improved basic community services for actors operating in sectors related to small-scale irrigation
- The embedding of community structural investments in community planning
- Greater willingness to pay taxes
- The creation of new funding streams for local authorities
- The empowerment of private sector actors in terms of investments

Costs and cost effectiveness of the good practice

Assessment of investment cost per unit:	Low	☒	Average	☐	High	☐
Rating of cost effectiveness:	Low	☐	Average	☐	High	☒

Sustainability

The beneficiaries (municipality and professional organisations) contribute to covering the costs involved. It is a win-win process for the municipality and professional organisations and the costs involved are low.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
PACT	Dieneba CISSE	dieneba.cisse@giz-pact.org

Reference documents

Not yet available

4.4.5 Deploying technology as a means of providing economic support to producers

Mohamed MINTA and Moussa DOUMBIA – AVAL Programme, HELVETAS Swiss Intercooperation

Objectives

The practice seeks to organise and engage actors in one or several value chains (for example, a rice hulling value chain where sector actors are organised around rice hulling units). The support aims to set up a functioning organisation to manage the equipment and promote the value chain in question. The goal of this approach is to increase the quantity and quality of produce using a multi-stakeholder strategy with the potential, through the value added, to bring in substantial revenues.

Definition and description of the good practice

Hulling, the main rice processing activity in the area, can be performed both manually and mechanically. Producers use pestles and mortars for manual hulling. This activity, commonly carried out by women, is mainly used to hull the portion of harvested paddy designated for home consumption.

To improve production and processing, the project supports the installation of rice hullers on farms in order to provide consumers with better quality rice, which also has a higher market value. With this support, mechanical hulling (often following drying) has become embedded in farming practice and has overtaken manual hulling. Producers' incomes have risen accordingly, given the reductions in broken grain and their more marketable produce. The interim objectives sought, with the project's support, are:

a) In production

- to increase the land area developed for rice production per site;
- to increase the agricultural yields of sites;
- to enable producers to master rice conservation techniques and methods.

b) In processing

- to facilitate access to rice hullers for producers in supported communes;
- to market new non-paddy products.

c) In marketing

- to increase consumer knowledge about the products;
- to improve the organisation of produce logistics by employing a more effective sales mechanism.

Operation

A rice hulling machine (huller) is installed for use. The fee for using the huller is set at a general meeting of the organisation, with a preferential rate granted to members. In addition, priority is given to local rice growers who wish to hull their rice. It should be pointed out that the machine is operated using animal traction and that millers often tour local villages offering their services.

At the end of each working day, the accounts are drawn up by the management committee treasurer who, on a weekly basis and in the company of the secretary general, deposits the funds in the organisation's bank account, held in a microfinance institution.

Implementation

To understand the difficulties encountered by producers, a diagnostic exercise is carried out. For example, where no rice huller is available, women are obliged to pound the paddy. The results are mediocre (difficult work and rice quality). Other difficulties include the long distances involved in accessing a huller and the possibility that, even though a huller is available, the quality of the end product may be lacking. A management committee is set up to ensure the income generating activities that contribute to the organisation's financial self-sufficiency are well handled.

Millers are trained to run and maintain the machine and are provided with simple management tools for compiling information on the quantity of rice hulled each day, the costs associated with operating the machine (purchase of diesel, oil), etc.

Implementation locations

- Sikasso Region, Sikasso Circle, Niena Commune (Brigan village)
- Sikasso Region, Koutiala Circle, Tao Commune (Fonfona village)
- Sikasso Region, Yorosso Circle, Ourikela Commune (Ourikela village)

Scope of application

In 2011, an organisation was set up in Ourikela comprising 52 members. The organisation's output was approximately 32 tonnes. The 60 hectares of farmland were divided up among all the growers in the locality.

The machine produced the following quantities:

- 232 sacks of hulled rice, with hulling charges of 650 CFA francs per sack for members and 750 CFA francs per sack for third parties

The initiative was adopted by five cooperatives.

Duration of application

Approach in use since 2010

Success factors and constraints

The main success factors for the practice are:

- the presence of a potentially large amount of paddy rice in the area;
- the sound adoption of the practice by actors, but also very good management and regular monitoring of associated activities (good entrepreneurial spirit).

The constraints mainly involve technical issues such as the availability of skilled labour to repair the machine and its spare parts.

Photo 71: Rice huller in Brigan village (Sikasso)

Source: HELVETAS Swiss Intercooperation

Roles of the actors involved

- **Beneficiaries** formulate their needs and pay their share relating to these needs.
- **The commune** facilitates business operations.
- **Consultants and technical services** structure the organisations, provide advisory support and train actors.
- **The programme** provides co-funding, advisory support and training.

Effects and impacts

The cooperatives benefiting from this equipment have been able to offer more competitive produce on the market as their processing costs are lower than those of other rice growers. Women's domestic duties are reduced, cooperative member incomes have increased and there is greater food security. The land given over to rice growing on supported sites has increased, ensuring food security. The rice hullers are easily accessible for rice growers in supported communes.

Costs and cost effectiveness of the good practice

A rice huller of this kind with a 10-year lifespan costs between 1,500,000 and 1,700,000 CFA francs when procured from the manufacturer in Niono in the Office du Niger area. To this, one must add the costs of a one-week training course for beneficiaries on running and maintaining the machine (to ensure better uptake). This training costs 200,000 CFA francs and is delivered by the supplier (two millers trained).

