

# Accelerating Farmer-led Irrigation Development

Theory and practice of the Smart Water for Agriculture  
in Kenya project





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## Acronyms

FLID	Farmer-led irrigation development
IAP	Irrigation acceleration platform
IWMI	International Water Management Institute
LCB	Local capacity builder
LCT	Local coordination team
M&E	Monitoring and evaluation
MIPP	Messica Irrigation Pilot Project
NGO	Non-governmental organization
O&M	Operation and maintenance
PM&E	Participatory monitoring and evaluation
PRA	Participatory rural appraisal
SMART	Simple Market-based Affordable Replicable and Technically feasible
SME	Small and medium entrepreneurial
SSA	Sub-Saharan Africa
SWA	Smart Water for Agriculture
SWS	Smart water solutions
WRUA	Water Resources Users Association
WRMA	Water Resources Management Authority

# Introduction

## Farmer-led irrigation development: a silent revolution in Africa

In Africa, irrigation is back on the agricultural development agenda. Major initiatives stress its importance. The Comprehensive Africa Agriculture Development Programme, for instance, has extension of the area under sustainable land management and reliable water control systems as one of its four central pillars (NEPAD, 2003).

Most of the debate on the required action and related investments for accelerating irrigation development suggests that public investment in large-scale irrigation development is required. Large-scale private (foreign) investments are considered as another promising way forward.

All this ignores the rapidly growing number of farmers' irrigation initiatives that are widespread throughout Sub-Saharan Africa (SSA) (Woodhouse et al., 2017). In many parts of Africa, unnoticed by many, small- and medium-scale farmers are making substantial investments in irrigation development, which, when combined, cover thousands of hectares. In these cases, farmers have assumed a driving role in developing or improving their water use for agriculture. In the process, they rely on and influence other farmers, private sector companies – such as agro-dealers and traders – extension agents, irrigation engineers and others. This is what is called farmer-led irrigation development (FLID).

The semi-invisibility of FLID, its diverse and autonomous character, and the large range of actors interacting with farmers in the process, pose important challenges for those seeking to provide support to the initiatives and address key challenges that cause low water use efficiencies, reduced productivity, poor marketing and limit FLID expansion. This publication is part of a pioneering project trying to systematically support FLID in all

its dimensions – the Smart Water for Agriculture project in Kenya (SWA).

## The SWA project and the Kenyan context

When it comes to water, Kenya is a land of contrasts. Though it is home to some of the great water towers of East Africa, 90% of the country is either arid or semi-arid. Rainfall patterns are highly variable, both annually and across seasons, a challenge likely to be further exacerbated by climate change. For the economy, water stress is already a serious factor, not only in the arid areas but also in the more water-rich regions where water-intensive economic and agricultural activity has grown rapidly.

Yet, opportunities for Kenya's economic growth through irrigation and agricultural water storage are considerable. The country has an irrigation potential of 1.342 million ha of which only 12% had been developed by the end of 2013 (Ministry of Environment, 2013). To realize the potential that exists, investment is needed at all levels. The Kenyan Government has thus identified "improvement of water management and irrigation development" as a strategic requirement for building a dynamic agricultural sector (Government of Kenya, 2009). As such, the (draft) National Irrigation Policy (Ministry of Agriculture, Livestock, Fisheries, 2015) promotes a holistic agricultural water management approach, which includes irrigation, water harvesting and storage, and field water management – all supported with appropriate agronomic practices.

While the government and its partners are mainly working to realize new irrigation projects, or to expand/improve already existing large-scale projects with various degrees of success, Kenyan farmers themselves – individually or in small groups – are also investing in irrigation development. This trend has been on the rise, particularly over the

last 10+ years (see e.g. SWA, 2016). Often on their own initiative and by making use of technologies available through the private sector or the county government, these farmers try to make good use of the water available to them.

There are, however, many Kenyan farmers who could also benefit from irrigated agriculture but have not yet taken the step to invest because of a complex set of reasons that include uncertainties around the risks involved, challenges to access adequate finance and problems related to the supply and maintenance of appropriate equipment.

Responding to the challenges of, and opportunities for, the FLID sector in Kenya, SWA was set-up with support from the Dutch Government in 2016. Scheduled to run until the end of 2019, the project is to encourage and accelerate FLID by identifying, promoting and upscaling SMART (Simple, Market-based, Affordable, Replicable and Technically feasible) water solutions (SWS). Box 1 summarises the project’s main features.

The project focuses on the needs and opportunities of SME farmers with as little as 0.1-5 ha of irrigated land, commercialized to a smaller or larger extent, and often growing high-value crops. SWA hopes to realize improved income and livelihoods for at least 20,000 smallholder farmers, while increasing water productivity by 20%.

Rather than working only with farmers, the project’s design to support FLID is rather unique as it targets the entire FLID ‘sector’. This approach allows the project to identify and address systemic constraints and opportunities at all levels of SWS value chains. The activities of the project are thus quite diverse – from the development of irrigation technologies (Figure 1) and strengthening of the supply chain of such, to the set-up of innovative irrigation financing mechanisms and addressing market and policy constraints. Given the important role the private sector plays in FLID in Kenya, it represents both a major partner and focus area of work of the project.



Figure 1: SWS spectrum under the SWA project

*Box 1: SWA in brief*

<b>Time frame</b>	2016 -2019
<b>Budget</b>	6 million euro
<b>Coordination</b>	SNV Kenya
<b>Core partners</b>	MetaMeta, Practica Foundation, Aqua for All, Royal Tropical Institute KIT
<b>Targeting</b>	<ul style="list-style-type: none"> <li>- Small and medium entrepreneurial (SME) farmers with 0.1-5 ha of irrigated land, often growing high-value crops</li> <li>- Private sector supplying or financing smart water products and services</li> <li>- Non-governmental organizations (NGOs) and county governments supporting FLID</li> </ul>
<b>Key targets</b>	<ul style="list-style-type: none"> <li>- 20,000 farmers to adopt SWS, at least 50% women</li> <li>- 200 SWS providers – for and not-for-profit – strengthened for improved service delivery to farmers</li> <li>- Access to finance for SWS for 12,500 farmers, from at least 5 providers</li> <li>- Five counties with a sustainable irrigation acceleration platform (IAP), and one national level IAP</li> <li>- Over 8 million people aware of SWS through Shamba Shape Up, a weekly radio/TV programme</li> <li>- Ten Dutch companies and more Kenyan ones supported to invest in SWS</li> <li>- Seven early stage/start-up entrepreneurs enter the sector to pilot innovative concepts</li> </ul>
<b>Main donor</b>	The Netherlands Government



## This guide

This publication targets managers and practitioners in Kenya – but also elsewhere – interested to link-up with and supporting FLID. They may be based in companies interested to better understand processes of FLID in order to expand sales of relevant irrigation technologies or services. Or they may be based in NGOs or in government agencies mandated to accelerate agricultural development.

As an analysis of the main driving forces of FLID, chapter 2 reviews the key developments of the ‘sector’ throughout Africa over the past two decades. Such a review is expected to provide readers with a deeper understanding of the relevance of FLID in developing agriculture and food realising food security. It will also show the key processes involved to inform future FLID development and support interventions.

Chapter 3 describes in detail how SWA understands FLID and how it has shaped its intervention

strategies and activities to actively engage with the sector. The chapter also looks at how SWA addresses the key challenges faced by farmers, as well as other stakeholders, in implementing FLID.

Finally, chapter 4 provides practical guidelines for those interacting with farmers and facilitating and supporting FLID ‘on the ground’,. It looks at processes such as the participatory analyses of FLID challenges and opportunities, and the systematic selection, design and implementation of relevant SWS. Taking these guidelines into account is expected to help practitioners ensure that their work matches farmer needs and continues to stimulates the farmer initiated development process. Chapter is based partly on the recent FLID-support experiences of the Messica Irrigation Pilot Project (MIPP) in Mozambique (Beekman et al., 2014), but also includes more up-to-date experiences from elsewhere in Africa which have been adapted for the Kenyan context.

# Chapter 2

## FLID in Sub-Saharan Africa

### Main principles and spread

Significant farmer-led irrigation expansion is taking place in Sub-Saharan Africa, to an extent that is largely under-estimated by state agencies, development organizations and researchers. The conditions under which this is happening and the dynamics of development diverge from models of irrigation and the policies formulated from such models. It is therefore important to further examine the FLID process and the way it is studied and supported.

FLID is a process where farmers take a driving seat in improving their water use for agriculture by bringing in or developing new ideas, knowledge and technologies, changing investment patterns and creating new market linkages. In the process, farmers show entrepreneurial skills, take considerable risks and interact with a range of other stakeholders for mobilizing support. FLID is thus not a specific type of irrigation, but a type of irrigation development process, which is why it is referred to as farmer-led irrigation *development*.

This understanding of FLID acknowledges that, from a farmer's perspective, it is intentional development that requires work and investment, and is therefore not a spontaneous or unplanned process. This definition also highlights the social interactions underpinning the process – with farmers taking a leading role. The farmers often work in collaboration with other stakeholders and sometimes building upon (earlier) investments by state, private or civil society actors. FLID thus often involves hybrid forms of collaboration that are not purely private, public or community-based. It can lead to varied levels of development – from very localized irrigation projects, to developments that expands over large areas often leading to interconnected irrigation 'networks'.

FLID is thus varied in its appearance, not being

confined to a particular irrigation technology, type of crop, type of farming business, agro-ecological condition etc.

Recent research has found that farmers across the continent invest substantially in irrigation, thus developing large areas suitable for highly profitable farming. However, the commonly used agricultural database on irrigation, AQUASTAT (developed by the Food and Agriculture Organization), does not show this data. The database collates information from existing maps and agricultural census statistics and is not able to capture irrigation development data, which is as yet unrecognized by governments.

Mapping exercises by individual scientists and research institutions using often remote sensing technology have gathered some data on the extent of Africa's irrigation developments. For instance, it is estimated that irrigated areas for the whole of SSA may be two to three times larger than previously recognized, and that some countries' irrigated areas within this region may be up to 14 times larger (IWMI, 2016). Focused research shows substantial FLID in countries like Mozambique, with 100,000 ha of irrigated land using stream diversions (Beekman et al., 2014) and Nigeria with an estimated 220,000 ha under FLID using land with pumps and boreholes (Vermillion, 2004:5). Malawi is reported to have 61,900 ha through cultivated wetlands and valley bottoms (FAO, 2015) and Ghana some 40,000 ha under urban vegetable production using waste water (Drechsel & Keraita, 2014).

A study by International Water Management Institute reports similarly high numbers (Giordano et al., 2012) for other countries, such as 170,000 farmers irrigating vegetable crops using buckets, watering cans and small motorized pumps in Burkina Faso, 70,000 pumps in use by farmers with numbers increasing rapidly in Tanzania, 185,000 ha in Ghana under private irrigation benefiting

half a million smallholders, while in Ethiopia the conservative estimate is that 400,000 pumps were imported for smallholder use alone in the last decade.

It is crucial to understand the conditions under which the above FLID is taking place and the factors that are contributing to its success. These will be discussed further in this chapter, as well as the implications of such for the design of FLID support and governance.

## **FLID forms and practices**

While FLID varies in its appearance, there are several irrigation practices developed through FLID that are widespread across Africa, including irrigation from earthen canals in mountainous areas, the use of shallow groundwater in valley bottoms, petrol pump irrigation from open water bodies and (peri-)urban agriculture using wastewater. These four common practices are further described below:

### **Irrigation from earthen canals in mountainous areas**

In mountainous areas across East and Southern Africa, mountain streams have been diverted for irrigation. Stream diversions are traditionally constructed using sticks, branches, stones and grass, but can also contain sand bags, plastics, meshed wire and concrete. This form of irrigation goes back to pre-colonial times and was at that time particularly present in pockets in Kenya, Tanzania and Zimbabwe. Irrigation from earthen canals has

expanded over the last decades, both in areas where it previously existed at a small-scale and in new areas. The earthen main canals carrying the water from the stream to the field is often referred to as the furrow. Usually, along a stream, several diversions are constructed, sometimes creating networks of interlinked canals on the mountain slopes. Water is predominantly used for intensive production of marketable vegetables, but also for supplementary irrigation of staple crops, particularly in times of droughts.

### **Use of shallow groundwater in valley bottoms**

Valley bottoms in dry regions can be relatively wet due to their shallow ground water levels. Such areas are known under a variety of names: bolis in Sierra Leone, fadama in Nigeria, bas fonds in Niger, Mali and Burkina Faso, the Swahili term mbuga in East Africa and vlei in Zimbabwe and South Africa. Over the past 40 years, there has been a gradual shift in the use of such valleys from dry season grazing to intensive dry season vegetable production. During the wet seasons, they are more commonly used for rice production. Supplementing available soil water moisture water is collected by manually scooping water from shallow dug wells and through the use of pumps on such wells. After the rainy season, farmers try to drain access water as soon as possible, while drains are closed later into the season to hold on to as much water as possible to sustain growth in the dry season.



