Financing Series

Financing Small-Scale Irrigation in Sub-Saharan Africa

Part 1: Desk Study

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gtz

On behalf of
Federal Ministry
for Economic Cooperation
and Development

THE WORLD BANK

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Acronyms

AfDB	African Development Bank
AFR	Agricultural Finance Revised
AIDS	Acquired Immune Deficiency Syndrome
AsDB	Asian Development Bank
BBC	British Broadcasting Corporation
BCEAO	Banque Centrale des Etats de L'Afrique de l'Ouest
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung - Federal Ministry for Economic Cooperation and Development
BNDA	Banque National de Développement Agricole
CBO	Community-Based Organization
CBFO	Community-Based Financial Organization
CGAP	The Consultative Group to Assist the Poor
DFS	Decentralized Financial Systems
FAO	Food and Agriculture Organization of the United Nations
G 8	Group of 8 Nations
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), GmbH - German Technical Cooperation
Ha / ha	Hectare(s)
HIV	Human Immunodeficiency Virus
IFAD	International Fund for Agricultural Development
IRR	Internal Rate of Return
KFW	Kreditanstalt für Wiederaufbau
MDG	Millennium Development Goals
MFI	Microfinance Institution
NGO	Non-Governmental Organization
PTO	Permission to Occupy
ROSCA	Rotating Savings and Credit Association
SSA	Sub-Saharan Africa
SSI	Small-Scale Irrigation
WUA	Water User Association
US$	United States Dollar
UN	United Nations
ZATAC	Zambia Agribusiness Technical Assistance Centre

1 Introduction

1.1 Background

Throughout the world 1.2 billion people have to survive on income levels of less than 1 US$ per day. Approximately three quarters of those live in rural areas and most of them depend on agriculture to sustain their meager livelihoods (37). Agricultural land is often a limiting factor thus confining many rural households to smallholdings. Locked into a scenario where spatial expansion of a household's agricultural production area, due to dense population patterns, is not possible any more, a more intensive use of their assets land and labor through irrigation might be a way forward.

It is estimated that worldwide agricultural production of about 7 million hectares could be intensified through small-scale irrigation (SSI) alone and benefit approx. 40 million smallholders (40). The same study shows that about 10% of this potential is located in Sub-Saharan Africa (SSA), 700,000 ha and up to 4 million beneficiaries respectively. One of the key constraints faced by rural dwellers in utilizing these water resources is the lack of access to capital sources for the intensification of their agricultural enterprises through irrigation, thus preventing an intensification and expansion of production.

In order to achieve Millennium Development Goal (MDG) 1 "eradication of extreme poverty and hunger" concerted efforts are required to create the mechanisms that allow the poor access to finance to develop their available resources to their fullest. Taking into account the importance of microcredit in the eradication of poverty the UN declared 2005 the "International Year of Microcredit". In 2004, the G8 endorsed the "Key principles of microfinance" in Sea Island and the 2005 summit again underlined the importance of access to finance for economic development, highlighting especially conditions in Africa where only about 10% of the adult population has access to bank accounts (9).

The World Bank has commissioned GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit - GTZ - GmbH) to carry out this study on "financing small-scale irrigation in Sub-Saharan Africa". The study will be implemented in a process consisting of three steps or sub-studies:

- step 1: initial desk study with literature review and summarization of information on the existing situation and experiences in the provision of financial services to the small-scale irrigation sector;
- step 2: conduct of a case study in one country of SSA (selected was Kenya where the study will be carried out in July / August 2006);
- step 3: summary of results from steps 1 and 2 and preparation of concepts and strategies for strengthening financial services for promoting small-scale irrigation through the local private sector in countries of SSA.

This report covers step 1. It is divided into seven chapters. Chapter 1 gives an overview of the background and objectives of the study and defines major terms used in the study. A review of available literature provides an overview about the existing data situation. Chapter 2 gives a brief overview of financial systems development in SSA with reference to the micro, meso and macro levels and rural finance. Chapter 3 describes the current situation and major development trends in SSI. In chapter 4, the demand for financial services in SSI-development is estimated, followed by an analysis of the supply side in chapter 5. Chapter 6 summarizes existing situations

and trends, outlines the key constraints for the development of SSI in SSA and provides major conclusions and lessons learned. Finally, chapter 7 resumes with final remarks to the coverage of the topic in literature.

This study is embedded into a broader cooperation between the World Bank and the German Federal Ministry for Economic Cooperation and Development (BMZ) aiming at the development and dissemination of extension concepts for strengthening the delivery of financial services in the water and basic sanitation sectors of countries of SSA. Under this cooperation BMZ has commissioned GTZ to carry out studies with focus on financing drinking water and basic sanitation through the private sector in countries of SSA. In this context, a desk study, two country case studies and a summarizing concept study will be conducted in 2006/2007.

1.2 Objectives of the Desk Study

The main objective of the study to be implemented are to support client countries' and the Bank's efforts to expand the access to financial services to water user groups and individual farmers engaged in small-scale irrigation activities. In this context an interdisciplinary concept is to be prepared for strengthening financial services for the promotion of small-scale irrigation through the local private sector relevant to the situation in countries of SSA. Target groups are small-scale irrigation farmers with insufficient access to financial services.

The initial desk study will focus as a 'state of the art study' on the compilation and assessment of information - mainly through the compilation and review of relevant literature - on the existing general demand and supply situation and available experiences and knowledge on strength and weaknesses of financial services to water user groups and small-scale farmers engaged in irrigation activities in rural and peri-urban areas.

The following are the major issues to be analyzed in the desk study:

- overview on the current situation and major development trends in the demand and supply for small-scale irrigation and potential for development;
- analyze by typical private sector service providers (water user groups) and individual farmers the type of activities and nature of finance involved, how this is financed and the resulting demand for financial services;
- summarize and analyze information on the existing situation and trends, experiences, key constraints and need for improvement and support on the different levels of the financial system in the supply of financial services to water user groups and small-scale irrigation farmers;
- identify, assess and document promising approaches, best practices, instruments/tools, and concepts which might already be available from specific interventions in the financing of small-scale irrigation sector projects (globally and in countries of SSA);
- identify and review general experiences and best practices for financing small-scale infrastructure and other longer-term financing projects for their suitability and relevance for the design of viable and sustainable financial services in the small-scale irrigation sector.

The literature review will mainly be based on published information sources including evaluations, reviews and reports accessible via internet of major donor agencies involved in the relevant sectors.

Overall, it is aimed at to elaborate promotional concepts that are in line with the financial systems approach. The World Bank, GTZ and BMZ have a clear commitment to this approach that recognizes that financial services are part of an interactive system of financial institutions, financial infrastructure, the legal and regulatory environment, and social and cultural norms.

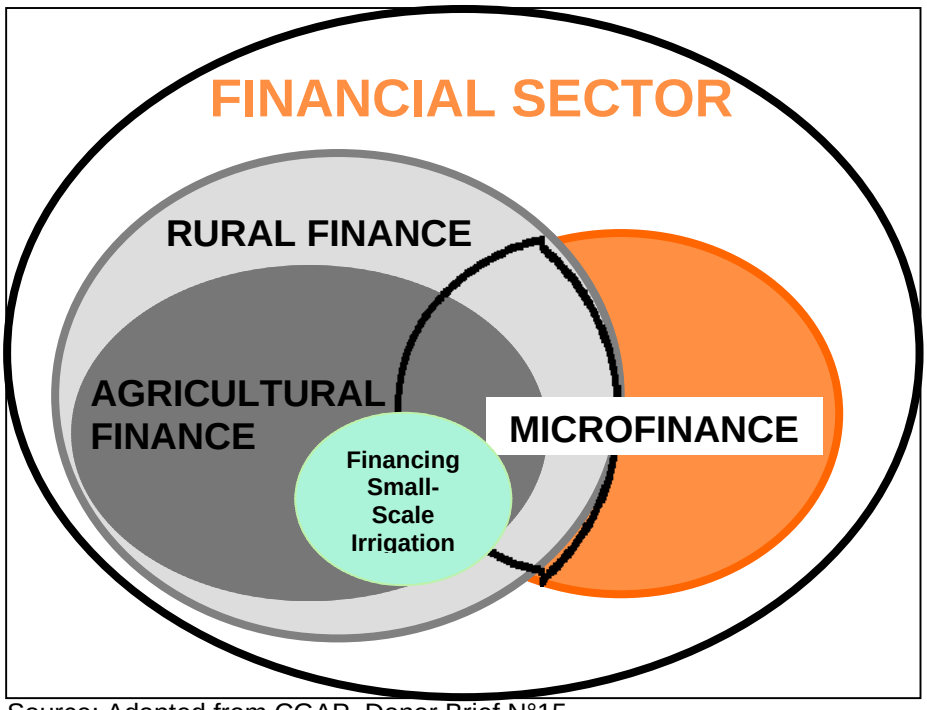
1.3 Definitions

For the purpose of this study the following definitions are being used:

Small-scale irrigation are development initiatives which are undertaken by small farmers who "own and manage an individual plot or are part of a community-managed irrigation scheme". The term "*small-scale irrigation*" therefore fits a wide range of irrigation activities ranging from bucket and drum kits with low-cost drip lines of individual farmers to irrigation schemes of several hundred hectares in which individual small farmers participate as users. A Water Users Association (WUA) is defined as "a group of registered farmers, within a given geographical location, who have come together for the purpose of utilizing a common water resource for irrigation and drainage development. The members are bound together by agreed by-laws, which specify the membership, functions and management of the association" (55).

Rural finance refers to financial services offered and used in rural areas by people of all income levels. *Agricultural finance* is a sub-set of rural finance dedicated to financing agricultural activities, such as loans to buy fertilizer or for marketing crops, or insurance products designed to meet the specific needs of farmers and agricultural workers. Financing small scale irrigation belongs into this category. *Microfinance* means financial services for poor and low-income people, and it encompasses the lower end of both rural and agricultural finance. (32)

Figure 1: Financial services in rural areas



Source: Adapted from CGAP, Donor Brief N°15

1.4 Review of Available Literature

There is a growing body of research around the development of small-scale irrigation technologies and financing. The literature available can be crudely grouped into 5 thematic areas for SSI and into 4 thematic areas regarding finance:

- Technology development: The past 2 decades have seen the development of new SSI-technologies and the adaptation of existing systems to address the needs of the small-scale irrigator. The progress made has been documented and the relevance of the technologies to reduce poverty is well covered.
- Scope for small-scale irrigation: The development of new technologies required has also led to have a new look at the assessment of existing irrigation potentials with regard to water and land resources. These new technologies open new opportunities to impoverished communities and individuals alike whether they live in rural or peri-urban environs. Assessments of the significance of various technologies for different resource potentials has so far only been documented with regard to specific cases e.g. dambo irrigation. An accurate estimation and analysis of how much of a country's land and water potential could be utilized employing SSI-technologies is still not available.
- Assessment of small-scale irrigation: Published information around the economic impact of SSI-technologies is so far very scarce in the public domain. Much of the information that could be accessed for this study is often based on isolated cases in a country quoting local costs and benefits in local currencies. In addition much of the specific data are spread over a time horizon of 10-15 years. Despite the patchy information base the publications indicate the significant contribution the use of the technology makes to the improvement of incomes of impoverished households. Unfortunately specific progress and evaluation reports of various donor organizations, which could reveal the actual impact of the various technologies were out of reach for the authors.
- Institutional development: The aspect of institutional development to address the specifics of SSI-implementation is so far not been satisfactorily addressed. Institutional development on grass-roots level limits itself to the establishment of WUAs and cooperatives in group and community schemes. Little attention is in this respect given to the individual operators and their needs for umbrella organizations for this diverse target group.
- Microfinance: Microfinance has proven to be an effective tool for reducing poverty and helping poor people to improve their lives. Worldwide, 'best practice' in microfinance is becoming a standard. Microfinance is a very broadly covered topic. The latest publication of Helms (2006) '*Access for All'* for example, lays out what the Consultative Group to Assist the Poor (CGAP) and others in the development field have learned over the past ten years about the true potential of microfinance and of integrating the world's poor into the financial mainstream.
- Rural finance: The question of how to best develop an effective rural financial system has been much debated over the past three decades. A significant evolution in rural development strategies has taken place over the last decade. Liberalization and market-oriented approaches have removed distortions in rural financial markets and enhanced the prospects for the long term development of a sustainable rural financial system. However, for the moment they have removed the availability of formal financial services in rural areas.