The machine hulls 800 kilograms of rice per hour, with a hulling rate of 60% to 67% using half a litre of diesel per hour. The monthly operating costs are as follows:

Forecast of monthly operating costs	
Items/month	Month 1
Revenue or produce	
Rice hulling (50 sacks per day)	1 500 000
Sales of bran (14 sacks x 1,500)	21 000
Total revenue = (A)	1 521 000
Costs or outgoings	
Diesel buying (135 litres per month)	81 000
Filter buying	3 500
Belt buying	4 000
Labour	30 000
Maintenance costs	10 500
Depreciation	13 750
Other costs	15 000
Total costs = (B)	157 750
Gross balance: (C) = (A - B)	1 363 250
Net balance (E) = (C - D)	1 363 250
Depreciation = G	13 750
Self-funding capacity C, A, F = E + G	1 377 000

NNB: The machine is operational for four months each year.

Assessment of investment cost per unit: Low ☐ Average ☒ High ☐
Rating of cost effectiveness: Low ☐ Average ☐ High ☒

Sustainability

The sustainability of the practice relies on producers' sound operation of the rice huller, which involves the following factors:

1. training millers in how to run and maintain the machine;
2. training in strategies for making the huller profitable;
3. ensuring the availability of spare parts;
4. drawing on pre-existing technical capacities in a given commune for the maintenance and repair of machines;
5. ongoing training along with management and accountancy over sight;
6. setting up a system of simple template documents for accounting purposes.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
HELVETAS - Swiss Intercooperation	Mohamed MINTA	mohamed.minta@helvetas.org
HELVETAS - Swiss Intercooperation	Moussa DOUMBIA	moussa.doumbia@helvetas.org

Reference documents

HELVETAS Swiss Intercooperation (2012): Note on rural associative enterprises

4.4.6 Temporary buying-in system for rice

Huub MUNSTEGE, Matthias KLIEWE, Pierre GUIROU and Yehia Ag Mohamed ALI – PMN/IPRODI

Objectives
The objectives are to combat speculation and the impoverishment of beneficiaries.

Definition and description of the good practice
The practice involves setting up local rice storage facilities and a fund for temporarily buying in rice after the harvest in order to (i) give growers access to ready cash, (ii) enable growers to benefit from price rises and (iii) prevent falls in the market price of rice. Growers buy back their rice stocks for the same price they sold it for and then resell it (during the period in which prices are high). Storage fees of 1,000 CFA francs per sack are charged in order to maintain and grow the fund (taking into account inflation).

Implementation
A fund is made available to satellite initiatives of the project or development planners to cover the reverse repurchase of sacks of rice during harvest time at the market price. The sacks are marked by the owners and stored in PMN/IPRODI's storage facilities. In the lean season (June to August) when rice prices are highest, growers can rebuy their sacks for the same price they were paid at harvest time plus 1,000 CFA francs per sack.

For example:
In 2009, in the Attara area, sacks of rice that were reverse repurchased at 8,000 CFA francs per sack were sold in July at 15,000 CFA francs. The grower earned an extra 6,000 CFA francs, with 1,000 CFA francs being provided to the fund.

Operation
See 'Implementation' above

Implementation locations
Implemented in Attara (Niafunké Circle), along the Bara Issa River and in the Kessou floodplain area (circles of Timbuktu and Goudam)

Scope of application
Approximately 1,000 tonnes of rice are stored per year. The fund only works with targeted growers who have an obvious need for such assistance. There are four storage centres holding a total of eight storage facilities.

Duration of application
Systematically applied since 2004

Success factors and constraints

- Availability of the rice fund
- Simple procedures
- Sufficient storage capacity available
- Credible management that growers can trust

Roles of the actors involved

- PMN/IPRODI makes funds available to the head of satellite initiatives/planners and carries out monitoring and follow-up.
- Planners/heads of satellite initiatives implement and monitor the practice.
- Growers are the clients in this process, providing rice and subsequently repurchasing it.

Effects and impacts

The practice:

- provides protection for growers with low incomes (1,000 to 1,500 people);
- prevents growers from falling into debt;
- enables a fund to be built up over time.

Costs and cost effectiveness of the good practice

Assessment of investment cost per unit:	Low	☒	Average	☐	High ☐
Rating of cost effectiveness:	Low	☐	Average	☐	High ☒

Sustainability

The practice has been in place since 2000. Annual audits show that the funds are growing. The client base is regular and unchanging.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
PMN/IPRODI	Yehia Ag Mohamed ALI	yehia@afribonemali.net
PMN/IPRODI	Matthias KLIEWE	kli@ces.de
PMN/IPRODI	Pierre GUIROU	pierreguirou@yahoo.fr
PMN/IPRODI	Huub MUNSTEGE	hmunstege@yahoo.com

Reference documents

Description of the trust fund approach

4.4.7 Warrantage (inventory credit system)

Ousmane TRAORE and Mamadou COULIBALY – IICEM

Objectives

The objectives of a warrantage approach are:
- to ensure agricultural producers have access to credit to cover their immediate post-harvest needs;
- to enable agricultural producers to profit from rising produce prices during lean periods;
- to provide access to inputs through a structured system of bulk purchasing.