*Picture 1: Wet valley bottoms are being developed by farmers (Credit: Gertjan Veldwisch)*

### Petrol pump irrigation from open water bodies

Petrol pumps have emerged as an irrigation technology for small holders to pump water from open water bodies, such as lakes and rivers, for intensive horticultural production. This appears to be a wide-spread development throughout SSA (Giordano et al., 2012), and has been well documented for Ethiopia, Ghana and Zambia. In Burkina Faso, small pumps are used to draw water from reservoirs behind dams in order to irrigate larger areas upstream of the dam rather than by gravity downstream of it (de Fraiture et al., 2014). In western Kenya, along the shore of Lake Victoria, horticultural production by means of petrol pumps provides an alternative to declining fisheries, and hence, an important alternative economic opportunity for young people in the area (Bosma, 2015).

### (Peri-)urban agriculture using wastewater

Small-scale horticultural producers in cities and peri-urban areas often make use of waste water – diluted or raw – creating serious health risks both for those handling the water and for consumers buying the products of such irrigation. Watering cans are commonly used for this type of irrigation. Though laborious, this technology often suffices for the generally small plot sizes in the city, which are mostly limited to between 0.01 and 0.02 ha per farmer. Motorized pumps are increasingly being used, especially where farmers can share a pump and where distances between the water source and the fields are large. Even in these cases, farmers

continue to use the watering cans, drawing from a reservoir on the farm that is filled by the pump.

In all these cases, FLID is strongly oriented towards producing crops for the market, and almost 40% of irrigators adopt intensive production practices using fertilizers and improved seeds, while only 10% of non-irrigators do so (SAFI, 2018).

### Drivers of FLID

There are a number of key factors and conditions required that determine whether or not farmers develop irrigation by themselves and how this process spreads. An analysis by Beekman et al. (2014), which identified the following seven sets of drivers and conditions for FLID, is useful in this context (Figure 2):

1. *Resource base*: The availability of sufficient amounts of water and land of adequate quality, potentially accessible. And the knowledge local people have of this.
2. *Technology*: The availability of and access to suitable technologies to abstract the water from its source, convey it and apply it to the fields.
3. *Markets*: The availability of markets and the capacity to market products is an important condition that determines the capacity of farmers to earn back the investments made in irrigation.
4. *Labour*: Population density and other factors determining whether sufficient labour is available for the more intensive forms of agriculture under irrigation, depending on



Pictures 2-4: Irrigation with small pumps is spreading rapidly in SSA (Credits: Gertjan Veldwisch (left, middle), Laurens van Veldhuizen (right))

technologies chosen.

5. *Irrigation knowledge*: Knowing (the benefits of) irrigated agriculture through experience from elsewhere or historic examples in the area.
6. *Funds*: The availability of (own) funds or the capacity to access (often informal) sources of funding to be able to invest in irrigation and develop agriculture.
7. *Local institutions*: Farmers' capacity to organize themselves into some form of groups and manage these well in order to be able to jointly address any of the above challenges.

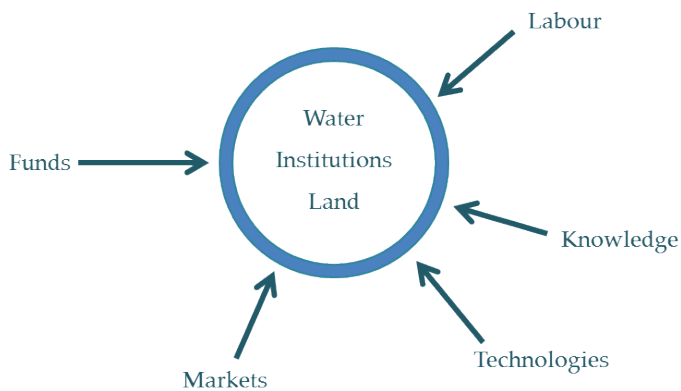


Figure 2: FLID an interplay of multiple drivers of change

Some of these drivers, e.g. the availability of land and water, are generally a given for a particular location, but most are factors that are or can be influenced by factors such as socio-political changes. An inflow of knowledgeable migrants, can, for instance, trigger FLID. The availability of credit for purchasing irrigation technologies and agricultural inputs has the same impact. Once FLID processes have started, they often attract external funding and the input of other actors such as, agricultural traders, laborers and technology suppliers, thus reinforcing the process and creating an upward spiral of irrigation development.

In summary, farmer-led irrigation development is a complex and challenging process that not only implies an interplay between the above mentioned drivers of change, but also has implications at multiple levels i.e., at the plot or farm, household, community, and county or national level. For innovation within farmer-led irrigation to take place, the involvement and collaboration of multiple stakeholders is required i.e., local communities, government actors, NGOs, research institutions and the private sector. For innovation to take

place patterns of collaboration between these stakeholders may need to change too.

## Contributing to income and food security

There is also growing evidence of the potential of FLID to lift millions of smallholder farmers out of poverty and significantly enhance the rural economic outlook. The earlier quoted work by Giordano et al. in 2012 estimates that small reservoirs alone could reach 369 million people across SSA and generate net revenues of USD 20 billion annually, whilst expanding the quantity of motor pumps could generate net revenues of USD 22 billion annually in the region. Similar income potential estimates are made for other promising technologies and practices in SSA, including communally-managed river diversions, and inland valley rice and in-situ rainwater harvesting.

Research on 18 cases of FLID in Tanzania and Mozambique show irrigators suffer fewer months of food insecurity, have better quality houses and more assets than non-irrigators. It is assumed that the irrigation practices are responsible for such benefits as a very large majority (84%) of the irrigating farmers report that irrigated crops deliver about half, or more than half, of their income (SAFI, 2018).

Evidence emerging from current work by SWA suggests that farmers involved in FLID with tailor-made SWS support can increase their net profit margin by up to USD 570/ha. If such an increase is realized across the 240,000 ha estimated to be suitable for small-scale irrigation in Kenya (IFPRI, 2014), this would translate into an additional annual revenue of USD 120 million. FLID thus offers clear potential benefits in terms of increased income and economic growth.

## Supporting FLID and its governance

A key feature of FLID is that farmers drive the establishment, improvement and/or expansion of irrigated agriculture, however, there is ample evidence to show how other stakeholders within the FLID sector have interacted with or enhanced the process. As an example, technologies used by farmers are copied from neighbouring irrigation schemes. Farmers may compliment their own funds with financial support from government agencies or financial institutions. The rise of petrol pumps in SSA has been driven primarily by the ability of farmers to establish their own initiatives and tap

into a network of small retailers and agricultural merchants. Yet, in some countries, such as Malawi, the rise of petrol pumps has also been facilitated by national trade policies, such as the duty-free importation of irrigation equipment. In Ghana, the state has recognized farmer-initiated irrigated urban agriculture as an important means to meet food demands and as such, has established offices in all cities with agricultural extension workers to support these initiatives.

Following the growing awareness of the extent and potential of FLID in Africa, both within and outside of the continent, international experts call for an action framework to support and engage with farmers' irrigation initiatives. Following the analysis of the previous chapter, such a framework would hinge on two major areas of work:

1. Developing a deeper understanding of the dynamics of FLID in specific contexts to understand its potential, its current limiting conditions, as well as opportunities for further development; and
2. Designing a comprehensive set of actions addressing the key drivers of FLID discussed above that require purposeful full attention in specific contexts.

It is on this agenda that SWA has been created and shaped, possibly the first of its kind. This does not mean that there are no concerns about possible negative effects of FLID, such as the depletion of water sources (de Fraiture and Giordano, 2014). Increased competition over water resources (and access to them) is another closely related potential downside to the relatively uncoordinated nature of FLID. While many farmers may benefit from self-developed irrigation, others may be adversely affected. The distribution of burdens and benefits may also be differentiated across gender, ethnicity, or length of residence, or may be determined by access to capital. Such considerations affirm the importance of the first point above – the need to understand FLID dynamics and possible negative effects more deeply before planning any form of support.

# Chapter 3

## SWA's approach to accelerating FLID

### FLID – the SWA perspective

As previously mentioned, the development of farmer-led irrigated agriculture is a complex process involving many actors – farmers themselves, their organizations/groups, government agencies, financial institutions, traders, NGOs and suppliers of SWS, among others. Central to SWA's approach to FLID is to build upon and link with farmer initiatives and/or interest in irrigation. Thus, FLID contrasts strongly with irrigation projects lead by the public sector, where farmers are mostly involved once the main work is done.

The project recognizes two common FLID scenarios and the outcomes of such:

In many situations, farmers **take the initiative to develop irrigation**, with or without collaboration with other actors and sometimes building upon (earlier) investments by state, private or civil society actors. These situations are usually as described in the previous chapter i.e., water sources, land and technologies are readily available; capable farmers organize themselves into groups and have good connections to markets; there are no labour constraints; government or private sources of funding to invest in irrigated agriculture are available. In such instances, private and public sector suppliers and support agencies can link-up with these farmers, understand their needs and support them in further developing their initiatives by offering the required services, products and information.

In other situations, **farmers could develop irrigated agriculture, but** as one or more of the above factors are absent, **expansion is hampered** in extent and/or pace of development. External actors (government, NGO, private sector, programmes such as SWA) may initiate interventions to facilitate farmers to develop

and expand irrigation. Given the central role farmers ultimately play in investing and operating the established irrigation system, they take charge in tailoring the development to the local context and needs, and ultimately, in making the decision whether to invest and how. External actors can actively participate in the decision-making process through, for instance, providing farmers with accurate information on the benefits and limitations of various SWS options.

The two scenarios share one common reality – the development of irrigated agriculture in which farmers ultimately take the lead is not a simple task. FLID requires interaction and collaboration among many actors, however, in practice, actors in the irrigated agriculture sector often do not coordinate their efforts and do not know what others are doing. This became strikingly clear during the national IAP multi-stakeholder irrigation masterclasses organized in Nairobi with support of the SWA project.

SWA often refers to its approach as 'market-driven' FLID. On the one hand, this ties in with the project's focus to involve entrepreneurial farmers who are already linked to markets, and for whom market dynamics are a major driver of their development efforts. On the other hand, it is a conscious choice to focus on private sector parties as the main actors to support and accelerate FLID in the long run. This private sector focus makes sense where farmers develop irrigation using technologies or services provided mostly by the private sector, such as pumps, sprinklers, pond linings, or credit provision and bulk marketing.

## Understanding existing FLID dynamics

### Rapid integrated county assessments

Any project or activity aiming to support and accelerate FLID needs to start with efforts to understand FLID dynamics in the relevant contexts – not just to help shape and direct further interventions, but also to lay the foundation for future upscaling. To this end, SWA undertook a series of activities that included rapid integrated county assessments, complemented with a baseline study. The project used the results of these assessments to try to define the scope of farmer-led irrigation and to understand the major dynamics, challenges and opportunities. The activities were also to help identify quick-win SWS with the potential to address key challenges of FLID and/or to respond to clear opportunities. The rapid assessments and baseline studies also looked at the dynamics of the SWS supply and support landscape to start building partnerships for upscaling.

The assessment and baseline study activities also played a key role in further developing and operationalizing the project design in terms of selecting its focus counties and identifying and mapping of intervention clusters, areas with high potential for expansion of irrigated area through FLID.

The project applied a three-step process (Figure 3) that included participatory multi-stakeholder county level assessment workshops followed by farmer field visits and discussions and key informant interviews with representatives of SWS companies and relevant government agencies and NGOs. The latter activities were carried out to verify the workshop outcomes. The process allowed the project team to interact with about 800 SME farmers and many support companies and institutions. Farmer representatives – rather than technical experts – played a leading role in the stakeholder assessment workshops particularly to identify FLID clusters of interest and their dynamics.