The topic is well covered by all relevant donors, especially the World Bank and the Food and Agriculture Organization (FAO) have made substantial contributions. Other major donors, such as the International Fund for Agricultural Development (IFAD), the IDB, the African Development Bank (AfDB), the Asian Development Bank (AsDB) fundamentally changed their rural finance strategies over the last decade.

- Agricultural finance: Agricultural finance is at the crossroads. It currently suffers from a dichotomy in purpose and direction, in view of increasing concerns about food situation as a result of world population growth and accelerated world food demand especially among low-income, large population countries. The challenge for agricultural finance in agricultural development lies in the support for solving the real sector challenge by creating rural financial markets that provide the economic actors with sustainable financial services.

  The FAO-GTZ series 'Agricultural Finance Revised' reviews the different experiences and sets out the issues involved in the changing status of agricultural finance in developing countries. Besides that, the coverage is rather moderate.

- Financing small-scale irrigation: A very limited number of reports on the topic itself 'financing small-scale irrigation' exists (Ruotsi 1999, Aeschliman 2001, Abermethy, 2002). For interventions in the field of finance for small-scale irrigation development there are up to now no interdisciplinary concepts available through which the access to financial services of private water user groups or small-scale farmers could be promoted.

  In general, the documented database on already existing and promising experiences and approaches in financing small-scale irrigation through the local private sector remains - globally as well as for the situation in countries of SSA - extremely limited.

2 Financial Systems Development in Sub-Saharan Africa

Available information suggests that the financial sector in countries of SSA is generally lagging behind that of the rest of the world[1]. A key characteristic of the financial sector in SSA is that the stock of bank credit to the private sector is very low, when compared with the situation of other developing countries. The only notable exceptions are South Africa and Mauritius which have a well developed financial infrastructure (69). In terms of efficiency, the interest rate spread increased from 8.2% in 1990 to 12.4% by 2003. In the two periods, the interest rates spread for SSA was the highest in the world implying that the SSA banking sector remains the least efficient in the world[2]. (69)

The main problem in countries of SSA is that the effective provision and outreach of financial services to the economy and the population is inadequate. According to

[1] The M2/GDP ratio, which was 32% in 1990, increased marginally to 37% by 2003. In the case of East Asia, the corresponding figures are 63% and 159% respectively. Sacerdoti (2005) even reports that for most SSA countries the ratio of M2 to GDP was in the range of 15 to 30% only.

[2] Sacerdoti (2005) points out that in fact the spread narrows when more banks enter the market. Spreads have been declining in recent years in countries such as Burkina Faso, Senegal, Cameroon, Cape Verde, and Gabon, reflecting more competition and ample liquidity in the banking system.

studies conducted by the World Bank, less than 10% of the population has access to financial services.

The financial system approach has the dual aim of creating an infrastructure for the provision of effective financial intermediation services and creating efficient and viable financial institutions. The causes for the undersupply of financial services are found on the level of financial institutions (micro level), the supporting and sector institutions (meso level) as well as in the enabling environment (macro level). Each level will be reviewed in turn with an adjacent regard to rural finance in SSA.

2.1 The Micro Level: Financial Service Providers

The backbone of financial systems are retail institutions that provide services directly to clients (13). Potential service providers range from informal to formal. A typology of rural finance providers is given in chapter 5.1.

Financial systems development on the micro level is about building sound domestic financial intermediaries that can provide financial services to poor people on a permanent base. Financial deepening and financial broadening remain the major challenges of today. Promising approaches include ‘upgrading’, ‘downscaling’, ‘greenfielding’ and ‘linkage banking’.

A common feature in countries of SSA is limited know-how and the need for capacity building on institutional level. The number of professionally acting financial service providers with client-oriented services and a potential for further development and sustainable operations remains limited. The challenge in SSA is to promote promising institutions or to create new ones, where local institutions do not exist in sufficient numbers. Promising developments are the emergence of Community-Based Financial Organizations (CBFO) and the growing interest of commercial banks in serving untapped markets.

The general approach to rural finance developed over the past decade emphasizes the importance of creating *sustainable financial institutions* providing *a range of financial services* that are based on *client demand*. (88)

2.2 The Meso Level: Financial Infrastructure

The meso level refers to the overall infrastructure of the financial system. This infrastructure can facilitate or obstruct the emergence of financial intermediaries and includes a complex and varied set of actors. (13) The meso level includes the basic financial infrastructure and the range of services required to reduce transaction costs, increase outreach, build skills, and foster transparency among financial service providers. It includes a wide range of players and activities, such as auditors, rating agencies, professional networks, trade associations, credit bureaus, transfer and payments systems, information technology, technical service providers, and trainers. (32)

In all these areas and among these players, significant progress has yet to be achieved in SSA countries. Institutions and structures on the meso-level of financial systems are either non-existent or extremely weak. Building markets for support services, and sharing the risk of creating such markets is vital for the long term viability of retail financial institutions.

The key constraint to extending access of financial services on the ground is a weak human and institutional capacity at the micro level. Therefore, it is imperative to

ensure that an adequate supply of technical service providers and education institutions exists to build the skills of existing and future managers and staff within financial institutions that serve the poor. (32)

In future, technical service providers, payments and clearing systems as well as professional networks will play an increasingly important role in reaching new client groups (financial deepening), especially in rural areas.

2.3 The Macro Level and Enabling Environment

Macroeconomic policy as well as legal and regulatory framework conditions play a crucial role but are in countries of SSA often poorly developed or not supportive of agriculture and financial sector development. In most of the SSA countries, the enabling environment is not at all conducive:

- regulation of financial markets is generally weak and the supervisory authorities do have limited know-how, especially in view of implementation and monitoring of legislation;
- the legal, judicial, and regulatory framework governing enforceability of claims and property rights are frequently inadequate;
- collateral and real estate registration is limited;
- the land tenure system, given the tradition of collectively held land is a major obstacle to agricultural credit. This aspect is further developed in chapter 3.1.

In short, the legal, judicial and regulatory frame conditions in SSA show basic weaknesses which results in major limitations of the functionality of financial systems.

Governments and donor agencies presently acknowledge the necessity of substantially strengthening the enabling environment for private sector development. However, in the past they have supported direct government interventions and supply-led credit programs to achieve short term social equity objectives, which in most cases have performed poorly due to inefficient management and political interference. (16)

While measures to create a favorable policy environment for agricultural and rural finance are necessary, they may not be sufficient in themselves. The development of rural financial markets requires also a supportive *legal and regulatory framework*. Formulating appropriate prudential banking laws, financial contract laws and procedures for the effective enforcement of these contracts are important areas for intervention.

Favorable agricultural policies create an environment in which private financial institutions are willing to service farmers. Appropriate macroeconomic policies and the provision of essential rural infrastructure and support services such as roads, markets, agricultural research and extension are crucial to making farming more profitable, especially in countries of SSA. As long as profitability of farming remains low, lending for agricultural production will be risky. Therefore, addressing profitability of farming is a crucial issue in *agricultural sector policy*.

Reforms of the rural financial system should be a vital part of financial sector reforms. The challenge is to promote a variety of viable financial institutions that are client oriented, that mobilize deposits efficiently, and that provide access to loans to a broad spectrum of farmers, agribusiness entrepreneurs and other rural clients. The new financial market approach does not ignore the important role of government in

reducing risks and increasing confidence, by improving information and providing incentives to improve the performance of financial intermediaries. In particular, the government has specific powers regarding taxation, subsidization, regulation and enforcement that can influence the direction of desired developments.

2.4 Rural Finance in Sub Saharan Africa

The rural finance sector faces in many countries of SSA particular challenges. The low population density in many regions, weak infrastructure (transportation, communication and energy) and the information asymmetry between clients and financial institutions significantly increase transaction costs and hamper the connection of rural areas to the financial system. External risks of agriculture (climate and / or price fluctuations), low levels of applied technology, production risks (e.g. pests and diseases) and seasonality of many agricultural activities as well as low productivity and lack of diversification are further problems. The weak institutional capacity of rural finance service providers is another important constraint.

During the three decades prior to the 1990s, supply-led and directed credit programs were an important tool to spur agricultural development in many countries of SSA. It was argued that enhanced access to credit would accelerate technical change, stimulate agricultural production and improve rural incomes. However, this approach failed to produce the desired results. In fact, directed agricultural credit programs proved to be subsidy dependent, prone to disasters, and ineffective in achieving its objectives. Instead of building a sustainable financial infrastructure, many of the directed credit programs undermined the development of a viable financial market. The flaws of directed credit led to the formation of a new paradigm, the financial systems approach which focuses on the primary goals of rural development: increase of incomes and poverty reduction. It is based on the assumption that a commercial approach is much more likely to reach large numbers of clients on a sustained basis.

The financial systems approach has the dual aim of creating an infrastructure for the provision of effective financial intermediation services and creating efficient and viable financial institutions. The key aspects are outreach, sustainability and performance with due emphasis on market orientation, decentralization, and savings mobilization.

This study is conducted in the light of this paradigm. It follows the financial systems approach and traces the evolution of 'best practice' in the field of rural finance. 'Financing small scale irrigation' is not an attempt to return to discredited approaches but rather to highlight innovative ways that are in line with the financial systems development approach.

3 Current Situation and Major Development Trends in Small-Scale Irrigation (SSI)

3.1 The Need for Small-Scale Irrigation

Population pressure in many countries has exhausted the access to fertile arable land suitable for sustained rainfed cultivation. Millions of subsistence farmers have been forced to toil land with marginal potentials to meet their household food requirements. These physical constraints are often compounded by harsh climatic conditions with scarce rainfall and a more pronounced seasonality of the rains.

This increases the need for the utilization of surface and groundwater resources for agricultural production. A range of technological concepts have been developed to suit a wide range of physical and socio-economic situations with the objective to stabilize or increase the income of the respective users.

3.2 Socio-Economic Setting for SSI-Development - Land Tenure System

Security of tenure is a crucial factor in the development of underutilized land resources. In many parts of Africa farmers cultivate arable land under the regionally prevailing traditional tenure systems, often allocated on the basis of a household's subsistence requirement. Such "PTOs" (Permission To Occupy) are usually issued in writing by the traditional authorities and provide families over generations with tenure security for their fields. The access to other communal resources such as water, forests, and land for building plots and grazing areas may also be controlled by the traditional authorities through different mechanisms.

It is a widely perceived view that individual land titles provide the best conditions for sustained economic development as the owners can make investment decisions on a medium to long term basis without fear of losing the land once it has been developed. Estimates for Africa show that approx. 75% of all irrigated land is cultivated by smallholders under communal or traditional tenure systems (23). This would suggest that the existing tenure systems are not curtailing irrigation initiatives.

FAO research (23) shows "that land tenure reforms which give traditional land users both communal and individual de jure ownership rights, are essential in creating effective and democratic rural and irrigating communities. These communities are able to exercise choice, be innovative enough in protecting their property rights and safeguard their economic interests". But it is further argued that a conducive environment is more important for growth and intensified production than formal land titles. Many of the investments in SSI-technology are investments in portable equipment and not tied to the land.