Definition and description of the good practice

Storage facilities are built using local materials to reduce investment costs. The storage conditions must adhere to quality standards for post-harvest produce. The agricultural credit means farmers can meet their own needs without having to sell their produce at a loss. During lean periods, produce prices increase (the price of rice grows by up to 200%, for example) and farmers can take advantage of these higher prices.

Implementation

The support structure (IICEM) contacts the bank (National Agricultural Development Bank – BNDA) to discuss ways in which loans can be granted and repaid. Farmers are grouped into producer organisations (POs) which are tasked with building hygienic and secure storage facilities. The POs use local building materials to minimise the investment costs (mud-brick storehouses).

PO members store all or part of their output in the storehouses, which is labelled with their own names. The POs are trained in how to bulk purchase inputs, so that reasonable prices can be negotiated with suppliers.

Operation

In November/December, just after the harvest, the POs club together to store their different kinds of produce in a hygienic and secure storage facility. PO farmers store all or part of their harvest in the storehouse, which is then labelled with their name. The banker checks the quantity and quality of the stock. The average value of the harvests is calculated according to average market prices. The storage facility is locked up using two padlocked chains – the PO has the key to one and the bank has the key to the other. The bank then awards a loan corresponding to the price of the harvest held in storage.

The producer organisation distributes the funds according to the quantity of produce stored by each member. Using the loan, producers can meet their primary needs or undertake an income-generating activity such as livestock rearing, market gardening, processing or trading. In April, the POs can forecast their available funds and negotiate good prices for inputs with suppliers. Due to greater demand, more favourable prices can be negotiated for the produce in storage. The produce is sold during the period when produce prices are high. Straight after selling the stock, the producers repay the loan plus 10% interest.

Implementation locations/scope of application

No information available

Duration of application

Applied in the Niger since the 1990s

Success factors and constraints

Monitoring stocks held in remote villages is expensive. For this reason, there are moves to place stock in the care of a local specialist outfit.

Roles of the actors involved

The following institutions and groups are involved: farming organisations, banks and IICEM.

Effects and impacts

Farmers can:

- provide their own loan guarantee;
- benefit from produce price rises;
- acquire inputs without affecting meagre household budgets;
- enhance the value of input use;
- bulk purchase inputs in a way that is solvent and predictable.

Warrantage results in 16 POs (Bokki and Danthiandou) for January to May 2000:

	Initial (in CFA francs)	Profit
Guarantee	3 630 490	924 510
Income-generating activity	3 636 000	288 252
Total working capital	3 630 490	1 212 762

Costs and cost effectiveness of the good practice

Assessment of investment cost per unit: Low ☒ Average ☐ High ☐

Rating of cost effectiveness: Low ☐ Average ☐ High ☒

Sustainability

Yet to be confirmed

Organisation, resource person and contact details

Organisation name	Contact name	Email address
IICEM	Ousmane TRAORE	traorous2002@yahoo.fr
IICEM	Mamadou COULIBALY	

Reference documents

FAO (n.d.): Le warrantage: une technique intéressante de crédit. [Warrantage – an attractive approach to credit], GCP/NER/041/BEL

The promotion of agricultural input use by Producer Organisations, Naimey, Niger

4.4.8 Bulk sales approach for farmer apex organisations (FaAO)

Maïga Rosaline DACKO, Lassana KEITA and Idrissa GUIDO – HELVETAS Swiss Intercooperation, San Hub

