IRRIGATION SERVICE PROVIDERS:

A BUSINESS PLAN

Increasing access to water for smallholders in Sub-Saharan Africa

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Imagine this…

Mr. Desmond used to work in Dar es Salaam for a car rental company. Separated from his family, left behind in his village near Rutamba, Desmond was having a hard time. “We were struggling to get along. My wife and my children were trying to grow food on our small bit of land while I was stuck far away in the big city.”

The business incubator program made it possible for Desmond to return to his village and set up his own business. Now Desmond travels around the area with his two diesel pumps hiring out his services as an irrigation water supplier. During the dry season, he can earn US$10 to 12 a day.

“Business is good and growing” Desmond says. “More farmers are trying their hand at vegetable growing and they all need irrigation in the dry season.”

During the peak season, Desmond hires two part-time helpers to keep his three pumps working at maximum capacity. “Next year I plan to buy a second-hand truck and a fourth pump” says Desmond.

Desmond was fortunate enough to have the chance to be his own boss. He is back with his family and the future looks good.

Now imagine this…

If Desmond’s story were repeated hundreds of times in small farming communities across Burkina Faso, Ethiopia, Ghana, Tanzania and Zambia it would mean:

375 new irrigation service providers after 2 years irrigating an average of 7.5 hectares per dry season = 2,775 hectares of irrigated vegetable crops. After the first year, 225 self-employed irrigators using small pumps earning an average of US$1240 per dry season cropping cycle. Up to 7500 smallholder farmers earning at least US$ 760 in supplementary income.
Why this business plan?

- In many Sub-Saharan countries millions of small-scale farmers earn a much needed cash income from irrigated vegetable cultivation during the dry season.
- Most use simple hand-watering methods that are time consuming and limit the area they can cultivate.
- Some farmers use small motor pumps to expand their area and hence profit.
- However, only relatively better-off farmers can afford the initial investment costs and have the means to run and maintain a pump.
- Women farmers, in particular, have difficulty gaining access to motorized pumps.

Domestic demand for fresh vegetables has more than tripled in the past decades.

With continued population growth, urbanization and improvement in living standards, demand is likely to rise throughout Sub-Saharan Africa. Effectively, it could triple from 26 million tonnes in 2007 to 71 million tonnes in 2050.

Smallholder farmers therefore have good prospects for increasing household income and a strong incentive for increasing yields and the area of cultivation. Irrigating with small pumps will become a key factor in their ability to take advantage of this opportunity.
**Proposed solution: irrigation service provider**

An irrigation service provider owns several portable motor pumps, with which he can irrigate farmers’ fields. He takes care of the running costs, operation and maintenance of the pump. Farmers pay a fixed rate per hour that covers all costs and a profit for the service provider.

Depending on the need of the farmers, the irrigation service provider can extend his services to providing loans for agricultural inputs, agronomic advice and credit.

**Benefits:**

- **For local entrepreneurs:**
  - a profitable business opportunity
- **For farmers:**
  - Affordable access to motorized pumping for those who don’t have the means or skills to buy, operate and maintain a pump.
  - Access to related services (agronomic / marketing advice and credit).
  - The ability to cultivate a larger area and extend the growing seasons, both of which mean higher profits.
  - Accessible to individual farmers; no need to organize in a group.

**This business plan:**

- Shows that the irrigation service provider model is a profitable proposition for local entrepreneurs and their customers (farmers).
- Shows that an irrigation service business is profitable under a range of scenarios.
- Shows how the set-up of these businesses can be facilitated by Business Development Services.

*This business plan is written for donors, investors and governments.*

*It offers the opportunity to stimulate new businesses in rural areas in Sub-Saharan Africa and at the same time increase the incomes of smallholder farmers.*

[Images of a pump and a field]
Executive Summary

Millions of smallholder farmers in Sub-Saharan Africa are earning additional income by growing vegetable crops during the dry season.

Over 80 percent of these farmers are watering crops by hand.

There are regions where many of the farmers are already using of small motorized pumps and it is clear that they have substantially higher incomes and better food security than those who depend solely on rainfed production.