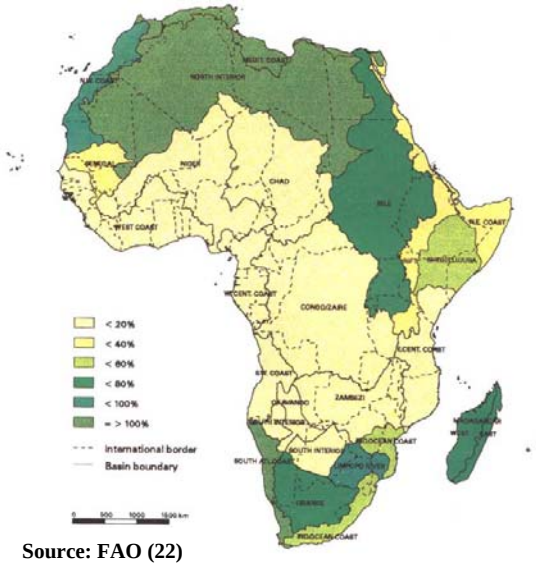
It is therefore important to take cognizance of this fact when designing financial services in an environment where land can not be attached as collateral for loans. In this context it is also important to consider the gender aspects of customary tenure systems. Although, women account for a large number of smallholder farmers, in many societies their legal rights to the land they are toiling are severely curtailed.

3.3 Technical Concepts for SSI in the Smallholder Context

3.3.1 Water Sources

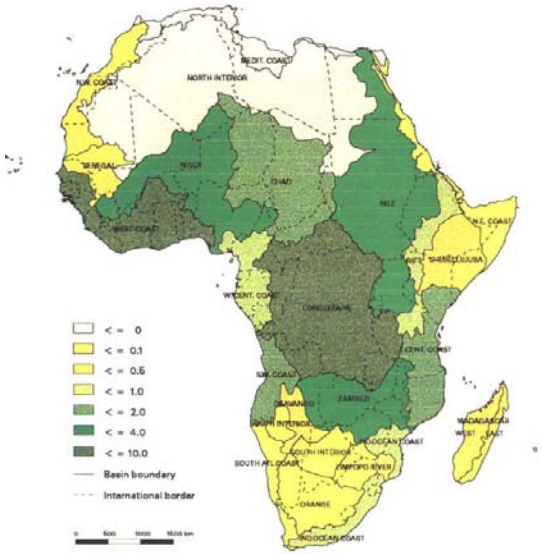
The irrigable land potential across Africa of about 42.5 million hectares is distributed over the different African basins (22), it represents about 7% of the continents total land area. Currently irrigation activities in SSA cover an area of about 5.5 million hectares (42), no analysis is available on the share of SSI in the total irrigated area. In West-Africa alone 34% of the existing irrigation potential has been developed so far (73), utilizing to a large extend (94%) surface water. Figures 2 and 3 give an indication of where the untapped potentials for irrigation are.

Figure 2: Percent of Irrigation Potential Developed



Source: FAO (22)

Figure 3: Basin Potentials in Mio ha



Source: FAO (22)

3.3.1.1 Rivers

Rivers are a major source of irrigation water. Depending on the water abstraction method the utilization of river water can require considerable investments depending on the size, distance and topography of the irrigation area, and the geo-physical conditions of the river system at the point of abstraction, etc. Abstraction methods are either with pumps or gravity systems depending on the topography. (22)

SSI will generally be confined to the arable land along the respective water source. This means in many cases dense populations resulting in high numbers of people applying or wanting to apply the technology and thus a good opportunity to establish WUAs and the required support structures.

3.3.1.2 Groundwater

Generally high groundwater tables in alluvial flood planes along river systems are an important water source for many small-scale irrigators. Especially in West-Africa the livelihoods of ten-thousands of smallholders is built around the “Fadama”-irrigation system. Wells and tube-wells in connection with pumps of all shapes and sizes are used to tap into the shallow groundwater tables along the streams. The high

groundwater recharge rate close to the rivers allows for a high concentration of irrigation activities in those areas.

Shallow aquifers further inland are also accessed with similar pump technologies. However, geological and hydrological conditions often limit the extent of water abstraction for irrigation. Often these water sources are used in competition with public water supply systems and water use for irrigation may be subject to restrictions.

3.3.1.3 Lakes / Dambos

Dambos are geologic depressions with underlying clayey strata that prevent seepage, which during the rainy season fill up with runoff from the surrounding plains. They are found throughout the savannah of SSA (42), Zambia, Zimbabwe and Malawi alone have more than 5.0 million ha of dambos. Traditionally farmers have planted crops along the water line as it slowly recedes due to evaporation and other water uses. Appropriate technology such as low cost pumps allows farmers to use this resource on a much bigger scale. Hand-dug shallow wells, in connection with bucket systems, treadle pumps and pressure pumps are in wide use to irrigate different plot sizes.

Dambo development for SSI-use provides an important element in a regional economic development context. The geographical spread may in some areas represent a stumbling block for the establishment of an efficient financial support system due to high transaction costs, but it offers economic development opportunities based on irrigation across large rural regions.

3.3.1.4 Water Harvesting Systems

With the development of new low-cost irrigation technologies water harvesting is a promising option in many parts of the world. Roof water collection is widely used for addressing household drinking water requirements. This technology also renders itself to be used in connection with bucket and drum kits for small-scale irrigation in garden plots in rural as well as peri-urban and urban areas. Furthermore, the undulating landscape in many countries of SSA renders itself for the construction of small dams and other water harvesting technologies, which can be used for domestic and agriculture water use. (46)

3.3.2 Irrigation Technologies

3.3.2.1 Bucket / Drum Drip Irrigation Systems

Bucket and drum drip irrigation kits for irrigation come in different shapes and sizes. These systems are particularly suitable to water-scarce regions, and they are easy to integrate into a household system in an urban, peri-urban and rural environment and especially well suited for the production of higher value cash crops. Water sources can be nearby streams or lakes, the public water supply, roof water collection devices as well as a variety of pump systems extracting groundwater. System expansion can occur through an increase in the number of small units or the upgrading to larger units. (40)

On the Deccan Plateau in India “kits” include the drip lines and vegetable seeds. Investments range from US$ 5 for a “bucket kit” (10-20 m^2), to US$ 90 for “drum kits”

(up to 2000 m²). Accompanying seed packages may range from $ 5 to $100 depending on the quality of seed. According to this study farmers annual net profit ranges between US$ 8 to US$ 252 for some of the larger units. Water requirement for a 100m² unit ranges in Kenya between 60 – 80 liters/day (42).

Reports from various countries (e.g. India, Kenya) suggest that the dissemination of these technologies is hampered by the availability of appropriate finance mechanisms. The great versatility of the bucket and drum systems allows them to fit into households in many regions, as they can be used in connection with a wide range of water sources.

3.3.2.2 Low-cost Shallow Wells and Shallow Tube-Wells

For the intensification of their production systems farmers are tapping the groundwater where water tables are within reach. Most of the wells are sunk on individual plots to provide water for supplementary irrigation.

Hand-dug large-diameter wells can be used with a variety of water lifting devices. If the water table, inclusive draw-down under pumping conditions, does not exceed the depth of 6-7 meters suction pumps (treadle, pressure, and other engine-driven pumps) may be used. Rope & washer pumps may be even more limited with regard to the depth of the water table. However, hand-dug wells can also access water tables in much greater depths, in such cases water has be lifted either by buckets or by hand- or engine-powered submersible pumps. The choice of lifting device is guided by the discharge capacity of the well and the financial capacity of the water users.

Shallow tube-wells are small-diameter wells (mostly cased with PVC pipes) sunk by different techniques depending on the physical properties of the underground using drilling techniques (e.g. rotary rigs, or percussion bailers) or jetting methods (washbore technique). The "washbore" [3] technology is being widely applied to construct tube wells, especially in the riverine alluvium along rivers in West-Africa, soil and underground conditions permitting.

These shallow tube-wells are comparatively cheap to construct, though costs differ considerably from country to country. From Nigeria it is reported (73) that the cost has been lowered to US$ 79 per tube well (1992) while in other countries in the region the costs are a multiple of that price (Ghana US$ 313 -1992; Burkina Faso 1995 and Niger 1991 US$ 200).

In northern Nigeria, washbore constructed tube wells in connection with small engine-driven pumps have led to a large increase in irrigated plots (73). World Bank had between 1983 and 1990 supported the establishment of about 15,000 tube wells. The success of this program led to the establishment of another Bank initiative for the construction of a further 50,000 units. The expansion also gave rise to the establishment of private drilling contractors.

Such wells often yield enough water for the irrigation of up to 1 ha. The investment costs need also to be seen in connection with a lifter pump and in-field distribution system. The total development will be in a magnitude where farmers will require medium term investment loans and short term finance for working capital.

[3] Construction method: Water is pumped at high velocity into the upper end of a vertical pipe. At the bottom end the water jet washes away all soil material as the pipe is lowered into the ground.

Experience from West-Africa has shown that this technology in particular has been and is in high demand in specific regions. This should allow for the effective establishment of rural financial intermediaries in these 'small-scale irrigation zones'. In Nigeria, parastatal organizations provided finance in the initial phase, though with a varying degree of success as far as repayment rates are concerned.

3.3.2.3 Treadle Pumps

On the side of manually driven treadle pumps there are basically two types in use, lifter pumps and pressure pumps. Both types extract water from depths up to 7 meters. Lifter pumps just deliver water to the surface, where it is then conveyed by gravity distribution systems. A lifter pump such as the 'money-maker' as it is called locally costs a Kenyan farmer about US$ 60 and has the potential to irrigate up to about 0.4 ha; in complementary irrigation systems areas of up to 1 ha have been served (42). Pumps are now even manufactured in Kenya. In this country an annual expansion potential of up to 8,000 hectares irrigation has been estimated. The expansion of the program is, however, slowed down by the target group's lack of access to small credits.

Pressure pumps are very versatile and can suck water from wells and other sources and pump it even on the surface under pressure. This makes them suitable for uneven agricultural terrain to feed gravity systems delivering water to higher elevations on the ground or water tanks, drums, and buckets, but they are also being used directly connected to drip lines and even low-pressure sprinklers. Unit cost of these pumps range between US$ 140 – 180 in different countries. These more sophisticated pumps do have a lower output of water and deliver water for up to ±2000 m² (0.2 ha); they allow, however, for overcoming topographic constraints with regard to the water access point and the surface of the land to be irrigated.

Treadle pumps are being owned by individual farmers or by groups of farmers. Pumps are movable and can therefore be used at different locations. Ownership patterns are governed by the actual irrigable plot size and the source of irrigation water, but also by access to micro-credit.

3.3.2.4 Rope & Washer Pumps

These pumps are often built from locally available materials and therefore comparatively cheap. Reports estimate the construction costs for a unit between US$ 20 – 60, depending on the sophistication of the device. Performances of up to 1,000 liter per hour have been recorded, thus providing water for up to about 2,500 m². Rope & washer pumps can lift water from up to 5 meters depending on the precision of the engineering. They can be used in vertical positions over wells as well as pumping at angles of up to 45º from rivers, lakes, and dambos. These pumps deliver non-pressurized water and therefore depend on gravity distribution systems. (40)

3.3.2.5 Hand-Operated Pumps

Hand-operated pumps are in use in many parts of the world. This manual water lifting device is widely used for household water supplies, for irrigation purposes the technology is also of significance in connection with bucket and drum systems. These pumps are often installed and maintained by the state and/or operated by the community. WUAs can play an important role in establishing and maintaining such

devices. Hand-operated pumps often have submerged pump elements and are then able to lift water from greater depths.