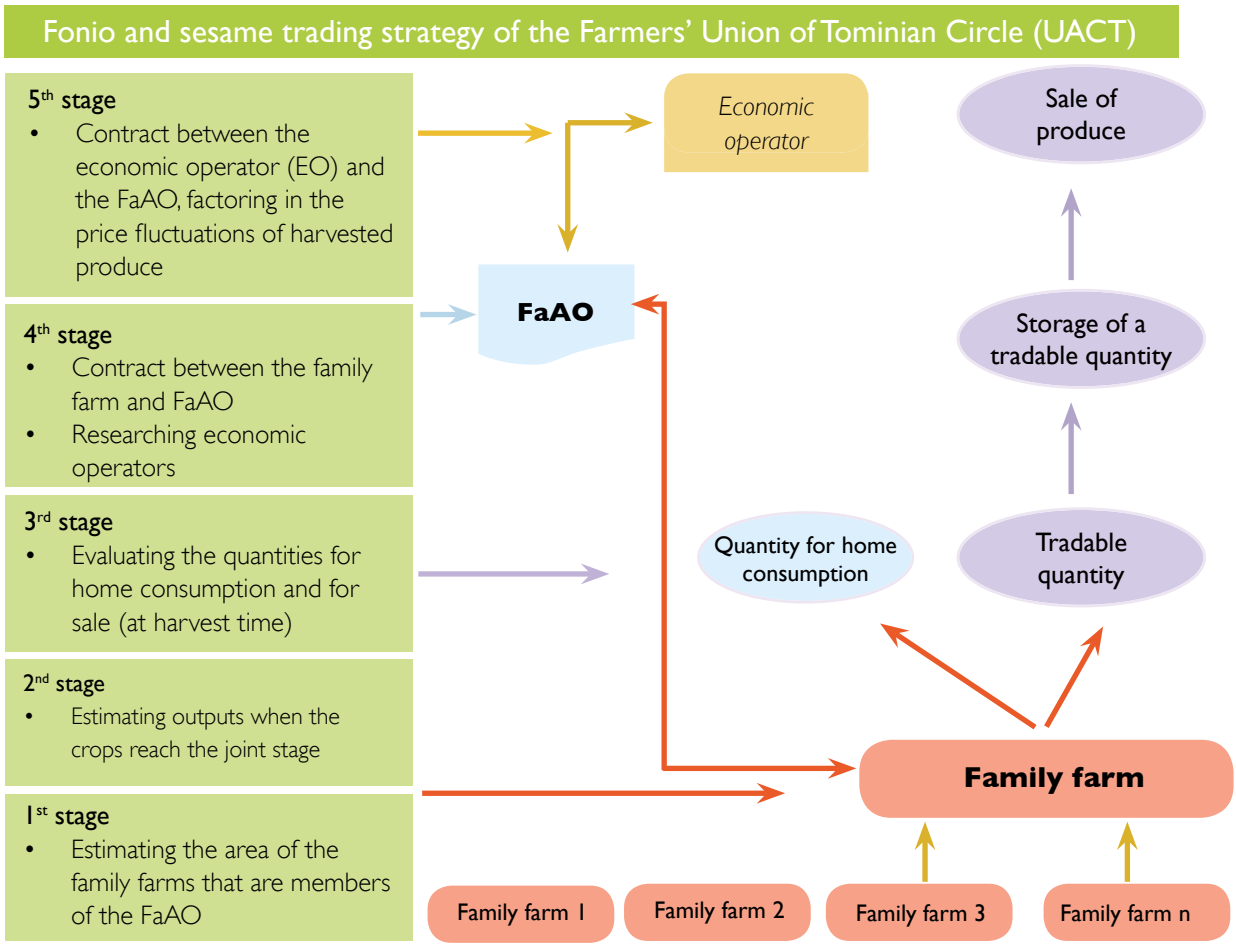
Objectives

The objective of the practice is to improve the income of family farms by setting up an organised trade mechanism that factors in market price fluctuations. Structuring trade in this way puts producers in a stronger position in their value chains.

Definition and description of the good practice

The FaAOs' approach to trade is based, on the one hand, on purchase agreements for preservable produce (cereals, sesame, etc.) between the FaAO and its producers and, on the other, on sales contracts with one or several market operators/suppliers. The practice enables producers to sell their produce after the harvest at an attractive price, depending on market fluctuations. For the operator, it means a large quantity can be purchased over time, without the need for mobilising major pre-financing resources. As the intermediary, the FaAO benefits from a profit margin and charges levied on transactions.

Figure 10: The stages of the trading strategy



Source: HELVETAS Swiss Intercooperation

Implementation

Setting up a system involves the following stages:

Stage	Activities	Description	Delivery period
1	Estimating the areas of family farms that are members of the FaAO	Together with its producers, the FaAO calculates sown areas (of rice, for example) fairly speculatively, providing the first estimates of future outputs.	Once all crops have emerged
2	Estimating outputs	Prior to harvesting, The initial estimates made in stage 1 are further refined through crop inspections.	At the joint stage
3	Evaluating the quantities for home consumption and for sale	After the harvest, FaAO producers assess what part of their output will be retained for home consumption and what will be sold.	Once all the output is stored in the granaries or storage facilities
4	Contracting between the family farms and FaAO	The FaAO enters into a contract with the producers for the part to be sold.	After the quantities for home consumption have been estimated
5	Contracting between the economic operator and FaAO	Research into economic operators	Once output is stored in the storage facilities
		At a consultation day involving producers, FaAO and operators, a contract is negotiated between FaAO and the operators, who will factor in price increases up to the lean period	When a price represents a win-win situation

Operation

Introducing this approach requires a robust FaAO or family farm, a market analysis and good quality produce. The portion of the output for sale is transferred to the FaAO storage facility. The operator draws down this produce over an extended period. The price for each consignment varies according to the market rate prevailing at the time the produce is drawn down.

Implementation locations

The regions of Ségou and Sikasso

Scope of application

In all, 12,750 beneficiaries are applying this approach in 14 apex organisations.

Photo 74: Hulling fonio in San

Photo 75: Despatching purchased produce

Source: HELVETAS Swiss Intercooperation

Duration of application
Since 2008

Success factors and constraints
A thorough market analysis must be conducted to enable market price fluctuations to be accurately predicted and the best times for sale to be pinpointed. Client relationships must be professional and contractual. Informal commitments often fall through. The FaAO must have committed and business-minded leaders. It is wise to stay vigilant when it comes to the governance of these organisations, as they can fall prey to corrupt practices and the embezzlement of collective funds.

Roles of the actors involved

- Producers provide, process and pack the produce, and enter into a contract with FaAO.
- The apex organisation researches economic operators, negotiates the sales contract on behalf of the economic operators, stores the produce, monitors sales and manages rebates.
- Operators draw down produce in line with the terms of the sales contract, and make payments accordingly.
- Support partners deliver training, provide advisory support and foster contacts.

