The Use of Output-Based Aid in Small Scale Irrigation Schemes in Developing Countries

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Final report

The Global Partnership on Output-Based Aid

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Note on the data: All monetary amounts are in U.S. dollars unless otherwise specified.

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List of Abbreviations

ADB	African Development Bank
AgDevCo	Africa Agricultural Development Company
ASA	Action for Social Advancement
AWS	Agricultural Water Solutions Project
BADC	Bangladesh Agricultural Development Corporation
BAIF	Bharatiya Agro Industries Foundation
BCCRF	Bangladesh Climate Change Resilience Fund
BMDA	Barind Multipurpose Development Agency
BMGF	Bill and Melinda Gates Foundation
BWDB	Bangladesh Water Development Board
CAADP	Comprehensive Africa Agriculture Development Programme
CEPA	Cambridge Economic Policy Associates
COMESA	Common Market of Eastern and Southern African States
ECA	Economic Commission for Africa
DFID	Department for International Development
DTW	Deep Tubewells
EAIF	Emerging Africa Infrastructure Fund
FAO	Food and Agricultural Organisation of the United Nations
GGRC	Gujarat Green Revolution Company
GIDA	Ghana Irrigation Development Authority
GPOBA	Global Partnership on Output Based Aid
Ha	Hectares
IDCOL	Infrastructure Development Company Limited
iDE	International Development Enterprise
IDEI	International Development Enterprises India
IDSP	Irrigation Support Development Project
IFAD	International Fund for Agricultural Development
IMIP	Integrated Micro-Irrigation Project
IMT	Irrigation management transfer

ISCs	Irrigation Service Charges
ITFC	Integrated Tamale Fruit Company
IWMI	International Water Management Institute
KASCOL	Kaleya Smallholders Company
MAL	Ministry of Agriculture and Livestock (Zambia)
MOFA	Ministry of Food and Agriculture (Ghana)
MT	Metric tons
NIB	National Irrigation Board
NIPRM	National Irrigation, Policy and Regulatory Measures (Ghana)
OBA	Output Based Aid
O&M	Operational and management costs
PIM	Participatory Irrigation Management
PPP	Public Private Partnership
PforR	Programme for Results Financing
PSP	Private Sector Participation
RAG	Red, Amber, Green
RDAs	Regional Development Authorities (Kenya)
SADC	Southern African Development Community
SCAMPIS	Scaling up Micro-Irrigation Systems
SSA	Sub Saharan Africa
STW	Shallow Tubewells
ToR	Terms of Reference
UNDP	United Nations Development Programme
WOTR	Watershed Organisation Trust
WRMA	Water Resources Management Authority (Kenya)
WUA	Water Use Associations

Executive Summary

This report has been completed to explore the use of output-based aid (OBA) as a financing mechanism to support the development and operation of small-scale irrigation schemes in developing countries. The specific objectives of the report were to:

1. Evaluate the scope for OBA in financing small-scale irrigation schemes to support poor farmers in developing countries.
2. Propose project design and implementation arrangements, based on real-world examples, to support sustainable small scale irrigation schemes benefiting from OBA, either under public or private management.

The aim is being to provide recommendations on the appropriate next steps for using OBA subsidies to support the implementation of projects in the irrigation sector.

ES.1 Scope for OBA in financing small-scale irrigation schemes

Based on desk-based research of the irrigation sectors in a sample of five countries: Ghana, Kenya and Zambia in Sub Saharan Africa (SSA); and Bangladesh and India (focused on the lagging States of Madhya Pradesh and Orissa) in South Asia we have evaluated the scope to use OBA to support irrigation schemes effectively.

Our overall assessment is that there is an important role for OBA to fill in helping to address financing gaps in both South Asia and SSA. Effectively designed OBA projects could play a role in addressing these investment needs; however there are some important general concerns that will need to be considered in the design of any potential OBA project:

- Given the difficulties experienced in charging smallholders ISC at a level required to cover O&M costs, an important part of OBA project design in the sector will be the associated technical assistance program s that build demand amongst local farmers to the extent that they are willing to pay for the improved services provided by the project.
- Sustainable OBA projects in the sector will need to be located in areas which provide access to functional markets. There may be occasions in which trade-offs have to be made between projects which target the poorest smallholder farmers and those which target poor farmers based in areas which have access to markets to help ensure that the irrigation project is more sustainable.
- It will be important to gain firm commitment from potential host country/ state government's given the political nature of irrigation, particularly in India.
- There are also notable risks in linking subsidy disbursements to farm productivity related outputs, as the private sector may not have appetite for such risks, even though such outputs may be a truer reflection of the OBA concept.

- The design of OBA subsidies will need to take account of the potential difficulties involved in measuring the delivery of irrigation services to smallholders and of the technical difficulty of excluding non-participating farmers from accessing certain types of irrigation scheme.

ES.2 Project opportunities that could benefit from OBA support

In the second part of the report we carried out in-country consultations in both India and Zambia to identify and evaluate projects that would have the potential to be supported by OBA funds. We have summarised the project opportunities in the table on the following page (more detail on indicative project structures can be found in the main report).

We reviewed the option of using market based approaches to supply farmers with micro-irrigation technology and of supporting farmers to construct rainwater harvesting ponds (we have classified these as small-scale opportunities). The analysis suggests that both of these options would be good candidates for support using OBA funds. Both of these approaches:

- have been shown to be successful at targeting large numbers of poor smallholder farmers in the SSA and South Asia;
- are relatively efficient in terms of costs per beneficiary and have the scope to increase poor farmers' incomes; and
- have limited/no involvement from government institutions so there is less complexity in seeking to implement projects.

We also looked at different options that make use of large-scale irrigation schemes to provide irrigation to smallholder farmers; the IMIP approach that is currently specific to India and the different commercial hub-outgrower models that are being developed in Zambia and across SSA. While both of these projects provide an opportunity to increase smallholder farmers' access to irrigation in our view they are less well suited to the OBA financing approach than the small-scale projects. In particular the indicative cost per beneficiary is quite high and both projects would involve quite complicated implementation arrangements. Based on the recent experience of the implementation of larger-scale projects in either South Asia or SSA, it will take much longer than the five-year timeframe typical for an OBA supported project to implement a sustainable project.

In summary our recommendations and next steps are as follows:

- We judge that the options of using OBA subsidies to support the market-based approaches and the rainwater harvesting schemes both provide the most promising opportunities to support the extension of irrigation services to smallholder farmers.
- Follow up is required with institutions such as IDEI and Kickstart to develop project proposals in more detail and then assess the potential for them to pre-finance the projects and take on the risks associated with tying the release of grant funds to the achievement of pre-defined outputs.

- In addition these discussions should explore further the scope to link OBA subsidy disbursements to verification that the farmers accessing the irrigation technology have actually achieved productivity improvements. These discussions will need to explore the private sector firm's appetite to take on these risks given that they do not necessarily have control over the effectiveness with which farmers use the irrigation equipment.
- Support for larger-scale project opportunities, in our view, will require GPOBA to be involved with the projects for a much longer time horizon than is typically covered by an OBA supported project.

Table ES.1: Summary of projects opportunities

Project	Description of the project	Role for OBA	Key risks	Indicative outputs
Small-scale project opportunities				
Market-based approaches	Organisations such as International Development Enterprises India (IDEI) and Kickstart have used grant funds (in IDEI's case from the BMGF) to extend micro-irrigation technologies to farmers by focusing on market development activities, such as product development; supply chain development and providing training/ technical assistance.	OBA funds would enable organisations such as IDEI/ Kickstart to cover their market development costs to ensure that the technologies are available to farmers at an affordable level.	To date project have been supported by traditional grant-based funds. It is unclear whether organisations such as IDEI has the capacity to pre-finance investments.	• Cost per farmer of approx. $75 - $125 • Increased poor farmers' incomes by up to $400 per annum
Rainwater harvesting tanks	Smallholder farmers are provided support to enable them to construct rainwater harvesting tanks on their land which enables them to collect and store water. If properly sited, these ponds can (i) reduce risk by supplementing rainfall in the main monsoon cropping season; or (ii) irrigate a smaller area of winter dry season crops.	OBA subsidies could increase the number of farmers able to invest in the tanks. The release of the funds triggered by the completion of the civil works	When a previous intervention was trialled in India it was difficult to build demand amongst poorer farmers to build the tanks.	• Cost per farmer $890, potentially lower depending on State contribution • Smallholders income up by $400
Larger-scale project opportunities				
Integrated Micro-Irrigation Projects (IMIP)	Private companies, such as Jain irrigation, are contracted by State governments to rehabilitate the down-stream irrigation infrastructure (minor canals and distribution channels); provide micro-irrigation technologies to farmers and manage the operation and maintenance of the scheme for a specified time period.	OBA funds provided in the form of capital subsidies to help bridge the financing gap caused by the limited availability of State funds that could prevent the implementation of the projects.	Implementation of the project is dependent on contributions from State governments.	• Cost per farmer of $825 to $1650 • Smallholders' income increases by over $550 per annum

Commercial hub-outgrower projects	Under this model, a large-scale commercial farmer enters into an arrangement to operate and manage bulk water irrigation services and, either constructs and operates, or constructs and contracts out the management of the irrigation services provided to emergent and / or smallholder farmers.	OBA funds could be provided in the form of capital subsidies, with the a proportion of the funds disbursed based on independent verification of the smallholders being connected to functional irrigation services.	Nature of the financial incentives of the commercial farmers to provide services on a sustainable basis to smallholders	• Cost per farmer could be in range of $5,000 to $25,000 • Smallholders income increases by up to $1,350 per annum

Report Structure

This report provides a review of the scope to apply Output Based Aid (OBA) subsidies to support the provision of irrigation to small scale farmers and then identifies specific project opportunities in the sector and evaluates how OBA subsidies could be used in each instance.

The report is structured as follows:

- **Part 1 Desk-based review of irrigation markets in selected countries**.
    - Section 1 provides an introduction to the report. It describes the report's objectives and the scope of the report.
    - Section 2 introduces the concept of OBA. It explains how the OBA financing concept works and describes the different types of subsidy that have been used in OBA financed projects.
    - Section 3 summarises the findings from our desk-based research on the different types of irrigation scheme and policy environment in selected countries and provides a qualitative assessment of the scope for applying OBA subsidies in the sector.
- **Part 2 Market assessment**
    - Sections 4 and 5 describes the type of project opportunities that could be supported by OBA funds identified during our in-country consultations in India and Zambia and provides a qualitative assessment of the benefits and risks involved.
- **Part 3 Recommendations**
    - Section 6 presents recommendations on how OBA could be used to support opportunities in the sector and our views on the next steps for the GPOBA.

The main report is accompanied by the following annexes:

- Annex A: PPP irrigation model user guide. Alongside the completion of this report, we have completed a model that can be used as an appraisal tool to evaluate the costs and benefits involved in applying OBA funds to support a project. The appraisal tool includes an example of a hypothetical PPP irrigation scheme, the annex provides an explanation of the assumptions included in the model and a step-by-step guide on how to use the appraisal tool.
- Annex B: OBA case studies. This annex provides an overview of how OBA subsidies have been used across different sectors together with some detailed case studies on projects that have applied OBA subsidies.
- Annex C: Country case studies. This annex provides desk-based research on the irrigation sectors in the five countries reviewed in this analysis.

Introduction

The purpose of this report is to explore the use of Output Based Aid (OBA) as a financing mechanism to support the development and operation of small-scale irrigation schemes in developing countries.

Objective of the assignment

CEPA has been commissioned to complete an analysis designed to inform the World Bank's understanding of the scope to apply OBA grants to support the increased provision of irrigation services to smallholder farmers. The specific objectives of the report are to:

- Evaluate the scope for OBA in financing small-scale irrigation schemes to support poor farmers in developing countries.
- Propose project design and implementation arrangements, based on real-world examples, to support sustainable small scale irrigation schemes benefiting from OBA, either under public or private management.

The aim is being to provide the GPOBA with recommendations on the appropriate strategy for using OBA subsidies to support the implementation of irrigation projects.

The analysis also includes a tool that can be used to carry out a financial and economic appraisal of the potential OBA subsidies.

Scope of the report and key definitions

We state up-front some important parameters that provide focus to the report.

Scale of irrigation schemes under consideration

The definition of a 'small-scale' irrigation scheme can vary from country to country; therefore it is useful to define what is meant by a small-scale scheme for the purposes of this study.

A review of the GPOBA portfolio of projects indicates that it has provided OBA subsidies in the range of $1m - $13m, with a typical project receiving $5m - $10m. We have therefore focused on irrigation projects that could utilise an OBA subsidy within this range that would benefit smallholder farmers/ the poor with improved and/ or more affordable access to irrigation services.

Given the potential size of the subsidy under consideration this suggests that we are not only looking at small irrigation schemes, which particularly in the Sub Saharan African (SSA) context would, individually, often be too small for support from an OBA grant, but at larger-scale schemes that primarily serve the needs of small scale farmers. We are also looking at the potential for OBA support for irrigation facilities operated by individual small-holder

farmers or by small groups of such small holders.[1] Typically such a facility is a pump extracting water from a well or river to serve a small patch of land. To be feasible for OBA, such farmer facilities would need to be addressed in some numbers, possibly via equipment dealers or a facilitating agency such as an NGO.

Regional/ country focus of the assignment

The assignment has focused on reviewing irrigation schemes in the SSA and South Asia regions, in line with GPOBA's funding priorities. Focusing on these two regions is interesting because of the different policy and operating environments found in each, as well as the fact that both are at quite different levels of development with respect to the irrigation sector and so should enable the report to identify different types of project opportunities that could be supported by OBA grants.[2]

In SSA irrigation does not currently play a significant role in the agricultural sector. Only approximately 3.5% of agricultural land in the region is equipped for irrigation, covering only seven million hectares (ha) out of a total cultivated area of 197 million ha.[3] Of this around five million ha (75%) is actually irrigated.[4] Overall, despite the variable and in many regions insufficient nature of rainfall and the prevalence of droughts, food production in SSA remains almost entirely rain-fed, therefore we expect that the opportunities in the region need to focus on extending the coverage of irrigation schemes.

In contrast the South Asia[5] region is one of the most heavily irrigated in the world with around 93 million ha of land currently equipped for irrigation, representing 46% of the total cultivated land.[6] Against a landscape of growing water scarcity, volatile cereal prices and limited potential for further irrigation expansion in the region, focus is now increasingly shifting towards improving water management and control, increasing agricultural productivity and facilitating diversification to higher-valued crops. As such there is less focus on extending irrigation and more on the need to improve technology and management to raise the efficiency of existing schemes and to manage water resources more equitably and sustainably.

While the two regions are different in terms of the current level of coverage and efficiency of irrigation schemes, they both suffer from issues surrounding the performance of the government institutions responsible for irrigation supply services; and the willingness and

[1] [1] Smallholder farms are typically small farms that support a single family through the production of a mix of cash and subsistence crops.

[2] According to the World Bank poverty rates (measured as the proportion of population on $1.25 or less a day) in SSA were 48.5% in 2010 and 31% in South Asia. This compares to the next highest region, East Asia, which had a poverty rate of 12.5%.

[3] Areas with other forms of agricultural water management include non-equipped flood recession cropping area, non-equipped cultivated wetlands and inland valley bottoms.

[4] FAO (2005). *Irrigation in Africa in Figures*. AQUASTAT Survey – 2005.

[5] South Asia region defined as Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka.

[6] FAO (2005). *Irrigation in Southern and Eastern Asia in Figures*. AQUASTAT Survey – 2011.

ability of smallholder farmers to pay for irrigation services given perceptions amongst some farmers that they should not have to pay for irrigation combined with affordability constraints. These issues are important when determining how OBA could be applied effectively in the irrigation sector.

Introduction to OBA

This section provides an overview of what the OBA financing approach is; describes how it has been used in different infrastructure sectors, supported with some case studies; and highlights the key lessons that could help to shape the application of OBA subsidies in the irrigation sector.

What is OBA?