Picture 5: Farmers play a lead role in the rapid assessments (Credit: Berry van den Pol)

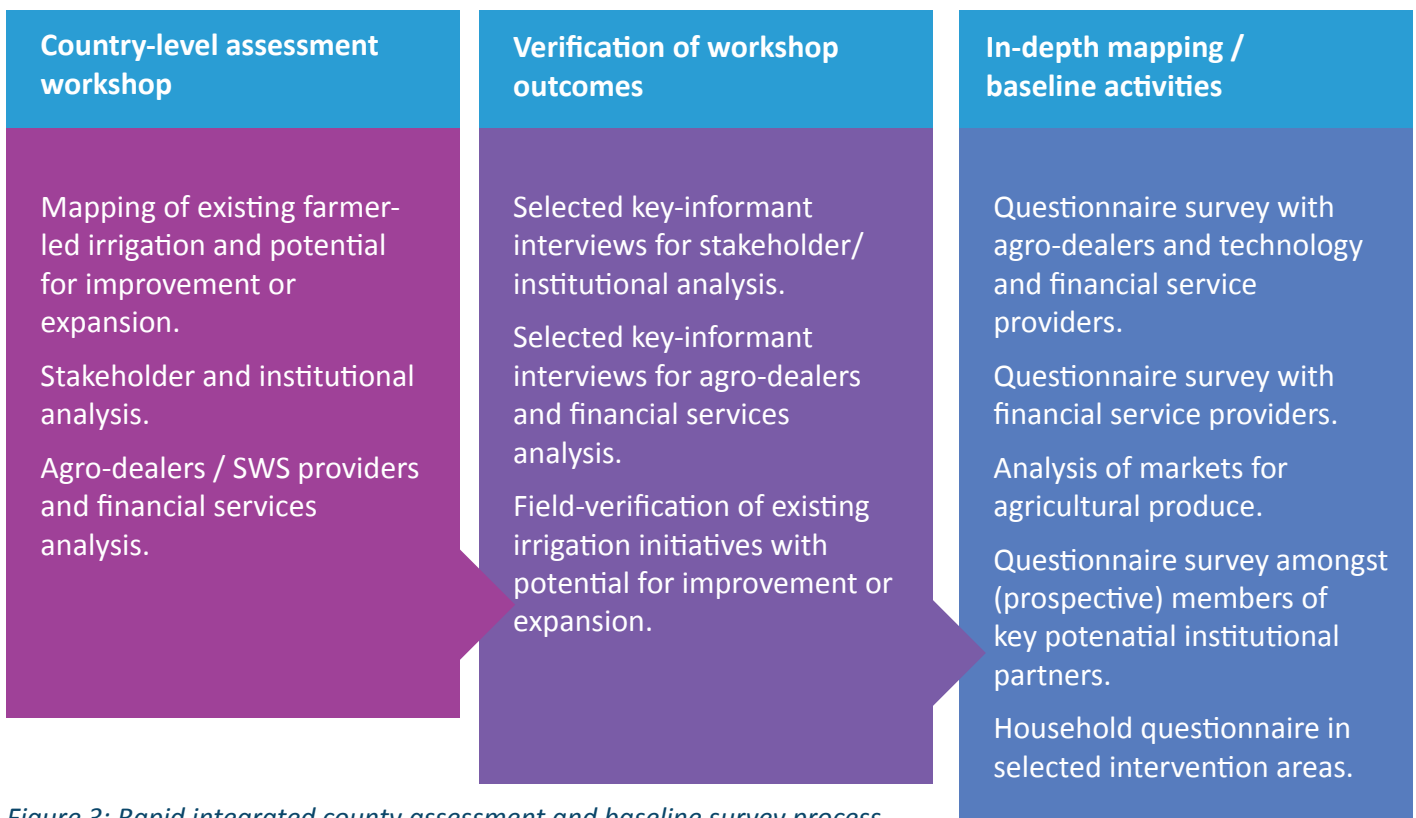


Figure 3: Rapid integrated county assessment and baseline survey process



## Supporting baseline study

In order to acquire baseline information and deepen the understanding generated through the rapid assessments, a comprehensive baseline study was done combining both quantitative and qualitative methods and tools. This covered close to 550 farmers randomly selected from the around 36,000 SME farmers in the clusters selected across the five target counties. The baseline study also established the indicator profile against which project targets would be set for implementation, performance monitoring and evaluation (M&E) as well as upscaling.

Data was collected via mobile devices using the Akvo Flow electronic data collection platform (<https://akvo.org/products/akvoflow/#overview>). At the end of each day, and after quality checks, data was electronically transmitted to a secure server. The downloaded data was subsequently analysed using the Statistical Package for Social Sciences application.

## Opportunities and challenges in FLID

The information collected from these activities helped to demonstrate the considerable potential of FLID in the five counties. The data also highlighted the challenges for farmers and other FLID stakeholders, such as equipment suppliers and

support agents, to improve, accelerate and expand farmer-led irrigated agriculture (Box 2).

## Selection of focus counties and clusters

The assessment activities also served to confirm the selection of five focus counties holding promise for FLID expansion. In the selection of the five project counties (Figure 4), six criteria were examined:

1. Existence and interest of functional institutions
2. Availability of water and land resources
3. Existing irrigation dynamics and availability of irrigation options/SWS suppliers
4. Availability of financial services
5. Market access
6. Capacity of farmers to collaborate and innovate



Figure 4: SWA focus counties

Opportunities	Challenges
<ul style="list-style-type: none"> <li>» 62,000 farmers with functioning irrigation</li> <li>» 8% of farmers effectively use full SWS packages, potential drivers of change</li> <li>» 58% of farmers surveyed are members in 99 different agricultural groups or associations</li> <li>» 76% have the possibility to access financial services from commercial banks, mobile money services, SACCOs or informal saving and lending groups</li> <li>» Over 100 active SWS suppliers and service providers</li> </ul>	<ul style="list-style-type: none"> <li>» Over abstraction and over irrigation</li> <li>» Upstream and downstream competition for water</li> <li>» Poorly operating sprinkler systems – 20% depending on bucket irrigation</li> <li>» Only 15% of farmers have received relevant knowledge or training</li> <li>» Only 12% of groups well integrated into relevant value chains</li> <li>» Only 12% of farmers currently accessing credit</li> <li>» Lack of farmer awareness on financing options, unmatched products, and credit and insurance</li> <li>» Staff of financial institutions lacks knowledge to develop products meeting SME farmers' needs</li> <li>» There is little coordination among the agricultural groups or associations.</li> </ul>

Box 2: Major opportunities and challenges in FLID

The assessments also served to identify 137 ‘clusters’ – locations with interesting and significant FLID. Out of these, and based on discussions with farmers and stakeholders, 37 clusters were ranked as having high potential for SWA (Table 1).

### Continued learning on FLID

The SWA project did not stop its search for a deeper understanding of FLID dynamics after this first main rapid assessments, but continued studying this as the project developed. Concerning the support landscape, for example, the project commissioned more detailed studies to identify county-level SWS suppliers and a consultancy to deepen understanding in issues affecting farmer access to finance. Other studies focused on certain technologies, such as pumps and sprinklers, to understand their availability on the Kenyan market and how efficiently they are used by farmers.

This continued learning is also integrated into major other project activities. For example, in the setting up and running of SWS technology demos, pilots and tests, the collection of farmer feedback on the relevance and appropriateness of the technologies

generates valuable insights. The same is true for meetings and interactions among county- and national-level stakeholders that are organized as part of SWA’s IAPs. Insights from private sector actors that can enrich the project’s research can also be gleaned during the discussions held as part of their application process for the SWA investment and innovation funds.

### Intervention strategies for accelerating FLID

Following the initial assessments and baseline studies, and taking into account the key drivers of FLID discussed in chapter 2, SWA put in place a comprehensive set of strategies and activities to accelerate FLID in order to help it reach its potential scale. For SWA, scaling is thus not a follow-up activity, but a function that is integrated into all aspects of project activities from the beginning.

### Knowledge and information mobilisation and spread

SWA undertakes a diverse set of activities to address gaps and challenges in the flow of information to and from stakeholders on FLID and SWS. Some of

Table 1: Example scoring matrix for FLID cluster selection

	Criteria	Weight	Mark/score	Maximum weighed score
1	<b>No. of SME farmers currently practicing irrigation (land holding: 0.05 -3 hectare irrigated land)</b>			
	1 to 50	1	5	5
	51 to 100	2	5	10
	> 100	3	5	15
2	<b>No. of potential SME farmers (0.05 -3 hectare rrigable land)</b>			
	1 to 50	1	5	5
	51 to 100	2	5	10
	> 100	3	5	15
3	<b>Need for SWS</b>			
	Technology	1	5	5
	Market	1	5	5
	Finance	1	5	5
4	<b>Demand for technology</b>			
	Abstraction	1	5	5
	Conveyance	1	5	5
	Application	1	5	5
5	<b>Water Availability</b>			
	Perennial rivers and springs	3	5	15
	Boreholes/water pans/seasonal rivers only	2	5	10
	Swamps only	1	5	5
<b>Total Score</b>				<b>75</b>

the activities support general awareness raising and information sharing on FLID for farmers and other stakeholders. Other activities target specific groups and provide these with focused training or other knowledge enhancing activities.

To raise general awareness on and interest in FLID, SWA facilitates exhibitions and fairs, farmer field days and demonstrations, as well as farmer-to-farmer exchange visits. In most cases, these activities are planned and implemented by or through partner organisations in the focus counties participating in the IAPs (see below). In addition, promotional videos are developed and spread through popular mainstream TV programmes as well as multiple social media outlets, including WhatsApp, YouTube, Facebook and Twitter.

Being aware that farmers often learn best from other farmers, SWA is encouraging farmer-to-farmer training by identifying and supporting capable and interested farmers to become farmer trainers. So far, the network has 12 lead farmers actively sharing SWS info and experiences to other farmers, a number that is expected to increase to 50 within the five focus counties.

Both at the level of the suppliers and supporting organizations, and at that of the SME farmers, important capacity gaps have been identified that can only be addressed by providing focused training. For this, SWA mobilizes local capacity builders (LCBs) – organizations with a strong track record in providing short intensive courses. The LCBs provide 1 to 3-day training events to farmers and farmer groups on topics such as water abstraction, application and storage, the installation of drip kits, and the set-up of demonstration sites. In addition, the LCBs also provide business management training to local service providers. The project prefers to work with LCBs active already at the county level so that they can easily continue this type of training post project.

To support the above, knowledge and information generated through project activities is being captured, summarized and spread in various forms, such as SWA fact sheets, success stories and brochures for use by any stakeholder. Sets of training materials are also developed and disseminated for use by other organizations in future SWS training and capacity building events. The materials are based on SWA training activities, such as the training of trainers event and the farmer

level training programme, which is being developed in collaboration with the Kaguru Agricultural Training Centre, a smart-water centre in Meru.

Finally, and as a more advanced approach, to help farmers and suppliers make decisions regarding the investment in – and use of – SWS, the project has developed mobile phone-based apps. These have information and design criteria for specific SWS, which are structured and presented in such a way that facilitate decision making and arrival at an optimum design. Examples include an app for the design of farm ponds and one for selecting the right pump for a specific irrigation activity.

### **Strengthening the private sector supply side**

In developing their irrigated agriculture, SME farmers often depend on private sector actors and companies for the supply of smart-irrigation technologies, inputs, financial products and/ or market advice. A central part of the project's intervention strategy is thus to accelerate FLID in order to strengthen and expand the supply and services of these actors, and arrive at market-based scaling. SWA does this mostly through two main mechanisms:

First of all, SWA manages a business investment fund which supports SWS suppliers to achieve greater outreach through wider dissemination and upscaling of their technologies. After a thorough application and screening process, companies can obtain up to 50% co-funding for their development or expansion plans. These plans refer to strengthening existing distribution channels, or creating new ones, as well as market development, the development of viable business models to respond to needs of the SME farmers, and facilitation of more effective market penetration. A total of 11 companies working on technologies, such as solar pumps or soil moisture retention-enhancing technologies, but also on financial and marketing products which allow farmers to invest in irrigation, have received this support.



Picture 6: Companies can apply for co-funding to improve or expand their business case

SWA also runs a business incubator programme to help build the capacities of promising Kenyan SWS companies and provide technical support where required. To this end, a business incubator expert from the project undertakes one-on-one coaching sessions with the selected companies. In addition, the expert organizes group meetings which bring together Kenyan and Dutch private sector institutions. These sessions facilitate the creation of synergies between the organizations, and validate and improve business models to make innovative ideas marketable and profitable. Support is given if needed to improve business plans and identify potential investors, production opportunities and marketing channels.

### Strengthening public support actors

Public sector actors, county governments, universities and NGOs play an important role in accelerating FLID. SWA seeks to strengthen their role on a number of important functions:

SWA strengthens the capacity of existing training and resource centres at the county level – often government-led – to become smart-water centres. These are centres that are well-equipped to provide information and training to farmers and suppliers on irrigated agriculture. The centres also play an important role in supporting the lead farmer network created by SWA for scaling SWS.

Given the lack of interaction and collaboration among stakeholders involved in SWS development, production, financing, promotion, and sales and spread SWA builds the capacities of government agents and NGOs in facilitating multi-stakeholder

for improved coordination and collaboration by providing training, coaching and support to selected organizations. The project also provides seed money to such actors to allow them to establish and run IAPs at the county and national level.

Finally, SWA's networks and networking activities at all levels allow the project to identify regulatory or policy barriers to FLID. Where possible, SWA works through the IAPs, particularly at the national level, to reach out to relevant authorities to address these regulatory or policy issues. The Laikipia IAP, for example, worked with the county government to have the platform added into the County Integrated Development Plan.

### Creating space for experimentation and innovation

FLID is often constrained by a lack of compatibility between the available SWS and the local conditions and needs of SME farmers. Without getting itself involved in longer-term research, SWA aims to create additional space for focused experimentation around SWS options.

To this end, the project operates the SWA innovation fund: The fund encourages and supports innovation by companies and co-funds small-scale testing of SWS options before companies invest in large-scale promotion of SWS. The application process and co-funding arrangements are similar to that of the SWA investment fund.