Effects and impacts

- Price stabilisation (to prevent produce from being sold-off) and improved producer incomes
- Improved post-harvest management
- Guaranteed revenues for small-scale producers
- Bank loans guaranteed as a result of retained stocks and management tools

Costs and cost effectiveness of the good practice

Assessment of investment cost per unit:	Low	☐	Average	☐	High	☒
Rating of cost effectiveness:	Low	☐	Average	☒	High	☐

Sustainability

As revenues grow, producers seek to maximise their cropping schedules in order to earn more money. The approach offers producers greater opportunities to access enhanced seeds and inputs (credibility among service providers). When prices become more lucrative, producers are less inclined to sell off their harvest; the risk of slumps in prices is minimal. Incomes are stabilised, which improves living conditions and social cohesion. Communities are better able to pay taxes and more receptive to formalised contracts.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
HELVETAS - Swiss Intercooperation	Maïga Rosaline DACKO	rosaline.dacko@helvetas.org
HELVETAS - Swiss Intercooperation	Lassana KEITA	lassana.keita@Helvetas.org
HELVETAS - Swiss Intercooperation	Idrissa GUINDO	idrissa.guindo@Helvetas.org

Reference documents

HELVETAS Swiss Intercooperation: annual report 2010-2011 for the San Hub (Pôle de San)
HELVETAS Swiss Intercooperation (2013): JIGIYA programme evaluation report

4.4.9 Grain exchanges

Mohamed HAÏDARA and Yacouba BALLO – AMASSA Afrique Verte Malii

Objectives

The objective of grain exchanges is to link up production areas with the areas where grain is consumed in order to encourage the flow of cereals from one area to the other. In this way, the exchanges contribute to stabilising market prices and informing cereal producers about how these markets function.

Definition and description of the good practice

The support structure (AMASSA – Afrique Verte Mali, a body devolved from the French NGO Afrique Verte) invites producers and buyers to participate in a two to three-day grain exchange. This process of connecting up parties allows producers to assess grain production levels for the current season and buyers to get an idea of the grain stocks available. The two parties then negotiate grain quantities and prices. A good number of contracts are agreed during the exchange, and the agreement of further contracts after the exchange is likely. The exchange also serves to foster exchange among other actors involved in the sale and production of grain.

Photo 76: Cereal samples presentation

Photo 77: A facilitator runs through the offers and orders

Photo 78: Negotiation between sellers and buyers

Source: AMASSA – Afrique Verte Mali

Implementation

Organising exchanges involves several stages:

- First, supplies are identified in areas with high levels of dry cereal production (millet, sorghum and maize in the Sikasso, Koutiala, Ségou, Senon de Koro/Bankass plains) and rice production (in the Niono rice growing region in the Office du Niger).
- At the same time, the needs of consumption areas (supply cooperatives in Kayes Region and grain banks in the areas of Gao, Timbuktu and Kidal) and major consumption centres with processing plants, merchants and consumer cooperatives (such as Bamako) are identified.
- The supply cooperatives from rice-deficit areas (the Kayes area, for example) are identified and their needs recorded (bulk purchasing requests).
- Producers' associations in the Niono region in the Office du Niger area are identified and their rice surpluses ascertained. Supplies for sale are then quantified and stockholders are encouraged to put together a bulk sales offer.
- Finally, a meet-and-greet workshop is held to foster exchange and discussion on grain supply and demand.

Operation

1. Organising grain pre-exchanges (preparatory meetings for exchanges)

Before each workshop, facilitators from AMASSA – Afrique Verte Mali ascertain the grain needs of consumer regions in order to bulk together orders to the different supply cooperatives and grain banks. Likewise, producers' available grain stocks are ascertained and bulked to build a substantial supply.

To ascertain the needs of the parties involved, AMASSA – Afrique Verte Mali organises forums in the main production areas called 'pre-exchanges'. These pre-exchanges are, in effect, regional preparatory meetings where around 80 to 100 people come together to assess the offers available and the approaches for bulking supply and demand.

In addition, facilitators use the pre-exchanges to train organisations in market negotiation techniques, price setting and drawing up sales contracts. An area of particular focus is the content of contracts (delivery deadlines, quality and standards to be delivered, quantities, packaging requirements, etc.) and the consequences of failing to meet the terms of the contract. A series of pre-exchanges are rolled out in different locations.

2. Organising the grain exchanges (linking up supply and demand)

After the pre-exchange, on the basis of the requirements and offers expressed, the exchange is organised with the participation of different operators in the cereals sector (farmer organisations, grain merchants, grain-buying institutions, animal feed manufacturers, agrifood processing outfits, logistics representatives) and the technical and financial services.

During the exchange, producers specify the grain stocks available in terms of quantity, type, quality, storage locations and types of packaging. Similarly, buyers convey their purchasing requirements, setting out their required delivery time frames, cereal types and quality standards.

The two parties then negotiate and conclude contracts under the supervision of the AMASSA – Afrique Verte Mali facilitators and with the support of a legal advisor. Model contracts have been drawn up for each of the different kinds of party involved (e.g., sellers, shippers and buyers).