OBA is a Results Based Financing approach used to increase access to basic infrastructure services for the poor in developing countries. It was introduced by the World Bank in 2002 as part of its Private Sector Development Strategy, and more formally in January 2003, when the GPOBA was launched: GPOBA's objective is to mainstream the use of OBA within the strategies of the IDA and other development partners.[7]

OBA subsidies seek to increase the level of transparency with which development funds are used by explicitly linking the release of funds to the achievement of pre-determined outputs. The application of OBA also aims to give service providers an enduring incentive to deliver an acceptable level of service performance to poorer consumers. These are customers they would otherwise not target due to the inability of those customers to afford the service.

The key features of the OBA approach include:

- Explicit targeting of the subsidy to ensure that the funds for investment are directed towards the poor for 'last mile' access/connection to public utility services (OBA is not designed to fund term investments in on-farm capital purchases such as machinery, but connection to a water service through a pump and small network distribution (such as drip lines) can be included).
- Third-party contracting for service delivery. Service-providers are paid the subsidy to complement or replace user fees that the recipients of the services would otherwise be unable to afford. OBA subsidies are thus explicitly based on an estimate of the ability / willingness to pay.

[7] World Bank, 2010 "Output Based Aid – Lessons Learned and Best Practice Guidance."

- Linking the aid disbursement to the delivery of outputs that are associated with the use of basic services by the targeted poor consumers. Service-providers are meant to pre-finance the project until output delivery.
- Independent verification to ensure that funds are paid following service / output delivery to the specified group of beneficiaries.

The OBA financing approach sits within a range of Results Based Financing methods that have been applied to improve the way in which development funds support infrastructure development. Other approaches include: Performance Based Financing, the Programme for Results Financing (PforR) and Conditional Cash Transfers. Section 3 of this annex provides more detail on how OBA compares to other types of Results Based Financing; however it is worth setting out the following characteristics that distinguish OBA as stated in GPOBA and World Bank reports:[8, 9]

- The project outputs are defined as closely to the desired outcome or impact as contractually feasible.
- Disbursement of funding is linked to the achievement of clearly specified results which directly support access to basic services by targeted poor people.
- The subsidy seeks to complement private sector financing, or leverage such financing to enable infrastructure services to be extended to poor consumers in circumstances where they would otherwise be too poor to pay the full cost.

What types of OBA subsidy have been employed?

The main types of OBA subsidy provided to support projects include the following:

- *One-off capital subsidies*: the most common application of OBA schemes involving the provision of an one-off subsidy to help service providers buy-down the capital costs required to supply consumers; usually by buying down the cost of constructing infrastructure or the costs related to extending access to infrastructure thus helping to reduce the connection fees that users have to pay to access the service. In a model example, the service provider would pre-finance the up-front investment, and receive the subsidy after the targeted beneficiaries are able to access the service, with the access being independently verified. The approach has typically be used in network industries to fund projects that aim to increase the number of individuals with access to an utility service such as water and electricity.
- *Ongoing subsidies*: Another form of OBA subsidy provided is the ongoing subsidy. As the name suggests this subsidy is provided continuously and is used where there is

[8] http://www.gpoba.org/sites/gpoba.org/files/OBA%20Universe.pdf ; 2010 WB Review

[9] World Bank (May 2011): "Financial and Other Rewards for Good Performance or Results: A Guided Tour of Concepts and Terms and a Short Glossary"
http://www.rbfhealth.org/system/files/RBF%20glossary%20long%20revised.pdf

judged to be an enduring gap between what poorer consumers can pay for a service and the tariff price required for the provider to recover its costs. Subsidies of this nature are often used to support the increased provision of basic infrastructure services such as roads, health and education. For example, continued access to care for the poor often requires OBA health schemes to provide ongoing subsidies to healthcare providers, as they continue to deliver agreed services over a defined period. Another example is when ongoing subsidies are provided to fund ongoing road maintenance over the life of a road.

- *Transitional subsidies*: are used to support tariff reforms, covering the difference between what the user is willing/ able to pay and the cost-recovery level of the tariff. The subsidy is transitioned out over a specified period of time, as the user contributions increase and/ or the tariff required to recover costs falls as the service provider achieves efficiency gains. This approach of providing OBA subsidies has been provided in only a few instances, potentially reflecting the associated risks such as the potential for the provider to become dependent on the funds and the transitional subsidy turn into an ongoing one. An example where this approach has been applied is the transitional subsidy that was used to improve access to high-quality solid waste management services in Nepal.[10]

Conclusions and summary

This Section has provided a brief introduction to the OBA concept, describing the principles that guide the use of OBA and the different types of OBA subsidies that have been disbursed.

In Annex B we have reviewed a number of case studies where OBA subsidies have been employed to support project development, to help us identify the key lessons/ factors required for the successful implementation of OBA projects to the irrigation sector. These include:

- The existence / capacity of supporting institutions to facilitate the effective implementation of an OBA program.
- The practicality of targeting defined beneficiary groups with certain types of irrigation technology.
- The extent to which controllable performance risk can be specified and incorporated into a project.
- The ability of the project to manage demand-side risks, which in the context of the irrigation sector has been a particular issue given the inability/ reluctance of farmers in both SSA and South Asia to pay for irrigations services in certain contexts.

[10] GPOBA (2012), Project Commitment Paper, Output Based Aid for Solid Waste Management in Nepal.

- The importance of structuring projects such that they remove payment risks, particularly when government institutions are involved.
- The existence of investors willing/ able to manage a significant portion of pre-financing costs.

Desk-based review of irrigation markets in SSA and South Asia

Introduction

This section summarises the outputs of desk-based reviews of the irrigation sectors in a sample of countries in the SSA and South Asia regions. The objective is to provide an overview of the different types of irrigation scheme and the policy environment for irrigation in each of the sample of countries; and then to provide an assessment of the suitability of the policy and operating environment for the provision of OBA subsidies.

Choice of countries for analysis

For the desk-based review, we have focused on the following five countries within the SSA and South Asian regions. These countries were chosen because they give good coverage across the two regions and to take advantage of the existing knowledge-base on relevant sources of publicly-available information, given the difficulty in sourcing up-to-date evidence on the irrigation sector.

- Ghana.
- Kenya.
- Zambia.
- Bangladesh.
- India (focused on the lagging States of Madhya Pradesh and Orissa).[11]

Overview of the irrigation schemes and policy environment

For each of the five countries we have tried to identify the following information:

- Categorise the different types of scheme that exist in the different markets (considering the involvement of smallholders, size, type of technology, crops supported etc.).
- Discuss the existing governance arrangements for the different types of scheme.
- Review the policy environment surrounding the irrigation sector, describing the policy with regard to Irrigation Service Charges (ISCs); the key institutions involved in implementing irrigation policy; and highlighting any interesting government/ development partner funded developments in the sector.

[11] The 'Lagging States' are States in India that have been defined by DFID as being amongst the poorest States in India (Madhya Pradesh, Orissa, Bihar and West Bengal). These States are the primary areas of focus for DFID's support to India.

We present the detailed country-level analysis in the Country Studies Annex, but have summarised the information below (please note that the full references for the figures quoted in the table can be found in the annex).

Table 3.1 summarises the information gained on the selected countries.

Table 3.1: Summary of country case studies

Types of irrigation scheme	Policy environment
Ghana	
• It is estimated that less than 1% of agricultural land is irrigated – around 30,000ha in total of land is irrigated and under cultivation. • Most irrigation systems are small-scale (<1 ha) informal schemes based around the production of crops to address food security concerns. Schemes typically involve low cost technologies and often use temporary structures such as hand-dug shallow wells due to land insecurity issues. • There are 22 public schemes with potential to irrigate around 13,500 ha but serving only 6,500 ha. Technologies used are reservoir-based gravity fed systems; though some make use of sprinkler systems. Costs of constructing these schemes estimated to be around $15,000 per ha. • There are estimated to be 18 large-scale privately run commercial schemes that have been constructed to support the production of vegetable and horticultural crops located in Greater Accra, Volta and Eastern regions. Main technologies used are trickle or sprinkler systems.	• Government policy is in principle supportive of the private sector, but to date policies have been skewed to supporting the public schemes. Recent policy statements highlight the need for government to provide support for the emerging informal sector more effectively. • On the 22 public schemes the level of ISC has been set well below the rate necessary to cover O&M costs and collection rates estimated to be in range of 45% - 65%. The level of charges vary considerably, depending on type of technology/ standard of the facilities; e.g. in a district served by a pumping facilities ISC is $110 per ha per year, while in one served by gravity charge is $22 per ha per year. • The Ghana Irrigation Development Authority (GIDA), is the key institution responsible for managing public irrigation schemes, existing research suggests that it suffers from significant capacity constraints.
Kenya	
• It is estimate that the land that is actually irrigated covers just 1.7% of total arable land or a total of around 110,000ha. • Smallholder irrigation schemes (average size 0.1 to 0.4 ha) account for over 40% of total irrigated area. They are typically owned, developed and managed by individuals or occasionally through community-based schemes. Schemes make use of simple technologies to collect water from open water sources. Some smallholders have been able to invest in portable pumps. • There are seven large-scale public schemes managed by the National Irrigation Board (NIB) and vary in size from 100 to 6,000 ha. They are	• Government policy has been geared towards increasing the development of the irrigation sector; specific reforms have been implemented in recent years to give the private sector, through Water Use Associations (WUAs) a bigger role in the identification, development and O&M of schemes. • ISCs have typically been set at below rates required to cover O&M costs; e.g. at the Mwea public scheme charges are around $10 – 20 per acre per year, but the charge required is upwards of $55. There are also significant issues with the collection of charges on public schemes in part due to a limited willingness to pay by farmers. The responsible

Types of irrigation scheme	Policy environment
designed to support rice and maize production. These include a mix of gravity and pump-based systems. • Commercial irrigation schemes account for around 40% of irrigated land, typically focus on high-value crops (horticulture and vegetables) focused on export markets. The schemes tend to use modern irrigation facilities, such as drip, sprinkler and centre pivots.	institution for setting irrigation charges is the Water Resources Management Authority (WRMA). • The National Irrigation Board (NIB) is responsible for managing the large-scale public schemes. It is one of a number of institutions involved in the policy and regulatory environment leading to inefficiencies and delays in the implementation of reforms required to modernise the sector.
Zambia	
• In total around 155,000 ha is actually irrigation out of 2.7m of arable land, or around 5% of arable land. • Smallholder irrigation schemes cover over 110,000ha of the irrigated land. The schemes are mainly used to irrigate vegetable crops and make use of basic technologies. • In some cases farmers make use of manual pumps cost at approx. $200 per pump (which have largely been distributed under FAO/ other donor programmes); and motorised pumps (generally used by medium-scale farmers, the approx. up-front cost is $400 - $500). • There are estimated to be seven large scale public schemes (covering up to a size of 2,760 ha of land). These are used to provide irrigation to a range of crops such as banana, vegetables and citrus. • There are also some commercial schemes in place throughout the country. These schemes typically support cash crops such as coffee, sugar and horticultural goods and in addition there are some pivot irrigation schemes to support the production of wheat, soya and maize.	• Overall government policy is geared towards increasing the level of irrigated land in Zambia; the country's National Development Plan specifically seeks to make use of PPPs to develop smallholder irrigation projects. • The World Bank is currently supporting the Ministry of Agriculture and Livestock (MAL) with $115m to develop the Irrigation Support Development Project (IDSP). Three projects are under development at feasibility stage, the plan is that they will operate under a PPP model in which a private farming company will act as a hub operation; the bulk water supply will be provided by the public sector but it will be operated privately, and all users will pay user fees. • The Agriculture Water Solutions (AWS) study identified that the Zambia Revenue Authority only grants VAT exemptions/ import duty waivers for irrigation equipment sourced from either the COMESA or SADC regions. Otherwise a customs duty of 15% is applied, which restricts smallholders access to irrigation equipment.
Bangladesh	
• Irrigated crops are grown on over half of all farm land, covering over five million hectares. Irrigation provision is classified as either being surface water or ground water schemes. The latter include Deep (DTW) and	• The Ministry of Water Resources (MoWR) is responsible for the overall management of water resources and for policy development. It includes the Water Resources Planning Organisation and the Bangladesh Water

Types of irrigation scheme	Policy environment
Shallow Tube Wells (STW). Ground water now accounts for 90% of irrigation. • Over 60% of total irrigated land in Bangladesh makes use of STW technology, covering nearly 3.25m ha. These are owned and operated by private individuals who supply the water for themselves. • There has also been significant uptake of human powered treadle pumps to irrigate around 0.5 acres of land. These devices have been popularised by and NGO, International Development Enterprises (IDE). Around 1.4m treadle pumps have been sold in Bangladesh at cost of around $200 per unit. • Initially the development of DTW schemes was led by government, but these are now increasingly in private hands due the difficulties that government had in recovering costs to provide the funds necessary to manage the schemes. However the Barind Multi-Purpose Development Agency (BMDA), a unit of the Ministry of Agriculture has been more successful and now operates about 14,000 DTW irrigating over 600,000 ha of land. • For surface water irrigation, the main technology used is Low Lift Pumps (LLP) – small diesel or electric powered pumps lifting water from rivers, canals and lakes. In 2009 there were about 147,000 LLP in operation providing water to 2.5m farmers irrigating just less than one million hectares. Most of these schemes are owned and operated by the private sector. The cost of operating these pump schemes is estimated to be around $50 - $65 per hectare. • Since the 1950s, 15 public large scale irrigation schemes have been constructed. The total area of the surface schemes constructed is 480,000 ha, but by 2009 only 75,000 ha, or 16% of the command area, was operational. These schemes use of a mixture of pump and gravity based technology. The capital costs of these surface schemes has been estimated at $500 to $1,800 per ha. These schemes often combine	Development Board (BWDB). • Although there is a high level of involvement by government in large scale and DTW schemes, overall government is supportive of private sector led development. For instance, reforms which removed the duties and restrictions on the import of small diesel engines and on the licensing of STWs by the private sector are partly responsible for the significant growth in the use of the technology by farmers. • There has generally been low cost recovery through ISCs on the both large scale and minor public schemes leading to ongoing problems with funding the required O&M, which has led to poor performance particularly for the large pump-based schemes. E.g. for the Ganges-Kobadak public scheme in one year it was estimated that the scheme required approx. $50 per hectare to cover O&M costs, the BWDB set a charge of around $3 per hectare of which only a small proportion was recovered. • To try to improve cost recovery on minor public schemes the BMDA has developed a system of payment for water via pre-paid coupons, which has helped it to cover its O&M costs associated with the DTWs under its operation. Other public sector DTW (and some LLP) are operated by the Agricultural Development Corporation of the Ministry of Agriculture. • The BWDB is the main institution responsible for running the public sector surface water schemes, but it has increasingly been trying to hand over control of these projects to water user groups (mainly medium and small scale farmers.). The World Bank supported Water Management Improvement Project is currently trying to strengthen the capacity of the BWDB with a new staffing and human resources plan. • The Local Government Engineering Department (LGED) of the Ministry of Local Government, Rural Development and Cooperatives has responsibility for water resources management for areas under 1,000 hectares. These include a number of smaller schemes for irrigation (usually along with drainage and flood control). A number of these

Types of irrigation scheme	Policy environment
irrigation with flood control and drainage.	schemes are supported by projects funded by ADB, IFAD and other donors.
India (overview)	
• India has the largest area under irrigation in the world, with a total of 62 million hectares covering about one third of all agricultural land. • Minor irrigation schemes cover areas of under 2,000 ha. 65% of irrigation is from minor schemes; most of these are privately owned and operated groundwater schemes. In terms of financing these minor schemes, around 70% of funds come from farmers' own savings, 13% from bank loans and around 9% from government funds. • There are a wide-range of different technologies employed in the minor irrigation schemes including groundwater schemes (mainly shallow and dug wells); sprinkler and drip schemes and tank irrigation (small storage tanks run by local community bodies – usually up to 40 ha). • Medium schemes cover areas of between 2,000 and 10,000 ha, and schemes covering over 10,000 ha are classed as major schemes (in practice they are not differentiated in terms of technology employed and the ownership/ operational arrangements, just in terms of size). There are around 400 medium and major irrigation schemes in India, which are owned and operated by government.	• Government, in the form of individual State level institutions, is responsible for the provision of irrigation services up to the farm gate. Government invests significant funds in the development, rehabilitation and operation of surface water irrigation schemes. Farmers are responsible for managing on-farm irrigation facilities and WUAs are responsible for collecting ISCs. There has been very limited private sector participation in medium and major schemes. • The focus of government policy continues to be on the provision of subsidies to farmers to enable them to afford access to irrigation equipment. In general (though there are a few exceptions such as the case of Gujarat) these schemes are not implemented effectively, with problems experienced with the manner in which funds are disbursed and on the availability of resources at State level to fund the implementation of these subsidy schemes. • There is inadequate regulation of groundwater extraction and few incentives to prevent over-exploitation. Current regulations allow anyone to sink a well on their own land, and the current pricing of electricity (as well as free power for agriculture in some states) does nothing to discourage overuse, including pumping from ever-greater depths. • Similarly there is a need to apply water charges for surface water schemes more effectively. In general the overall revenue collected from irrigation fees barely covers 20% of O&M costs.
India (Madhya Pradesh)	