SWA also directly organizes or facilitates SWS experiments and demonstrations with farmers and groups. Such demonstrations are often held with lead farmers who are experienced in irrigated agriculture practices and happy to receive other



Picture 7: KUSCCO staff presenting a new financial product developed with SWA co-funding

farmers for training. Often, the lead farmers belong to organized groups and this increases their influence over the training participants.

To support the above, SWA undertakes supporting studies where masters' students from the Netherlands and Kenya are encouraged to carry out studies related to promising irrigation innovations and technologies. The studies are also designed to look deeper into possible FLID success and failure factors in order to suggest ways forward for the project team.

### **Facilitating and brokering stakeholder linkages and collaboration**

Effective expansion of irrigated areas through FLID requires the coordinated involvement of multiple actors, along with their respective products, expertise and services, whether these refer to knowledge, technologies, access to finance or marketing. In practice, however, opportunities for these actors to interact, learn about who is doing what and find opportunities to link-up, are limited.

A central strategy for SWA to address this gap is through supporting the creation and functioning of Irrigation Acceleration Platforms (IAP). Using an interactive process involving interviews with individual stakeholders as well as meetings and mini-workshops, SWA has helped to establish and co-fund these multi-stakeholder platforms in the five focus counties, and one at the national level. Each is shaped and hosted fitting local interests

and capacities. The IAP activities include meetings, exhibitions, fairs, field days and master classes to encourage stakeholders to get together, interact and seek collaboration to build on existing interests and capacities (Box 3). SWA also works with the IAPs to strategize their functioning for the long-term and post project funding.

SWA specifically homes in on missing links – i.e., links in SWS value chains that seem particularly weak and need focused attention that individual actors cannot provide. SWA creates e.g. linkages of financial institutions with interested farmer groups for providing credit and partnerships of financial institutions with SWS suppliers for joint marketing. SWA also facilitates collaboration between, for example, technology suppliers and government extension workers so that the latter have a clear understanding of the new technologies before scaling them out to farmers.

IAP events, such as exhibitions, workshops and field days helped create direct links between farmer groups and financial institutions interested in irrigation, such as the micro financier ECLOF Kenya, the Kenyan Central Bank, and Equity Bank. Through these linkages, the farmer groups have been provided with training on book keeping, record keeping, and savings required for accessing loans. The farmer groups have also been linked to market actors such as processors and exporters identified by the IAPs, e.g., Frigoken, KDF and others in Nakuru and to Rupa Fruits and Vegetables and Mace Foods in Uasin Gishu.

Other linkages have also been important for the project; the Uasin Gishu IAP, for example, has created links between Sunculture and its solar irrigation pump programme, and with the County Director for Agriculture and the County Agriculture Engineer. As a result of these links, Sunculture has set up demo sites for its pumps in Uasin Gishu and hired a salesperson and an engineer to work in this county. Processors can link farmer groups to other processors during IAP interactions such as in the case of Njoro Canning which linked farmers for products it did not process to Green Blade company in Nakuru.

*Box 3: Partnerships brokered through IAPs*

## Vertical and horizontal scaling

As part of the discussion regarding intervention strategies for accelerating FLID, it is important to note that some contribute to 'horizontal scaling' of SWS. This refers to the spread of successful and promising SWS options at the farmer level, i.e., farmer-to-farmer learning. Others activities contribute to 'vertical scaling', where promising SWS are spread through working with companies and public support agents by strengthening their capacities to develop, promote and/or sell SWS. Both processes are critical in realising SWS scaling and realizing project ambitions. It is important to find - given context and overall mandate – the most effective balance between working directly at the level of farmers and working through and building the capacities of existing organizations.

In the SWA strategy to support FLID, there are important elements of both horizontal and vertical scaling approaches. Given SWA's overall strategic direction of addressing systemic constraints in spreading FLID, the project takes vertical scaling seriously and interacts with, and supports key actors responsible for, relevant parts of the system, from technology supply and knowledge provision to policy development. Vertical orientation may imply that initially, impact at the farmer level is slower, but once the institutions and companies have their strengthened systems and resources in place, the rate of spread and impact will rapidly increase and, more importantly, continue to do so after the project ends. Horizontal scaling and intervening directly at farmer level are equally important for the project as this generates important insights, facts and experiences on the ground that will orient and enrich the project's work with the institutions.

# Chapter 4

## Facilitating FLID on the ground

### Introduction

At the heart of any intervention to support FLID on the ground – whether by public support agents, private companies or a combination of the two – is the creation and implementation of a series of activities for the systematic interaction and collaboration between farmers and their groups. These individuals and groups then carry out joint analysis, planning, implementation, and M&E of the proposed irrigation-related development activities. This chapter provides practical guidelines on how to go about creating the series of activities.

The chapter is based partly on recent FLID-support experiences of MIPP in Mozambique (Beekman et al., 2014), but also includes updated experiences from elsewhere in Africa that have been adapted for the Kenyan context. In Mozambique, for example, farmers have initiated irrigation through the construction of diversion dams in small streams and by digging a very basic canal distribution network to allow surface irrigation of farmers' fields. Support interventions identified with the farmers included improvement of the diversion structures, lining of the canals, experimentation with water-saving application technologies, such as sprinklers, and marketing.

As previously discussed, FLID support can be provided by numerous different stakeholders, such as commercial companies, NGOs, government agents or larger development projects. Often, two or more stakeholders need to join hands for an intervention to have an impact. Intervention can vary in terms of their focus and time-frame – those with a wider agenda, for instance, tend to require a longer time-frame. The scope and time-frame will of course influence the extent to which the below guidelines (which are also summarized in Box 4) can be applied, but the main message will apply in all

cases:

- » *Preparation*: Before starting interaction with farmers and their groups or villages, existing information should be reviewed on local irrigated agricultural development, including on environmental, socio-legal, cultural and local organizational issues. If needed, focused studies can be done. Good preparation helps in making informed choices on, for instance, the villages and farmers to work with. If partnerships with other stakeholders are needed, they should be initiated at this stage. Local field teams are formed, organized and, if needed, trained. All this leads to well-founded planning of the intervention process and its next steps.
- » *Mobilization for local buy-in*: This is a crucial phase where farmers – individually or as groups – and relevant local leaders are informed of the intentions of a project. Other important stakeholders in irrigated agriculture would be invited to join key planning events so that they are informed. Through such processes, a basis of trust is established between the project and farmers, allowing farmers to decide whether or not they would like to work with the project. If they agree, the project becomes a joint process from this point. If they do not, a group of farmers or a local team may be formed to coordinate collaboration with the project. Practical planning of the next steps should conclude this phase.
- » *Participatory analysis*: A series of focused activities is organized to arrive at a deeper understanding – shared between the farmers and the project – of the real dynamics of irrigated agriculture, i.e., the challenges farmers face and areas for possible improvement as well as the opportunities and current local initiatives. Such an open and participatory analysis strengthens

the basis for trust and collaboration. If focused data collection is still needed to deepen understanding, this is done in consultation with the farmers.

- » *Decision-making and action planning*: To make an informed choice on which SWS to invest in to improve local irrigated agriculture, farmers and the project team systematically compare the options, with the project providing relevant additional information where needed. Once a choice has been made, specific implementation activities are planned. Often the issues of local level coordination among farmers, and between the farmers and the project team, need to be addressed again.
- » *Detailed design, joint implementation and participatory monitoring and evaluation (PM&E)*: This is the central part of the project process where, in close collaboration with the farmers, a detailed technical design of the agreed SWS is made and implemented, and PM&E is discussed. Producing a detailed design of the proposed SWS allows for final consideration as to whether or

not the development should be implemented.

- » *Longer-term operation and support*: How can a project ensure that the irrigation improvements invested in bear fruit and continue to function well in the long-run? And how can a project create the conditions required to scale up successful improvements? Though only mentioned here in the final phase, these questions need to be on the agenda from the start. In terms of ensuring the technology bears fruit, this may concern the ongoing maintenance of the equipment invested in and the continued supply of the required parts. For scaling up and sustainability, this may relate to the functioning of the farmer group established and the institutional arrangements/partnerships. What do the farmer need to be responsible for in the process, and what needs to be taken on by others? Are all actors involved capable to take on their allotted responsibilities? The project also needs to be designed in a way that allows other farmers to access and apply the irrigation improvements.

Phase	Key activities
Preparation	<ul style="list-style-type: none"> <li>» Review existing information; preparatory studies if needed: <b>choice of villages and farmers</b>;</li> <li>» Build stakeholder partnerships, form the project team and deliver capacity building if needed;</li> <li>» Planning of the next steps of the process</li> </ul>
Mobilization for local buy-in	Introduction to villages and farmers, matching expectations, <b>agreement to collaborate</b> ; formation if needed of farmer group; planning next steps
Participatory analysis	Focused participatory study activities leading to joint understanding of local conditions, challenges, opportunities, and most promising SWS options
Decision-making and action planning	<ul style="list-style-type: none"> <li>» Listing and prioritization of most promising SWS options;</li> <li>» <b>Decision-making and choice of SWS to be implemented</b>;</li> <li>» Consolidation of local coordination group; Joint action planning</li> </ul>
Detailed design, joint implementation and PM&E	<ul style="list-style-type: none"> <li>» Detailed planning analysis and design of irrigation improvement / SWS;</li> <li>» <b>Final decision to go/no go for implementation</b>;</li> <li>» Implementation and PM&amp;E</li> </ul>
Longer-term operation and support	Ensuring that operation and maintenance, and required support will continue post-intervention and that the process and SWS can be scaled.
* <b>Bold</b> : important decision moments in the process	

Box 4: Main flow of the FLID facilitation process



In the case of local companies or public actors already possessing detailed knowledge of local farming conditions and farmer contacts, the first set of activities can be relatively short. But it is always necessary to consider that the project team's understanding of irrigated agriculture and its challenges may be very different to the local realities and thus, participatory analysis activities are critical for sustained success.

Though it seems that each phase builds on the results of the previous, and provides inputs for the design and implementation of the next, the above list of steps is a simplified explanation of the process. In practice, it is not always so linear, and often, because of experiences during later phases, a project will need to revisit assumptions and choices made during earlier phases and adapt its planning accordingly.

The approach as described above may also need to involve cycles of participatory analysis, planning and implementation at two different levels – once with the individual farmers or farmer groups directly involved, and in rural Kenya, a complementary process of consultation and planning at the village or community level. This would most likely be the case when an SWS development has implications that go beyond the farmers directly involved. This second level allows coordination of the project with relevant village structures, such as local government and traditional leadership. Such collaboration may also be helpful further down the line if wider issues, such as joint marketing, inclusiveness and equity need to be addressed.

In the subsequent chapters, each of the six mentioned sets of activities will be explained in more detail, with experiences from MIPP project added where appropriate.

## Preparations

### Partnerships

Successful implementation of FLID support work requires diverse sets of expertise, knowledge and skills, such as technical know-how regarding SWS, knowledge of the local value chains, and also, facilitation and communication skills. Before initiating FLID support, a review of staff/company capabilities to take on the project should be carried out. If the team is found lacking in certain necessary skills, new staff need to be recruited or new partnerships formed with other organizations to

ensure that the relevant competences are covered.

Other than complementary areas of expertise, for FLID partnerships to be effective, a real interest in FLID as well as an openness for new ideas, approaches and experiences is required. Good inter-personal skills may be very helpful too. It is also important to maintain a balance between the nature of the organizations handling both the technical side – often commercial companies – and those handling farmer/community facilitation and organization, to ensure that both critical functions receive adequate attention.

*In MIPP, the initial idea that most field work with farmers would need a team that included at least one good facilitator and one technical expert proved ineffective. After the technical experts had gained basic facilitation skills, they could handle many of the field visits. The strong community facilitators joined the teams only when required, i.e., during the initial community entry, the mobilization and participatory analysis phase and during other more complex meetings.*

In Kenya, IAPs function or have functioned in several counties, and one operates at the national level. As mentioned in chapter 3, these platforms bring FLID stakeholders together to present and discuss relevant developments, as well as solutions they can offer, and broker partnerships. Where IAPs have not been established or are no longer running, other networking tools can be used for the same purpose, such as Facebook or WhatsApp groups, or networking events by, for instance, local agricultural training centres.



Picture 8: Field demonstration organised by IAP (Credit: Leonel Wambia)

## Reviewing existing information on dynamics and potential

Too often, projects (start to) engage with farmers, groups or villages without making good use of existing information, thus making unnecessary mistakes or investing time in collecting information that is already available. Existing information can be in the form of documents, reports or notes, but can also be obtained from talking with knowledgeable colleagues and partners. Taking the time early on to take stock of this may help to save a lot of time later.

Key local, cultural and regulatory factors that may influence the project's development/progress include, but are not limited to: land tenure (formal and informal systems); land use and availability and the dynamics of such; the structure and role of local leadership and community bodies; water rights; existing irrigation practices; organization of labour; and the functioning of input and output markets. For all the above, socio-economic differentiation among farmers (rich and poor) and gender and socio-cultural dynamics need to be taken into account. The policy environment is another important factor to consider.