In other areas there is great potential, but there is a paucity of credit facilities for farmers, information about pumps is patchy and there is a huge discrepancy in prices. The purpose of this business case is to make it possible for more farmers to reap the benefits of pump-driven irrigation.

The case

This business case examines the economic feasibility of establishing irrigation provider businesses. It is based on research from the AgWater Solutions Project (AWM Solutions project) in Burkina Faso, Ethiopia, Ghana, Tanzania and Zambia.

The case shows how small entrepreneurs can earn a good income selling water pumping services during the dry season and how smallholder farmers can benefit by earning more money growing vegetables.

We examine the case from the two points of view: that of the smallholder farmer (the customer of the business) and that of the pump service provider (the business owner or entrepreneur).

The rise in demand for vegetable production in domestic and regional markets will mean that it is economically viable for smallholder farmers to increase production. The case further illustrates that poor access to water for dry season irrigation is one of the key factors limiting smallholder farmers and how that challenge can be overcome by establishing a pump rental market.

*By improving access to irrigation, a farmer can harvest good crops even in the dry season.*
The investment

Direct investments are required in three areas:

1. **Business Development Services** to help local entrepreneurs set up businesses providing irrigation services: 10 Business Development Services at an average cost of US$ 250,000 over 3 years = US$ 2.5 million.

2. A **loan guarantee fund** to encourage micro-lenders or Business Development Services to extend small loans to smallholder farmers who want to switch from hand watering to irrigating with motorized pumps: A fund of US$ 560,000 for the first year of operation.

3. A **loan guarantee fund** so that Business Development Services can offer loans to irrigation service providers to buy pump sets and start a business: A loan guarantee fund of US$ 500,000.

**Total investment for 3 years: US$ 3.8 million**

The returns

After the first year of operation:

- **375 new businesses a year earning total revenue of US$ 1.4 million annually.**
  
  Each year, 375 self-employed irrigation water suppliers using small pumps earning an average net income of US$ 1235 on revenue of US$ 3600 per dry season cropping cycle. Part-time employment for another 750 pump operators.

- **2,775 hectares of newly developed irrigated crop land per dry season after the second year.**
  
  10 business development services graduate 500 business operators in two years; assuming that 75% of these operations are in business after 2 years; assuming that each operator serves an average of 7.4 hectares per dry season.

- **7500 smallholder farmers earning at least US$ 756 each in supplementary income per dry season for total net revenue of US$ 5.7 million.**
  
  375 irrigation service providers servicing 20 farmers per season.

**Note:** Dry season vegetable cropping does not replace production of staple crops. Vegetable growing provides supplementary income in the dry season using small plots of land. The increased income is a significant contribution to household food security.

Vegetables include a variety of cash crops such as onions, tomatoes, leafy vegetables, carrots and peppers among others. While onions and tomatoes dominate, farmers change crops depending on price, marketing opportunities and storage options.
**Geographic scope**

The geographic scope of the case includes Burkina Faso, Ethiopia, Ghana, Tanzania, and Zambia. The scope was determined by the availability of sufficient data of the required quality on which to build the business case. Within each of these countries, we have assessed the potential application of low-cost motorized pumps as an agricultural water management solution, taking into account the bio-physical suitability and potential impact on rural livelihoods. The maps below illustrate this potential, both high and low, for each of the five countries.

[insert FAO maps in order the countries are presented above]

For the whole of Sub-Saharan Africa, we estimate motorized pumps having a potential application area of 20.5 million hectares, benefiting some 122 million rural people and generating net revenues of up US$7.5 billion per year, once river basin hydrology, incremental yield improvements, investment costs, market access, and particularly potential impact of expanded crop production on local food price developments are taken into account.

*This business model has huge potential across five countries in Sub-Saharan Africa.*
The smallholder farmer

In brief:

- Population growth and increased fresh vegetable consumption are driving demand for vegetable production.
- Smallholder farmers want to use pumps but can’t for several reasons, including the upfront investment cost.
- Farmers who use small pumps earn more money than those who don’t, hence there is an economic incentive for farmers to make use of pumping services.
- Some farmers who do own pumps are renting their pumps to farmers who don’t, hence there is an emerging rental market on which to build.
- For poor farmers, an irrigation delivery service offers more benefits than owning pumps.