Types of irrigation scheme	Policy environment
• Recent estimates suggest that over 6m ha of land is under irrigation in the State, which is around 32% of agricultural land. 80% of this land, or just under 5m ha, is irrigated by groundwater technologies, primarily privately owned STWs and hand-dug wells. • The remainder of schemes are surface water schemes, with around 1m ha of land irrigated by government run canals and the remaining schemes utilising water tanks and other technologies. • At present the State has around 20 major, 85 medium and 4,500 minor schemes which are currently operational. In addition to this, as part of the State's expansion plans, there are an additional 8 major, 35 medium and over 650 minor schemes currently under of construction.	• The Madhya Pradesh Water Resources Department is responsible for the creation and maintenance of irrigation potential through the construction of water resources projects. It looks after the construction, maintenance and regulation of major, medium and minor irrigation projects in the State. • Various subsidies are in place, such as the subsidy of up to approx. $2,250 provided to support the construction of Balram Talabs (large water tanks that can irrigate up to 50ha), and subsidies of 70-80% of costs to support farmers to purchase micro irrigation technologies that improve water use efficiency (such as sprinkler and drip irrigation systems). • Research suggests that these subsidy schemes do not operate effectively; for instance the AWS study of the drip irrigation subsidy concludes that the existence of the subsidy scheme is a major factor restraining the take up of drip irrigation schemes in the State, in particular as a result of its impact on reducing competition and innovation in the market as the provision of the subsidy applies only to pre-approved manufacturers of drip technology.
India (Orissa)	
• According to the State's estimates around 6.2 million ha of land has the potential to benefit from irrigation in Orissa; however, around 3 million ha of this is currently being irrigated, which represents around 35% of agricultural land. According to the Asian Development Bank (ADB) there has been a deterioration of the quality of existing schemes due to insufficient O&M, and a lack of farmer participation to support O&M. • Minor irrigation schemes in the State make use of groundwater technology such as DTW and STWs; while the surface water minor schemes water primarily make use of lift pumps. The government has started to transfer a number of these schemes to the control of WUAs.	• The Department of Water Resources (DOWR) is the responsible body for the development and management of formal irrigation schemes in the State. • According to DOWR the government's policy is to seek full cost recovery when setting charges for irrigation services for public schemes. The rates are published on the DOWR website and vary depending on the classification of the irrigation works, and the crops produced by the farmers; for instance for vegetable crops they are set at $3.70 per ha per year but for sugarcane the price is $8. In practice these charges are significantly lower than the O&M costs, and in addition collection rates

Types of irrigation scheme	Policy environment
• The government run the States' medium and major schemes, many of which make use of dam and canal technology.	are low. • The government currently provides a 90% subsidy for drip irrigation schemes; the subsidy programme suffers from similar difficulties as the programme in Madhya Pradesh.

Assessment of the policy and operational environment

Using desk-based research we provide a qualitative assessment of the suitability of the policy and operating environment for the provision of OBA grants in the countries that we have reviewed. The analysis is intended to help identify issues that need to be discussed with policy makers/ potential investors before proceeding to give consideration as to how the OBA approach may need to be adapted to fit the needs of the sector.

To help with this assessment we reviewed the GPOBA Diagnostic Tool report, which provides guidance on the factors to be considered when determining whether a sector could benefit from OBA support.[12] The diagnostic tool sets out requirements, split into institutional capacity and financial criteria, which should be met to satisfy the necessary conditions for OBA. We focus on the following criteria:

- **Sector fit**. The government should support the use of OBA in the sector and it should be consistent with the sector's priorities, e.g. is the government committed to invest the time/ resources necessary to support implementation of the scheme; is there an institution/ individual within the government that is willing and able to help champion the use of OBA within the sector?
- **Monitoring and evaluation**. Does the government have the capacity to manage an OBA contract? It should be possible to establish an effective monitoring and evaluation process, including the potential to use an independent institution to verify the delivery of the pre-specified outputs.
- **Sector financial sustainability.** The sector should have some level of financial sustainability with tariffs in place that cover a significant proportion, if not all, of the operational and maintenance costs associated with the project.
- **Subsidies and grants.** It must be acceptable/ practical to provide subsidies in the given sector and it must be possible to provide explicit, targeted and performance based subsidies.

In addition to the above four criteria, the OBA diagnostic tool also includes the following two criteria:

- **Capacity of the service provider**. The potential service providers must have the technical, managerial and financial skills necessary to manage the requirements associated with the potential OBA subsidy. Do service providers in the sector have an established track-record of delivering successful projects? Do they understand what is entailed within an OBA scheme?
- **Pre-financing capacity.** The service providers in the sector must have some capacity to pre-finance the required investments. This also includes the requirement that

[12] GPOBA, Diagnostic tool, part one Initial assessment.

mechanisms should be available that enable the service provider to pre-finance investments before the disbursement of the OBA.

We have not considered these last two criteria at this stage of the assessment because they are more suitable for consideration when looking at the specific project-level opportunities set out in the market assessment part of the report.

Assessment against criteria

We consider the selected countries/ states against the selected criteria below.

Sector fit

As part of a limited scope desk-based assignment, we have not had a chance to discuss with the respective governments their level of support for the use of OBA to increase the provision of irrigation to smallholders. Instead we have taken a view based on the extent to which we judge that the policy environment within the countries is in-line with the OBA financing approach.

Overall, with the possible exception of India (though this varies by State) the governments in each of the five countries that we have reviewed are, at least in terms of stated government policies, supportive of/ actively implementing policies designed to attract more private sector investment in the provision of irrigation services to smallholder farmers and are implementing reforms that are consistent with OBA principles.

In India, while Central Government is supportive of making use of more innovative approaches to secure the provision of irrigation to smallholder farmers, the individual State governments have responsibility for implementing policies in the sector. At State level the provision of irrigation to smallholders is a highly political issue and attention has focused on the implementation of subsidy schemes rather than on the reforms to improve the efficiency of the sector. In general, there are issues with the way in which the subsidies have been implemented, particularly with the level of transparency around the allocation of funds to support smallholder farmers. There are thus reasonable concerns about the ability of State level institutions to commit to supporting the implementation of an OBA financed project, which rely on the transparent release of funds based on the achievement of pre-defined outputs.

This suggests that, in India, it would be particularly important to get firm commitment and ownership from the State governments before trying to proceed with any OBA project in the irrigation sector; or alternatively adopt project approaches which only need limited State government involvement, such as providing suppliers with incentives to sell certain types of irrigation equipment to specific target groups.

An additional concern, particularly with regards to the SSA countries, is the number of government institutions that hold important policy responsibilities in the sector. This can often lead to bureaucracy and inter-departmental disputes that cause delays in project

implementation. One potential way to address this concern is to work with government to establish a project taskforce that is given delegated responsibilities for a particular project. For instance, the progress of the Irrigation Development and Support Project (IDSP) in Zambia has been helped by the formation of a project level taskforce that has the mandate to take the project forward. This has created a centralised body with the clear mandate, and responsibility to make progress with the implementation of the irrigation projects. This is useful because stakeholders have a clear institutional point of reference to which they can refer if any issues arise.

More generally as part of the sector assessment we have also considered the ease of doing business in the agribusiness sectors of the countries that we have covered.

For Ghana, Kenya and Zambia countries the World Bank have completed a series of studies that assess the ease of doing business in the agribusiness sectors, while these studies do not cover specifically the irrigation sector they provide some useful overview of the availability and cost of finance for agribusiness and the overall policy and regulatory environment for the sector. We summarise the key points from the analysis in the table below.

Table 3.2: Summary overview of the business environment for agribusinesses

Indicators	Ghana	Kenya	Zambia
Agricultural finance	•% of commercial bank lending to the agricultural sectors just 6.1% • Agribusiness indicators reports that commercial bank rates offered to agribusiness sector upwards of 25-40% •Commercial rates of around 25% according to the Central Bank	•Commercial bank lending to agricultural sector at just 5.7% •Agribusiness indicators reports loans to agricultural sector attract up to 20-25% •Commercial rates of around 17% according to the Central Bank	•Commercial bank lending at 17.1% •Agribusiness indicators reports rates to agribusinesses at 23%. •Compares to commercial bank lending rates around 16% according to the Central Bank
Policy and regulatory environment	•Government attempts to stimulate private sector have achieved success but stakeholders judge that more work needed to improve dialogue between government and the private sector •Government spending on the agricultural sector 9% of budget, which is broadly in-line with CAADP target of 10%	•Agribusiness sector perception is that government is trying to support private sector growth in the sector, but is still prone to ad hoc interventions. •Government spend on agriculture just 4.3%.	•Government seen as trying to support increased private sector participation in the agricultural sector, though private sector thinks that government should do better to take account of its concerns when developing policies. •Government spends around 6% of budget on agriculture.

Source: World Bank Agribusiness Indicators, Central Banks of Ghana, Kenya and Zambia

In all three SSA countries, while the policy and regulatory environment is broadly conducive, the cost and availability of finance for agribusinesses is a significant constraint to private sector development. For instance, in Zambia, although the agricultural sector gets a higher proportion of bank lending than in Ghana or Kenya, most of that lending is restricted to large commercial farms. As a result a large proportion of the agribusiness sector rely on informal financing or retained earnings rather than banks. In Zambia banks also do not lend in general to greenfield investments in the agricultural sector.

In the context of OBA this is potentially an issue because the lack of available and affordable credit could limit the ability of potential service providers to pre-finance their investments. The development of an OBA project in these regions would most probably need some consideration to be given to how to support the private sector to pre-finance the project; for instance on the Microfinance for Community Managed Water Projects OBA project in Kenya, a local bank – K-Rep was directly involved in the implementation of the scheme to help finance the project.

We have not been able to access detailed assessments of the business environment for agribusinesses in either Bangladesh or India; however, the more general World Bank Doing Business indictors for both countries suggest that the agribusiness business environment will be challenging. India and Bangladesh are ranked 134th and 130th out of 189 nations, which is worse than Ghana (ranked 67th), Zambia (ranked 83rd) and Kenya (ranked 129th).[13]

Particular issues raised for both India and Bangladesh include difficulties in the enforcement of contracts and getting an electricity supply. Not discounting the importance of these issues, in our view it emphasises the importance of designing an effective OBA project in the irrigation sector, rather than suggesting that it is not possible to develop an OBA irrigation project in the regions that we have reviewed in this report.

Monitoring and evaluation

An important requirement for OBA is the existence of institutions that have the capacity to manage OBA contracts effectively. Based on our research there are concerns about the capacity of some of the relevant government institutions to do so.

For instance the institutions responsible for managing irrigation in SSA such as the Ghana Irrigation Development Authority (GIDA) and the National Irrigation Board (NIB) in Kenya are reported to suffer from considerable capacity constraints. In the case of GIDA it is reported that the institution is primarily staffed by engineers, and thus lacks the range of individuals with the agronomic, financial and policy making skills necessary for the sustainable and profitable operation and maintenance of the infrastructure.[14] According to Ministry of Food and Agriculture's (MOFA) 2011 Irrigation Policy and Strategy document,

[13] http://www.doingbusiness.org

[14] MOFA (2011), Irrigation Policy and Strategy.

"GIDA's limited human and financial resources have severely compromised the extent and quality of delivery while further constraining both the development and productivity of the formal sub-sector".

Similar to the case in SSA, South Asian institutions generally have limited financial resources and weak institutional frameworks. There are some exceptions to this such as the Local Government Engineering Department (LGED) in Bangladesh which is responsible for water resources management, and developing "small-scale" water resource projects for areas under 1,000 ha. The LGED has been quite successful in securing the services of technical specialists, and has built a reputation as an efficient project implementation agency.

Overall, our desk-based research suggests that it will be necessary to provide technical support to the government agencies responsible for irrigation to facilitate the establishment of an effective monitoring and evaluation framework. Alternatively, OBA projects should target projects where the partner institutions come from existing NGOs/ private companies. Across all five countries that we have reviewed there are a number of NGOs/ private companies that have been involved in implementing projects funded by development partners.

Sector financial sustainability

Across all of the five countries there are significant concerns around the level of financial sustainability of the provision of irrigation services to smallholders.

In each country that we have looked at, despite the existence of written government policies that are seemingly consistent with the application of charges for irrigation services that cover O&M costs, the ISC for public irrigation schemes does not cover a significant proportion of O&M costs, let alone allow for the recovery of up-front capital costs. In addition, all of the countries have encountered significant problems in collecting fees from farmers. For instance, in India the ISC is estimated to cover barely 20% of O&M costs, while in Ghana the collection rates are estimated to be in range of 45% - 65%, and in Bangladesh collection rates were estimated to be in the range of just 3 to 10%.[15]

The end result of this is that schemes are effectively reliant on ongoing subsidies from government to fund O&M, which is not a sustainable source of funds for the irrigation schemes. Governments have typically been unable to continue to subsidize the costs required to maintain the quality of the infrastructure for irrigation services, causing publically operated schemes to get into, what has been characterized in a number of reports as, the 'build-neglect-repair-neglect' cycle.[16]

In combination with the issues with the implementation of the ISC there are underlying concerns about smallholders' willingness and ability to pay for irrigation services. From the farmers' perspective, using their limited spare capital to pay for irrigation is quite a risky

[15] World Bank (2005), Cost recovery and water pricing for irrigation and drainage projects.

[16] See for example FAO (1999), Realizing the value of irrigation maintenance. Issues paper No. 2.

investment, unless they have the capacity to both apply the farming techniques and invest in complimentary inputs (such as fertilizer and improved seeds) necessary to generate yield improvements; and also have the access to markets necessary to realize an increased level of income from their additional production.

The policy environment can also contribute to an unwillingness to pay for irrigation provided by public schemes. Once government has invested its own resources in a scheme, farmers think that maintenance of the scheme is also the responsibility of government. This attitude can be reinforced by politicians who identify farmers as a vote bank and talk of access to irrigation as being a social necessity. Local authorities responsible for scheme operation and maintenance can also be discouraged from seeking to recover cost from farmers if central government or overseas donors are willing to fund periodic rehabilitation - which may not only cover arrears in maintenance, but in addition provide resources for major up-grading and expansion.

These issues imply that an important part of any OBA program will be an effective technical assistance program that can build demand amongst local farmers for the irrigation services and come to some arrangement to ensure the sustainability of these services. This would need to provide farmers with the technical support necessary to enable them to make effective use of the irrigation services; on the farming practices that would help them to increase their yields; and on the skills necessary to enable them to market their produce effectively.

Irrigation projects are self-contained investments which are linked solely to the local off-take, i.e. the viability of agricultural activities using the water. Hence the technical assistance programs will need to ensure that the farmers targeted by the OBA project have the capacity to increase the productivity of their farming practices to the extent that they have the potential to gain a return on their investment in irrigation services.

In addition sustainable OBA projects in the sector will need to be located in areas which provide access to functional markets. The Africa Infrastructure Country Diagnostic (AICD) (2008) carried out an assessment of the scope for financially viable investments in irrigation in SSA and found that a key criterion for viable investment is that the irrigation scheme be located within five hours trucking time to a major city, to ensure that the farmers have a reasonably nearby market in which their goods can be sold. The choice of potential OBA projects will need to take this into account, as a result, there may be occasions in which trade-offs have to be made between projects which target the poorest smallholder farmers and those which target poor farmers based in area, which have access to markets.

Without appropriate access to markets there is limited potential to implement a sustainable OBA project in the irrigation sector – the specific project designs presented in the market assessment part of the work provide examples of how this component of the projects would need to operate. The approach would differ, amongst other things, depending on the scale of the scheme, technology employed and the location of the project.