*In MIPP, the project coordinator based at Wageningen University prepared a three page summary paper with an overview of information and data available on the project area to make the pre-existing information available to all partners and, particularly, to the field teams.*

The FLID approach is based on the assumption that the potential for development or expansion of irrigated agriculture is high in places where farmers have already started developing their water sources, and marketing their produce in substantial amounts.

The SWA project in Kenya thus undertook so-called rapid integrated county assessments to map and understand existing FLID examples in its focus counties, and to assess the potential for expansion and/or improvement as detailed in chapter 3. The information generated from such assessments was enriched through systematic baseline studies, and the findings were made available to those planning practical work on FLID.

The generation of information through such processes helps to provide valuable insights into the current irrigation dynamics, as well as the general constraints and potential solutions. Further and more detailed analysis on the ground with farmers will need to be part of subsequent steps to be able to better understand which solutions would work best in given situations, and to design their implementation.

### Preparatory research

If there are key information gaps, additional preparatory studies can be done – preferably after going to the field and interacting with the farmers involved. This ensures that relevant issues are looked into that are necessary to support FLID development in the local context. It also allows the research to have participatory dynamics, at least to the extent that the research questions and methodology have been defined following consultation with the key beneficiaries.

Research by students supported by their universities can be an effective way to generate more in-depth additional information (Box 5). It is important to take care that communities and farmers participating in the project are consulted and informed about such studies, their aims and ultimately, their findings.

Intensive collaboration with universities in the Netherlands (e.g. Wageningen University and Research) and Kenya (e.g. Jomo Kenyatta University) allowed SWA to mobilize master students and interns to undertake a number of important studies. For example, water availability in catchments along streams, gender dynamics around the promotion of SWS, and the ways in which to monitor water productivity were studied in detail. These studies helped to sharpen the focus and direction of the project's work, highlighting water distribution issues and management challenges along streams, and helping the project to arrive at its own operational approach to look at water productivity.

*Box 5: Supportive student research in SWA*

## Strengthening capacities of staff

Capacity strengthening for project staff in FLID and FLID facilitation is often an extensive process. Some investment in staff capacity building in FLID is useful and can encourage further work between the farmers and the project to ensure FLID is focused and effective. FLID capacity building usually covers four main areas:

- » The *basics of farmer participation* in agricultural and rural development: Why do we think it is necessary? To what extent is participation possible and needed in the local context? What are the advantages and limitations? What does this imply for the intervention and the team?
- » The *main flow of the FLID support process* and its logic: What are main elements and 'steps'? What is the main rationale for each step, and what would we want to achieve with it?
- » The specific *tools and methods* that can be part of the field interaction process: What are they? Why and under which conditions would they be used? How are they used?
- » The basic *skills for participatory interaction and communication*: effective listening and questioning, summarizing discussions, facilitation of group meetings or discussions, handling of visuals etc.

*In MIPP, all staff involved took part in a 5-day basic training that addressed all four areas mentioned, which helped to build on the existing knowledge and experience of the participants.*

Introductory training workshops often need to be followed up with 'refresher workshops' to review experiences obtained, revisit earlier learning and deepen understanding of selected issues.

For FLID trainers to be convincing, they need to practice what they preach. Therefore, training events apply similar principles as those found in FLID, such as building on the participants' knowledge and experiences, providing training inputs to complement these, and encouraging participants to discuss and experiment with new ideas in an action-reflection mode. This type of training is known as experiential learning and can be realized through brainstorming about particular issues, group work, and relevant practical exercises followed by joint reflection, which leads into the



Picture 9: Capacity building of field staff in FLID as part of preparations (Credit: Gert Jan Veldwisch)

planning of future work. Good resource books are available to assist trainers in designing participatory training programmes (see the reference section at the end of this guide for user-friendly options).

The role of men and women in the FLID process and gender dimensions of FLID require specific attention during staff capacity building events. In the MIPP project, gender dimensions were discussed during various workshops, which led to a summary of suggestions as in Table 2.

Phase	Issues and suggestions
Preparation	<ul style="list-style-type: none"> <li>» Understand local gender relations, either by compiling existing knowledge or by commissioning new research</li> <li>» Agree on a project strategy to handle gender issues (see below)</li> <li>» Consider team composition (including women), their capacities regarding gender issues and provide training, if needed</li> <li>» Plan clear steps on how to put the strategy in practice</li> </ul>
Mobilization for local buy-in	<ul style="list-style-type: none"> <li>» Initially, hold separate meetings with women and men farmers bringing them together afterwards</li> <li>» Identify 'role models' - such as the (female) governor of the province, who can show local women that they are capable</li> </ul>
Participatory analysis	<ul style="list-style-type: none"> <li>» Give women the word, specifically when they seem to be passive</li> <li>» In group work, divide groups according to age and gender, and make sure that both women and men are present in all activities</li> <li>» Make arrangements to avoid that women are always in the kitchen, e.g. rotate cooking responsibilities</li> <li>» Train women on leadership skills</li> <li>» Remunerate, where needed, for efforts made – husbands would otherwise not allow 'their' women to participate</li> </ul>
Decision-making and planning	<ul style="list-style-type: none"> <li>» Deliberately ask women to say whether they agree or disagree with what the men say, encouraging the women to voice their opinions</li> <li>» Arrange the seating in meeting so the women do not always sit on the floor or at the back or in other disadvantaging places</li> <li>» Hold separate meetings with men and women, then share results</li> <li>» Ask a local woman to be the local facilitator and translator where needed</li> <li>» Allow for specific project activities to be managed by women alone</li> </ul>

Table 2: Options from MIPP for integrating gender in FLID process

## Mobilization for local buy-in

### Entry into the community

In most cases in Kenya, a company or NGO can interact directly and easily with individual farmers to, for example, provide advice or to sell a product. But, if they are planning to implement wider-reaching activities that are longer-term and go beyond impacting individual farmers, the process of entering a village or community needs to be well planned, as this can make or break the process that follows.

A larger community meeting can be an important step prior to entering a village, as it allows everyone to be informed and shows the necessary respect for local formal and informal leaders. To arrive at an effective meeting that is well organized and attended by all key actors, one needs to work with

the area's local administration and its extension staff, as well as with the traditional village-level leaders and church leaders. Generally, attracting high numbers to attend the first meeting is not difficult, as people will be curious. However, the meeting must be well prepared in order to encourage sustained interest in the proposed collaboration.

During the introductory meeting, the objectives of a given project and the proposed approach need to be carefully explained. The expectations people have of an external intervention will strongly influence who/how many will attend the project meetings, and how they will express their interests and needs. Experiences with previous projects may strongly colour their expectations. It can be very useful to prepare and bring along a short brochure or other written paper summarizing the key features

of the project, so that this can be distributed widely.

The MIPP team learned how important it is to consider how to frame the project and its focus. For example, people can respond very differently to the label 'irrigation project' as compared to 'small-scale horticulture'. The first promises a larger, high-investment kind of intervention and may attract men. The second more easily attracted the attention of women, who are actually very much involved in irrigation.

One needs to be clear from the start about the areas of work that will be the responsibility of the farmers – and those that won't. Interests and demands beyond the capacity and mandate of the project should not simply be ignored but given some attention to demonstrate an awareness. Discussions should be held with the beneficiaries to understand what can and cannot be done in the framework of the project, and perhaps suggest ways for the communities to address issues not covered by the project.

1. Possible opening words / activities by local leaders
2. Greetings by the project team, referring to their previous presence and interactions if there have been any
3. The project and its main features: Supporting farmers in developing their irrigated agriculture; assisting in analyzing local situation to plan for actions; a partnership between project and community, cost sharing  
Discussion and clarifications with final question: Are you interested to work with us on this basis?
4. Explanation of the intervention process, its phases, focus, and anticipated time-frame  
Discussion and clarifications
5. Explanation on the need for and the process of next steps, focusing on further analysis, participatory diagnosis, detailed discussions: Give examples, typical group size, time-frames etc.  
Discussion and clarification, ending with basic agreements on implementation
6. Choice of local contact person or small contact team to coordinate with the project
7. Thanks and summary of the meeting
8. (Late) Lunch

*Box 6: Typical agenda of introductory community meeting*

## **Organizing a successful village meeting**

Preparing for the meeting, consider the usual planning concerns: Have the relevant local leaders been properly invited? Is the agenda clear and does it cover all the important issues (see Box 6)? Is it clear for each part of the agenda how the discussions will be organized? Is there a need for specific materials, equipment or tools? What is the role of different types of participants, including local leaders and resource people if there are? Is adequate space given for the community and formal/informal leaders to shape the meeting and contribute throughout? For example, in almost all cases, leaders may suggest that the opening of the meeting includes a prayer. Ensuring such questions are addressed will help to ensure the smooth running of the meeting and cordiality of attendants.

As part of the preparations for the meeting, it is also useful to consider the translation of key terminology from the project objectives and approach into the local language (e.g. farmer-led, farmer priorities, integrated approach, own contributions).

A village level introductory meeting ends with some form of agreement regarding the general terms of a collaboration between the project team and the village and/or specific farmers or farmer groups confirming interest to collaborate. Confirmation by the village/farmers involved that they are clear on what will be expected of them and what they can (and cannot) expect from the project is a critical step. This sets in motion a change of project ownership – from an externally initiated intervention, to a process that is co-owned by the farmers involved.

1. Why am I here? What is in it for others? What is in it for me?
2. Why have they come here and not somewhere else?
3. Why do other community members, or the project staff, think I am here?
4. What are their expectations of me, us?
5. Who is involved in this? Whose project is this? Who owns it? Can it become ours?

*Adapted from Sanginga & Chitsike (2005)*

*Box 7: Questions in the head of community members coming to a first project meeting*

At this point, the agreement of farmers to work with the project is not set in stone, but discussing the issue of whether or not to collaborate conveys an important message, i.e., that the project takes local participation seriously. Later in the project process, the interest and commitment of the people to be involved will need to be reaffirmed, sometimes through some form of a 'contract'. If farmers do not show real interest in practice, i.e., they do not join relevant meetings or related activities, work with this group should be stopped and relevant resources allocated elsewhere. This requires flexibility from the project and possibly the project donor/financer.

### Local coordination and institutional development

If the irrigation development intervention, the "project", works with a large group of farmers, local coordination of this group – and by whom – needs to be considered. Where an active farmer group exists, its own leadership can help organize coordination. If not, a local coordinator or small coordination team will need to play this role, to

ensuring information regarding project issues is communicated to the farmers, and any farmer issues/complaints are communicated back to the project team. It is important to identify whether or not any farmer or self-help groups already exist and can take part in a project before encouraging farmers to form a new group (cf. Figure 5 below). If such groups do already exist, it is also important to assess their functioning and role within the community to ensure they will be able to help coordinate the proposed work.

If a new farmer group is formed, this needs to be an open and transparent process. It will take time and will require people with relevant experience to support the process. A local coordinator or small team of farmers can be identified initially in order for the project to progress whilst the group is established. Selected farmers for the group need to be able to represent other farmers, be interested and adept in irrigated agricultural development and have good communication skills. The group should also preferably involve both men and women.



Figure 6: Farmer groups? (Source: Baobab Magazine)

*In Mozambique, it seemed that certain functions of the local coordination team, such as communication, moderation and facilitation of farmer meetings and actions did not align with the traditional roles of women. Women thus could not get a good foothold in the teams. Having female staff on the teams would probably have helped to understand local dynamics earlier and find ways to keep women involved in some way.*

For a newly established farmer group or coordination team, their initial focus is project implementation. Possible longer-term roles – beyond the project – e.g. related to managing a common water source, resolving conflicts over water, or joint marketing, may also need to be considered on establishment. To perform these roles, the group may require consistent capacity building depending on existing experiences and abilities of its members. Maximizing the role of the group or the team in the project increases capacities in itself.

Important issues needing attention in capacity building often include functioning as a team, principles of self-organization, leadership, communication, and handling of meetings. When the local team or group expands its role, its capacities in community consultation and facilitation or conflict resolution may also become important. Training in project technical issues may be needed too, e.g. when local team members are asked to take part in and partly handle data collection and measurements.

Capacity building need not always be in the form of organized training sessions but could partly be carried out ‘on the job’ or visits to well-functioning groups or associations in other villages. When formal training is organized, it can be useful to invite key community leaders to also participate so as to encourage their engagement with the project, and to facilitate smooth interactions with these actors.

*Remuneration* of farmers handling local coordination needs to be avoided. Generally, they will receive considerable benefits from improved irrigated agriculture once the project is underway. Remuneration can become an issue, for instance when coordinating farmers put in much more time and effort as compared to other farmers. In such cases providing incentives to the local coordinators would be primarily a responsibility of the other farmers benefitting from their work. In fact,

this could form part of their contribution to the project. On the other hand, the work of the local coordinators does facilitate smooth implementation of project activities and, in a way, they act as the ‘hands and feet’ of the project at field level. These considerations can often be discussed locally to decide whether or not – and how – local coordinators should be compensated for their efforts.