The second day of the exchange is used to disseminate a range of information – such as information on customs and trade services, the Agricultural Market Observatory (OMA), the World Food Programme (WFP), the Mali Agricultural Products Office (OPAM), the National Directorate of Statistics and Informatics (DNSI), the Early Warning System (EWS), etc. In practice, the exchanges serve as platforms for information exchange that give operators the opportunity to get up to speed with certain key aspects of the trade. They provide information on the status of cereal production, areas facing food scarcity or economic difficulties, cereal price trends, legislative and regulatory procedures relating to cross-border trade, invitation to tender opportunities for replenishing the National Security Stock (SNS) and sales of intervention stocks. This range of information is essential and enables operators to better position themselves in the grain market.

Following negotiations, a portion of the contracts is then signed during the exchange event under the supervision of the facilitator and legal advisor. Other contracts are firmed up after the exchange and are modelled on the contracts signed during the two-day event. The signed contracts include provisions on essential factors like the price, collection and delivery points, delivery deadlines, quality standards and the type of packaging. Stocks are sold in sacks marked with the village of origin so that producers can be identified should the product quality be poor. Marking up in this way is important as the stocks are sourced through a range of organisations from different villages. This being the case, it is useful to know grain origins in order to identify the provider organisation and detect any possible problems.

The implementation of signed contracts is monitored using the mechanism put in place on the ground by AMASSA – Afrique Verte Mali, which entails facilitators supervising the two contracted parties. While produce is being gathered in, the area facilitator supports organisations to improve the way bids are organised and ensure the quality standards laid down in the contract are respected. When stock is received, the facilitator covering the consumer area then supervises the delivery operations and provides support and advice should problems arise.

Implementation locations

AMASSA – Afrique Verte Mali organises several exchanges each year in Mali:

- One exchange in Niono to supply Kayes Region and urban centres like Bamako with rice from the surplus area of Office du Niger. This exchange only involves parties interested in trading rice.
- One exchange in Koutiala in South Mali to supply regions in the north of Mali (Gao, Timbuktu and Mopti) and major consumption centres in Bamako with dry cereals (particularly maize, millet and sorghum derived from the surplus area of Sikasso).
- One exchange in Sévaré-Mopti to supply regions in the north of Mali (Gao, Timbuktu and Mopti) with dry cereals (particularly millet and sorghum derived from the surplus area of the Séno de Koro plains).
- One national exchange in Ségou involving all national cereal operators (producers, farmer organisations, cereal processing plants, cereal merchants, logistics companies, institutional market structures and technical partners). This exchange involves all tradable cereals (rice, millet, sorghum, maize, fonio and others).
- Two regional exchanges within the Kayes region (Kita and Diéma). These exchanges enable deficit areas to source dry cereals regionally in Kita and Diéma. Kita and Diéma are considered surplus areas in the Kayes region.
- One international exchange that involves several countries. The last international exchange was organised on 13 and 14 December 2011 in Bamako with nine ECOWAS countries participating. The exchange resulted in the sale of 50,000 tonnes of grain for more than 8 billion CFA francs.

Scope of application

Each exchange in Niono, Sévaré-Mopti and Koutiala involves between 70 and 80 participants, representing nearly 120 villages. The transactions effected are viable.

- Niono exchange: between 2,000 and 3,000 tonnes per year
- Sévaré-Mopti exchange: between 800 and 1,500 tonnes per year
- Koutiala exchange: between 1,500 and 2,500 per year

The Diéma and Kita exchanges involve around 50 people, with around 80 to 120 tonnes of cereals sold at each yearly exchange. The yearly Ségou national exchange involves around 150 to 200 operators in the cereals sector. 9,000 to 15,000 tonnes of cereals (millet, sorghum, maize and fonio) are sold at the event each year. The international exchange involves 200 participants and the trading of 50,000 tonnes of grain between cereal operators from participating countries.

Duration of application

AMASSA – Afrique Verte Mali began operations in Mali in 1994 and the first exchanges took place in 1995.

Success factors and constraints

Successful exchanges require:

1. the organisation of producers and buyers to increase supply and demand;
2. bulk purchasing approaches to secure lower prices;
3. the formalisation of purchase contracts and cereal logistics;
4. the origins of merchandise to be traceable;
5. contractual agreements to be respected in terms of quality, payment methods and deadlines, delivery deadlines and methods, etc.

There is no doubt that grain exchanges have attracted the interest of many actors in the cereals sector. Interest is so high that a host of organisations have expressed the desire to hold their own grain exchanges (e.g. chambers of agriculture, cereals sector support projects and programmes, decentralised authorities). Currently, exchanges – in particular, the national grain exchange – are jointly delivered by AMASSA – Afrique Verte Mali and the Permanent Assembly of the Mali Chambers of Agriculture (APCAM). However, a certain level of expertise is required to organise and run the exchanges in a way which ensures they deliver all their desired outcomes.

The critical factor in making these exchanges genuinely successful is ensuring their sustainability, i.e. ensuring that their main beneficiaries (producer organisations, processing outfits, cooperatives, grain banks, merchants and animal food manufacturers) take financial and political ownership of the exchanges. Beneficiaries across the board recognise that the tool is useful and necessary. But how, with what means and when will these parties take over the organisation of exchanges and cover all the costs involved (organisation, facilitation, technical support)?