Subsidies and grants

We have found nothing from our desk-based research that suggests that it is not possible to apply grants and subsidies in the countries respective irrigation sectors. However, given the technical nature of the sector it will be a challenge to design grants that are explicit, targeted and performance based given the difficulties in measuring the performance of irrigation schemes. Provision of irrigation facilities are of little use unless they actually provide water and that water is then used to increase crop production on a sustainable basis. Unlike a system that supplies domestic water to homes, it is costly and time consuming to try to measure the amount of water that has been used by individual smallholder farmers served by a formal irrigation scheme. Moreover delivery of a certain volume of water is not the only indicator of system performance, as the need for water will vary with seasons and the type of crops grown.

Furthermore the ability to apply targeted subsidies is dependent on the nature of the technology employed on the irrigation scheme. It is possible to assign defined property rights for specific types of micro-irrigation technology such as tubewells and pumps (hence a market has developed to serve individual farmer's needs in the five countries covered). It is much more difficult and expensive to exclude potential users on large-scale schemes, such as flow irrigation schemes, as it is usually necessary to develop projects that cover all of a specific geographic area, with everyone who owns land in this area having access to water.

Summary assessment

In the table below we present an assessment of the suitability of the irrigation for OBA against the four criteria considered. We have used the Red, Amber, Green (RAG) assessment approach that is used in the Diagnostic Tool, and set out potential mitigations.

Overall, our assessment is that there is scope to apply OBA to support the provision of irrigation to smallholders, but our desk-based analysis has identified some important concerns that will have to be addressed appropriately when designing potential projects. In particular, it is imperative that any project is designed alongside an effective technical assistance programme that builds farmers demand/ willingness to pay for irrigation services by ensuring that the farmers have the capacity to recover the full economic benefits from the investment.

Table 3.3: summary assessment of suitability of the irrigation sector

Criterion	Sector fit	Monitoring and evaluation	Subsidies and grants	Financial sustainability
Summary	• Stated government policies generally in-line with OBA principles, but limitations of financial sector particularly in SSA suggest that service providers will need some support to pre-finance investments •However, issues with implementation of policies, particularly with regards to India's existing subsidy schemes •Multiple responsibilities for irrigation amongst government institutions has potential to create difficulties/ delays in implementation of projects	• Previous projects in irrigation sector have employed independent third-party organisations to monitor and verify pre-determined outputs •Concerns about the capacity of government agencies/ WUAs to manage an OBA contract.	• Potentially difficult to measure delivery of irrigation services •Difficult to exclude farmers from accessing certain types of irrigation scheme and therefore in certain circumstances challenging to provide targeted OBA subsidies	• It is possible to levy Irrigation Service Charges (ISCs) •However, these charges typically cover a very low proportion of O&M, and the countries reviewed have experienced significant difficulties with collection of charges •There is a need to build demand amongst smallholder to increase willingness to pay for formal irrigation services
Rating against OBA standards				
Comment on the scope for mitigation	• Will need to seek firm commitments for projects with host government before proceeding •Potential to develop a project-level task-force to minimise bureaucracy/ inter ministerial disputes	• A number of NGOs/ institutions experienced in managing development projects are available, should be possible to identify an independent organisation capable of managing contract or to provide capacity building to relevant government institution	• Technologies exist, albeit costly ones, that could measure flow of water delivered to farmers •Possible to develop solutions, such as area-based-charging, to mitigate concerns about targeting OBA on beneficiaries	• Need to integrate technical assistance programmes as part of the projects to ensure sufficient emphasis on development of sustainable project •May need to make trade-off between targeting the poorest farmers and developing schemes with appropriate market linkages

Summary of the desk-based review

This section has presented a review of the irrigation sectors in a sample of countries in SSA and South Asia, to provide an overview of the different types of irrigation scheme available in each country and to get an initial understanding of the suitability policy and operating environment for OBA support.

Summary on the types of irrigation scheme

- There are significant differences in the scale and technologies employed in different irrigation schemes across all the five countries. The provision of irrigation to smallholders is primarily through small informal schemes that are funded, owned and operated by individual farmers/ small groups of farmers themselves. The growth in the use of informal small-scale schemes has occurred as farmers have opted out of formal public schemes, and the technology for small-scale irrigation (e.g. small pumps, sprinklers) has become accessible by smallholders. The growth in the use of informal small-scale schemes has occurred as farmers have opted out of formal public schemes, and the technology for small-scale irrigation (e.g. small pumps, sprinklers) has become accessible by smallholders through agro-dealers, such as Netafim, operating in the sector.
- In the SSA countries informal schemes typically involve basic technologies and temporary structures such as hand-dug wells and temporary river diversions, with land insecurity an important factor driving the lack of investment in more permanent structures. In addition the relative high cost of drilling/ energizing pumps in SSA relative to South Asia is another factor that has stimulated the growth of informal schemes. Overall the nature of the irrigation market in SSA is more fragmented with more limited opportunities for grouping together large number of farmers onto a single scheme.
- In India and Bangladesh millions of farmers have made use of groundwater to irrigate their land. In the case of India this is supported by the provision of subsidies for irrigation equipment and for pumping electricity by State governments.[17].
- The provision of irrigation to smallholders through publically-owned and operated schemes (both large-scale and small-scale) has generally not proved to be a sustainable approach. This is for a variety of reasons, but the underlying problem is that the publically run schemes have typically not been developed for commercial reasons but instead in an attempt to satisfy food security concerns or political priorities. In an attempt to move beyond the unsustainable publicly owned and operated model all five countries have, to differing extents, tried to make use of

[17] Rural users of electricity in Bangladesh may pay less than the full cost of their supply, but there are not the special subsidies for electricity for water pumping, which in some states in India, is provide to farmers completely free of cost.

Participatory Irrigation Management (PIM) programs that use farmer groups to manage irrigation schemes and (primarily in SSA) PPP models in which a commercial farmer is responsible for managing the provision of irrigation to smallholder farmers.

- There are a number of medium/ large-scale commercial schemes in operation in the SSA countries, which are owned and operated by commercial farmers themselves. Given that the focus of the report is on the provision of irrigation to smallholders, we have considered this type of scheme to the extent to which there is scope to extend large-scale irrigation schemes to smallholders through the use of PPP arrangements.

Summary on policy and operating environment

Our overall assessment of the policy environment is that there is scope to utilize the OBA financing approach to support increased provision of irrigation to smallholder farmers. In particular, there is an important role for OBA to fill in helping to address the financing gaps in both SSA and South Asia. The fact that smallholder farmers have turned towards the use of informal irrigation schemes demonstrates that there is demand for irrigation services in the region.

Effectively designed OBA projects could play a role in addressing these investment needs; however the desk-based research has highlighted some important concerns with the sector that will need to be considered in the design of any potential OBA project:

- Given the difficulties experienced in charging smallholders ISC at a level required to cover O&M costs, an important part of OBA project design in the sector will be the associated technical assistance programs that build demand amongst local farmers to the extent that they are willing to pay for the improved services provided by the project.
- Sustainable OBA projects in the sector will need to be located in areas which provide access to functional markets. There may be occasions in which trade-offs have to be made between projects which target the poorest smallholder farmers and those which target poor farmers based in areas which have access to markets.
- The business environment for agribusinesses in the countries that we have reviewed is difficult, and a sustainable OBA irrigation project will need to be designed to reflect context specific issues. For instance in the SSA context the costs and availability of finance for businesses in the agricultural sector suggests that potential service providers would find it difficult to pre-finance investments. This issue has been considered across GPOBA's portfolio of projects, see for instance Kumar, Lieberman and Mumssen (2010)[18], which highlights the range of options that are available to help service providers to pre-finance investments such as the provision of partial risk guarantees and equity investments by regional funds.

[18] Kumar, Lieberman and Mumseen (2010), Access to finance in Output-Based Aid.

- It will be important to gain firm commitment from potential host country government's given the political nature of irrigation.
- There are also notable risks in linking subsidy disbursements to farm productivity related outputs, as the private sector may not have appetite for such risks, even though such outputs may be a truer reflection of the OBA concept.
- The design of OBA subsidies will need to take account of the potential difficulties involved in measuring the delivery of irrigation services to smallholders and of the technical difficulty of excluding non-participating farmers from accessing certain types of irrigation scheme.

The next section presents some examples of different types of project that the OBA financing approach could support, while the market assessment part of the work identifies and reviews the suitability of specific project opportunities.

Assessment of project opportunities for OBA support in India

This section presents an assessment and evaluation of the potential to provide OBA subsidies to support project-level opportunities in India (focused on the lagging States of Madhya Pradesh and Orissa). To complete the analysis we have carried out in-country consultations with stakeholders in both States, which has been complemented with additional desk-based research.

Nature of project opportunities in India

The projects that we have identified through our consultations in India provide different approaches to support the extension of technologies that can increase water use efficiency while also providing farmers with an input that can increase their incomes on a sustainable basis.

This is because in India there are growing concerns around the problem of water scarcity and as such policies around irrigation have increasingly focused on how to improve water conservation and water use efficiency in the country. It is generally understood that the most effective policy approaches to achieve this would be to increase the prices for surface water irrigation schemes and establish a market for groundwater resources that enables farmers to be charged more appropriately for the use of the resources. These reforms would enable policy makers to set the price of water for irrigation at a level that reflects its increasing scarcity and gives farmers a greater incentive to be more efficient in their use of water.

In practice, the existing policy environment makes it difficult to implement the required reforms. In particular the ability of government to allocate and enforce effectively property rights over groundwater resources is doubtful; and more generally the implementation of the reforms would lead to a significant increase in the price farmers paid for water which,

given political considerations, would be a difficult option for policy makers. As such efforts to improve water use efficiency in India have focused on technological solutions.

This includes micro-irrigation technologies such as drip and sprinkler irrigation and water conservation technologies such as rainwater harvesting ponds. These technologies have the scope to deliver significant water efficiency benefits. For instance drip technology has been shown to achieve up to 95% and sprinklers 80% water use efficiency rates, compared to the rates for surface water of around 35 to 40%.[19] In addition to the improved water efficiency, micro-irrigation technology also increases the productivity of farmers' land, giving them scope to generate higher yields and thus incomes where sufficient links to markets are in place.

The cost of micro-irrigation technology is, however, typically too expensive for a smallholder farmer. For instance conventional drip irrigation costs around $2,000 per ha. To try to address these affordability issues a number of States have implemented subsidy schemes.

For instance, the Madhya Pradesh scheme subsidises around 70% to 80% of the capital cost of drip-irrigation technology for farmers, in an attempt to reduce the costs of the technology to a level that enables smallholder farmers to afford it. In practice, the way in which the subsidy operates is actually restricting more smallholders from accessing drip-irrigation technology. The scheme is reported to have distorted the market in the favour of the few drip manufacturers that are licenced to supply drip-technology under the programme leading to increased prices for the technology (AWS estimates that if the subsidy were to be withdrawn the price of drip technology could fall by over 40%). In addition, the level of bureaucracy involved in allocating the subsidy to farmers has led to significant delays and concerns about the level of transparency involved in distribution of funds amongst competing applications from farmers. The overall result is that the take up of drip technology amongst smallholders has been low.

In the subsequent sub-sections we look at the following opportunities that we identified through our consultations and research:

- The scope to apply market-based interventions to extend supply of micro-irrigation technology to smallholder farmers.
- The use of Integrated Micro-Irrigation Projects to extend irrigation to smallholders.
- The use of rainwater harvesting structures to improve water use efficiency.

For each example we give some background/ context before describing how the project operates, the potential beneficial impacts and conclude by considering the suitability of applying OBA subsidies to support the project.

[19] Agricultural Water Solutions Project (2012), Accelerating adoption of drip irrigation in Madhya Pradesh, India.

Market-based interventions in micro-irrigation technology

There are a number of private companies in India that are involved in the production and manufacture of micro-irrigation technology. One such organisation, International Development Enterprises India (IDEI) (a not-for-profit company registered in India), has played a role in implementing a number of donor-funded projects that have focused on extending affordable micro-irrigation technologies to smallholder farmers in India.

The IDEI employ a market based approach to supply farmers with micro-irrigation technology that involves:[20]

- carrying out activities to develop the product by working directly with farmers to understand their needs and the specific design solutions that are most appropriate given their circumstances; and then
- working to establish a sustainable supply-chain for the product within a target market, which includes finding manufacturers for the products, recruiting retailers to sell the products, and training mechanics to install the products. IDEI does not pay manufacturers or dealers, instead it provides training, sets prices, and conducts quality inspections. In addition IDEI can provide/ manage the provision of additional training and capacity building to farmers to ensure that they can utilise the technology effectively.

Their model requires farmers to pay directly for the costs of the micro-technology, the grant funds that they receive are used to support the development of the irrigation equipment and market establishment activities. For instance, the treadle pumps provided by IDEI retail at around $36 - $42, which the farmer pays; however it costs IDEI approximately an additional $75 per smallholder farmer for all the additional costs related to the development of demand and of the supply chain for the micro-irrigation equipment.

While it would be possible to charge smallholders the full cost-recovery price doing so would limit the affordability of the micro-irrigation equipment. Hence the provision of the micro-irrigation technology to a targeted group of smallholders effectively requires a subsidy to help ensure the up-take of the technology amongst the targeted smallholders.

Through funding provided by the Bill and Melinda Gates Foundation (BMGF) IDEI completed the $27m Micro-irrigation for Indian Smallholders project, which ran from 2007 – 2011. The project aimed to provide micro-irrigation to 250,000 smallholders (160,000 foot powered treadle pumps and 90,000 drip irrigation systems), in order to increase their incomes by approx. $400 per year. IDEI were successful in promoting these products successfully amongst 244,404 smallholder farmers.

[20] IDEI have been involved in promoting the extension of water accessing technologies, such as low cost boreholes; water lifting technologies such treadle pumps; water application technologies such as drip and sprinkler equipment and water storage bags. All of their technologies are promoted under the Krishak Bandhu (KB) brand.

The impact of this project was assessed by a study completed by IMRB (a research firm based in India), which conducted a survey of farmers in Maharashtra and Tamil Nadu, Bihar and Orissa.[21] The survey found that the project was successful in reaching the poorer farmers and increasing their incomes – of the farmers purchasing treadle pumps in Bihar and Orissa 96% and 97% respectively were on incomes of less than $2 per day prior to purchasing the pumps and 90% and 83% of the farmers reported achieving an increase in their incomes as a result of purchasing the pumps, compared to just 8% of farmers reporting increased incomes in the control group that didn't purchase the treadle pumps. As the programme was implemented only a few years ago the durability of the pumps was not verified as part of the survey; however IDEI expect that their pumps will last for eight to ten years before they need to be replaced.[22]

We consider how an OBA subsidy could support the further extension of micro-irrigation technology through the IDEI model.

Role for OBA financing

To date IDEI's activities have been funded largely by traditional grant-financing approaches. However following our discussions with them they would be interested in financing their activities using the OBA subsidy approach. They have already demonstrated the capacity to deliver projects in the lagging States and they consider that there is scope to extend further the provision of affordable micro-irrigation technology in both Madhya Pradesh and Orissa.

In this case the OBA funds would be provided to cover the difference in costs faced by IDEI in extending micro-irrigation technology of around $75 which is in addition to the costs that farmers pay which varies with the technology but can average around $50. Theoretically IDEI could charge the farmers the full cost recovery price, but by supporting their intervention with OBA grants the micro-irrigation technology would potentially be more affordable to a wider range of smallholder farmers.