*Communication* is another aspect that needs careful attention. The local coordinating team needs to be informed and updated on all relevant activities related to the proposed work, based on joint action planning of project and team. The local team also needs to organize its own communication with other farmers.

The *role* of the local coordinator or coordinating team *may change* and deepen over time. Initially, its role may be primarily to mobilize other farmers and help organize the initial farmer or village meetings. If the selected coordinating individual/group is efficiently fulfilling their role, they can become key actors in the planning, strategy development and implementation stages.

## **Participatory analysis**

For most projects, an initial analysis is needed to determine the most practical method for improving existing irrigation, and the activity that will benefit farmers most. A variety of participatory analysis tools and methods can be adopted for this and will help to ensure that farmer-led dynamics within irrigation development are maintained, and that relevant and realistic information is generated. Many handbooks are available detailing participatory analysis methods and tools (see e.g. FAO, 2010 and Pretty et al., 1995). This section discusses the analysis process in the case of FLID and details methods and tools most relevant in this context.

## **Design and organization of the process**

Participatory analysis aims to generate knowledge for creating a joint understanding between the project team and the farmers. If done well, it will strengthen the collaborative relationship and trust among the two groups, and encourage and empower local people to make informed decisions regarding their irrigation developments.

Many of the methods and tools used to organize participatory analysis are from the Participatory



*Picture 10: Listening closely to farmers; a key for success (Credit: Laurens van Veldhuizen)*

Rural Appraisal (PRA) toolbox. Individuals or small groups of typically three – but up to 10 – farmers or villagers participate in the analyses. Selection of participants needs specific attention, taking into

account the objective of the activity, as well as the diversity of participants to ensure that everybody interested can contribute. The local coordinator or local team can help propose participants.

Success of a participatory analysis depends on the quality of the facilitation. Box 8 presents basic guidelines for successful facilitation. An important task is to make sure that participants can express their views and the associated reasons. Each study or analysis activity is concluded with a final discussion in which the main findings from the activity are summarized: 1) what has been learned on key challenges in improving irrigated agriculture; and 2) which improvements would seem to make most sense and why?

Findings from the participatory analysis work are shared with all the farmers concerned. For larger projects, a village meeting involving relevant leaders and local resource people, such as government extension staff, may be required. Maps, drawings and other forms of information produced are left with the farmers.

#### **Before you start:**

- » Agree within the team the activity to be carried out
- » List clearly the key questions on which the activity will focus
- » Prepare the tools and materials needed
- » Divide up the roles within the team

#### **When you start:**

- » Present what you want the activity to achieve; explain again how it is part of the overall participatory irrigated agricultural development process, and that findings need to be shared with the rest of the community
- » Explain how the activity will be done and its main steps, including the concluding joint session to summarize findings
- » End with clear question(s) and instructions to start the process

#### **During the activity:**

- » Ask, probe and help clarify viewpoints of all
- » Be sensitive to the mood of participants; adjust when they do not understand or are frustrated
- » Support those who tend to speak less, and actively solicit their participation
- » Encourage main points to be visualized for all to see, as part of the PRA tool or otherwise

#### **At the end:**

- » Summarize what has been done
- » Help systematize key findings and conclusions, agreements and points of disagreement
- » Help plan next steps, including who will present findings to the wider community and how



As previously mentioned, there are good handbooks on PRA and other participatory analysis methods that are suitable in the context of innovation in irrigated agriculture in Africa. The following sections provide practical guidelines in using those most relevant in the context of FLID.

### Key methods and tools

The following methods and tools are particularly useful in studying issues around water sourcing, management and water use for agriculture. They address technical issues around how farmers organize water distribution, the rules and norms around water use, and availability and access to agricultural inputs and marketing. Field teams are encouraged to modify methods/tools to suit the local context, or innovate and develop new ones.

#### *Water source and water use mapping*

If the availability of water for irrigation is a major concern, participatory mapping is useful. This process involves a small group of farmers who are asked to draw a map of their village or another agreed upon area, and identify the relevant sources of water. The map will reflect the way in which the farmers look at their situation with regard to the issue at hand. The maps do not need to be geographically correct, as it is more important that they represent the participants' perceived reality.

Participatory mapping follows three distinct steps. First, farmers are asked to indicate the boundaries of the village, the overall irrigation system if there is one, or another boundary relevant for the focus of the mapping. Next, they are asked to place reference points in the map, such as roads, schools, churches etc. People can choose their own reference points, reflecting what is important to



*Picture 11: Farmer mapping of water distribution practice a powerful tool (Credit: Francesco Sambalino)*

them. Thereafter, they are asked to fill out the rest of the map, focusing on the resources in question. During this process the facilitator asks clarifying questions.

For participatory mapping of irrigation systems, guiding questions include:

- » What are the main water resources used and where are they located?
- » How is water being distributed? Where are the main canals or pipes? Why is it done this way? How well does the system work?
- » Where are the irrigated areas? How big or small are they? How many farmers are involved?
- » What field irrigation methods are used? Why these? How effective are they? Do they vary in different locations? Why?
- » Are there new areas that people would like to put under irrigation? Where?

Similar questions can be asked on local agriculture and other topics related to use of natural resources.

The exercise is not designed simply to prepare a map, but to encourage farmers to consider relevant issues around resource use, as well as the dynamics – challenges and strengths – related to what is depicted. The reasons for the way resources are accessed or not may appear to be obvious for those involved in the activity, but these questions are asked if alone to ensure a shared understanding between the farmers and the project.

In using participatory resource mapping, make sure to:

- » Allow participants enough time to draw their own map;
- » Use local materials, such as stones and sticks, or draw the map in the soil if participants are not used to working with paper and markers;
- » Facilitate the process but do not provide too much guidance or push your own ideas.

### Transect walks along canals and rivers

A transect walk is a good way for farmers and the project to see, check, discuss and understand local realities. Generally, it implies walking through a village more or less in straight lines to cover the relevant sections of the community, depending on the topic of study. In supporting FLID, transect walks often follow the trajectory of a stream or canal and usually works best if a few farmers (four-six) join the project team. These farmers should

preferably obtain their water from the stream/canal in question, or be involved in its management. If possible, the group would also include farmers from the stream start and tail-end areas.

The first objective of a canal or stream transect is to arrive at a shared understanding between farmers and project staff of the water distribution system, how it functions in practice and its challenges. The transect exercise also helps to clarify land use activities along the canal, which is useful during initial explorative participatory analysis activities, particularly in villages new to the project.

Before starting the transect walk, the group discusses what needs to be observed and discussed, e.g. water lifting or management technologies, the recent history of water use developments, maintenance issues, and/or new initiatives or innovations by farmers. The project actively stimulates discussion of such topics during the exercise. Farmers or project staff may take pictures of specific points of interest for sharing and discussing later. At this stage, project staff often refrain from directly proposing specific solutions in order to avoid narrowing the thinking of participants, and giving off the impression that the decisions have already been made.

Relevant questions for probing and discussion during canal/stream transect walks can include:

- » How is water distributed between the different users? What kind of agreements are there about this? How does it work in practice?
- » Who is involved practically in managing water use – is it the farmers themselves and if so, does this specifically involve the men or women? Are they contracted labourers?
- » What are the recent developments? What led to these developments? Which producers joined in using the irrigation canal most recently?
- » When someone wants to open another irrigated field, what needs to be done in terms of permissions and collaboration? Who decides?
- » Which fields suffer most from water shortages in the dry season?
- » Why are things done as they are?

Immediately after the walk, it is important to summarize and check with the farmers what was established and learned. One way of doing this is to schematically draw the walked canal trajectory and add key observations and information at the



Picture 12: Simple diagram summarising notes from a transect walk along a canal (Credit: Gert Jan Veldwisch)

relevant places, creating a diagram (see Picture 12 taken from the example of MIPP in Mozambique). Encouraging farmers to lead the analysis and produce the drawing is important at this stage. The project staff can also prepare a separate list of key issues learned for future reference and sharing.

Visualizing the main observations through a drawing makes it easy for everyone to follow the discussion and contribute. It also facilitates sharing of the findings with others at a later stage. When doing transect walks:

- » Be prepared that rivers and streams are often only accessible at a limited number of points. Discuss with people who know the area how to organize the walk, in order to maximize the use of the time available and avoid getting lost; and
- » Plan enough time for the group meeting at the end of the walk as this is often where most of the joint learning takes place.

### Focus group discussion

A well-organized focus group discussion (FGD) is a powerful approach to analyse local issues. FGDs are semi-structured discussions on a selected topic with a small group – often those directly involved/impacted by the (irrigation) development work considered. In some cases, FGDs are carried out with a specific subgroup, such as a group of women, youth or vegetable traders, for instance. The group size should not exceed 5-10 people in order to maximize interaction and analysis. It

can be worthwhile to organize several FGDs on a given issue so as to obtain different perspectives. For example, on the issue of water use and management along a canal, it would be interesting to organize a FGD for tail-end users as well as for head-end users. An analysis of the annual agricultural calendar and related activities can be done separately with men and women, as this exercise often generates very different perspectives on what is important in which period.

*In the context of the MIPP work in Mozambique, FGDs were usually held on three topics: water use and management along a canal or stream, the annual agricultural cycle and its related activities, and on the marketing of agricultural produce. These three topics proved to cover all important issues that needed to be considered to allow decision-making on further investment or not in irrigated agriculture, and if so how.*

Points to consider when organizing an FGD:

- » Define the objectives and guiding questions before starting
- » Explain the steps in the process to all participants
- » Note the relevant remarks on a flipchart and/or appoint somebody as a note-taker
- » Ensure quality facilitation to ensure everyone feels comfortable and respected to express their views

An FGD on *water use and management* can cover all locally relevant issues, including those that have emerged from previous activities, such as walks. More specifically, water use and management bottlenecks and possible ways to address these can be discussed, as well as water distribution in time of water-shortage and the handling of conflicts. However, these topics can be sensitive and a level of trust will need to have been established prior to such discussions.

An FGD discussing the *agricultural cycle* is almost always an important part of the process, as it provides all with a good overview of the main activities throughout the year. It also highlights possible bottlenecks and opportunities to be considered when investing in irrigated agriculture. Development of irrigation almost always has implications for agriculture, and/or changes in agriculture may be required for irrigation investment to become profitable. Through an FGD on the annual agricultural cycle, a diagram of the

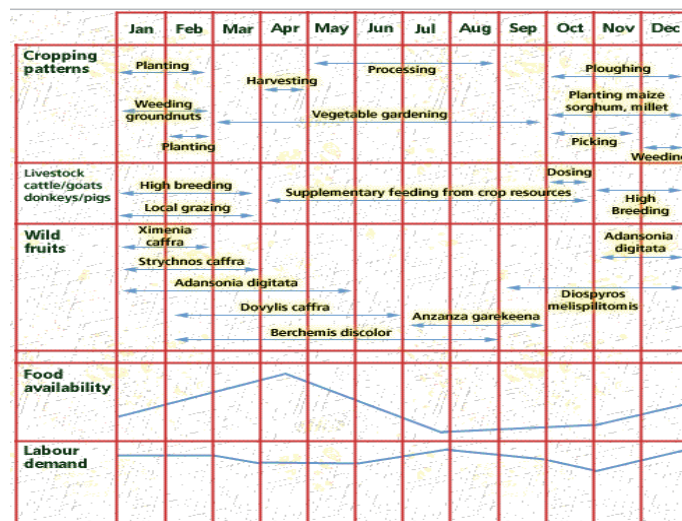


Figure 7: Annual agricultural calendar

local agricultural calendar can also be prepared (Figure 7).

If a separate FGD on *marketing* is carried out, it should focus on the main crops marketed in the area, the ways in which they are sold, and where. A marketing FGD should also discuss other important points, such as the marketability of alternative crops, the handling of annual price fluctuations, and an analysis of the marketing chain.

When using FGDs:

- » Limit them to groups of not more than 10 people
- » Try to prevent passers-by from actively joining the discussion halfway through
- » Be very clear who you think should participate in a session and why
- » Consider again all suggestions on facilitation from Box 8

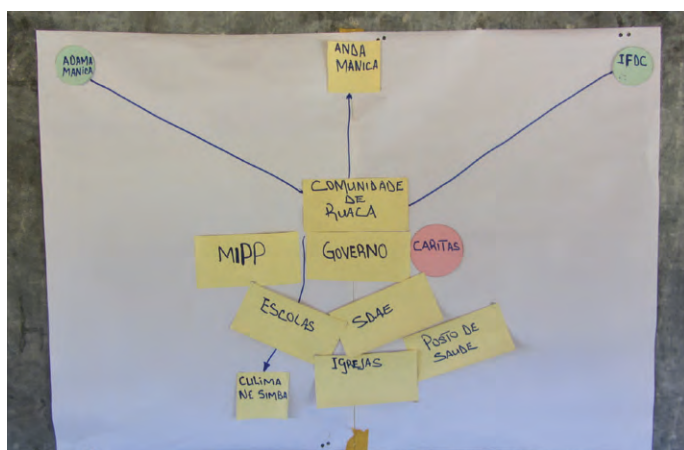
### Venn diagrams

A Venn diagram is a tool that identifies the formal and informal organizations interacting with farmers relevant involved in irrigated agricultural development. The diagram helps when analysing the roles of these organizations, their importance in terms of power and influence, and their strengths and weaknesses. The tool also helps to review the landscape of supporting organizations and to decide which could be mobilized for the purpose of the project. Development of the diagram also creates a good opportunity for farmers to discuss existing local groups and decide whether they should be at the centre for the proposed work and its local coordination.