It remains to be seen how these actors will be able to take on this responsibility in the short or medium term given the frequently low incomes among producer organisations, and particularly among those in rice-deficit areas. On the other hand, it is certainly possible over the medium term to maintain partial ownership and to foster a gradual shift towards ownership by producer organisations and operators through the progressive increase of their contributions. Setting up partnerships involving support for organisations and programmes operating in the sector is also a viable option. The sustainability of this approach depends on it being fully appropriated by the beneficiaries themselves, so that AMASSA – Afrique Verte Mali becomes merely a provider of technical know-how.

Roles of the actors involved

A number of actors are required to organise the exchanges:

1. **AMASSA – Afrique Verte Mali** catalogues and groups offers (purchase or sale) and cereal requirements during the pre-exchanges, and promotes the exchange among relevant cereal operators (advertising). AMASSA also provides financial and technical support in organising the exchange (venue hire, refreshments).
2. **Supply cooperatives and private operators** support the process of identifying cereal requirements prior to the exchange and then participate in the exchange itself. Their role is to buy stock.
3. **Producers' associations** communicate how much of their stock is available and trade this in bulk at the exchange.
4. **The legal advisor** helps draw up the sales contracts and explains the content of sales contracts to operators.
5. **Others**, such as technical partners in the sector (Planning and Statistical Unit of the Ministry of Agriculture, DNSI, OMA, OPAM, Customs Service, EWS, WFP, National Agency for Food Safety and Security, etc.), provide additional specific information.

Effects and impacts

The exchanges help producers and consumers agree preferential prices without the need for intermediaries with the aim of reducing the cost of cereals in consumer areas and increasing it in production areas. Product quality improves and becomes more standardised, regular interaction increases client loyalty, and there is greater structuring of producers and consumers. For example, the apex organisations in Niono (20 rice grower organisations collectively called 'Jèka Feeré') and in Yalimenané (28 supply cooperatives collectively called 'Supunu Kafô') have been set up as a result of the exchange system.

The exchanges enable people working in the sector get to know the main challenges in trading cereals. They therefore constitute a suitable framework for advocacy activities (advocacy platform) where actors involved in the sector have the opportunity to communicate directly with leading figures in the sector and to defend their interests in terms of the production and sale of cereals.

Costs and cost effectiveness of the good practice

AMASSA – Afrique Verte Mali organises the pre-exchanges and exchanges. No other subsidies are involved.

Assessment of investment cost per unit:	Low ☒	Average ☐	High ☐
Rating of cost effectiveness:	Low ☐	Average ☐	High ☒

Sustainability

The transactions carried out in the exchanges are fairly advantageous both for the sellers (producers and their organisations) and the buyers (merchants, supply cooperatives, consumer cooperatives, processing outfits).

These advantages can be measured in terms of price and quality. The grain exchanges are prized by many actors and an increasingly large number of structures have built them into their support mechanisms. The farming profession is interested in this approach. For this reason, the exchanges are increasingly being jointly delivered by APCAM and often by the Association of Professional Farming Organisations (AOPP) and projects and/or NGOs. The fact that the farming profession is appropriating the exchange concept bodes well for its sustainability.

Organisation, resource person and contact details

Organisation name	Contact name	Email address
AMASSA - Afrique Verte Mali	Mohamed HAÏDARA	afriqueverte@afribone.net.ml
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Web: www.afriqueverte.org; www.facebook.com/afrique.verte.international

Reference documents
Afrique Verte activity reports
Find out more at: www.afriqueverte.org

5 Annex

5.1 Good practices listed according to organisation

Organisation	Good practices	Contact/s	Details	Others applying the same practice
ACDI	1. Delegated cooperation among donors	Jan JAKOBIEC Nathalie O'Neill Mamadou DIARRA	jan.jakobiec@international.gc.ca nathalie.oneil@international.gc.ca Tel: 44 98 04 50 mamadou.diarra@uapmali.org Mobile: 76112078/66782891	GIZ/KfW, DNGR, Danish and Swedish cooperation
Afrique Verte	2. Grain exchanges	Mohamed HAÏDARA	afriqueverte@afribone.net.ml Tel: 20219760/20215769 Mobile: 76282467	Office du Niger, IER
National Directorate of Agriculture (DNA)	3. Developing lands adjacent to small-scale irrigation schemes	Dalla DIARISSO	diarissodalla@yahoo.fr Mobile: 66722681	
	4. Using organic fertilisers on small-scale irrigation plots	Jean Parfait DAKO	Parfaitdako@yahoo.fr	
	5. Integrated Production and Pest Management (IPPM)			
	6. Introducing tomato varieties using succession planting			
International Fund for Agricultural Development	7. Deepening the channels supplying water to lakes and ponds	Bakary Sékou COULIBALY	Bakary.coulibaly@cdp-mali.org Mobile: 76433082/66764356	Development Office for the Lake Faguibine system GRCI
	8. Promoting bourgou growing	Mamadou NADIO	Mamadou.nadio@cnppf-mali.org Mobile: 66746854	PDLG, Mali Northeast, PHACVD
	9. Combining agroforestry and gardening to rehabilitate lands that have been left barren			World Vision
HELVETAS Swiss Intercooperation	10. Earth embankment dams	Célestin DEMBELE	Celestin.dembele@helvetas.org Mobile: 66794564/78667801	IPRO-DB
	11. Dams with water-spreading weirs			
	12. Deploying technology as a means of providing economic support to producers	Moussa DOUMBIA	mtdoumbia@yahoo.fr Mobile: 66768928	
	13. Identifying and prioritising scheme sites using a territorial, multi-stakeholder approach	Mamadou Moustapha DIARRA	Mamadou.diarra@helvetas.org Mobile: 76383389	
	14. Meeting the differing needs of farmers in a given lowland area: local-level agreements and conventions			
	15. Locally sourced farming trainers: the farmer resource persons system	Maïga Rosaline DACKO	Rosaline.dacko@helvetas.org Mobile: 66905384/76452702	National Coordination of Peasant Organisations (CNOP), AOPP, Swisscontact, Technical Services, Water and Forests, DNA