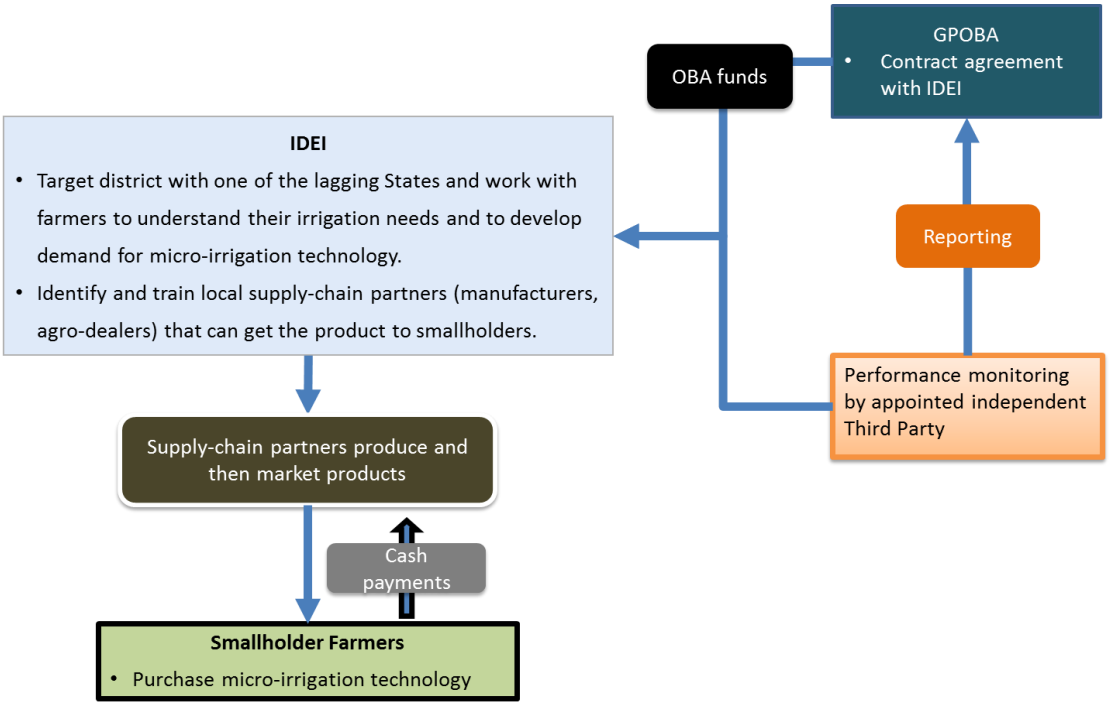
This type of opportunity could potentially be supported with the disbursement of OBA funds upon independent verification that each stage of IDEI's market development activities have been carried out; i.e. when they have successfully developed the product for the region targeted by the intervention, and when they have developed the supply chain for the product. A final tranche of the OBA funds could be released upon independent verification that one of the targeted smallholder farmers has purchased one of their pieces of micro-irrigation technology and are using it successfully.

This type of intervention would require quite simple institutional arrangements. IDEI would be the main contract partner for GPOBA and be responsible for managing the implementation of the project including working with smallholders to understand the specific types of irrigation equipment that would be most suitable to their needs and

[21] IDEI (2012), India Micro-Irrigation Program Survey. Summary of findings.
[22] http://www.ide-india.org/SurfaceTreadlePump.aspx

working to identify and train the supply-chain partners that can produce the technology and take it to market. An independent third-party would be appointed to validate that the smallholders had been able to access the different technology and would then report back to GPOBA to facilitate the release of funds.

Figure 4.1: Indicative institutional arrangements for project



Potential impact of an OBA grant

We have described the impact of the Micro-irrigation for Indian Smallholders project above. If for illustrative purposes, we assume that a $10m OBA subsidy was provided to support a similar project, the potential benefits could include the following:

- Provision of micro-irrigation technologies to around 90,000 smallholder farmers (depending on assumptions on the household sizes this could benefit 450,000 individuals).[23] Furthermore, their project could be targeted specifically towards a poorer district of Madhya Pradesh/ Orissa to achieve similar levels of uptake from poor farmers that was achieved on the BMGF funded project.
- Based on the information provided by IDEI, the marginal cost per smallholder is around $75, which implies that the marginal cost per beneficiary could be as low as $15. Though based on their previous project with the BMGF the cost per beneficiary might be slightly over $20.
- Smallholder farmer income could increase by up to $400 per year.[24]

[23] We have assumed five individuals per household for the purposes of this report.

[24] Based around the estimated per farmer impact of the BMGF funded Micro-irrigation for Smallholder farmers programme. In practice the impact on increasing farmer incomes will vary considerably based on the specific

- Significant benefits in the form of water use efficiencies could also be generated by extending access to micro-irrigation technology.

Even taking account of the potential risks of such a project; for instance, the level of uptake from poor smallholder farmers might not be as high, or the estimated $400 increase in each farmers' income might be an overestimate, the project offers a relatively cost effective and proven option to deliver micro-irrigation technology to smallholder farmers in India. When one also considers the simple institutional arrangements this would seem to be a good opportunity to apply OBA in the irrigation sector.

Suitability for OBA financing?

Utilising the OBA diagnostic tool criteria, there are a number of features of IDEI's market based approach that could make them suitable for OBA financing:

- **Sector Fit:** There is no reason why State governments in the lagging States would not be in support of IDEI extending their existing smallholder irrigation schemes, particularly as it has already implemented similar projects in Orissa.
- **Monitoring and Evaluation:** The implementation arrangements for this opportunity are relatively simple and would not need to involve government directly. Further, it should be relatively simple to verify that a smallholder has purchased the micro-irrigation technology and are using it effectively to increase their yields. It has also been demonstrated that it is possible to evaluate directly the impact of their interventions; IDEI have completed audits to verify that their equipment ends up in the hands of the smallholder farmers that have been reported as their customers and that these farmers have experienced an increase in their yields.[25]
- **Capability of service providers:** IDEI has implemented successfully similar projects for the BMGF and for IFAD in the past and has worked with a wide range of development partners such as DFID, the Ford Foundation, USAID and IWMI.
- **Financial sustainability:** The issue of the financial sustainability of the intervention should be less of a concern in this case. The farmers purchase the micro-irrigation technology themselves and would be expected to fund any costs of operating the machinery themselves - IDEI suggest that the O&M costs are very low and based on their previous projects farmers are able to cover the costs of maintaining the equipment using the increased income gained from using the micro-irrigation equipment. For instance the O&M costs for IDEI's drip irrigation kit were estimated to be $6 per annum, which compares to the up to $400 per year increase in income

micro-irrigation technology purchased by the farmers, the crops they produce and the farmers' ability to access markets.

[25] TUV India Private Ltd (2011), Quantity audit of low cost irrigation device at Uttar Pradesh.

that the farmers would receive.[26] IDEI's approach also includes an element of training and support to farmers to ensure that they realise the increased incomes available from the purchase of the micro-irrigation kit.

- **Subsidies and grants:** It would be possible to link directly the disbursement of a portion of the subsidies to specific independently verifiable outputs:
    - potentially when IDEI has achieved each stage of the market development activities required to take to facilitate farmers' access to the technology; and
    - when a smallholder has purchased the micro-irrigation technology and upon verification that the farmers have realised a target increase in the productivity of their agricultural production. Though this would need additional discussion with IDEI, as they are not directly responsible for the effectiveness with which farmers use the micro-irrigation technology and so this would involve them taking on risks which they do not have direct control over.

Pre-financing capacity: IDEI is a not-for-profit organisation that is reliant primarily on receiving funds from development partners to implement their projects. As such it may have limited capacity to cover the up-front costs required to implement their projects and would probably need some assistance to help initiate a new project. The precise form of this assistance would need to be determined following follow-up discussions with them, but it is unlikely that they would be in a position to take on debt given their operating structure. Further, given the analysis that we have presented on the lagging States in India it may prove to be difficult to rely on government funding. It may be that assistance from development partners will be the most appropriate way to help IDEI cover the up-front costs associated with project implementation.

Overall, the project opportunity is one that could potentially benefit significantly from OBA funding. As demonstrated by the Micro-irrigation for Indian Smallholders IDEI's approach has the potential to target a significant number of poor beneficiaries and has supported smallholders to increase their incomes.

The costs of reaching additional farmers is low at $75, and the sustainability of the intervention is in-built: the farmers purchase the micro-irrigation equipment themselves and they are given training to use it; and the IDIE interventions can be targeted around areas where farmers have some scope to access markets; hence the farmers have strong incentives to make effective use of the technology and achieve higher incomes making it a potentially sustainable approach to providing smallholders with irrigation equipment.

In addition to IDEI there are various NGOs that are adopting a similar approach to extending micro-irrigation in India, these include Driptech and the Development Alternatives

[26] The Energy Resources Institute (2007), Socio-economic-techno environmental impact assessment of IDEI products.

Group.[27,28] There are also various organisations that are actively applying the same approach across different countries in both South Asia and SSA. For instance, IDEI now operates as an independent company but used to be part of the wider international IDE group that has completed projects across South Asia, Latin America and SSA. There is also an organisation called Kick-start, which is a not-for-profit social enterprise that uses a similar approach as IDE to sell low-cost human-powered irrigation pumps to farmers in Africa.[29] If it were decided to use OBA funds to support this opportunity it is therefore possible that it could be applied across a wide-range of developing countries.

The main concerns around this opportunity relate to the ability of organisations such as IDEI to manage the risks implied by an OBA financing arrangement. To date they have typically been funded by more traditional grant financing, where they receive money up-front to cover the costs of developing the market and product design etc. In the OBA model that we have outlined they would bear the risks related to their ability to generate sufficient demand for their products. From an incentive point of view this may be desirable, but it would be important to work closely with them to ensure that they understand fully the nature of the risks involved.

Integrated Micro-Irrigation Projects

As discussed in Section 3, in India the medium and large-scale irrigation schemes (typically surface irrigation schemes under furrow irrigation) are the responsibility of the State governments, with the State managing irrigation infrastructure up to the farm gate, farmers responsible for on-farm irrigation infrastructure and WUAs responsible collecting ISCs from farmers. In these arrangements the inability of WUAs to collect ISCs at a level necessary to cover O&M costs has meant that many of these schemes have fallen into a state of disrepair and has led to the growth of informal groundwater irrigation schemes as farmers have sought alternate sources of irrigation.

The Integrated Micro-Irrigation Projects (IMIP) approach includes the implementation of interventions designed to rehabilitate these failing public sector schemes. In the IMIP a private sector firm operates under contract to complete projects that have been originated by the State governments. In a typical arrangement the private partner is responsible for:

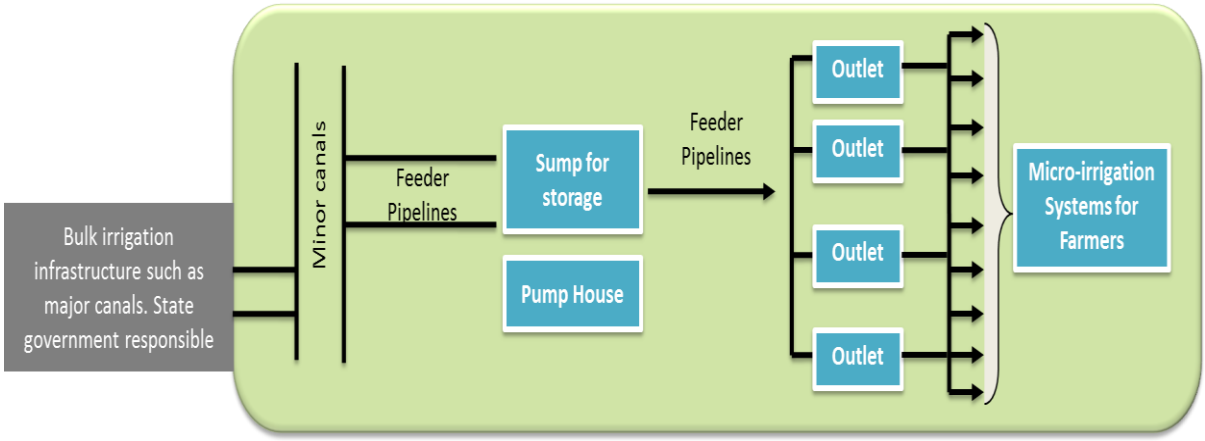
- Planning and then implementation of improvements to the irrigation infrastructure at the scheme. This can include organising rehabilitation of the minor canals, but these can remain under the control of the State; and includes the distribution channels between the minor canals and the farm gate and any necessary pump and storage facilities.

[27] http://www.driptech.com/aboutus.html
[28] http://www.devalt.org/Default.aspx
[29] www.kickstart.org

- The provision of micro-irrigation technologies to the farmers and of capacity building for the WUAs to enable them to manage the farmers more effectively and to collect water use charges.
- The provision of both technical training and farming practices to farmers to enable them to use the micro-irrigation effectively and to support them to realise increased incomes.
- The operation and maintenance of the scheme for a contracted period of time, with the objective of passing over control to the WUAs in the longer-term.

The layout generic IMIP is illustrated in Figure 4.2 below.

Figure 4.2: Layout of a generic IMIP project

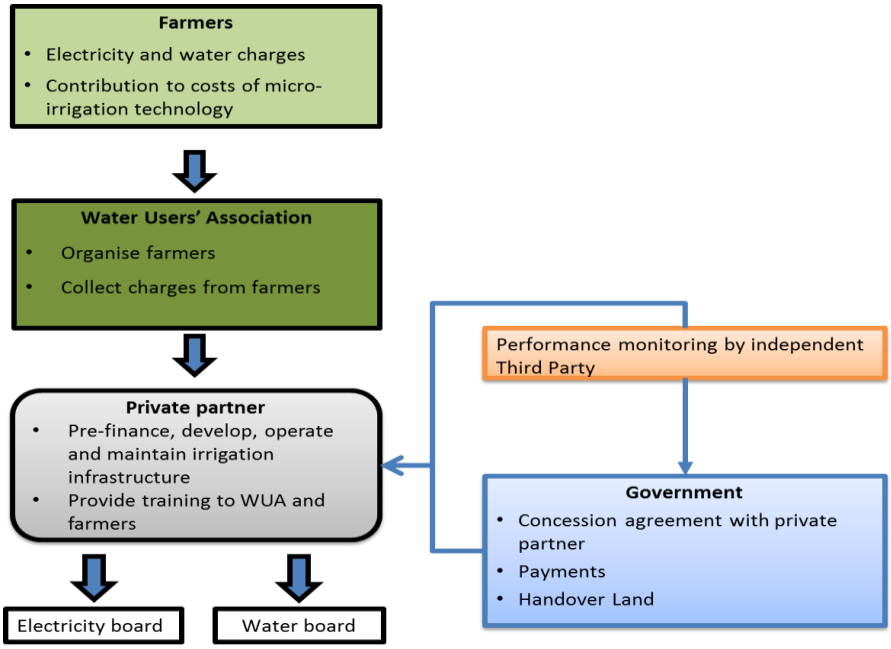


The financing arrangements for IMIPs differ depending on the specific aspects design of the project, but typically:

- The private company pre-finances a proportion of the infrastructure construction costs (minor canals if included, and the feeder pipelines, storage, pumps etc.) with the money being reimbursed by government.
- The micro-irrigation technology is financed by a combination of government subsidies and contributions from the farmers.
- O&M charges for the irrigation infrastructure as well as a service fee are recovered by the private company from government.
- The private company is responsible for recovering both water and electricity charges from the farmers and passing it on to the relevant water and electricity utility companies.

The institutional arrangements of a generic IMIP are set out in Figure 4.3 below.

Figure 4.3: Institutional arrangements of a generic IMIP project



Jain Irrigation Systems Ltd has experience of implementing the IMIP approach in India. It is currently in the process of implementing a project in Karnataka State, which seeks to provide micro-irrigation technologies to 7,000 smallholder farmers. The capital cost of project is estimated to be $63m, 70% of which will be recovered in the form of up-front capital from the State with the remaining 30% of capital costs recoverable once pre-specified performance targets are achieved (90% of the targeted area under irrigation, or at least 90% of the outlets operational). Hence the arrangement includes an aspect of payment based upon achievement of pre-specified results. Under the contract Jain Irrigation will be responsible for the operation and maintenance of the scheme for a five-year period.

Role for OBA financing?

As described above, in principle the financing arrangements for IMIP projects should be managed between the private partner, government and the farmers. In practice, State governments lack access to the finances necessary to support the implementation of projects, creating a financing gap between the funds available to complete projects and the pipeline of projects that could yield significant development benefits to the smallholder farmers.