A Venn diagram is best done in small groups of 5-10 people or even with individuals:

- Ask the group to list all organizations and institutions relevant for FLID i.e., local groups or organizations, government agencies, private companies and financing institutions, but also informal community structures or even individuals (local leaders).
- » Suggest to indicate the relative importance of each organization (according to its size, its resources, its status and influence). This is visualized by drawing or cutting out circles for each, the different sizes of the circles indicating the relative importance.
- » Ask to indicate the actual relevance of the organization for the farmers and visualize this by arranging the organization circles in relation to the circle that represents the farmers or village. Organizations placed close to or even partly overlapping with the community circle are those that interact or visit regularly and show understanding of the village interests (Figure 8).
- » Keep notes on what is said during the exercise in terms of the functioning of the organizations mentioned.

*The MIPP project used Venn diagrams to help map the different organizations active in the villages and what they were doing, but little of what emerged was new to the teams. The teams probably needed more experience in facilitating a Venn diagram exercise to be able to arrive at a deeper analysis.*



Picture 13: Venn diagram analysis (Credit: Wouter Beekman)

When using a Venn diagram:

- » Allow for enough time for brainstorming to list organizations before moving into visualization
- » Prepare well where and how the diagram can be visualized
- » Encourage members of the small group to handle the visualization as much as possible
- » Ensure that both formal and informal organizations are included in the analysis

#### *Other relevant methods and tools*

There are other methods and tools from the PRA toolbox that could support the participatory analysis<sup>1</sup>:

- » *Wealth and livelihood ranking* can be used to understand local socio-economic differentiation. Insights into such dynamics can be important to understand e.g. access to water and the relative position of farmers to the water source, the number of hours per day that water is received and/or the number of irrigated hectares.
- » *Pair-wise, matrix and other ranking tools* systematically compare the advantages and disadvantages of using different practices/ technologies, as a basis for making choices e.g. the cultivation of certain crops or the use of a particular system for lifting water.
- » *Farmer-to-farmer visits* are useful for farmers to learn about new SWS options and technologies used elsewhere. Such visits also help farmer groups to reflect on their own situation.

#### **Choosing and combining participatory analysis methods and tools**

Analysing irrigated agriculture as above is effective only when it limits itself to focus on the issues that are currently not clear and relevant for the choices to be made. If not, farmers may quickly show participation 'fatigue', bored by activities that do not demonstrate clear added value. Thus, the process must be organized well and kept simple and focused to ensure that farmers understand the relevance of activity. The most relevant analysis methods and tools should be combined creatively and in a consistent process.

1) For guidance on the use of these methods and tools, please refer to the PRA manuals mentioned in the reference section at the end of this guide.

## Supportive research

Before the project goes to the field, also at this stage, specific issues may emerge that need more in-depth study than is possible through participatory analysis activities. The involvement of students or other forms of research support can play an important role in documenting key phases of the project and its activities, and help generate in-depth insight into the process as a basis for learning.

*In MIPP, women's participation in meetings and exercises became a clear issue very early on in the process. Two Mozambican students and a Dutch student then studied gender relations in the two communities. The Mozambican students in particular were able to clarify that the differences in dynamics between the two communities encountered by the project were caused partly by religion, but also by the more isolated position of one community, which influenced the role of women in agriculture.*

## Decision-making and action planning

Findings of the different participatory analysis activities need be **processed and combined** in order to be able to decide on the most relevant SWS for the local context. This is a key challenge given the complex issues involved and the sometimes contradicting views and interests. Processing of the data and information generated is usually done in three steps: first, in-'office' by the team itself incorporating all relevant suggestions from the activities with farmers; secondly, this is followed by sharing and discussing the results with the farmer coordinator contact person or local team; and finally a meeting is held with all those involved to discuss the results.

The team's analysis of the findings of the participatory analysis should involve the following:

- » Capturing results of each activity as discussed and summarized with the farmers (field reports)
- » Listing of the problems/issues and/or the proposed SWS from each activity
- » Brainstorming of the main points
- » Clustering similar points, doubles and elaborations
- » Discussing detailed notes on each of the core issues identified, focusing on causal relations, root causes and feasibility of the SWS solutions proposed

The results of this data processing and analysis by the team are shared with the contact farmer or local coordination team (LCT) to verify or expand the analysis, and to help the team strategize how to present the analysis to a meeting with the other farmers. If fully involved at this level, the LCT members can play an important role in clarifying issues and helping to overcome any uncertainties and doubts of other farmers.

The analysis is shared and discussed at a meeting with all farmers, and other stakeholders involved, in order to make the key decisions on whether or not to proceed with the proposed SWS options – and if so, how. Farmer participants to the meeting may present what they learned from the participatory analysis activities they joined. In addition – or alternatively – the project could present a synthesis of results across all activities, highlighting the most promising SWS options that would meet the problems identified, be feasible in the local context, and match the support capacity of the project.

*In MIPP, the list of possible activities that came out of the participatory analysis was presented by the team and translated directly by a lead farmer. Following this, a second farmer was asked to explain in his/her own words how he/she understood the various possible SWS activities listed by the project. Issues that were raised during this presentation were incorporated into the activity list. Farmers were asked to add other issues or possible SWS options not yet captured before moving to the next step.*

Ultimately, these processes should all lead to **making choices** on whether or not to pursue specific SWS options based on information and data generated from the previous activities. In line with the FLID process, the decision to invest in SWS has to come from the farmers, either individually or as a group. In the latter case, some form of group meeting will need to take place to confirm on decisions. In both cases, the project can facilitate decision-making by making sure that all involved have a good understanding of the SWS options shortlisted. Pairwise ranking (comparing and choosing between two SWS options) is a fast, efficient tool for a more qualitative analysis of pros and cons (Box 9). One can compare one SWS with another, e.g. improved water distribution using a solar or petrol water pump, and compare the best one of these with yet another option, such as

SWS	Criteria	Investment costs	Recurrent costs	Capacity	Reliability	Repair, spares	Total score
Solar pump		2	1	2	2	2	9
Petrol pump		1	2	1	1	1	6

Box 9: Pair-wise ranking example of two SWS with one as highest rank

investing in sprinklers, to ultimately find the one with the highest potential.

An important element for finally deciding whether or not to for a proposed SWS is the weighing of investment costs against the return on this investment – in terms of the extra income it would generate for farmers. The project can help farmers in making these calculations. Using figures that farmers feel are realistic will help to make this analysis more relevant and convincing. Rapid developments in information and communication technologies are leading to the development of apps that facilitate such analyses. As mentioned in chapter 3, SWA has developed an android app for the design of farm ponds and one for the selection of pumps. The latter app not only enables SME farmers to assess, quickly and with high accuracy, the suitability and affordability of a technology or product in the local context, but also to feedback these results instantly with the technology or product supplier using the same app.

Choices made at this stage may have to be revisited at a later stage based on the results obtained during design and initial implementation of the chosen SWS, as evident from M&E. At this later stage, farmers and local coordinators will have gained important experiences that allows them to play a more proactive role in planning further FLID support work.

When making decisions on SWS selection, a farmer meeting should:

- » Coordinate timing and location with the local contact or LCT to ensure maximum participation;
- » Ensure that the meeting ends with a clear understanding of what the next steps will be (and by whom and when).

## Detailed design, joint implementation & PM&E

### Introduction

Before preparing a detailed design and implementation plan and making investments, it is often useful to have farmers involved formally confirm their interest in the proposed work. This strengthens local ownership and ensures farmer commitment to the contributions expected from them, be this in the form of cash for equipment or inputs purchased, or through their labour and provision of locally available materials. Working on the basis of confirmed farmer interest only also gives the the project a tool to choose among farmers or farmer groups in case there is more general interest than the project could handle. A simple format for confirmation of interest can be prepared and shared with the farmers if needed.

*In MIPP, using the approach of working on the basis of confirmed expressions of interest, the project was able to select 10 of the most promising canal systems for improvement from among 70 systems in the area. This selection was based on the strong ownership that was shown by the farmer groups involved for work to be undertaken.*

Using the approach of confirmed interest, it can be expected that the better organized farmer groups, or those with entrepreneurial leaders, will be the first to take the initiative in expressing their interest, while less resourceful groups will take longer to do so. The success of the first groups will encourage others to take part. Follow-up processes to facilitate the involvement of new groups/individuals to the project are therefore important.

In the case where an SWS is to be implemented with a group of farmers – because they share the same water source or plan to jointly use the project’s irrigation infrastructure and equipment – they can be asked to indicate how they plan to collaborate in using and maintaining the equipment or infrastructure; in other words, to provide a basic

operation and maintenance (O&M) plan. Again, a simple format for such a plan can be provided to them by the project. Completing such a document helps to highlight to the farmer the importance of considering the longevity of the project, and the organizational aspects of using the SWS.

Aside from the more technical details of implementing and running an SWS, more general issues and steps to be considered in the detailed design and realization of the selected system. The following paragraphs discuss these for four broad categories of SWS: The main irrigation infrastructure for bringing water to farmer fields, field water application, related agricultural development, and (local) institutional development.

Irrigated agriculture is a complex system in which irrigation infrastructure and technologies, agricultural practices and human organization are tightly linked. Changes made in one area require or often lead to changes in other areas. Farmers often prioritize actions in irrigation infrastructure over actions in the other areas as they seem to offer more direct and tangible results. Projects of commercial actors may have the same bias if their interest is in supplying irrigation hardware. As a result, water shortages caused by poor handling and sharing of water among farmers, and subsequently, reduced agricultural production, are often important bottlenecks that need to be overcome.

### **Participatory design and implementation of irrigation infrastructure and technologies**

Detailed design of the chosen SWS is made possible through the gathering of information and data collected during initial field activities, as mentioned previously in this report. However, for more complex SWS and those that involve elaborate engineering (e.g. ), further collection of technical or other data may still be needed through:

1. *A systematic transect walk* (see chapter 4) with the farmer(s) directly involved if this has not already been done during earlier interactions. The transect walk is necessary to survey the fields and the water source, as well as its current distribution network.
2. *Detailed technical data* collection required for the design of the SWS. This would include gathering the measurements of, e.g., the performance of pumps currently in place, the rate of water flow in rivers or irrigation canals, the size and elevation of fields and their distance

to water sources. Measurements may have to be repeated over the season to understand, for instance, how water availability changes throughout the year. Availability of water may be limited by the end of the dry season when irrigation is most critical. In this scenario, good planning is essential.

The project should try to ensure that farmers are present when taking measurements, and should encourage them to assist where possible, so that they understand the need and relevance of the data for decision-making. It can be cost effective to train farmers in taking measurements that need to be done more frequently. However, farmer should only receive payment from the project when asked to provide labour for arduous and repetitive work, such as land levelling to help the engineers do their job. In all other cases, farmer labour should be considered as part of their contribution to realization of the SWS.

3. *A meeting with farmers involved* is most often requires to discuss and confirm on the data collected from the above activities – particularly if the data suggests that an alternative way to implement the SWS is required, or it casts doubt on the feasibility of the option selected itself.

Following the above, detailed design of the agreed upon SWS is carried out at the project office, as well as a technical and feasibility assessment, covering:

- » The specific technical limitations of the physical realities on the ground;
- » The design criteria, referring back to earlier analysis with the farmers, which will have included cost-effectiveness, complexity of the technologies involved and user-friendliness, the availability of materials required, and how the technology will be maintained. In certain cases, a detailed design and analysis may need to be developed for 2 options;
- » A review of O&M implications of the proposed SWS.

A well-structured farmer meeting to share the results of the project teams' work, and possibly the farmers' internal consultations, to consolidate the design process is required. The discussion would pay specific attention to the O&M aspects of the SWS chosen. These O&M implications can be added to the O&M plan prepared by the farmers – if one was made. The project may need to consider how the design and implications of the SWS option selected

can be made clear to the farmers. Sticks could be positioned on the ground, for example, to indicate possible construction sites, and stones and local materials used to explain hydraulic principles that influence design choices.

This meeting agrees on the concrete planning of activities for the implementation of the SWS, as well as the timing and the specific roles and responsibilities of all involved. Depending on the local context and the SWS involved, a cultural and/or religious ceremony can be an important activity to consider before work commences.