3.3.2.6 Engine-Driven Pumps

The introduction of small engine-driven pumps (electric, diesel, petrol) has been a major factor in the expansion of small-scale irrigation. In the past countries of SSA have mainly had access to relatively costly 'European' technology. For instance a 2 HP diesel-driven centrifugal pump from a European source costs up to US$ 600, while an Indian farmer can buy a locally built equivalent model for a third of this price (57). Petrol and diesel engine powered pumps are movable and offer therefore greater versatility in their use. They can be moved to different pump positions on water sources and can hence be shared by different owners.

Electric pumps are usually substantially cheaper to purchase than petrol and diesel powered pumps, but they depend on a reliable access to the grid at the pump station. A further advantage is their low maintenance requirements compared to petrol and diesel engines.

All engines can be fitted with a variety of high and low pressure circular pumps and therefore be used in a wide variety of circumstances, e.g. lifting water to greater heights, pumping water over longer distances, using with gravity, drip or sprinkler systems.

The cost of a distribution system such as sprinkler or drip lines may need to be added to the bill, depending on the method of water distribution in the field. This represents a relatively high investment for a smallholder which can only be undertaken with access to financial services and managed with close technical and financial support. In larger groundwater abstraction schemes the establishment of WUAs is of similar nature as the one described below for gravity-fed water supply systems.

3.3.2.7 Gravity-Fed Water Supply Systems

Depending on the prevailing topography along a water course, there is a wide variety of gravity based options available, from individually operated furrow irrigation to systems with head works and distribution networks for several hundred farmers. Unlike the other systems described above, which are largely owned and operated by individuals or small groups of farmers, gravity systems often bring together many farmers in a group, who share a communal water source. It is also in such circumstances where WUAs play an important role with regard to systems operation, maintenance and water management.

Gravity systems can be based on open supply channels with on-field furrow irrigation, or using pipelines in connection with sprinklers or drip systems. Investment costs vary depending on size and sophistication of the conveyance system. The initial investment costs per ha vary considerably, but also proper maintenance and operation provide many communities with a technical and financial challenge. The need for working capital arises with the maintenance of the water supply infrastructure and the on-field equipment. In the first case it will be the WUA who has the responsibility to maintain the infrastructure, but in the latter it will be individual farmers who will require access to credit.

Alternatively gravity designs may be based on head works and a network of underground pipelines that convey the water to individual plots or distribution points

accessed by a group of farmers. In-field technology can vary widely with sprinklers and drip systems most commonly used. Though the technology differs, the split of financial and managerial responsibility between WUA and farmers are the same as in open systems (on-farm versus off-farm investments), only the magnitude of financial requirements involved may be different.

The size of some of these schemes is quite large and involves considerable investments in the common infrastructure as well as on individual plots. In Kenya the state subsidizes to varying degrees the construction costs of the main distribution system, whilst farmers have to finance the balance, i.e. up to 50% of the total investment costs, through group and individual loans. (55)

3.4 Potential for Irrigation Development

Only a small fraction of Africa's irrigation potential has been developed so far (see also Figures 2 and 3 above). Financial commitments for the development of large-scale irrigation schemes have been on the decline for many years. In past decades large perimeter development had been the central focus in irrigation design and construction. Partly due to the varied success of these mega-projects and their environmental fragility partner governments and donors have reviewed their strategies.

With the development and refinement of a great variety of small-scale irrigation technologies it has, however, become possible to reach large number of households. Some of these allow the utilization of some resource potentials (land and water) which had not been considered for irrigation development before.

However, to fully utilize Africa's irrigation potential, development will need to be balanced between large-scale and small-scale irrigation schemes. The paramount design principle needs to be governed by the principle of the 'most effective design' in utilizing the limited resources most efficiently.

3.5 Opportunities for SSI-Development

The definition of small-scale irrigation embraces a broad range of irrigation activities. A range of technologies have been developed for the utilization of different land and water resources. Especially bucket and drum as well as treadle pump systems target specifically the poorer segments in the population with an enormous potential for broad-based use in rural, urban and peri-urban areas in a variety of agro-ecological and socio-economic settings.

With the "dambo" development the focus is largely on supplementary irrigation of rain-fed crops to improve food security, but it also offers the opportunity to venture into cash crop production. It centers on the utilization of a very specific resource base widely available but so far much underutilized in large parts of southern Africa. The dispersed occurrence of these dambos provides a good opportunity to spread economic development over a large region and contributing towards improved food security at the same time.

Ground water abstraction has its range of proven technologies. Investments by the farmers are required to utilize these potentials. Depending on the local circumstances a variety of SSI-technologies are available to suit the various conditions under which this resource can be developed. A spectrum of manually-operated pumping devices

to technically and financially demanding engine-driven pumps are available to utilize the enormous ground water potentials.

Contrary to large-scale irrigation development, which requires decision-making by technical and political levels as well as national and often international financial institutions, SSI development is largely driven by individuals and small groups. It is based on their initiative and will to better their livelihoods. What is however required is to create the support mechanisms, technical and financial, that enable agricultural entrepreneurs to realize their business objectives. (26)

3.6 Implementation of SSI

The utilization of the SSI potential progresses much slower than the market would demand. There is great demand reported from potential users. Most technologies are actually basically already available for dissemination and adoption in many countries. An increasing number of these irrigation devices are already manufactured under license in a number of countries of SSA. Decentralized production of SSI technology should also lead to a more effective and efficient supply of spare parts and speed up necessary repairs.

The lack of adequate finance has been identified as the biggest stumbling block preventing an even faster adoption of the new technologies. To stress the point there is not only a lack of financial products, but in many parts of SSA there are only very few rural financial intermediaries working and supporting the potential market for SSI development.

There have been mixed results with leasing arrangements (4), especially with engine-driven pumps. Lessees are often failing to properly maintain leased equipment or overuse it, thus contributing to frequent breakdowns and shortening engine life. Whilst there is a lot of merit in such initiatives, there is a need to monitor them more closely and develop them further.

Besides the financial and engineering aspects of SSI development, there is a great need to advise irrigators in the correct and efficient use of these technologies. It is a massive challenge which the conventional government agencies can not address on their own in most countries of SSA. Whilst there is also an important role for NGOs to play, community-based organizations (CBOs) such as WUAs need to be empowered to provide such services on the ground to their members.

Research into smallholder agriculture and into SSI in particular is very limited in countries of SSA. As a contrast in India there are 26 universities involved in irrigation research (57). That country renders itself as a learning ground for countries of SSA since its conditions for smallholder development (farm sizes, tenure systems, etc) and some of its agro-ecological conditions are comparable.

3.7 Economic Aspects of SSI-Development

In traditional land tenure systems land was allocated to rural households on the basis of their subsistence needs, often small holdings range therefore between 1 – 3 ha in size. On many of these farms productivity levels compare favorably with larger farms (67). The availability of low-cost irrigation technologies and related equipment has started to unlock large human and natural resources through individually owned and operated small-scale irrigation initiatives. The available literature suggests that operators realize high returns on their investments for these units.

The aggregation of these numerous irrigated small plots makes them in many countries an important economic factor, which will increasingly need the attention of political decision makers. Irrigators will demand the provision of technical and financial services, and will need to access national and international markets for their products.

To ensure the most effective utilization of available resources, especially the development of larger water sources is for economic reasons ideally to be organized in communal schemes with umbrella organizations such as WUAs. In such cases the state might need to contribute substantially towards the initial investment costs, especially the cost for the bulk infrastructure. 'Mixed' finance has proved a successful model in Kenya for communal gravity systems where the state sometimes carries up to 50% of the initial investment costs as a grant contribution, the other part of the investment has to be raised by the beneficiaries. Whilst the internal rate of return for the overall investment is still positive, it would be difficult to burden the participating farmers with the full costs of the development. Besides the direct benefit to the participating farmers such larger initiatives will also have the positive effect of providing a focal point for a wide range of services which can be accessed by their respective WUAs on behalf of the individual farmers.

Given the large potential for SSI and irrigation in general it can not be assumed that all efforts of the farmers will only be geared towards the production of high value cash crops. Often farmers will employ this technology also as a priority to ensure their own household's food security. Thereafter they will, production and market environment permitting, produce higher value cash crops for the market. The rate of adoption for such enterprises will depend on the costs of the inputs, an attractive financial cost/benefit ratio and the support system that comes with it.

The role of a **functioning market** is paramount for the success of SSI initiatives. Irrigation technology may increase production, but it doesn't suffice to double or triple production for farmers to render the activity profitable. If products cannot be sold at the market, farmers will – in most cases - loose, if higher investment costs are involved. Therefore, any irrigation activity has a close relationship to market access and market creation respectively must be taken into consideration.

The **internal rate of return** of irrigation investments is basically determined by the cost and income streams. Technological innovations do provide low-cost equipment that can be locally produced and are simple to be installed, operated and maintained. Past experiences have shown that high investments in large irrigation perimeters often fall short of their original profitability projections. For SSI there are only limited data available, but experience so far shows very attractive cost / benefit ratios for many of the technologies. This can apply to simple bucket systems in towns and peri-urban areas selling vegetables on the local markets as well as for rural farmers producing high value crops for the urban and overseas market (e.g. in Kenya).

It is crucial for economically successful irrigation to tailor the technical design to the actual resource base available (land and water), the technical and management capability of the beneficiaries, and a realistic judgment on the need for accessible support services.

In the accessed literature the information on investment, replacement and variable costs for the different SSI technologies is very sketchy. This data base does not allow any serious financial or economic analysis, but it is nevertheless good enough to identify trends. Authors refer to the low investment costs and the achievable net margins, but depreciation for the equipment is generally not discussed. For instance

a simple bucket system costing US$ 10, allowing to irrigate 40 m², represents an investment of US$ 2,500 per ha, which might need to be depreciated over 2-3 years resulting in annual depreciation costs of US$ 833 – 1250 per ha. In comparison some gravity-based communal schemes providing water for an irrigation area of 100 ha with high initial investment costs can be depreciated over 5 years at a rate of US$ 400/ha. Despite the large difference in investment costs per ha the small units are on par with the compared larger scheme regarding the financial income they are able to generate.

3.8 Environmental Aspects of SSI-Development

Large-scale irrigation developments are often prone to water-logging and salinization due to the lack of effective water management. For example some of the lands along the major water courses, especially in West-Africa are seriously threatened by salinity problems (22). However, even small-scale schemes depending on their water source might cause and encounter similar problems. Dambos, mainly recharged through surface runoff from the surrounding areas, may incur growing levels of salinity in the water. However, carefully planned crop rotation and good irrigation practices can contain the problem.

Health hazards such as malaria, bilharzias and other water borne disease may also occur even in small water storage and conveyance systems. Small irrigation developments in remote areas provide “crystallization points” for increased human settlement with all its positive and negative side effects.

Groundwater use has in many parts of Africa led to a lowering of ground water tables. The large-scale expansion of irrigation using groundwater aquifers close to river systems, such as Fadama irrigation in West Africa, requires careful monitoring and management. Especially in Southern Africa commercial irrigated agriculture has over-exploited groundwater resources, resulting in a substantial lowering of water tables, thus threatening the “water security” of nearby communities and public drinking water supply systems.

In addition environmental threats not only stem from a lowering of ground water tables, but also from the contamination of domestic water resources through the inappropriate use of agro-chemicals and fertilizers.

The specific literature reviewed pays little attention to potential environmental risks of SSI development.

4 Demand for Financial Services in SSI

4.1 General

Irrigation in the early 1990s was used on 17% of the cultivated area (82) worldwide. In SSA just over 5,5 million hectares of agricultural land is being utilized for irrigation, this represents 13% of the total potential (59). Irrigation had its peak of investment in the 1980s, then the annual investment globally reached US$ 2,500 to 3,000 million in annual commitments. Currently World Bank as the main financial source invests less than US$ 1,000 million (26) per year into the sector. Some of these large schemes did not always meet the expectations vested in them for a variety of reasons, e.g. requirement for complex financial and technical management systems, and environmental aspects such as siltation and salinization.