Through our consultations with Jain Irrigation we understand that there are potential IMIPs in both Orissa and Madhya Pradesh that could benefit from OBA funding to support implementation. Both projects aim to provide smallholders with improved micro-irrigation technologies that will enable them to produce higher-income crops and vegetables and improve the quality of their farming practices, while at the same time improving the efficiency of water use on the existing surface irrigation schemes. The specific details of both projects are confidential at this stage, but we can give an outline of the overall costs and number expected beneficiaries of both:

- The capital cost of the first project is expected to be in the region of $30m and will provide micro-irrigation technologies to around 6,000 farmers on 7,000 ha of land. The required investment will include works on minor canals, pumping machinery and pipes. O&M costs are estimated to be around $30 per ha per annum, recoverable from the State. The farmers are expected to pay water charges of up to $10 per ha per annum and electricity charges which will vary depending on the final design of the project but could be in the region of $10 - $15 per ha per annum.
- The second project is expected to cost $70m and benefit 15,000 farmers on 20,000 ha of land. Farmers would be expected to pay the similar electricity and water charges on this project as set out above.

In the case of both projects Jain Irrigation would require a 20% – 25% return on investment, and they stated to us that the key barrier to both projects being implemented is the limited availability of funding from the respective State governments. Their experience of implementing similar projects is that the government typically runs into funding constraints during the project cycle that leads to delays and cost overruns in project implementation.

There is a role for OBA financing to play to support the implementation of IMIPs by either providing capital subsidies to help bridge the financing gap caused by the limited availability of State funds that could prevent the implementation of the projects.

OBA subsidies could be provided in the form of capital subsidies, using a similar output-based structure as used on the Karnataka project; where a significant proportion of the funds provided by the State governments was triggered following independent verification of the achievement of pre-specified output targets such as the provision of irrigation on a targeted amount of land for a set period of time, and potentially verification of the farmers increasing the productivity of their farming activity.

In terms of institutional arrangements, the project implementation model would resemble Figure 4.3 above. GPOBA would make a joint agreement with the selected private partner and the State institution and would need to appoint a third-party institution to monitor and verify the achievement of pre-specified targets by the private partner.

Potential impact of providing OBA financing

The impact of OBA support for an IMIP will vary depending on the specific design of the project and the level of performance of the existing irrigation infrastructure. Using the first example outlined above, if we assume that a $5m to $10m OBA grant in the form of capital subsidies was required to support the implementation of a project (for illustrative purposes, the amount of OBA grant would need to be determined when more specific project details are available following discussions with both the State and the prospective private partner), the potential beneficial impact of the OBA support would be as follows:

- 6,000 smallholder farmers (and depending on assumptions about farmers' household size) and 30,000 individuals would benefit from the investment. This

suggests that the cost per beneficiary from the OBA funds would be in the range of $165 - $330.

- The provision of micro-irrigation technology and farmer training could be expected to increase farmers' incomes by over $550 per ha per annum, this is based on AWS estimates of the average marginal increase of farmer incomes by applying drip vs. the surface-based furrow irrigation schemes.[30]
- The project would also deliver significant improvements to productivity of the irrigation scheme. This would depend on the micro-irrigation technology employed; drip irrigation could deliver improved water use efficiencies of around 60%, while sprinkler based schemes could deliver around 45% improvement in water use efficiencies. The opportunity to link some of the output related subsidy to the achievement of improved water use efficiencies could also be considered, but would need to be discussed in more detail with Jain/ the potential private service provider in advance.

Suitability for OBA financing?

Utilising the OBA diagnostic tool criteria, there are a number of features of IMIP that could make them suitable for OBA financing:

- **Sector Fit:** The IMIPs are a key priority for the State governments and given the typical capital costs of the projects, government will be required to make a firm financial commitment to support project implementation.
- **Monitoring and Evaluation:** Previous IMIPs have required the use of third-party monitoring and verification of pre-determined outputs.
- **Capability of service providers:** Private investors such as Jain irrigation and Netafim are available that have a track-record of completing similar investments.[31]
- **Financial sustainability:** The financial sustainability of the project would be the key area of concern. Even with the provision of the OBA grant the private company would be dependent on recovering a significant portion of its capital costs and also the O&M costs of the scheme from government. There is some uncertainty about the ability of the government to cover these costs – and around the ability of the private company to recover the necessary contributions from farmers. These are risks that the prospective private investor would have to bear, but if the State does not make timely payments it could delay the implementation of the project potentially reducing the beneficial impact of the project. Thus, depending on the nature of the project it may be necessary to bring in other development partners to

[30] AgWaterSolutions Project (2012), Accelerating adoption of drip irrigation in Madhya Pradesh, India.
[31] http://www.netafim.com/offerings/irrigation

help finance the project and/ or seek explicit financial guarantees from the State and potentially Central government prior to initiating the project.

- In the longer-term the assumption for IMIPs is that the provision of micro-irrigation technology together with training will enable the farmers to build their capacity and incomes to a level that enables them to make a bigger contribution to the scheme over time to make the IMIP a more sustainable proposition.
- **Subsidies and grants:** Previous projects have made use of explicit and performance-based grants. Given the technical layout of typical IMIPs it would be possible to measure the provision of irrigation services and the farmers included in the scheme would need to be registered with the WUA.
- **Pre-financing capacity:** Private investors such as Jain Irrigation are available that have experience of pre-financing similar investments.

Overall, the IMIP approach presents an interesting opportunity that is consistent with OBA's core principles. The big risk is that the implementation of the projects will in part rely on the involvement of State governments. From our consultations it is clear that there is a risk that the State government is unwilling/ unable to release funds on a timely and consistent basis to support the implementation of irrigation projects. If this type of opportunity were to be pursued it would be critical that effective mitigations were put in place to help manage effectively the involvement of the respective State government.

Despite the difficulties involved in working with State governments, an important benefit from using OBA to support the implementation of a successful IMIP is that it could act as a model to rehabilitate other failing State run irrigation schemes in India. However, given the probably complexities involved in such a model it is unlikely that it represents an opportunity that could be implemented successfully in the short term; significant work would have to be done with the targeted State institutions to take the project opportunity forward.

Rainwater harvesting structures

A further example of applying micro-irrigation technologies to improve the efficiency with which water is used was identified in the AWS analysis. In the work done on that project in Madhya Pradesh, an intervention was piloted that involved decentralized rainwater harvesting in which farmers were persuaded to dig ponds on their land to collect and store water. These ponds can also, if properly sited, provide water to either provide protective irrigation to supplement rainfall in the main monsoon cropping season (kharif), and so reduce risk, or to irrigate a smaller area of winter dry season (rabi) crops. [32]

The impact of this intervention was found to be positive; the portion of the area cultivated in the region during the dry season increased from 23% to 95%. When farmers used their

[32] AgWaterSolutions (2011), *Rainwater harvesting in Madhya Pradesh*.

own funds to carry out the investment the pay-back period was estimated to be 2 – 3 years. There is also a government subsidy program in place in Madhya Pradesh that covers 50% of the costs; however the funds available from this subsidy are limited so it can often take some time for farmers to access the funds.

The project report recommends making loans available for ponds and irrigation equipment to enable more farmers in the region to apply the rain water harvesting techniques.

Role of OBA subsidies and outline of a potential OBA pilot project

In this model the disbursement of OBA subsidies increase the number of farmers able to invest in rainwater harvesting infrastructure. The release of the majority of the OBA funds could be triggered by the completion of the civil works and enable farmers to invest in irrigation equipment.

The rainwater harvesting ponds that were constructed in the AWS pilot programme were relatively large - ranging from 0.2 to 4ha, and also expensive to construct – the average cost was around $6,500 for a 0.8ha pond. This makes the construction of ponds a less accessible option for poorer farmers – who not only lack the ability to fund such investments but also the land on which to construct them. Therefore the role of OBA financing in this option would be to support smallholders to afford to construct the rainwater harvesting ponds.

Based on our consultations in India and research, an outline of rainwater harvesting project supported by OBA in Madhya Pradesh could be as follows:

- A pond of 30 x 30 x 3 m could provide one season irrigation to two hectares of kharif crops such as cotton, sorghum or maize, or provide sufficient water to grow about 0.5 hectares of wheat in the rabi season.
- Growing 0.5 acre of wheat using irrigation, would produce about 2.2 tons, worth $600, which, after deducting production costs, leaves a gross margin of about $400.
- Total investment in pond of 30 x 30 x 3 meters and irrigation equipment (diesel/electric pumps, pipes and sprinklers) would be US$1,600.
- The costs of constructing the pond and the irrigation equipment could be part financed by an OBA subsidy of $650 per smallholder, a bank loan of $650 and a farmer contribution for the remaining costs. It is assumed that no government subsidies would be available. If they were, the OBA subsidy could be reduced and a larger number of ponds constructed.
- The bank loan would be repayable over 4 years at 12% annual interest, with equal half-yearly instalments of around $130. Without the OBA subsidy, the loan would be twice this amount, and could not be serviced unless water was used to grow higher value crops – and the availability of a market for such crops cannot be assured in all locations in Madhya Pradesh. In addition the local banks would be more likely to provide loans to the farmers if OBA funds were included as part of the project.

- An additional $130 per pond would be required for technical site selection, mobilization of farmers and technical supervision. Scheme overheads, including independent verification for OBA payment, are assumed to add a further 10%. Based on these assumptions, the total cost of a project to construct 10,000 ponds would be US$8.9m.
- In practice such a project is unlikely to wish to build 10,000 ponds of identical size, and a range of water harvesting structures may be used according to the needs of the location – including recharge pits, recharge of dug wells and small check dams. However for this outline proposal ponds have been used to illustrate how such a scheme might work.

There are a number of government agencies that implement schemes involving such rainwater harvesting ponds and other structures. These include, in particular watershed agencies and agricultural departments. In addition the National Bank for Agricultural and Rural Development (NABARD) which, apart from being the apex bank for agricultural lending, implements a range of agricultural development programs using funds from GoI, including watershed development. However a project of the scale envisaged for this pilot scheme is unlikely to warrant interest from a government agency – unless it could be sold as an action research project, or be implemented as a component of a larger program – with the risk that the implementing agency would not give it the attention that is required.

It may be more feasible for such a project to be implemented by an NGO, and a number of such NGOs (e.g. include Pradan, the Watershed Organisation Trust (WOTR) and the Bharatiya Agro Industries Foundation (BAIF)) have considerable experience and expertise in such work, and are active in Madhya Pradesh and Orissa. The NGO (which might form a consortium with other NGOs) would be responsible for identification of suitable areas, design of water harvesting structures, engagement with farmers, site selection, supervision of construction and quality control, and support for irrigated agriculture. A verification agency (possibly an engineering firm) would verify completion of construction to enable the release of OBA subsidies.

Potential impact of providing OBA financing

The potential benefits could include the following:

- Provision of irrigation facilities to around 10,000 smallholder farmers (benefitting 50,000 individuals). Furthermore, the small size of ponds compared with those in the AWP project means they are of interest to smaller farmers. The project could be targeted specifically towards poorer districts of Madhya Pradesh/ Orissa.
- Based on the calculations above, the cost per smallholder is around $890, which implies that the marginal cost per beneficiary could be $178.

- Smallholder farmer incomes could increase by an average of $222 per year (net of loan repayment – after loans are repaid after four years, income would increase to almost $400).
- Seepage from ponds will recharge wells nearby – generating further benefits for farmers and possibly their neighbors. These have not been included in the calculations.

Suitability for OBA financing?

Utilizing the OBA diagnostic tool criteria, there are a number of features of rainwater harvesting structures that could make them suitable for OBA financing:

- **Sector Fit:** with increasing scarcity of water for irrigation (and also for other purposes), governments at state and central levels are actively promoting rainwater harvesting as part of watershed development. This is supported by the National Groundwater Recharge Master Plan. The centrally sponsored Integrated Watershed Management Project (IWMP) is being implemented in a number of states, but resources are limited to by ceiling of the maximum cost per hectare, so scope for water harvesting interventions such as farm ponds is limited. In a number of states watershed development is being undertaken by projects funded by state, national and donor resources, but coverage by these projects is limited.
- **Monitoring and Evaluation:** monitoring and verification of completed farm ponds would be relatively straight forward, but should include a technical assessment to evaluate of the meet the required design criteria and are fit for purpose. An NGO could also be engaged to carry out follow up work to evaluate the longer-term economic impact of such an initiative.
- **Capability of service providers:** A number of local NGOs such as Pradan, WOTR and the BAIF have considerable experience and capacity in the implementation of projects that include water harvesting structures. Pradan has implemented projects funded by agencies such as BMGF and IWMI. BAIF has enormous experience of working alongside government agencies and often implements projects on behalf of state governments.
- **Financial sustainability:** there should be no real issue of financial sustainability – once ponds and other water harvesting structures are built farmers will wish to continue to use them for irrigation, and as basically private infrastructure, will need to maintain them in order to continue to receive irrigation water.
- **Subsidies and grants:** issues regarding subsidies and grants may be the area of most uncertainty for this proposal. A number of government programs provide these farm ponds free of cost – although numbers constructed are quite limited. Nevertheless the existence of such programs may persuade farmers not to build their own ponds but rather wait in the hope of a free pond from the government.

That said, the experience reported by AWS in MP shows that farmers are willing to invest in their own ponds, although these were larger farmers building much larger ponds.

- **Pre-financing capacity:** NGOs, such as Pradan, will have limited resources for pre-financing, so will need some sort of up front support to implement the programme. However, as certain individual farmers have been pre-financing the construction of the ponds themselves, a significant portion of the OBA subsidies could be released following the verification of the completion of the ponds.

In addition, by targeting smallholder farmers located in the lagging states of Orissa and Madhya Pradesh, the OBA support could be said to be targeting explicitly the poor. These farmers will not be served by existing irrigation schemes and so will represent farmers who are relatively more vulnerable to the effects of climate change.

With this type of approach there would also be scope to develop rainwater harvesting projects in other countries across South Asia and SSA. Projects have been implemented by NGOs such as Practical Action in Sri Lanka and WaterAid.

Overall, the rainwater harvesting approach presents an interesting opportunity that is consistent with OBA's core principles. The big risk is whether or not farmers will be willing to invest in constructing their own ponds, particularly given the need to give up some of their farming land – even with a 50% OBA subsidy. Thus the main issue to explore with a potential implementing partner is the strategy to build farmers' demand for constructing the ponds.

Summary assessment of the market opportunities for OBA in India

We have reviewed three indicative project opportunities and summarise them below.

Table 4.1: Summary of project opportunities assessed in India

Criteria	Market-based approaches	IMIP	Rainwater harvesting
Project objective	Expanding smallholder farmers' access to appropriate micro-irrigation technologies	Support the rehabilitation of an existing scheme and provide smallholders with access to micro-irrigation technologies	Support the construction of rainwater harvesting ponds
Indicative project cost	Assumed OBA contribution of $10m	Total project cost of approx. $30m with up to $10m OBA contribution	Approx. $9m OBA contribution
Trigger for release of OBA funds	• A portion of the funds could be released upon independent verification that farmer has purchased an appropriate piece of technology • A small portion of the funds could be tied to verification that farmers have utilised technology to increase productivity	IMIP projects have a number of elements that could be used as triggers: • completion of works to improve the minor canals and distribution channels • linked to the provision of micro-irrigation technology to the farmers • linked to the provision of technical advice and training to the smallholder farmers • the long-term sustainability of the project- i.e. a final payment if project achieving targets in 5-7 years.	The completion of the construction of the ponds would be the most appropriate trigger in this instance.
Outputs	Up to 90,000 smallholders provided with micro-irrigation technologies	The rehabilitation of a large-scale public sector scheme and provision of micro-irrigation technologies to 6,000 smallholders as well as farmer training/ capacity building	Up to 10,000 rainwater harvesting ponds constructed
Beneficiaries	450,000 individuals	30,000 individuals	50,000 individuals

OBA efficiency	• Cost per farmer approx.. $75 - $125 • Cost per beneficiary approx.. $15 - $25 • Smallholders income increases by up to $400 per annum	• Costs per farmer £825 - $1,650 • Cost per beneficiary of $165 to $330 • Smallholders' income increases by over $550 per annum	• Cost per farmer of approx. $890 • Cost per beneficiary $178, potentially lower depending on State contribution • Smallholders income up by $400 per annum when loan repaid
Scope to target	Geographic and self-selection	The State originates projects, can target opportunities in lagging States	Geographic and self-selection
Scope to pre-finance	The organisations that have been involved in implementing programmes of this nature are typically charitable organisations with limited capacity to pre-finance investments. They will most probably need some up-front financial assistance to implement the projects	Private companies such as Jain irrigation have the experience of pre-financing similar investments and have expressed interest in doing like-wise for an OBA funded project. Though the details, i.e. amount of risk that they would be willing to bear would depend on the nature of the specific project opportunity under consideration	An NGO would have to be engaged to help implement a large-scale project and would most likely need some financial support to cover operational costs, but farmers could be in a position to cover a reasonable proportion of the up-front costs, so there is scope for some pre-financing in this instance
Key risks/ unknowns	Previous projects have been funded by more traditional grant-based support	Quite big, complicated project that relies on State to maintain appropriately bulky irrigation infrastructure assets In addition reliance on the on State to fund the implementation of large aspects of the IMIP for it to be financially viable	Level of smallholder demand to construct the water harvesting structures
Mitigations	Work with potential implementing partners to test applicability of OBA to the approach	If possible seek ex-ante guarantees from the State and/ or Central government	Focus on developing a robust strategy to build demand amongst targeted smallholders
Scope to scale?	Similar interventions have been implemented at similar costs/ outputs across South Asia and SSA, a number of partners exist with experience of delivery effective programmes	Potentially restricted to India, but could act as a model for implementation of other projects to rehabilitate failing State run irrigation schemes	Similar interventions have been implemented in South Asia and scope to apply in regions of SSA

Assessment of project opportunities for OBA support in Zambia

This section presents the market assessment and evaluation of potential options to apply OBA subsidies to support specific project opportunities that our team has identified in Zambia. To complete the analysis we have carried out in-country consultations with stakeholders during a visit to the country where we discussed the OBA concept with stakeholders attending an agribusiness investors' forum. The findings from the consultations have been complemented with additional desk-based research.