For poor farmers, renting offers significant benefits

- No capital outlay or loans.
- No operational costs
- No fuel or transport costs
- No ‘hassle’ taking a pump for repairs, storage, etc.
- No storage and security concerns.
- Less risk.

For women in particular, renting is easier than owning.

Population growth and increased fresh vegetable consumption are driving demand for vegetable production.

![Population in SSA Chart](chart.png)

<table>
<thead>
<tr>
<th>Per capita and total vegetable consumption in Sub-Saharan Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td><strong>1961</strong></td>
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<tr>
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</tr>
<tr>
<td>Consumption (kg/cap/yr)</td>
</tr>
<tr>
<td>Population (millions)</td>
</tr>
<tr>
<td>Total consumption (million/ton)</td>
</tr>
</tbody>
</table>

Source: based on FAOstat database
Current production

In Burkina Faso, 94% of all vegetable production is sold at local markets, generating revenue of US$ 350 on an average land holding of 0.1 hectare. Peaks in vegetable production are observed in years when the cereal harvests during the wet season are lower than usual, pointing to the importance of off-season vegetable cultivation for additional income (DSA 2005).

In Ethiopia, 70% of the farmers in Oromia and SNNPR depend solely on rainfed staple crops, while 30% earn additional income from irrigated cultivation.

In Ghana, smallholder irrigation – primarily dry season vegetable cultivation – adds between US$175 to 840 to household income depending on the technology used.

In Tanzania, 50% of the cash income of smallholders involved in dry season private irrigation comes from dry season vegetable cultivation.

In Zambia, 20% of smallholders engaged in dry season vegetable cultivation earn an income 35% higher than the average.

Projected demand

Domestic demand for fresh vegetables has more than tripled in the last few decades. With continued population growth, urbanization and improvement in living standards demand is likely to rise throughout Sub-Saharan Africa. If these trends continue, demand will effectively triple from 26 million tonnes in 2007 to 71 million tonnes in 2050. This means good prospects for smallholder farmers who can increase their household income by increasing yields and the area of cultivation. Irrigating with small pumps will become a key factor in their ability to take advantage of this opportunity.

Smallholder farmers want to use pumps but can’t

Farmers generally do know about motorized pumps. Surveys conducted for the AWM Solutions project show a high level of awareness of both private irrigation in general and water lifting technologies in particular. However, most of them, (more than 80%) still use manual watering methods such as buckets and watering cans. Those who do own a pump typically paid for it themselves, and are among the top 20 percent in terms of income. The majority of farmers in Ghana, Tanzania and Zambia who rely on buckets or rainfed cultivation said they would prefer to use a motorized pump but lack the resources to do so. Farmers want to use pumps but can’t

<table>
<thead>
<tr>
<th></th>
<th>Area under private irrigation (ha)</th>
<th>People involved</th>
<th>Buckets (% users)</th>
<th>Treadle pumps (%)</th>
<th>Motor pumps (%)</th>
<th>No. of motor pumps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burkina</td>
<td>10,000</td>
<td>170,000</td>
<td>85%</td>
<td>2%</td>
<td>13%</td>
<td>20,000</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>350,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>400,000</td>
</tr>
<tr>
<td>Ghana</td>
<td>120,000</td>
<td>500,000</td>
<td>84%</td>
<td>&lt;1%</td>
<td>15%</td>
<td>160,000</td>
</tr>
<tr>
<td>Tanzania</td>
<td>150,000</td>
<td>750,000</td>
<td>91%</td>
<td>1%</td>
<td>8%</td>
<td>70,000</td>
</tr>
<tr>
<td>Zambia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSA</td>
<td>&gt; 1 million</td>
<td>&gt; 5 million</td>
<td>85%</td>
<td>&lt; 1%</td>
<td>15%</td>
<td>&gt; 1 million</td>
</tr>
</tbody>
</table>

Source: farmer surveys – AWM Solutions project
**Reasons for not cultivating potential irrigable area**

- Lack of money to buy equipment: 34.1%
- Availability of water: 25.4%
- High cost of labour: 23.6%
- Wet season cultivation is enough: 19.5%
- Unsuitable land: 14.3%
- Lack of equipment: 13.4%
- High cost of fuel: 8.3%
- Grow drought resistant crop: 5.01%
- Others: 2.6%
- 1.5%

*Source: farmer surveys in Ghana, AWM Solutions project*

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**Farmers who use small pumps earn more money than those who don’t**

Farmers who own or use rented pumps cultivate more land, get higher yields and earn twice as much as farmers who water by hand. Farmers are generally aware of this.