Low-cost technologies have been refined to suit the socio-economic conditions of small-scale producers and the related equipment is already manufactured in several countries of SSA. The development and adaptation of the technology for this new target group enables access to water and land resources for millions of small-scale farmers.

A changing macro-economic environment and the advent of globalization in Africa provide even small-scale farmers in a number of locations with the opportunity to produce quality products for overseas markets. Decisions about how and what to produce are being taken by individuals or small groups. The new brand of SSI technologies enhances the entrepreneurial aspirations of small farmers. However, one of the most critical bottlenecks in this development scenario is to provide small-scale farmers with the required support services, especially access to financial services tailored to their specific needs.

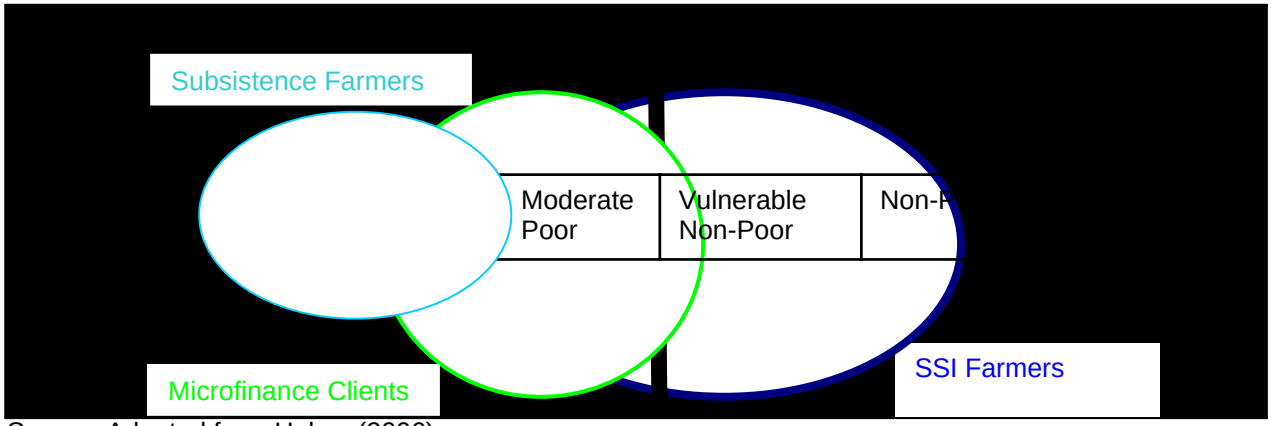
4.2 The Clients

4.2.1 Defining SSI Farmers

The target group are farmers that are engaged in small-scale irrigation. For the purpose of this study, SSI applies to farmers who irrigate areas up to five hectares but typically less than one hectare. Often, they are relatively resource-poor, rely heavily on family labor and are weak in bargaining power.

The following categorization of the poor, usually used in microfinance shows that most SSI-farmers are expected to belong to the group of “moderately poor” and “vulnerable non-poor” people.

Figure 4: Level of poverty



Source: Adapted from Helms (2006)

4.2.2 Individual Farmers

Rural livelihood systems: In smallholder irrigation development a farm needs to be considered in the context of the rural livelihood system. Whilst revenue from agriculture might be the most visible or even the main source of income, many households have access to other incomes through other economic activities and/or remittances, transfer payments, etc. The importance of irrigation in a household farming system will be determined by the percentage of the income derived from this activity in comparison to other income sources.

The broad range of SSI-technologies available offer a range of options on how to utilize a household's land resources for irrigation, from a small home-garden to plots of several hectares in size in which subsistence and cash crops are produced contributing towards household food security and cash incomes.

These days displacement of households due to political reasons or natural disasters and the spread of HIV & AIDS impact severely on many households. In SSA alone over 14.7 million women are infected by HIV and nearly 11 million children have been orphaned through AIDS (87). The vastly growing number of female and child-headed households in communities often stretches the provisions of customary law regarding inheritance and access to resources in general in the context of the extended family.

SSI-technology has already in many countries proven its potential in substantially contributing towards the stabilization of nutritional and income levels of such vulnerable households.

Farming systems: Small-scale irrigation is often only one of several sources of a household's income from agricultural activities besides rainfed cropping and livestock activities. In most circumstances it is only a part of the total land a household has access to that is being irrigated.

The asset structure and the entrepreneurial skill of the farmer will influence the resource allocation of a farm to its different enterprises. Experience from around the world shows that particularly small irrigators grow normally a variety of crops under irrigation. Addressing household food security often has a high priority in the cropping schedule e.g. maize is being planted under irrigation, though, some cash crops could be grown which would achieve higher net margins. Only after that primary objective is accomplished irrigator households will diversify into other agricultural and horticultural enterprises, if from a farmer's perspective the perceived risks are acceptable.

Financing rural clients: Agricultural finance programs have been able to dramatically increase repayment rates by treating farming households as complex financial units, with a number of income generating activities and financial strategies for coping with their numerous obligations. In other words, successful rural lenders recognize that farming households have multiple sources of income as well as multiple sources for loan payments. Therefore, repayments are not directly linked to loan use. Lenders assess farmers repayment capacity by looking at all household's income sources, not just the income produced by the investment (e.g. products from SSI) of the loan proceeds. (14)

4.2.3 Water User Associations

Water User Associations perform basically two important functions. Firstly, they represent a forum where individual interests in irrigation water use and management are to be balanced against the needs of the community as a whole and where the management and operation of the common irrigation infrastructure is to be ensured. WUAs are particularly important in situations where a group of farmers share access to the same water source through a commonly owned infrastructure. Their effectiveness in managing and operating this resource determines to a large extent the success of a scheme.

Secondly, WUAs become an increasingly important interface between individual farmers and financial and technical service providers. The high rate of expansion of small-scale irrigation in many regions of the world fuelled by new low-cost technologies allows large numbers of individuals to use irrigation for the production of food and marketable horticultural produce. Whilst they own and manage their equipment individually it would be too costly to provide all of them directly with the technical and financial support they require. WUAs are becoming the intermediaries through which such services can be obtained.

In this service provider role a spectrum of different institutional models are in place. In some cases a WUA is only the independent broker for services for its members without getting involved in service delivery. In other cases such as in the cooperation with Zambian Agribusiness Technical Assistance Center (92) such organizations mature into fully-fledged cooperatives as effective partners in service provision to small high-tech agribusiness enterprises.

These institutions need to be strengthened to handle their growing portfolio of responsibilities. With regard to financial services it will be of paramount importance to design financial products addressing a farmer's complex needs. However, the management of loans and deposits should not overwhelm these often fragile self-help organizations who are supposed to administer them.

4.3 The Demand for Financial Services for SSI-Development

In SSI, the financing and managing of the systems will be to a large degree the responsibility of the smallholders and their associations. In this situation, the importance of financial services to farmers increases significantly.

Financial support to SSI development can not be limited to the irrigation hardware only. In most cases the equipment is the minor component in such investments. The seasonal purchase of seeds and other yield-increasing inputs often outweigh the costs of the hardware required for irrigation development. SSI development therefore requires specific financial products tailored to the nature of this business.

In general, poor people need a variety of financial services, not just loans. In addition to credit, they need access to savings, insurance, and money transfer services (13). For the purpose of this study, we will concentrate on irrigation credit and savings.

4.3.1 Irrigation Credit

Farmers engaged in SSI have different financing needs. A wider range of financial services is required by the smallholders, including not only seasonal credit to cover the costs related to annual crop production and the operation and maintenance of the irrigation system, but also term finance for procurement and construction of irrigation facilities and equipment. Credit demand has been identified for the following purposes:

- seasonal working capital loans for agricultural inputs and to cover the operation and management of the irrigation system;
- investment loans for the construction of irrigation facilities and acquisition of equipment.

4.3.1.1 Financing Seasonal / Annual Working Capital Loans

In general, loans to finance the variable cost (fuel, maintenance, repairs, labor) of operating and maintaining irrigation water extraction and delivery systems are geared to seasonal production cycles. The duration of the loan is therefore **short term** in nature, typically from 5 to 10 months and is ideally adapted to the production cycle of the respective enterprise.

Depending on the irrigation technology employed operation and maintenance costs vary considerably. On the one side labor intensive low-cost technologies such as bucket and drum as well as treadle pump irrigation systems are characterized by low maintenance and operation costs especially when the labor is provided by the family. In these cases, loans may even not be required. Mechanized irrigation systems on the other side are characterized by relatively high operation and maintenance costs which may require access to finance.

Together with the installation of irrigation systems farmers normally intensify also crop husbandry techniques in order to optimize the use of the additional water supply. Short term loans may be required to finance additional farm inputs, such as seeds and fertilizer. Timely availability of these loans, in accordance with the production cycle, is essential in farming, and requires flexible financing mechanisms.

Farmers should generally be able to cover one forth to one half of the seasonal production cost out of their own resources.

4.3.1.2 Financing Investment Costs for Small-Scale Irrigation Facilities and Equipment

The financing of the initial purchase of equipment and / or construction of irrigation facilities is the most common and widely used form of irrigation credit. Many investments in irrigation development require larger amounts of capital that only amortize over several years. These investments are often beyond the self-financing capacity of farmers and require access to term finance, which allows spreading the repayment of investment costs over several years. The size of the up-front investment loan depends largely on the technology and origin of equipment and on

the percentage of the borrower's contribution that is typically 10% to 25% of total cost.

Typically, in the past, depending on the degree of subsidization, the loan repayment schedule for the construction of wells was normally set up over a two to three year period. Mechanized water extraction and delivery systems have often been quite costly, and were usually set up to be repaid over a much longer period, typically 3 to 5 years for gasoline or diesel motor pumps, and about 7 years for electric pumps. (4)

The same research points out two problems that are related to this type of irrigation credit, summarized under "lack of machine culture" in most of Africa: First, the durability of equipment in importing countries is often much shorter than the predicted life because of frequent overuse and lack of maintenance. Repayment schedules of long term loans are stretching too far out into the future, so that the machine is already on the scrap heap long before the loan's final due date. Second, the need for replacement equipment in case of breakdowns has often been neglected. A third important constraint is the purchase of unnecessarily expensive irrigation equipment.

Farmers need solutions that are tailored to their capacity, both, financially and technically. Less costly and less complex designs of irrigation equipment (e.g. drip systems, low-pressure sprinklers, treadle pumps, rope pumps) are the most appropriate solutions in most situations in countries of SSA where farm sizes are steadily decreasing, access to finance and other services is limited and subsidies are not any longer available. Such more appropriate and affordable technologies show also very attractive economic advantages. For example treadle pump investments have in some instances been estimated to yield a benefit : cost ratio of 5:1, an internal rate of return of around 100% and a payback period of *less than a year*.

In contrast, the costly investments with imported motor pumps from Europe were reported to be not economical in the African environment.(4) Complex infrastructure installations using large pumps or gravity systems result in very high initial investment costs. Shouldering such a large sum is beyond the capacity of many SSI farmers. For this reason, the infrastructure was in the past mainly subsidized but never financed by farmers on their own.

Investment loans that are either **short term** or **medium term** are adequate to satisfy the financial requirements associated with the establishment SSI technologies. Long term loans with maturities of more than five years are not required and are therefore not subject of this study.

4.3.2 Savings

Contrary to earlier perceptions, research on rural households has shown that even small farmers save. Savings are an integral part of farm household livelihood strategies (43). Savings help the poor to manage emergencies and to meet unexpected demands better, facilitate smooth consumption, and take advantage of investment opportunities. For many of the rural poor, irregular income streams prohibit assuming a loan with fixed and regular payments. For this group, savings services can play a critical role, buffering them from crisis and enabling them to meet basic needs (34).