Nature of the opportunities in Zambia

In Zambia, similar to other countries in SSA, irrigation plays a marginal role in the agricultural sector for smallholder farmers. According to government estimates only around 3% of the country's cultivated area is currently irrigated and in total only 155,000ha of land is under irrigation out of a potential 2.7m ha which could be irrigated.

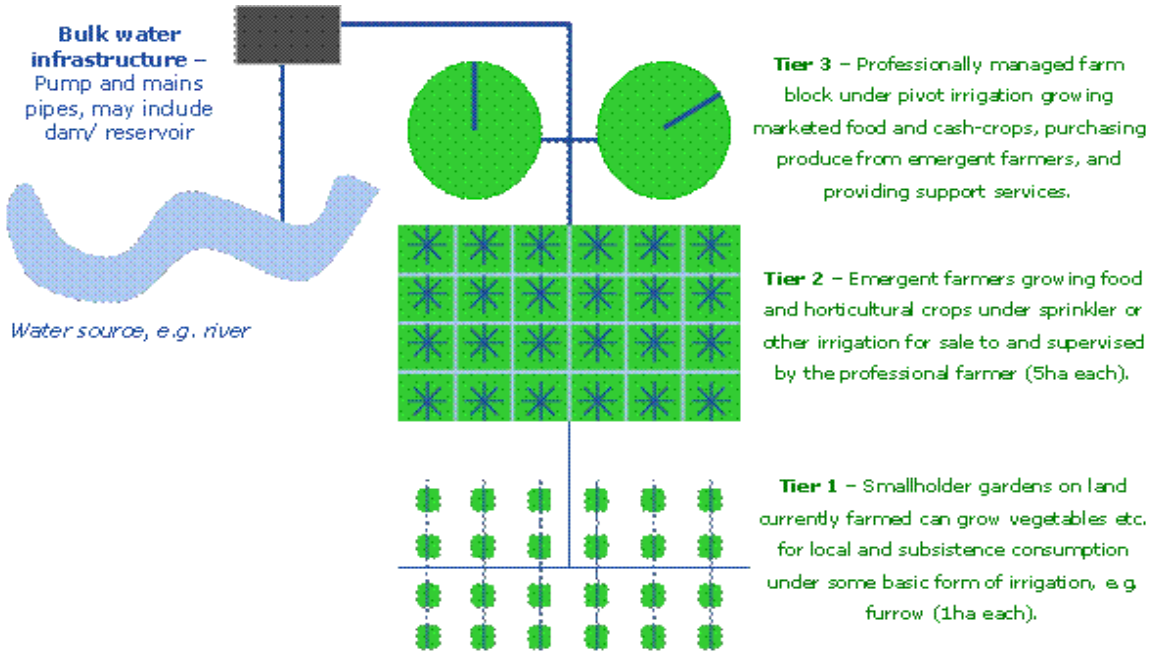
In the past, the public sector has tried to take the lead role in the provision of irrigation to smallholder farmers. A number of smallholder schemes were implemented such as such as Buleya Malima (275ha vegetable/fruit), Mununshi Bananas (100ha), Mukonchi (500ha tobacco, cotton), Kawambwa Tea (500ha), Kateshi Coffee (348ha). Over time these schemes have largely fallen into disrepair due to a lack of availability of funds to cover O&M costs – farmers have not paid sufficient charges to cover costs and public funds have not been available to cover the financing gap.

As a result of the limited success of public sector intervention in stimulating sufficient provision of irrigation services to smallholders government has sought to increase the role of the private sector. In particular government has sought to promote the development of models that involve commercial farmer and outgrower/contract-farming farming arrangements to provide irrigation services to smallholders.

Under the model a large-scale commercial farmer enters into an arrangement to operate and manage bulk water irrigation services and, as part of that agreement, either constructs and operates or constructs and contracts out management of the irrigation services provided to emergent and/ or smallholder farmers. Often these arrangements are managed through a PPP contract between the commercial farmer and government, but it is also possible for a private firm to initiate an investment itself.

An example of the commercial hub-outgrower farmer model is depicted in Figure 5.1 below. The figure illustrates a three tier model that involves a commercial hub farmer, an emergent farmer group and smallholders. This is one example out of a variety of ways in which arrangement could be structured.

Figure 5.1: An example a commercial hub-outgrower farmer model



As can be seen from the above figure, the model seeks to combine both commercial and small-scale farmers within a single scheme. The potential benefit of this type of model is to facilitate the development of more commercial irrigation schemes big enough to operate on a financially sustainable basis (and potentially without the commercial farmer having to go through the difficulties associated with trying to acquire sufficient land, as typically the Government will already have identified and titled land for the irrigation scheme), while at the same time extending irrigation services and crucially other services such as capacity building and access to improved inputs to smallholders, without involving government directly in the implementation/ operation & maintenance of the scheme.

The key to the sustainability of this model is the strength of the incentives on the commercial farmer to provide these services to the smallholders on an on-going basis. A successful example of this type of model is the scheme that is operated by the Kaleya Smallholders Company (KASCOL) that was established in 1981 with finance from Zambia Sugar, Barclays Bank, CDC, the African Development Bank (ADB) and the Development bank of Zambia. In this arrangement KASCOL provides irrigation services, technical support and inputs to 161 smallholders that have been selected for the scheme. In return KASCOL receives 53% of the value of the farmers' sugarcane produce.

The success of this arrangement is based on the fact that KASCOL has an ongoing incentive to ensure that the smallholders attached to the scheme continue to generate sufficient yields of sugar. This is because there is a significant profit margin on offer from processing the sugar produced by the farmers - the company has an off-take agreement with Zambia

Sugar plc's Nakambala sugar factory, thus it has a guaranteed market for the sugar that it receives from the smallholders. Hence KASCOL has a strong ongoing rationale to ensure that the smallholders continue to access the irrigation services as well as technical assistance/ inputs when needed.

Overall, these commercial hub-outgrower farmer models work best when there is a financial incentive for the commercial firm to continue to provide irrigation services to the smallholders. In the following sub-section we consider the merits of applying OBA to support a project proposed by KEDE Ltd, which has a similar set up to Kaleya.

There are a number of other commercial hub-outgrower models where there is less of a financial incentive for the commercial farm to continue providing services to the smallholder. We therefore also consider how OBA could be used in this context using an economic and financial model that is based on projects that we know of in Zambia.

Market-based approaches

In Zambia, as with other countries in SSA, there is also scope to apply both the market based approaches. For instance iDE have been operating in Zambia since 1997. In 2008 they successfully formed a partnership with a micro-finance company to develop an agricultural product that was designed to support smallholder farmers to access micro-irrigation technologies and other agricultural inputs. Between 2008-2011 this project has provided loans of over $1.5m to around 2,800 smallholders, supporting them to increase their agricultural yields and incomes.[33]

We have not carried out detailed analysis of the scope to use OBA to fund market-based approaches in Zambia because it would, at a high-level involve a similar model to that discussed in India. While there are clearly country-specific supply chain/ market issues; for instance, Willem and Koppen (2013) have reviewed the supply chain for motor pumps in Zambia and found that the supply chain is underdeveloped particularly for farmers that live away from the country's urban centres.[34] The approaches developed by organisations such as iDE and Kickstart are tailored to address these country-specific issues, and thus we judge that there is also scope to consider these market-based opportunities in Zambia and other countries in SSA.

The subsections below therefore focus on reviewing the scope to use OBA subsidies to support the commercial hub-outgrower models, rather than repeating the market-based model.

[33] http://www.ideorg.org/OurResults/SuccessStories/Cetzam.aspx#

[34] Willem Colenbrander & Barbara van Koppen (2013), Improving the supply chain of motor pumps to accelerate mechanised small-scale private irrigation in Zambia

KEDE project

KEDE is a joint venture of three commercial farmers, established to enable the farmers to jointly arrange and manage the financing, construction and operation of a bulk water system to supply irrigation services to their farms. They are located in the Mazabuka, Southern Province of Zambia, and combined will irrigate an area of 2,500 ha.

The development of the infrastructure required to serve the commercial farms is estimated to cost $10m. They have already managed to arrange the finance for this through a combination of equity and commercial bank loans and the project is currently under construction. The bank loans are for a seven year term and include a combination of USD debt at an interest rate of around 12% and Zambian Kwacha at around 18%.

The bulk water irrigation system which is under development passes through and around 500 ha of land that is used by around 200 smallholder farmers. KEDE believe that it would be technically possible to connect the smallholders to the emerging scheme.

The expected development cost of this is as follows:

- $3,500 per ha for the development of a pivot irrigation system to serve the smallholders. An alternative option of using a dragline sprinkler option at cost of $2,000 per ha is also under consideration.
- The land-clearing and land levelling required to connect the schemes would cost around $2,400 per ha. In addition around $300 per ha is required to establish an electricity supply and $250 per ha for the development of roads and construction of fences.
- It is estimated that it would cost an additional $1,200 per ha to establish a sugarcane crop on the land should this opportunity be made available.

In total the costs of extending the scheme, excluding the bulk water irrigation infrastructure is expected to range from around $6,000 to $7,000 per ha. In addition if the costs of the bulk water irrigation are spread equally across the total 3,000 ha of the scheme at cost of $3,500 per ha the total development costs are estimated to be around $10,000 to $11,000 per ha. Given that around 500 ha of land is covered the total up-front cost of connecting the smallholders could be around $5m. The construction to operation timeframe is expected to be around one to two years.

Under the arrangement, and subject to available quota, it is feasible to assume that costs by contributors can be recovered through mill proceeds with a pre-arranged agreement.

Role for OBA financing?

KEDE are currently seeking additional finance to fund the expansion of the scheme to the smallholders and could use an OBA financing agreement to help achieve this. In the absence of access to concessional finance, they indicated that they would be unable to carry out the investment themselves as the opportunity would not yield the returns necessary to

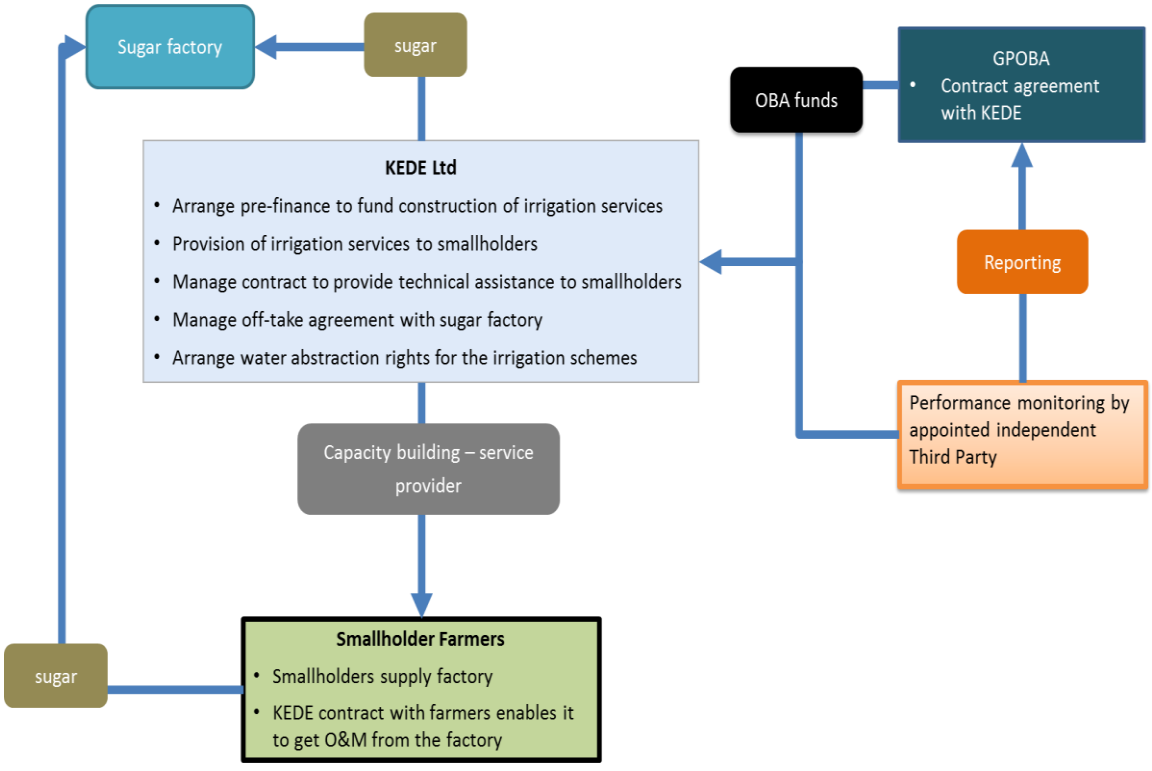
justify taking out loans from commercial banks to fund the investment. They believe that gaining agreement to access OBA funds could be used to help them secure the additional finance necessary to carry out the expansion of the scheme. Hence the use of OBA funds could help to address the financing gap that is preventing the extension of irrigation to smallholders.

In this instance the OBA funds would be provided in the form of capital subsidies, with the proportion of the funds disbursed based on independent verification of the smallholders being connected to functional irrigation services. In addition a proportion of the OBA funds could be released based on verification that the irrigation services had continued to be provided for a pre-specified length of time to strengthen the financial incentives for the commercial hub to provide services to the smallholders.

The indicative institutional arrangements for the model are shown in Figure 5.2 below. In this model KEDE would play the key role in:

- Arranging the implementation of the construction of the irrigation infrastructure to smallholders.
- Managing the provision of capacity building to smallholders - but with the expansion of sugarcane growing in the Mazabuka region, knowledge of the crop is becoming widespread and many of the farmers would have worked on commercial cane farms.
- Managing the provision of sugarcane to the sugar factory.

Figure 5.2: Potential institutional arrangements for KEDE project



Potential impact of OBA

The estimated total cost of providing irrigation to smallholders is estimated by KEDE to be $5m, for illustrative purposes we assume that a potential OBA funds would cover all of this cost – in practice, in this case we expect that the provision of OBA funds could be limited to cover the costs of constructing the irrigation infrastructure dedicated to supply the smallholders ($1m to $1.75m for the dragline sprinkler or pivot schemes), rather that the costs related to setting up the farmers as sugar producers, but this would depend on a more detailed assessment of the finances of the project and further discussion with the project developers.