Organisation	Good practices	Contact/s	Details	Others applying the same practice
	16. Creating scale models for the development of lowland areas and the participation of the farming community	Lassane KEITA Idrissa GUINDO	Lassana.keita@helvetas.org Mobile: 64 51 27 27/ 71 05 77 66 Idrissa.guindo@helvetas.org Mobile: 64 51 27 27/ 71 05 77 66	Office du Niger (simulateur hydraulique)
	17. Participatory Learning and Action Research for Integrated Rice Management (PLAR-IRM)			RCI, Burkina Faso, Bénin, Togo, Ghana, Consortium Bas.Fonds IER
	18. Bulk sales approach for farmer apex organisations (FaAO)			Office du Niger, IICEM
	19. Delegating the management of facilities to users	Moussa Doumbia Jacques Tamini	jacques.tamini@helvetas.org	
	20. Public audits as a civil oversight mechanism for project mplementation.			
IICEM Bamako	21. System of rice intensification (SRI)	Minamba TRAORE	tbaminan@gmail.com	IICEM Sikasso
	22. Lining irrigation canals			
	23. Guaranteeing loans taken out by growers			
IICEM Sikasso	24. Warrantage (inventory credit system)	Ousmane TRAORE Mamadou COULIBALY	traorous2002@yahoo.fr	Association for the Development of Production and Training Activities (ADAF Gallé) in Kolokani, HELVETAS Swiss Intercooperation
Intercommunalité Bougouni	25. Agricultural credit and start-up funding for small-scale irrigation cooperatives	Moussa DOUMBIA	Douballa03@yahoo.fr bulonbasecom@yahoo.fr Mobile: 78 46 35 02	Helvetas/Swiss Intercooperation (AVAL), IPRODI, IICEM
IPRO-DB	26. Feeder roads to transport produce	Ralf SCHNEIDER Abass OUOLOGUEM Mamadou Gallo KONE	ralf_schneider5@hotmail.com ouologuemabass@yahoo.fr gallokone@yahoo.fr	Assemblée Régionale de Sikasso/DDC, Helvetas Swiss Intercooperation
	27. Participatory approach to small-scale irrigation			IPRODI
	28. Masonry micro-dams			Helvetas Swiss Intercooperation?
	29. Cyclopean micro-dams			Sikasso Regional Assembly
	30. Administering the process of implementing a small-scale irrigation scheme			Sikasso Regional Assembly, HELVETAS Swiss Intercooperation
	31. Fish farming as a way of adding value to dam schemes			Office du Niger, Sikasso Aquaculture Industry Support Programme (PRODEFA)
	32. Awareness raising on sexually transmitted diseases			Office du Niger

Organisation	Good practices	Contact/s	Details	Others applying the same practice
PMN / IPRODI	33. Village irrigation schemes developed using the PMN/ IPRODI approach	Yehia Ag Mohamed ALI Matthias KLIEWE Pierre GUIROU Huub MUNSTEGE	yehia@afribonemali.net M_Kliewe@hotmail.com Mobile : 70 77 15 58 pierreguirou@yahoo.fr hmunstege@yahoo.com	IFAD, CARE International Mali, Rural Development Support Programme (PADER), Development Programme for Village Irrigation Systems in Gao (PAPIV)
	34. Using modern technologies in the design of small-scale irrigation schemes and in their monitoring and evaluation			Support Programme to Develop Livestock Farming in Northeast Mali (PADENEM), Support Programme for the Sustainable Development of Livestock Farming in the Western Sahel (PADESO), Fishing/ Haute Vallée du Niger Office (OHVN), PACT
	35. Developing professional standards in the installation, maintenance and management of pump units			
	36. Temporary buying-in system for rice			CARE International Mali
	37. Geographic concentration of small-scale irrigation schemes			
PACT	38. Establishment and support of coordination platforms for commune and private sector collaboration	Mme Dieneba CISSE	Dieneba.cisse@giz-pact.org Mobile : 76 02 88 87	Helvetas Swiss Intercooperation
	39. Local agreements on the management of small-scale irrigation facilities	Godihald MUSHINZIMANA	godihald.mushinzimana@giz.de	
PCDA-Sikasso	40. Irrigation using a Californian network	Oumar ASSARKI	assarki@yahoo.fr Mobile : 79 40 92 75	Sasakawa global 2000
	41. Using gas dryers (Atesta-Sikasso type) to process animal and vegetable products			
	42. Ventilated storehouses for highly perishable produce			DNA, Helvetas/Swiss Intercooperation San
	43. Centre for the Demonstration and Dissemination of Technologies (CDDT)			

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