For farmers, engaged in SSI, savings equally play a crucial role as they enable the rural household to

- become less vulnerable to emergency situations;

- store the crop produce for deferred consumption by taking advantage of more lucrative prices later in the season;
- cover investment and / or operating cost from own resources; and
- enable the farm household to establish a savings track record with financial institutions for future access to credit.

Encouragement of savings and building up the financial reserves of farmers will strengthen their self-financing capacity and the household itself. Therefore, savings play a crucial role for rural households in financing small-scale irrigation whether direct or indirect.

4.3.3 Effective Demand for Financing SSI

Effective demand is the demand generated when a client is both *willing* and *able* to purchase a good or service. The *willingness* of farmers to take up a loan is not questioned in literature.

The *ability* to repay the loan under agreed conditions is at least as important. The factors that determine the ability of farmers to repay a loan for SSI are mainly:

- technology and its total cost including cost of operation and maintenance of equipment and its appropriateness for local conditions including small-farmers financial and managerial capacities and capabilities;
- market prospects;
- profitability and liquidity related to the investment.

Firstly, we should ask what kind of irrigation facilities and equipment is affordable for small-scale irrigation farmers under a given scenario. Past experiences in SSA have demonstrated that the more sophisticated and costly equipment is often not appropriate/suitable for small farmers and the environment in which they operate. Investment costs are often beyond their financial reach. Secondly, there need to be the market prospects for sales of agricultural products. Frequently, increased production could not be sold because of market imperfections. Thirdly, the profitability of the investment and the resulting cash flow determines the repayment capacity of farmers and is therefore of crucial importance. Risks must be manageable for the farmer.

Therefore, the demand for finance may be very high whilst the effective or qualified demand for loans is much lower.

4.4 The Role of Subsidies in SSI-Development

Irrigation development in SSA as in many other parts of the world is seen as an important strategy to reduce poverty. Small-scale irrigation development targets specifically resource-poor smallholder farmers with the objective to improve their incomes on the land they cultivate and often own. The absence of adequate financial services for small farmers has often resulted in shifting the sole responsibility for the implementation of smallholder irrigation schemes to the state.

This has led to financing models for turn-key projects where farmers did not have to contribute financially to the investments on their plots. Direct subsidies drained the

state of valuable resources and also contributed towards financial problems and even the insolvency of financial institutions and technical support agencies, thus leaving farmers in the end without any effective financial and technical support systems. Furthermore it undermined ownership of these developments by the respective target groups.

Depending on the SSI technologies applied different types of irrigation equipment and/or facilities are required ranging from movable equipment (e.g. pumps, etc.) to complex infrastructure installations. Consequently the need for financial services varies. Especially the development of larger projects using large pumps or gravity systems and benefiting groups or whole village communities result in high initial investment costs. Such interventions often facilitate the use of land by beneficiaries that is several kilometers away from the actual water source and which could otherwise not be irrigated with other low-cost technologies. The overall investment in such schemes has to provide for comparatively high investments in headworks, conveyance systems, and infield distribution equipment. In addition such schemes are often integrated into existing land use systems providing water only for a fraction (e.g. 0.2 – 2.0 ha) of the land a farmer may own. Such designs are costly during initial establishment, but are often designed to have a lifespan of 10 - 20 years.

Whilst such projects are economically sound investments, experience has shown that it is generally not feasible to burden subsistence farmers with the full costs of such developments. It is meanwhile generally accepted that beneficiaries should - also for ownership creation - be required to make substantial contributions to the initial investment and in any case must bear the responsibility and full costs for operation and management.

SSI-technologies to be used by individual users such as treadle pumps, bucket and drum drip systems should not be subsidized. Supporting financial contributions may, however, be appropriate as a promotional measure on the meso level, e.g. for the support to the development (research, manufacturing) and the distribution of technologies (e.g. subsidies to support the set up of decentralized dealerships for distribution and maintenance).

5 Supply of Financial Services for SSI

The range of rural and agricultural lenders is far more limited than in urban financial markets, especially in countries of SSA. This results from the specific features of agricultural production, finance and the history of financial sector development.

5.1 Typology of Rural Lenders

Table 1 presents the types of rural lenders that can be found in developing countries.

Table 1: Typology of Rural Lenders

1. *Formal lenders*
- agricultural development banks;
- rural branches of commercial banks**;**
- co-operative banks;
- rural banks / community banks.

2. *Semi-formal lenders*
- credit unions;
- co-operatives;
- village or semi-formal community banks**;**
- NGOs.

3. *Informal lenders*
- relatives and friends;
- moneylenders;
- rotating savings and credit associations.

4. *Interlinked credit arrangements*
- input suppliers / crop buyers;
- processing industries.

Source: (43)

Developing rural and agricultural finance has been a priority in many countries. Yet, specialized agricultural banks, generally created by the state, have become insolvent, or had to be rescued at high public cost. In West Africa, agricultural banks have collapsed in the 1980s in Togo, Benin, Senegal, and Ivory Coast (69). Those that have survived (e.g. Ghana's ADB and Mali's BNDA) have adopted the new paradigm (see chapter 2.4), before it was too late.

Commercial banks in SSA are usually not involved in rural finance. They have not voluntarily established rural branch networks nor have they developed specific financial services for the rural clientele. However, in some countries, commercial banks are discovering that micro credit activities can be profitable. A number of commercial banks in SSA have been seeking new markets and have begun experimenting within the micro-lending market. In most of the cases, they are providing wholesale loans to rural financial intermediaries that already have a track record in lending and successfully recovering loans to the rural poor. Experiences in Asia have shown that with rising competition, commercial banks will move successively into the rural sector, especially in areas with a solid infrastructure and

established market relations. In countries of SSA, yet, such cases are rather exceptional but an interesting path with high potential.

Beyond formal rural lenders, there are many small, decentralized, semi-formal or informal financial intermediaries. Examples of these providers include village banks, community banks, co-operatives and credit unions. Community-based financial organizations (CBFO) provide financial services in proximity to the rural population and have a great potential in reaching small farmers, especially in remote, rural areas. Aeschliman (4) emphasizes the rise of CBFOs in the light of an emerging new African financial market. The 'quasi-banking sector' has been particularly remarkable in French-speaking West Africa where over 15.000 individual CBFOs are in existence. Major efforts were undertaken by the Central Bank (BCEAO) to promote and strengthen the CBFO sector. The emergence of CBFOs and their networks gives hope to a rising coverage of the rural poor with financial services.

However, the involvement of semi-formal financial intermediaries is constrained as they often lack sufficient longer-term financial resources for agricultural lending.

There is evidence that many small farmers now rely on semiformal and informal arrangements for financing their own production costs (43). The main source of finance for farming in most places is not a bank or a cooperative or a financial institution. There are many other unregulated arrangements that provide a huge volume of financial services to rural households. Farmers rely on moneylenders, their own families' resources, as well as on those with whom they have existing business relationships. They are often the only source of financial services, especially in geographically more remote locations. These informal and often rather expensive arrangements are build on trust, social and family relations, and reciprocity rather than written contracts.

Group-based savings and credit arrangements exist in form of rotating savings and credit associations (ROSCAs).

As mentioned before, financing SSI is a sub-set of rural finance and has to be seen in this context. The described scenario applies equally for financing SSI. Literature stresses the **growing importance of CBFOs** in many countries of SSA and their potential for financing SSI. While most commercial banks in SSA are not yet interested in the costly retailing of financial services to the rural population directly, they are getting interested in providing wholesale loans to CBFOs and other rural financial intermediaries. Both options are still in an early stage of development. However, potentials do exist and strengthening efforts are required to fully exploit potentials.

The meso level infrastructure is vital for the long term viability of retail financial institutions, especially in the rural environment where human capacity and refinancing is the bottleneck.

5.2 Constraints to Financial Services in Rural Areas

Financial service providers face high financial transaction costs and risks when granting small loans to poor farmers. The major constraints to the provision of financial services in rural areas include:

- *dispersed demand* for financial services due to low levels of economic activity and population density;

- *high information and transaction costs* linked to poor infrastructure (roads, telecommunications) and lack of client information (no personal identification or functioning asset registries);
- *weak institutional capacity* of rural finance providers also caused by the limited availability of educated and well-trained people in smaller rural communities;
- *crowding-out effect* of subsidized and / or directed credit from state-owned banks or donor projects;
- *seasonality* of many agricultural activities and long maturation periods for others, resulting in variable demand for savings and credit, uneven cash-flows and lags between loan disbursal and repayments;
- *risks specifically linked to farming*, such as variable rainfall, pests and diseases, price fluctuations, and small farmers' poor access to inputs, technical advice, and markets;
- *lack of usable collateral* due to ill-defined property and land-use rights, costly or lengthy registration procedures, and poorly functioning judicial systems. (12)

These general constraints of agricultural lending apply to a great extend also to SSI but must be reflected against a number of distinguishing features. The major factors are:

→ Irrigation has the advantage of **reducing agricultural risks**. SSI farmers are less vulnerable to weather conditions, which reduces the climatic production risk substantially. From a financial institution's point of view this is a very positive feature.

→ Irrigation generally improves substantially agricultural productivity also by **reducing the effects of seasonality**. It allows farmers to cultivate different crop varieties with diverse vegetation periods not only at the traditional planting season but also in the off-season. Such staggered planting allows a longer and stronger presence at the markets, resulting in higher incomes, a more even cash-flow and thus contributing to a reduction of credit risks.

→ Strong **WUAs** can approach financial institutions as an entity. A WUA organizes small-scale farmers (in some cases farmers may live dispersed in one or more villages) into an interest group of farmers that can be a valid interlocutor for a financial institution that is not prepared dealing with small farmers individually. Solidarity among group members and social pressure may replace traditional collateral if all group members guarantee for each other.

5.3 Availability of Short- and Medium Term Finance for SSI

The quasi absence of banks in rural areas of SSA is a major constraint for financing small-scale irrigation. The rise of semi-formal institutions at the local level does cover only a small proportion of financial needs. The vast majority of rural farming households still have *no effective access* to institutional financial services.

Even in locations where financial institutions already exist, the range of financing for agricultural production is limited. If available at all, the loans offered are to a high extent short term working capital loans. Most often, financial products do not correspond to the financing needs of small farmers in terms of timing and repayment schedule. In other words, despite the expansion in a number of countries of rural financial intermediaries (notably in Tanzania, Kenya, Benin, Senegal, Ethiopia), their

activities remain inadequate to provide other than modest working capital services in some locations.

Providing larger amounts of funds over longer time horizons is even more risky for a financial institution. Thus, financial institutions are often reluctant to provide term finance. In the past, governments and donors have frequently stepped in to enhance the supply of term loans through agricultural development banks and credit projects. However, after the recognition of the poor performance of directed credit, both in terms of outreach and sustainability, this practice has widely disappeared. Moreover, the liberalization of marketing boards in many countries has dismantled interlinked credit arrangements, which constituted another important source of working capital for small farmers. This decline in funds for agricultural term lending has not yet been compensated for by other financiers. (35)

The complex problems resulting from traditional land tenure systems and lack of land registration in many African countries represent a major impediment for long term financing of agricultural investment. As long as the scale of operations of small farmers is very modest, land titles do not exist, and the overall credit culture is weak, the provision of credit for capacity expansion will often continue to rely on the existence of strong marketing firms, as in a number of Western African countries. These maintain control of the farmers by requiring that their crops are sold to the same agency (69).

In conclusion, the availability of term finance for small and medium-scale farmers is extremely limited or non-existent. Short term loans are in a number of countries of SSA available in some locations through formal, semi-formal or informal arrangements but often do not correspond to the financing needs of clients. Informal arrangements are often very expensive.