*This includes fuel costs of US$300/ha plus US$115/yr amortization of the pump (price of the pump is 400 US$ - including accessories, interest rate 15% per year, lifespan of the pump 5 years).*

*Source: farmer surveys in Ghana, Namara et al 2011.*
Case Studies

Some farmers who own pumps are renting them out

Some smallholders rent pumps from neighboring farmers who are better off.

Rentals play a significant role in the use of petrol and diesel pumps in selected areas in the Volta Region in Ghana where pump ownership is atypically high. Farmers already renting out their pumps are potential candidates for expanding their informal rentals into an irrigation delivery business.

<table>
<thead>
<tr>
<th>Mode of access</th>
<th>Bucket (%)</th>
<th>Treadle pump (%)</th>
<th>Petrol pump (%)</th>
<th>Diesel Pump (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Privately owned</td>
<td>98.6</td>
<td>66.2</td>
<td>50.4</td>
<td>67.6</td>
</tr>
<tr>
<td>Communal</td>
<td>0.9</td>
<td>9.2</td>
<td>8.6</td>
<td>5.5</td>
</tr>
<tr>
<td>Company</td>
<td>0.3</td>
<td>1.5</td>
<td>1.7</td>
<td>2.7</td>
</tr>
<tr>
<td>Rental</td>
<td>0.0</td>
<td>9.2</td>
<td>36.8</td>
<td>10.8</td>
</tr>
<tr>
<td>Borrow from Friends/</td>
<td>0.0</td>
<td>7.7</td>
<td>2.6</td>
<td>8.1</td>
</tr>
<tr>
<td>Other</td>
<td>0.3</td>
<td>6.2</td>
<td>0.0</td>
<td>5.4</td>
</tr>
<tr>
<td>N</td>
<td>351</td>
<td>65</td>
<td>234</td>
<td>37</td>
</tr>
</tbody>
</table>

*Source: Farmer surveys in the Volta region, Ghana, AWM Solutions project*

Existing irrigation service providers in Gujarat and Burkina Faso

Sanjeev is a farmer. He lives in the village of Chhaapi in Gujarat where he cultivates maize and gram. He started renting out his services as an irrigation water supplier a few years ago. He charges US$ 1 an hour for 7 to 10 acres. Taking his pump on a donkey cart he supplies water to a dozen neighbouring farms. Demand is higher than he can supply. (Based on an interview by Tushaar Shah, 2010).

Around the Korsimoro reservoir in Burkina Faso, groups of farmers started pumping water to irrigate vegetables. Typically, the relatively better-off pump owners rent out pieces of irrigated land to those without pumps. They buy the fuel, and maintain and operate the pump or hire an operator to do so. They charge US$ 120-150 per growing season for 0.1 hectare (Ndanga 2011).

Another example comes from Bangladesh where a local NGO initiated irrigation delivery businesses for small farmers (Wood and Palmer-Jones in their 1990 book: The Water Sellers).

This business model seeks to scale out these and other successful paid-for sharing arrangements.
The pump service provider

_In brief:_
- There is a large potential market for irrigation services.
- Thousands of hectares of irrigable land could be cultivated if farmers had access to small pumps as pump owners cultivate more land.
- Farmers are already renting pumps from others.
- Large numbers of pumps are imported and sold and there are existing networks of dealers.
- Pump rentals would be a new niche in a well established rental business sector.
- A financial analysis shows that a single entrepreneur operating an irrigation delivery service can earn an above average income.

_There is a large potential market for pump rental_

Thousands of hectares of irrigable land could be cultivated if farmers had access to small pumps.