- The project expects to connect around 200 smallholders to the irrigation services, potentially benefiting 1,000 individuals. The cost per beneficiary of the using the PPP model would be in the range of $1,000 to $5,000, which is very high compared to the other opportunities that we have reviewed in this report and more generally compared to other projects that have been supported by OBA funds, which often have a cost per beneficiary of below $100.
- However, the project could generate quite significant increases in revenue for the smallholders. Their incomes could increase from around $650 per ha per annum, which they receive from producing maize under rain-fed conditions, to over $2,000 per ha per annum producing sugarcane under irrigation (based on the assumption that the farmers yield 100 tons per hectare and can sell the sugarcane at $40 per ton with operating margins of 45%).

The project cost and number of beneficiaries would vary depending on the nature of the project/ assumptions (for instance, it is possible that there could be additional beneficiaries such as the commercial hub employing labourers). However, the above example gives a reasonable guide to the costs and number of smallholders that could be covered by a typical commercial hub-outgrower farmer irrigation scheme model. Large-scale pivot-based irrigation schemes in SSA cost around $10,000 per hectare when all the associated costs of developing the schemes are taken into account, while the average plot size for a smallholder can vary from around the 4 ha assumed in this example depending on the specific crop. Therefore, the indicative cost per beneficiary shown in the KEDE example gives a reasonable estimate; with the range likely to be around $1,000 to $5,000.

There is obviously an element of judgement around the merits of using OBA finance to support this type of opportunity, but it does not necessarily seem consistent with OBA principles of targeting resources at the poorest farmers, and there is a more fundamental question about whether grant-finance would be necessary to support this type of opportunity given that a commercial farmer could potentially exploit opportunities of this nature on a stand-alone basis.-. It is possible that alternative types of concessional finance such as patient capital could provide a more cost effective alternative way to support the

implementation of this type of project.[35] It is therefore worth exploring whether the OBA subsidies could apply to concessional loans instead of grants.

For instance, the OBA funds could be provided to an agricultural developer such as AgDevCo[36] with the intention of subsidising the interest rate that the private partner would have to pay to finance the extension of the irrigation scheme.; i.e. at the beginning of the agreement the private partner would be liable to repay the loans required to finance the extension of the scheme at market rates of for example 12%, but the effective interest rate would fall to say 6% if specific smallholder targets were achieved. Ideally, an arrangement such as this would include provisions which would allow interest rates to rise again if the delivery of irrigation services to smallholders was not maintained. This could require the OBA programme to remain in place for longer than the usual five to seven year window, but by providing longer term support to the projects the OBA funds could have more influence in supporting the implementation of sustainable projects.

Suitability for OBA financing?

Overall, while this opportunity is broadly consistent with the requirements set out in the OBA diagnostic tool, in particular it fits in with the objectives of the government of Zambia, KEDE could pre-finance the investment; and critically for irrigation schemes there is a strong financial incentive for KEDE to ensure that the smallholders continue to have access to the irrigation services and employ the improved farming practices and generate more sugar for the factory.

The issues with this opportunity revolve around the costs involved and the number of beneficiaries compared to alternative potential uses of OBA funds. More fundamentally, given that the private company, such as KEDE Ltd, has a clear financial incentive to ensure the continued provision of irrigation services, the main role for OBA in this project would be to help bridge the financing gap that is reportedly preventing them from funding the extension of irrigation to the smallholders. Potentially the most cost effective way to achieve this would be to explore whether it is possible to use OBA funds to support the private partner to access finance at concessional rates, rather than the provision of grant-based finance.

There may be a question, which will need to be explored with the investors, as to whether the concessional lending on the expansion project alone will sufficiently incentivise the

[35] For instance, InfraCo (2010) explains how the concept of patient capital can be a more suitable form of financing to support the implementation of irrigation projects. Patient capital is long-term, subordinated capital invested at a sub-commercial cost, which is used to fund the one-off start-up costs and part of the cost of the very long-life assets.

[36] AgDevCo is a social impact investor and agribusiness project developer, incorporated as a non-for-profit distribution, limited company in the UK. It invests patient capital in the form of debt and equity into early stage agribusinesses and acts as promoter or co-promoter of greenfield agriculture opportunities.

commercial farmers to extend and operate the scheme. If necessary, incentives could be extended to cover the entire irrigation scheme.

Alternative commercial hub-outgrower models

The Kaleya/ KEDE model works, in terms of scheme sustainability, because the commercial hub farmer benefits directly from the smallholder accessing the irrigation services to produce higher yields of sugar given that there is an agreement to supply the local sugar producing factory.

As discussed in Section 5.1 there are various project examples in Zambia and across SSA where the strength of the financial incentive of the commercial hub to provide ongoing services to smallholders does not exist because the hub has no commercial interest in the smallholder's output. This is usually because the commercial hub is growing different crops than the smallholders using different irrigation technologies. Based on project examples about which we have some experience, we have developed a financial model to explore how OBA could be used to support the more generic commercial hub-outgrower farmer model. This model is explained in detail in Annex A.

The key point to take from the modelling analysis is that the costs and benefits (in terms of number of beneficiaries and expected increase in smallholder farmer income) of developing such a project are broadly similar to those set out in Section 5.2. However, as opposed to the KEDE model there is less certainty about the potential to use concessional finance to fund the more generic commercial hub-outgrower models. It is unlikely that private investors would be willing to take on debt to fund the extension of the schemes to smallholders, given the absence of a financial return. As such there is a question mark about whether grants should be used to support this sort of opportunity given the potential costs of the scheme and the more limited number of individuals that would benefit compared to the other potential project opportunities, unless of course justified by economic cost benefit analysis.

Summary assessment of the market opportunities for OBA in Zambia

In this section we have explored the potential to apply OBA financing to support the extension of commercial large-scale irrigation schemes to smallholder farmers using variants of the commercial hub-outgrower model.

Table 5.1: Summary of the commercial hub-outgrower model

Criteria	Commercial hub-outgrower model
Project objective	Extend commercial irrigation schemes to provide services to smallholders
Indicative project cost	Total project cost of approx. $5m, which includes an OBA contribution of up to $5m
Trigger for release of	The release of OBA funds could be staged to match progress in completing the project:

Criteria	Commercial hub-outgrower model
OBA funds	• A proportion of funds released upon completion of the work to prepare the site for the development of the scheme, e.g. land clearing and preparing the area for the production of the crop • A proportion of the subsidy released following completion of the irrigation systems designed to serve the smallholder farmers • A portion of the subsidy reserved for verification that the scheme is operational and serving a proportion of the farmers • A portion tied to the scheme being verified to serve all the targeted number of smallholders • A final payment tied to the project remaining operational for a pre-specified length of time
Outputs	Around 200 smallholders connected to irrigation services and supported with capacity building/ training
Beneficiaries	1,000 individuals
OBA efficiency	• Cost per individual could be in range of $1,000 to $5,000 (costs per farmer $5,000 to $25,000) • Smallholders income increases by up to $1,350 per annum
Scope to target	Projects will be originated by commercial farmers, smallholders located near schemes where approach is technically feasible can be targeted
Scope to pre-finance	Will vary depending on the nature of the project opportunity, but from the consultations that we have had some of the commercial farming companies have some experience/ capacity to pre-finance portions of these investments.
Key risks/ unknowns	Nature of the financial incentives of the commercial farmers to provide services on a sustainable basis to smallholders
Mitigations	• For projects where there is a clear financial incentive for the commercial hub to maintain the provision of irrigation and technical assistance services to the smallholders, such as the KEDE example discussed in Section 5.2, it would be worth exploring the potential of using OBA funds to support the private company to access finance at concessional rates, rather than simply providing grant-based finance. • For the more generic commercial hub-outgrower models, where the commercial farmers have no real financial interest in the smallholders' output there is likely to be less opportunity to use concessional finance to support the implementation of projects. While there is an option of using grant-based finance to support this type of opportunity the costs would in most cases be too high compared to alternative uses of the funds.
Scope to scale?	Similar hub-outgrower projects are under development across SSA, opportunity to use this approach as a model solution to the issue of how to connect smallholder farmers to large-scale irrigation schemes

Conclusions & recommendations

The objective of this report was to:

- Evaluate the scope for using OBA funds to finance small-scale irrigation schemes to support poor farmers in developing countries.
- Propose project design and implementation arrangements, based on real-world examples, to support sustainable small scale irrigation schemes benefiting from OBA, either under public or private management.

The aim being to use the analysis to provide GPOBA with recommendations on the way forward for using OBA subsidies to support the implementation of small scale irrigation projects.

Scope to apply OBA in small-scale irrigation sector

In Section 3 of this report we presented an assessment of the scope to apply OBA to support the extension of irrigation schemes to smallholder farmers, based on desk-based research of the irrigation sectors in a sample of five countries in SSA and South Asia.

Our overall assessment is that there is scope to utilize the OBA financing approach to support increased provision of irrigation to smallholder farmers. In particular, there is an important role for OBA to fill in helping to address financing gaps in both South Asia and SSA. Effectively designed OBA projects could play a role in addressing these investment needs; however the desk-based research presented in this report has highlighted some important concerns with the sector that will need to be considered in the design of any potential OBA project:

- Given the difficulties experienced in charging smallholders ISC at a level required to cover O&M costs, an important part of OBA project design in the sector will be the associated technical assistance programs that build demand amongst local farmers to the extent that they are willing to pay for the improved services provided by the project.
- Sustainable OBA projects in the sector will need to be located in areas which provide access to functional markets. There may be occasions in which trade-offs have to be made between projects which target the poorest smallholder farmers and those which target poor farmers based in areas which have access to markets to help ensure that the irrigation project is more sustainable.
- It will be important to gain firm commitment from potential host country/ state government's given the political nature of irrigation, particularly in India.
- There are also notable risks in linking subsidy disbursements to farm productivity related outputs, as the private sector may not have appetite for such risks, even though such outputs may be a truer reflection of the OBA concept.

- The design of OBA subsidies will need to take account of the potential difficulties involved in measuring the delivery of irrigation services to smallholders and of the technical difficulty of excluding non-participating farmers from accessing certain types of irrigation scheme.

Potential project opportunities for OBA in small-scale irrigation sector

In the second part of the report we have identified specific project opportunities that could be supported by OBA funds in India and Zambia.

We reviewed the option of using market based approaches to supply farmers with micro-irrigation technology and of supporting farmers to construct rainwater harvesting ponds. The analysis suggests that both of these options would be good candidates for support using OBA funds. Both of these approaches:

- have been shown to be successful at targeting large numbers of poor smallholder farmers;
- the potential cost per beneficiary could be as low as $75 per smallholder farmer (or $15 per individual), with smallholders' incomes increasing by as much as $400 per annum depending on the type of micro-irrigation technology provided;
- have limited/ no involvement from government institutions so there is less complexity in seeking to implement projects;
- could be adopted across a range of countries in both SSA (for instance organisations such as Kickstart and iDE have been successful in supplying large numbers of smallholder farmers with micro-irrigation technology in a number of African countries) and South Asia; and
- is a potentially sustainable approach given that the micro-irrigation equipment is developed to meet the needs of the targeted smallholders farmers, both in terms of affordability and suitability given the geographic conditions.

We also looked at different options that make use of large-scale irrigation schemes to provide irrigation to smallholder farmers; the IMIP approach that is currently specific to India and the different commercial hub-outgrower models that are being developed in Zambia and across SSA.

These two models are quite reflective of government's attempts to bring in more private sector participation to improve the performance of large-scale schemes in the two regions. A number of governments in SSA are currently in the process of trying to develop commercial hub-outgrower models. While in India, where government retains responsibility for up-stream irrigation infrastructure, efforts to rehabilitate large-scale schemes have focused on bringing in private sector participation to improve down-stream irrigation facilities. The two models thus present interesting examples of the type of opportunities that might be available for supporting large-scale irrigation schemes in the two regions.

The IMIP approach looks like an innovative way to rehabilitate existing irrigation schemes in India, while at the same time improving water use efficiency. However, given the policy environment for irrigation in India, and the costs involved in implementing a project it would be necessary to work directly with the State governments to implement such a project. Previous experience suggests that it can be complicated to work with State governments to implement irrigation projects, particularly if there is a dependence on the State for the release of funds. If this type of opportunity were to be pursued further, it would be imperative to get firm commitment, in the form of financial guarantees, from State governments before proceeding.

The commercial hub-outgrower model also has the potential to be used to support smallholders to access irrigation. We have consulted with potential investors and developed a financial model to explore the costs and benefits involved with this approach. Overall, our analysis suggests that the use of OBA subsidies for this type of opportunity be restricted to supporting investors to access finance at concessional rates to fund the extension of irrigation to smallholder farmers. This implies that OBA funds should focus on supporting projects where there is a clear ongoing financial incentive for the commercial hub to provide services to the smallholder farmers, which will help to ensure that the OBA funds support financially sustainable irrigation schemes.

Recommendations & way forward

Based on the information gained from desk-based research and consultations, the option of using OBA to support the extension of small-scale irrigation technologies, particularly through the use of the market-based approaches used by institutions such as IDEI and Kickstart, offer the most potential. This potential is in terms of cost efficiency, the scope to scale up the approach across countries in both SSA and South Asia and the ease of implementation given the limited role that government institutions would play in the project outlines that we have described.

We would caution that all the project opportunities identified in this report were not initially designed with OBA subsidies in mind, but were suggested to us by private sector stakeholders as being projects that could potentially be adapted to fit with the OBA approach. We have discussed the nature of OBA projects with stakeholders and they have indicated an initial willingness to take the projects forward, but the natural next phase of the work will be to hold more detailed discussions with them.

Therefore, in terms of follow up, GPOBA should hold discussions with the institutions such as IDEI and Kickstart that have implemented successfully development partner funded projects (and are thus likely to be experienced in dealing with any necessary World Bank monitoring and evaluation etc. requirements) that have extended micro-irrigation technologies to smallholder farmers, to assess in more detail the scope to use OBA funds to develop interventions targeted at poor smallholder farmers. In particular GPOBA should evaluate in more detail the scope for these institutions to pre-finance their projects and to

take on the risks of having the release of funds tied to the achievement of pre-specified outputs.

The option of using OBA funds to support the extension of irrigation through large-scale schemes also provides some interesting possibilities, but in practice will be difficult to implement given the probable complexity involved in both working with government institutions and seeking to organise large groups of farmers. However, there is a question mark about whether GPOBA should be using their funds to try and address implementation blockages such as these that are restricting Private Sector Participation (PSP) in the provision of infrastructure services to the poor. While the option of using OBA funds to support the extension of small-scale irrigation equipment certainly has potential to improve outcomes for smallholder farmers, it is unclear what it does to address structural problems within the business environment that prevent private investors from fulfilling their role. If the GPOBA's objective for using OBA funds in the irrigation sector is to address these constraints, then perhaps the larger-scale project opportunities will need to be targeted over a longer timeframe.

Of the projects opportunities that we have reviewed, the potential of using OBA funds to support commercial hub-outgrower models where it is possible to use OBA funds to enable investors to access funds at concessional rates is the best option. Otherwise the costs involved in supporting large-scale projects are potentially too large for OBA funds to support. As a next step GPOBA should discuss specific investment opportunities with institutions that are currently working on trying to find ways to support the development of irrigation schemes in SSA. In our view, given the nature of the irrigation sector, if GPOBA were to get involved with larger-scale schemes it should also consider whether it is possible to provide longer-term assistance to projects than the quoted five to seven years or explore the possibility of linking the project to larger World Bank/ development partner interventions. This would enable the provision of OBA funds to have an on-going influence on ensuring that smallholder continue to be provided with the required standard of irrigation services.

In summary:

- We judge that the options of using OBA subsidies to support the market-based approaches and the rainwater harvesting schemes both provide the most promising opportunities to support the extension of irrigation services to smallholder farmers.
- Follow up is required with institutions such as IDEI and Kickstart to develop their project proposals in more detail and then assess the potential for them to pre-finance the projects and take on the risks associated with tying the release of grant funds to the achievement of pre-defined outputs.
- In addition these discussions should explore further the scope to link OBA subsidy disbursements to verification that the farmers accessing the irrigation technology have actually achieved productivity improvements. These discussions will need to

explore the private sector firm's appetite to take on these risks given that they do not necessarily have control over the effectiveness with which farmers use the irrigation equipment.

- Support for larger-scale project opportunities, in our view, will require GPOBA to be involved with the projects for a much longer time horizon than is typically covered by an OBA supported project.

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