5.4 Financing Term Investments – Worldwide Experiences Translated into Financing SSI

Financing agricultural-term investments remains a challenge worldwide. SSI farmers demand medium term loans for the purchase of advanced equipment such as motorised irrigation pumps that can increase productivity significantly. Even in countries like Kenya with one of the most diversified and developed financial sector in SSA term-finance for agricultural purposes is hardly available. The major constraints of term lending in SSA are the limited capacity of designing and managing term loan products and the limited access to refinancing.

In Box 1 selected case studies are summarised that provide insights into successful agricultural lending practices around the world that are also relevant for lending to SSI farmers. From the case studies the following trends can be observed:

- the loan portfolios are mainly financed by concessionary and / or commercial sources;
- loan portfolios are diversified (urban / rural and agricultural / non-agricultural loans);
- some institutions have linked the term loans to the marketing of produce;
- long-standing financial institution - client relationships and / or established track record is required;

- individual lending technology is used, sometimes secured by joint liability groups;
- most institutions lend only to experienced farmers and / or for existing activities.

The gained experiences should be taken into account when designing term lending products for SSI farmers. In this context it is of special importance to consider financial and technical capabilities of SSI farmers and not to overstrain capacities. Term investments require substantial experience in production, a long-term relationship with financing institutions and previous payment history, and an established market demand for the products to be produced by the client. From the perspective of the financial institution a diversified portfolio and reliable sources of funds for agricultural lending are of special importance. The design of products and the development of financing technologies are other important tasks. Second-tier institutions on the meso level have a significant role to play, notably in refinancing and training.

Box 1: Selected Case Studies: Agricultural Term Finance

Philippines – PAICOR offers financial and non-financial (processing and marketing) services to cooperative members. The financial services are nowadays mainly directly refinanced by the Land Bank of the Philippines.

Medium term loans of up to three years are offered for agricultural activities at an annual interest rate of 20%-23%. In 2000, term loans for agricultural equipment and land purchase amounting to US$ 81,000 were disbursed, constituting of 8.4% of the loan portfolio. Term loans are granted to cooperative members only with a good credit record and proven farming skills. Furthermore, in case of serious arrears, a temporary farm takeover for two to five years is possible.

Experiences show that the combination of financial and non-financial services assures a marketing outlet and is strengthening the repayment ability of farmers. Furthermore, the membership of the farmers creates a long-term partnership, creating strong incentives to adhere to the agreed rules.

Bolivia - Caja Los Andes (CLA) is one of the countries most successful MFIs with 29 branches. The sources of funds are mixed and include deposits, national commercial banks and international donors.

CLA lends 13% of its loan portfolio for agricultural purposes (e.g. for milking equipment, irrigation motor pumps, cowsheds). Medium term loans are given for a period of up to five years. The maximum loan amount is US$ 40,000; 48% of all loans are of a size below US$ 500. Interest rates for agricultural loans are 3% to 3.5% monthly.

Specifications of the CLA business strategy include: (i) the loan portfolio is highly diversified between urban / rural and agricultural / non-agricultural loans; (ii) on loan appraisal, projected revenues to be generated by the financed investments are considered only for the investment in existing activities; (iii) besides this conservative approach, the whole existing household cash flow is taken into account and the repayment schedule is adapted to the farmer's household income streams; (iv) as collateral, even non-registered land titles are accepted, as they still have an enormous psychological effect. Furthermore, default borrowers are announced by local radio stations to enforce peer-group pressure.

India - The BASIX group consists of a Non-Bank Financial Institution, a Local Area Bank and a NGO providing technical assistance. The group gains funds from commercial and concessionary sources.

Having more than 12,000 borrowers, the loan portfolio exceeds US$ 4 million and includes term loans up to three years for motor pumps, farm equipment and land development. The interest rate for term loans is 24% annually. On loan appraisal, incremental revenues are taken into account, but only expansion or renovation of existing activities is financed.

BASIX cooperates with several non-financial service providers. For example, a NGO is giving additional marketing and agricultural advice to the investing farmers to insure the effective use and maintenance of the technology and the successful sale of the produced crops.

Thailand - The Bank for Agriculture and Agricultural Cooperatives (BAAC) is a successfully reformed agricultural development bank. Its credit portfolio is co-financed by international term loans and bonds in the national capital market. The loan portfolio is nationally diversified and had an original agricultural focus.

In 2002, 58% of the US$ 5,631 million loan portfolio has been classified as term loan for agricultural purposes. Its outreach to small-scale farmers is based on a highly efficient, individual lending technology, based on joint liability groups for loans up to US$ 2,000. Medium- and long-term loans are offered to farmers with a track record in short term borrowing. In line with its understanding as an agricultural development bank, the agricultural term loans are cross subsidized to a low annually interest rate of 8% - 14%.

Source: the case studies were summarized from various sources by Karsten Pagel, 2006

Leasing is an attractive instrument to finance farm equipment and particular attractive for the acquisition of motorized diesel pumps. It is an alternative to standard medium term loans for equipment. Leasing is of interest for SSI farmers because security for the transaction is provided by the leased asset itself. Financial lease arrangements for new equipment are therefore able to remove the collateral constraint. Worldwide experience has shown that the access to lease is often restricted to the upper segment of clients. Leases on *used* equipment are an alternative for low income SSI farmers; they offer the advantage that they are more affordable and are likely to attract more clients. However, the example of CECAM in Box 2 illustrates that additional collateral is required, taking into account the higher risks of break-down. Alternatively, institutions may require a higher down-payment.

Box 2: Leasing Arrangements in Madagascar and Bolivia

Madagascar - The Caisses d'Epargne et de Crédit Agricoles Mutuelles (CECAM) are a federation of savings and credit cooperatives. Apart from several credit schemes, leasing was introduced in 1991. In ten years, CECAM has provided 25,000 leases to members. Leasing accounts for 20% of the total outstanding portfolio.

Most of the assets are related to agricultural activities (harrows, pumps, ploughs, carts, seeders, dairy cattle, draught oxen, brood hens). The borrower pays a down payment of 25% of the original value of the asset. The interest rate used varies from 24% to 30% per year, for a maximum duration of 36 months.

Since often used equipment or livestock is leased, the lessee is responsible for selection of the asset. Additional collateral of 50% - 150% is required if used equipment or livestock is involved.

The outspread of the CECAM network in rural areas enables it to closely monitor the lessee without high transaction costs, as this task is carried out by local MFI members.

Bolivia - The Asociación Nacional Ecuménica de Desarollo (ANED) is an association of financial NGOs, providing leasing techniques worth >US$ 0.5 million or 7% of its total loan portfolio (2002) to experienced small-scale farmers. The leased equipment is bought by ANED from selected wholesalers and the payment schedules are adjusted to the farmer's household cash flow.

In case of motorized irrigation pumps (average asset price US$ 500 - US$ 700) two yearly installments have proven to be most appropriate. The annual interest rate is 16% -17% and a 25% down payment is obligatory.

To improve the leasing environment, ANED developed contractual relationships with agricultural equipment suppliers providing the farmers with technical training to ensure proper use and maintenance of the equipment. Future challenges are the high asset prices of the leased equipment, and the problems accruing by scaling up the program to inexperienced farmers.

Source: the case studies were summarized from various sources by Karsten Pagel, 2006

Basic principles in leasing arrangements include that: (i) the financial institution continues to own the equipment until it has been fully paid; (ii) the lessee is monitored through the duration of the lease; (iii) usually 25% down payment is required; (iv) in the event of default, the financing organization can repossess the equipment without any specific litigation. (39)

Poor handling and maintenance of the equipment have been reported as specific problems in leasing arrangements that need to be resolved.

Not only financial institutions but also equipment suppliers can engage into leasing of SSI equipment. Requirements for institutions to engage into leasing are reliable technical structures and solid financial resources. At present, unclear legal frame conditions are an important constraint for the development of leasing in countries of SSA.

5.5 Self-Financing

In the absence of financial institutions, self-finance continues to play a vital role in many agricultural production systems. Smaller or divisible investments that can be gradually expanded may to a certain extent be financed out of existing cash-flow surplus or – in the case of lumpy investments – through the “saving up” of funds. “Saving up” does not always imply monetary savings. In the absence of safe and convenient deposit facilities, farmers frequently save in kind by investing in relatively liquid assets such as livestock, which can be sold to finance other investments or in case of emergencies (65).

Under these circumstances, investments in low-cost irrigation technologies are an appropriate and obvious option for SSI farmers. Examples from Kenya show that quite a number of farmers have been able to fund treadle pumps out of their own resources. This is not an optimal solution and it is assumed that a multiple of investments could take place if medium term finance is available.

The self-financing capacity of farmers can be enhanced through the availability of deposit facilities. Research has shown that rural households do save and that they are willing to deposit as long as the requirement for safety and access is given. Unfortunately, the demand for secure savings services remains largely unmet in SSA.

6 Summary, Major Conclusions and Lessons Learned

6.1 Summary

New approaches to develop the continent's natural resource potential and to exploit its comparative climatic advantages are increasingly spearheaded by market-driven private sector initiatives which are often based on irrigated development. The advances made during the last years in the development of low to medium cost SSI technologies that are more affordable for small-scale farmers and easy to operate, maintain and repair are increasingly benefiting also farmers in terms of additional income and employment in a number of countries of SSA (e.g. Kenya). The considerable potential for further development using this kind of technologies has been estimated for SSA to be about 0.7 million ha which could benefit about four million households. To utilize these development opportunities farmers are faced with a number of constraints which need to be overcome in an integrated interdisciplinary approach.

In many countries of SSA ongoing market reform and privatization has not yet produced the desired results. Farming profitability is still low and agricultural support services are rarely available. In most SSA countries SSI farmers have today even less access to rural financial services and institutional agricultural lending facilities than before.

SSI allows farmers to increase their productivity in farming significantly. It also reduces the risk of unpredictable weather conditions and allows producing crops in the off-season, hence providing additional income streams to the farm household. These facts have significant impact for financial institutions that are mostly still reluctant to extend finance for agricultural production.

On the demand-side, it has to be distinguished between the demand for irrigation equipment and facilities and the demand for financing. The reason is that SSI farmers would demand large, expensive irrigation schemes if grant funding is provided - but farmers do not demand financing in form of a loan because the volume exceeds their financial capacities. Detailing investment costs for different technical solutions and contrasting them with expected income streams needs further elaboration.

On the supply side, it has to be recognized that rural areas are rarely covered by formal financial institutions. Informal or semi-formal arrangements cannot satisfy the increasing demand for financial services including secure savings facilities or term finance.

6.2 Supply – Demand Gap in SSI Financing

To a great extent, literature identifies the quasi non-availability of finance to the agricultural sector as the major bottleneck for the development of SSI. Without question, it has to be recognized that there is a supply – demand gap for financing SSI, especially when it comes to term finance. However, the statement – and the underlying assumption for this study – comes only partially to the point because SSI-farmers need not just loans but permanent access to a whole range of financial services, especially a combination of deposit facilities and financing as well as transfer services.

The availability of low-cost irrigation technologies and related equipment has started to unlock large human and natural resources through individually owned and operated micro-irrigation systems. Costs for such micro irrigation devices vary in different countries but are generally below US$ 200 per unit. Such investments can be even within the self-financing capacities of smallholders or can be financed out of savings and / or short term loans.

In general, the self-financing capacities of farmers have been underestimated; many rural financial markets are presently rather unable to meet the demand for secure deposit facilities. Therefore, the self-financing capacity of farmers is at present not fully developed but will play an increasing role in the future.

In addition it has to be recognized that not only financial services are a bottleneck for the development of SSI, but also all issues that are related to the *marketing* of agricultural production.