Most farmers have access to an average of 1.4 hectares of additional land that could be cultivated. This land is idle because smallholder farmers can't afford either to buy a pump or the time and labor it costs to water by hand.

<table>
<thead>
<tr>
<th></th>
<th>Own farm</th>
<th>Cultivated land (ha)</th>
<th>Additional irrigable area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petrol pump</td>
<td>3.9</td>
<td>2.3</td>
<td>1.6</td>
</tr>
<tr>
<td>Rain-fed land</td>
<td>2.2</td>
<td>1.5</td>
<td>1.3</td>
</tr>
<tr>
<td>Bucket (hand watering)</td>
<td>2.0</td>
<td>1.7</td>
<td>1.4</td>
</tr>
<tr>
<td>Treadle pump</td>
<td>2.4</td>
<td>4.0</td>
<td>2.1</td>
</tr>
<tr>
<td>Canal</td>
<td>1.7</td>
<td>1.7</td>
<td>1.5</td>
</tr>
</tbody>
</table>

_Source: data from farmer surveys in Ghana, AWM Solutions project_

Nearly 90% of the 1.8 million farm households in Ghana have an additional 1.4 hectares they could irrigate. That means 2.3 million hectares of extra land could be under cultivation.

In Burkina Faso, some 170,000 farmers, mostly smallholders, are involved in off-season irrigated vegetable cultivation, using buckets, watering cans and small motor pumps. Vegetable production nearly tripled from 60,000 tons in 1996 to 160,000 tons in 2005 (DSA 2005).

_Large numbers of pumps are imported and sold..._

There are currently an estimated 160,000 small motorized pumps in use Ghana, 70,000 in Tanzania, more than 20,000 in Burkina Faso, and 60,000 in Oromia, Amhara and Tigray in Ethiopia. Research by the AWM Solutions project shows that use of small motorized, mostly diesel pumps is on the rise in Sub-Saharan Africa. This is driven, in part, by the potential amount of land available for irrigation and high demand for vegetable crops during the dry season.

In Tanzania, an estimated 600,000 farmers grow vegetables using buckets and watering cans to get water by hand with water from rivers and wells. Surveys indicate motorized pump sales are on the rise with estimated sales of over 7,000 pumps annually, and more than 70,000 pumps in use, which currently benefits over 150,000 farmers.
...and there are existing networks of dealers

In Ghana, there are approximately 1500 agro dealers operating 3500 agro-input sales points (IFDC, 2010). One-third of the sales points responding to an AWM Solutions survey indicated they do sell pumps.

Renting is a widespread business model. The irrigation service provider takes this one step further by including the pump operation into the model to avoid damage from mishandling the pump.

Pump rentals are a new niche in a well-established rental business sector

Rental services are familiar in the target countries. In all five, there are companies renting out cars and mobile phones. In Ghana, there is a thriving rental sector offering office/conference equipment, cars, trucks, mobile phones, and equipment for construction, engineering, oil and gas, food and other services.

Rental services are more common and more sophisticated in large cities, but in most small towns you will find people renting chairs and tables and speaker systems for parties and events. Renting is a widespread business model. The irrigation provider service takes this one step further by including the pump operation into the model to avoid damage from mishandling the pump.

Most small scale farmers know a pump will help them grow more.
The implications for the business model are:

1) the rental model is widespread and therefore familiar to potential users;
2) there is a pool of people with knowledge and practical experience in the rental business;
3) there will be legal instruments (contracts, laws, etc.) and accounting practices designed specifically for rental businesses that can be easily adapted to pump rentals.

The low use of pumps indicates considerable scope for pump rental

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<td>Zambia</td>
<td></td>
<td></td>
<td>90%</td>
<td>8%</td>
<td>2%</td>
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</tbody>
</table>

Source: AWM Solutions project

Farm equipment dealers in small towns in all study areas indicate an increased demand for small motorized pumps in recent years, which they attribute to the influx of cheap pumps from China. More than a million pumps are currently in use (compared to 20-25 million in India). The potential market for pumps in all of SSA could be in the range of 10 million.