*In Mozambique, ceremonies led by the traditional leader (Mambo) of the region were held before the start of the work on each irrigation canal. The ceremonies involved the appeasing of the ancestors and the water spirit, by offering symbolic amounts of tobacco, wine and money, as well as a Christian prayer. In the local tradition, the water spirit is believed to be feminine and locally it was believed that, for this reason, at least one woman should take part in the ceremonies. Such ceremonies demonstrated that the planning and preparation processes for the irrigation work had been done well, with effective local involvement, and very clearly marked the start of the construction phase. Often, specific contracts required for the work to be implemented were also signed on that day.*

Involving local technicians or artisans in the project's construction work helps to strengthen local capacities in terms of carrying out future repairs, which they can then also carry out to increase their incomes outside of the project. In selecting local technicians, it is better not to employ a member of the farmer group, as this may cause tensions if the



Picture 14: Involving local artisans in construction to build local capacities (Credit: Gert Jan Veldwisch)

other farmers are unpaid. Quality control issues, if they arise, may also affect the functioning of the whole group in that case.

During the construction phase, the project may have to make regular (weekly, sometimes even daily) visits for monitoring and supervision, depending on the chosen SWS. This is particularly important in the initial stage, when parts of the design may have to be adapted and when new insights or ideas emerge during construction activities

Upon conclusion of the work, a meeting needs to be organized with all those involved in the construction. This meeting should 1) evaluate the work done and formulate lessons for future work in similar situations; and 2) formally decide whether the work has been completed as planned and agreed. If the latter is not yet the case, remedial action needs to be agreed upon. Some form of local ceremony may be organized to celebrate the successful completion of the work and to inaugurate the improved irrigation system. This activity also marks the end of the collaboration as formally agreed, and at this stage, the farmers may communicate that they believe the contract – on the side of the project – has been fulfilled, and that it is now up to them to manage the improved water system. Such a statement should be publicly acknowledged and appreciated by the project staff.

### **Introducing and experimenting with improved field application**

Improving the field application of water is a high priority in areas where water shortages represent a significant bottleneck to agricultural production. Field application issues can be addressed by planning and implementing action research and learning activities with farmers (van Veldhuizen et al., 1997) to study what influences water application efficiency, and to find ways and technologies to increase it. Such action research and learning activities work well with a group of 5-10 interested and research-minded farmers, and should involve:

**1. Planning:** A meeting with the farmers should be planned to discuss the basics of water application at field level. This would help to establish the important factors and considerations for farmers when deciding how and when to irrigate, and should lead to the design and planning of simple field tests. Questions for discussion include:

- » *When and how often do they want to irrigate ideally, i.e., if not restricted by water availability?*



Is this based on field observations, such as plant or soil colour or form? Are there fixed intervals between water applications? Are there any reasons why they would sometimes need to irrigate more frequently than expected, e.g. because of climate unreliability?

- » *What current methods of water application are used* e.g., basins, short or long furrows/ridges, sprinklers or drip irrigation? If sprinklers or drip irrigation are used, where does the water come from?
- » *What are the advantages and disadvantages of such application methods*, i.e., flexibility, frequency of irrigation, costs, quality of the technology, link with crops grown or type and slope of the land?

Further to these discussions, it should be identified with the farmers: 1) which methods they would like to test and compare with others; and 2) a currently cropped field on which to study and evaluate each method. In these experiments, it is important to agree clearly who does what, and also, what resources would be contributed by the farmer(s) and the project.

**2. Field studies and measurements:** A series of field observation visits should be carried out to collect measurements on the water-application methods being compared. Two such visits would be the minimum but more could be planned, depending of the methods being studied and the time, interest and resources available. The issues for observation and/or measurement will follow from the discussion of advantages and disadvantages of various methods and tools, but would probably include at least:

- » The maximum and minimum water flow that can realistically be handled by the chosen method;
- » The time it takes to irrigate a field, for instance, a 10x10m plot;
- » The labour needed to irrigate the field: how many hours by how many people;
- » The application depth i.e., the depth of water infiltration in the field after irrigation;
- » Where, how and why water loss occurs;
- » The costs and quality of the equipment in the field.

**3. Concluding review meeting:** The results of these experiments should be discussed and lead to a



*Picture 15: Field testing of Rota Sprayer (Credit: Vandana Thottoli)*

structured comparison of the water application methods studied using e.g., participatory matrix ranking. At this stage, it would be easy to identify with the farmers the main criteria to use in the ranking. Given the overall objective of the action research, overall efficiency in applying water to the field is bound to be one key aspect. Labour requirements and costs of tools should also feature, as well as specific issues from the local context, such as suitability for using the method at low discharges and certain water qualities.

### **Addressing agricultural development issues**

Farmer investments in irrigation often need to be accompanied by improvements in agricultural production practices and access to inputs or services to ensure that investments are profitable. These could involve the production of new crops, improving soil fertility, new methods for pest management, and increased access to agricultural markets. .

Often, an SWS project simply link farmers with organizations and companies with the relevant expertise in above areas or provides their services in an integrated way with them. In all cases, organization or companies involved should have a long-term interest and presence in the area, and be able to engage with the communities after the project ends.

Apart from facilitating the relevant links between farmers and specific supporting agencies in the area of agricultural production, for developments in agriculture to be truly effective, - the project needs to ensure that the main dynamics of the

farmer-led design and implementation approach is maintained. Farmer research and learning groups can again play an important role in exploring the local feasibility of the proposed new methods and practices. Well-known participatory agricultural extension and innovation development approaches and methodologies, such as farmer field schools and participatory innovation development, are options to work on improving agricultural production methods in a farmer-led mode. These methods go beyond the scope of this manual, but the reference section of this guide lists some relevant publications and manuals.

### **Strengthening local institutional development**

Institutional development actions for FLID can cover all efforts to strengthen mechanisms for coordination and cooperation among farmers, i.e., to improve rules and ways for accessing water and organizing O&M of infrastructure, and to handle conflicts between farmers, farmers groups and support organizations. The project and its donors can bring issues of equity and gender sensitiveness into the agenda across all of these actions.

Institutional actions can be necessary at various levels: the level of farmers and their groups (e.g. around a common water source of SWS), a village, or a water-shed or higher. A project's direct role can thus be in the strengthening of farmer cooperation around water use and management (discussed further below). At higher levels, relevant authorities – in Kenya the Water Resources Users Associations (WRUA) and the Water Resources Management Authority (WRMA) – have been set-up to play a role in these activities. A project's scope will influence whether or not it can include activities to for strengthening WRUAs and WRMA as part of its SWS agenda.

It is important to thoroughly understand the **existing patterns of interaction and collaboration between farmers in accessing and handling water** before initiating interventions to strengthen this. Water distribution and management by farmers is often a delicate issue that needs to be tackled with care in order not to disturb any working methods. Relationships between farmers of varying status and power is a key consideration but not something that is immediately obvious. One or two local influential persons, for example, may play a key role in the structure of an informal water management system. These 'structures' may not fit the typical

models of formally organized water user groups, or water user associations (WUAs), based on democratic principles of representation and elected leadership, but they do perform the tasks and roles of WUAs. Sometimes, more in-depth studies by students can help the project to understand local water management mechanisms and collaborations between village members. Reviewing farmer collaboration for water management, and O&M of irrigation equipment and infrastructure, can also be made an important part of a project's key participatory analysis and design activities.

*In MIPP, informal farmer water management mechanisms existed that handled the following tasks:*

- » *Sharing of water: The local view is that everybody has a right to water and that an owner (and often sole investor and developer) of a canal is obliged to share water with other users, but he determines the rules on how and when.*
- » *Organizing O&M: Without any written document, farmers appear to be clear on what their roles and responsibilities are in O&M, following the principle that the right to water brings the obligation to take part in O&M.*
- » *Planning of water distribution: Although difficult to fully understand from the outside, most farmers claim they know well who can irrigate when and for how long.*

Although these informal mechanisms have their limitations and may not always work as hoped, they are relevant enough to justify not directly enforcing an external joint water management model. It is not uncommon that externally initiated formally organized farmer water user groups are hijacked by (new) local elites, thus replacing a working system with an imposed faulty one. It is more effective to address the issues via focused discussions with farmer groups, for example, regarding the O&M of chosen SWS. This would bring to light the current operational practices and create a platform for discussions around how such practices could be strengthened by enhancing collaboration and management. Such discussions can also help to raise and resolve issues around how to deal with non-compliant farmers, and rules around shared maintenance of resources and equipment.

Many of the other activities and interventions that are part of the FLID support work discussed in previous chapters have important local institutional

development dynamics. Most obviously, this refers to the establishment and functioning of an LCT for larger project – as discussed above. While initially, this may just be formed to handle and locally organize a specific SWS activity, the team may (be encouraged to) grow to handle other local water-related challenges. Further, they could be involved in marketing or joint credit access involves development of new forms of collaboration or rules and regulations. The attention to the role of traditional leaders and to gender dynamics before and after interaction with the project are other examples of important institutional issues to be considered in FLID support discussed in previous chapters. Capacity building and institutional strengthening of farmer groups or other local structures and organizations – if needed – have their own specific dynamics and areas of attention. Projects are best advised to mobilize people or organizations with ample experience in this field to assist.

### **Sustainability: Long-term operation and support**

Any intervention to improve current FLID – whether from a government agency, NGO or private company – ends sooner or later. Whether it concerns a few weeks of focused commercial interaction, or an integrated support effort lasting several years, it is important to consider from the outset: 1) what is needed to ensure the continued use and possible further scaling of the SWS after the project ends; and 2) what needs to be done during the project to prepare for this. Local capacities in the following areas needs to be discussed when considering project sustainability:

- » Technical O&M of improved irrigation technologies;
- » Organization of problem solving, repairs and access to spare parts;
- » Handling wider changes in farm management, e.g., the production of new crops and access to the requires inputs, as well as marketing of increased surplus;
- » Farmer collaboration and/or functioning of farmer groups;
- » Local scaling of the chosen SWS, e.g., horizontally to other farmers.

Where relevant, notes on these issues have been included already in previous chapters. Here, these

are brought together systematically, looking at farmer-level measures, the measures taken by farmer groups and villages, and those by FLID-supporting companies and other organizations.

#### **Farmer and local level sustainability**

*Longer-term O&M of irrigation technologies, facilities and systems* is an issue to be considered throughout the project process. It is an important consideration when deciding upon a specific technology/brand/company and/or the materials involved. The continued provision of *technical support and repair services* with related adequate access to spare parts is another key aspect to be flagged when choosing an SWS option. Again, consolidating these points into a basic O&M plan, with the input from farmer and support agents, would identify who is responsible for what, and provide details regarding any cost sharing arrangements.

*In MIPP, with its focus on improving small-scale canal-based irrigation, farmer canal groups had to prepare an O&M plan as part of their interaction with the project. This meant any issues of O&M were explicitly addressed from the start. The detailed SWS design and implementation process of the project led to further O&M tasks to be consolidated into the initial O&M plan developed by the farmers, creating a strong basis for the canal groups to handle the improved systems on their own in the long-run.*

A third and key longer-term sustainability concern is the creation or building of *local capacities to spread the SWS – if successful – to other farmers*, without the need for intensive support from external companies, government agencies or others. This would benefit all, but to realize it, project farmers and other local community members people need to have acquired all the necessary know-how to be able to advise other farmers and help them make appropriate decisions regarding SWS. Through the active involvement (or training on the job) of local people within the design and construction activities, their capacities to scale-out SWS can be strengthened. Farmers or other local actors would also be able to carry out quality maintenance work on equipment and infrastructure if involved in the M&E activities, and could help undertake similar work upon request of other farmers. If, through its participatory processes, the project leaves behind a strong local team/LCT, the chances of further SWS

development and spread are significantly increased.

### **Sustainability and support organizations**

While the above is aimed at ensuring that farmers and local people themselves can continue to use and spread the results of the project, it is equally important that the support linkages created under the project remain in place to follow up after the project ends. Equally important is the sharing of (information on) successful SWS and the FLID support process within the companies and agencies involved to allow for spreading and scaling to other areas, and to create opportunities for less proactive farmer groups to also be supported.

The involvement of NGOs with an existing presence in the project area helps to facilitate field interactions with a project and ensure **continuation and expansion of the farmer and village facilitation and empowerment** work after the project ends. These NGOs may not always be in the position to focus on irrigation development, but they will: continue to operate in the area after irrigation projects have ended; will remain linked to the farmers and villages; can continue to spread

information on successful SWS; and use some of the insights and skills obtained through the project as part of their future activities. The involvement of government extension staff in project activities serves the same purpose – i.e., this increases local insight into the FLID process and use of relevant SWS, and creates a capacity to provide further support the project after it has ended. Although, planning frameworks will need to be conducive for such interactions.

In regards to long-term sustainability for FLID projects, it is certainly also part of the project's role to **link farmers, their groups and/or villages to other support agencies** or actors with other services and resources where possible, for example, in the areas of marketing or access to finance. To this end, relevant companies or organizations can be invited to attend key project activities, such as village meetings or farmer field days. Such activities can easily be designed in such a way that they allow for the sharing of information and experiences of irrigated agriculture by and with other relevant organizations in order create leads that can be followed-up later.

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