6.3 Key Constraints for the Development of SSI in Sub-Saharan Africa

6.3.1 Key Constraints on the Policy Level

The rural population has today in most countries of SSA even less access to financial services than before. One important constraint is the absence of an adequate policy framework. SSI development is affected by four different policy areas: macroeconomic policy, financial sector policy, agricultural sector policy and water/irrigation policies. Deficiencies that effect SSI development include often:

- macroeconomic policies: lack of real estate registries; inefficiencies in the legal and judicial framework;
- financial sector policies: interest rate ceilings; restrictive legal and regulative framework;
- agricultural policies: agricultural trade and price controls; laws and policies that encourage subsidized and directed lending;
- water/irrigation policies: inappropriate integration of irrigation policies into overall water policies; uncoordinated subsidy regimes for irrigation development also regarding the support systems of different donors.

6.3.2 Key Constraints from a Financial Sector View

The financial sector in countries of SSA does not provide the necessary services to SSI farmers. On the different levels of the financial system the major reasons include:

- *The macro level and enabling environment:* the inability of many governments to assure an adequate legal, regulatory and supervisory framework is a major constraint for the development of financial services to the rural population in SSA. As long as these obstacles are not removed, it is unlikely that the rural financial sector will develop. The most important factors are (i) contract law, (ii) land tenure and registration, (iii) prudential regulation, and (iv) supervision.
- *The meso level:* the financial infrastructure on the meso level is weak in nearly all SSA countries. The viability of financial institutions on the micro level depends to a high degree on the level of support services they are able to receive from meso level institutions. Rural financial intermediaries need professional networks that

provide (i) training to build-up human resource capacities; (ii) refinancing facilities to buffer liquidity shortages and term-mismatch of funds; and (iii) control mechanisms to assure financial soundness of business and the security of savings. In addition, transfer and payment systems are required by the rural population, for example, to receive remittances from abroad.

- *The micro level:* rural financial markets are still largely untapped by financial institutions. The reluctance of formal financial institutions towards banking with poor farmers has a long tradition in SSA. However, some positive trends can be observed: (i) the involvement of commercial banks in refinancing rural financial intermediaries has been successful in various countries (e.g. Madagascar); (ii) due to rising competition of financial institutions in the lower segment of the market, the involvement of commercial banks in prosperous rural areas with good market connections is slowly rising; (iii) the development of CBFOs in least developed areas has proven to be an appropriate solution in some countries of SSA (e.g. Caisses Villageoises d'Epargne et du Crédit Auto-Gerées du Pays Dogon in Mali). On all levels, capacity building is required, especially in terms of product development and the adaptation of lending methodologies towards the specific needs of SSI farmers.
- *Market distortions:* subsidized interest rates and / or directed credit are still present in many SSA countries. Viable financial institutions have to reflect their cost-structure in their prices (mainly interest rates and fees) and operate under market conditions. If they face 'unfair competition' they have to withdraw from the market or even get never established.

  Farmers will always prefer the cheaper option as long as subsidies are in reach. They are used to receive so called 'soft loans' and have often benefited from 'mass forgiveness' or 'write-offs'. In many countries, a 'dole-out' mentality has been established over decades. In addition, financial institutions' market rates are traditionally conceived by farmers as too expensive. Under such conditions, the development of a market for financial services is hampered.

  The effect of subsidies has the opposite effect of the one intended because rural financial markets cannot develop under such distortions. In times of decreasing public funds for subsidized development support, farmers are confronted with the situation we can observe at present: financial services are hardly available.

6.3.3 Key Constraints from an Agri-Business Perspective

The introduction of SSI-technologies on a broader scale in countries of SSA is from an agri-business view hindered by the following factors:

- *Local production of low-cost equipment:* currently many countries still depend on the import of such technologies, negatively affecting the cost and availability of the equipment to the potential users. The absence of a local production can lead to higher costs of the equipment and a reduced availability of spares.
- *Distribution channels for small-scale irrigation equipment:* the sustainable and widespread adoption of these technologies requires a competent trading network selling the equipment and providing decentralized maintenance services close to the potential clients. This is obviously only possible if there is a minimum number of potential users in a given area.

- *Availability of producer markets / outlets that are accessible for farmers:* a first address for selling agricultural and horticultural products is always the local market, where producers will aim to sell their production. However, with a larger number of producers in a given area, other efficient outlets need to be identified and developed in cooperation with the commercial trading sector. Successful examples in several countries are encouraging signs that small producers can effectively team-up with traders and through them access markets that would otherwise be out of reach for them.
- *Technical knowledge / management capacity of individual farmers*: this refers to actual agricultural and horticultural husbandry methods as well as to the effective use and maintenance of the irrigation equipment and facilities. The utilization of the full potential of irrigated production requires also training of the users. To get established on the market requires the adherence to certain quality standards, and the timely access to production inputs, know-how and services. Producers require technical and economic information that is best provided through specialized technical services, especially public and/or private extension services.
- *Organizational / institutional capacity of WUAs*: these participatory and representative structures are charged by their members with a varying array of responsibilities. Whilst this institutional level has the potential to be an important mediator and facilitator for service provision to its members, reality is that the service delivery potential of this often fragile bodies is infringed by lack of experience and qualification to deal with the arising challenges.

6.4 Conclusions and Lessons Learned

The development and customization of irrigation technologies especially for small and resource-poor households has opened a wide range of opportunities for economic development for this target group. While India and Bangladesh are largely responsible for much of the progress in this sector, these technologies are now also rapidly finding their way into countries in SSA.

The financial system development approach is largely accepted by the international community which is reflected in most of the literature reviewed. However, the switch from directed credit to financial market development is only partial for a variety of reasons. Firstly, the conversion from the old to the new paradigm is still facing strong resistance by different interest groups for example politicians or policy makers. Secondly, the pressure for developing the agricultural sector leads donors as well as governments to extend funding in various forms in order to push for fast results. In many countries of SSA, directed credit and subsidized schemes do still exist and hamper the development of rural financial markets.

In future, the financing and managing of irrigation systems need to be market-driven and to a high degree the responsibility of smallholders and where applicable their WUAs. Therefore, the importance for the supply of a full range of financial services increases significantly. Not only short-term seasonal credit is required but also term-finance for procurement and construction of irrigation facilities and equipment. Savings are of crucial importance to strengthen the self-financing capacity of farmers and to become more independent from external factors. Therefore, the supply – demand gap is even much greater when considering *financial services* in general, including loans, savings, insurance and money transfers. Efforts to develop SSI should not be limited to the question of *financing* but to the provision of *financial*

services in general. To close the gap, rural financial systems have to be developed in countries of SSA.

The aim should be a range of viable financial institutions that serve the rural population with a variety of financial services on a permanent base. In order to achieve sustainable access to financial services, a broader systems approach is needed. This includes all levels within the financial sector, informal as well as formal. Such a comprehensive financial systems development approach includes institutions, instruments and procedures, at all levels and in all segments of the rural financial market.

Small-scale irrigation with its range of technical solutions for different water resource potentials and socio-economic settings can have a broad reach into rural and even semi-urban communities and offer many opportunities for successful farming enterprises. However, SSI development should not be singled out as a special focal area, because only very few countries will have the capacity to sustain the necessary support services to this specialized target group. SSI should rather be seen in the context of a wider economic development strategy.

Low-cost solutions do not work in all circumstances. To make use of development opportunities which can only be utilized economically by groups of small-scale farmers together, many communal irrigation schemes were promoted in the past that have, however, relatively high initial investment cost for the basic scheme infrastructure (including headworks, major distribution networks). These costs often exceed the ability of farmers for financing, respectively their repayment capacity, even with a long-term maturity period. The question to be resolved is if such communal systems targeting low income households living under difficult physical and socio-economic conditions and often receiving repeatedly famine relief should generally not anymore be assisted or if the establishment of the scheme infrastructure should also in future be supported by donors or governments. The literature does not treat these essential questions in detail but agrees generally to eliminate subsidies. This would, however mean that in a purely market-driven approach such irrigation schemes for marginalized farmers would be discontinued and large areas that have irrigation potential in countries of SSA would no longer be developed for irrigation. This is politically likely not to be an acceptable solution in most countries of SSA. Further information needs to be collected in the Kenya case study to see if there are approaches possible that allow the financing or co-financing of the scheme investment costs by low income farmers according to their financial capacities and under the consideration of the future income to be generated from the SSI activities.

Small-scale irrigation technology has no prospect to generate cash income for smallholders unless there are *market opportunities* to exploit. These provide the driving force that draws goods and services with value being added at each stage: from input supply chains, through on-farm production, to post-harvest processing and delivery and sale to consumers. Thus, a technology such as small-scale irrigation should be seen as a factor that enables market participation by smallholders, not as a driving force in itself.

The local development of manufacturers, supply chains, marketing and other promotional efforts like the appropriate provision of extension services have often been neglected in the past. These had a variety of consequences ranging from negative effects resulting from relatively expensive imported irrigation equipment to

the unavailability of technical back-up services and spare parts to the unsatisfactory achievement of adequate performance levels in farming.

The major target group for promoting SSI will most probably not be the destitute or very poor. Subsistence farmers living in remote areas with no cash income and access to markets need other kind of support than access to financing for SSI activities. Some may profit from the need for additional labor in irrigation where they may find employment. SSI farmers belong to the economically active sector of the rural population and range mainly from the moderate poor to the vulnerable non-poor. It is expected that they can reach higher income levels through irrigation and move out of poverty.

7 Final Remarks

The literature review has only partly provided the desired results. The experiences reflected in the literature mirror the intervention approaches for irrigation development from a technical point of view. The prominent statement is that the availability of *finance* is the main bottleneck for the development of SSI because farmers are resource poor and have not the necessary financial capacity for investments into SSI technologies. A more detailed demand analysis for financial services based on the wide range of technical solutions and different development scenarios related to physical and socio-economic potentials is rarely provided.

On the other side, literature regarding financial systems development underlines the importance for the creation of an infrastructure for the provision of effective financial intermediation services and the need for creating efficient and viable financial institutions. The challenge for agricultural finance lies in the creation of rural financial markets that provide the economic actors in the agricultural and irrigation sector with sustainable financial services. References to irrigation are rarely provided.

Literature covers both topics comprehensively in isolation and does in most cases not link the two areas. There are references about the importance of better integrating those areas in general but the lack of detailed analysis of existing - or even best - practices and experiences suggest that the topic has not been given the attention it deserves.

Supply-led and directed credit programs have failed to produce the desired results. The widely accepted financial systems development approach is based on the assumption that a commercial approach is more likely to reach large numbers of clients on a sustained basis. This new paradigm is internationally largely accepted which is also reflected in most of the literature reviewed. However, the switch from directed credit to financial market development is often only partial. In many countries of SSA, directed credit and subsidized schemes do still exist and hamper the development of rural financial markets. In this respect, literature on financial sector development is far ahead of the realities in the field, especially regarding interdisciplinary concepts that involve agriculture. The difficulty is clearly to close the large gap between development perceptions and successful implementation of concepts.

The development of small-scale irrigation technologies has a significant impact on the demand of *financing* because it shifts the focus from supply-driven approaches to demand-driven private sector initiatives that need not only *financing* but a whole range of *financial services* on a permanent base. This shift has not sufficiently being considered in literature because the importance of new micro irrigation technologies has only recently being acknowledged and a financial systems development ‘lens’ has not yet been integrated into SSI development concepts.

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PUBLISHED BY

Deutsche Gesellschaft für
Technische Zusammenarbeit (GTZ) GmbH

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DESIGN

WEBER/SUPIRAN Kommunikationsgestaltung, Berlin

COVER PHOTOS

GTZ

PLACE AND DATE OF PUBLICATION

Eschborn, December 2006

ACKNOWLEDGEMENTS

The publication draws on excellent research studies carried out by Josef Grimm and Maren Richter, commissioned by GTZ. The publication has been financed by GTZ (Sector Programmes International Water Policy and Infrastructure; Millennium Development Goals and Poverty Reduction; Financial Systems Development) and the World Bank. GTZ works on behalf of the German Federal Ministry for Economic Cooperation and Development, BMZ.