Kahe case study

We will now take you on a field visit to an irrigation site in Tanzania where farmers use pumps to draw water from shallow, hand-dug wells without government support or control. The site illustrates how farmers established groundwater irrigation in response to water scarcity, newly available petrol pumps and growing produce markets. This type of irrigation has benefited different socio-economic classes of farmers differently and brought new challenges to the area.

Key learning points:

1. Farmers quickly innovated in response to changing water availability, newly available technologies and growing urban markets;
2. A lack of access to markets, extension services and sustainable energy sources are threatening the profitability of shallow well irrigation;
3. Rich farmers are more likely to make a profit because they have better access to knowledge, inputs, and markets;
4. Government agencies have not tried to support or control farmers using shallow wells for irrigation;

The location

Kahe ward lies 12 km south-east of Moshi town, in the Kilimanjaro region in northern Tanzania. It is part of the Pangani River Basin, and falls within the Northern Irrigation Zone. It has roughly 19,000 inhabitants and is comprised of eight villages.

The context

The mean annual precipitation is 365 mm, with most rain occurring between March and May. Agriculture is the main source of income for most villagers.

Until the 1980s, the Rau River was used for irrigation by smallholder farmers in Kahe, who dug their own canals. After this, the river dried up for large parts of the year as a result of upstream developments. During the 1990s, rainfall decreased until even the rainy season became insufficient to farm productively.

Recent developments

Farmers in Kahe first started using wells for irrigation in the early 2000s in response to decreasing water availability and the emergence of affordable petrol pumps in the nearby urban centre. Wells which were dug before that time were for domestic use or the construction of a house. Now almost all wells in the rural area are used for irrigation. Before, a few people were using KickStart treadle pumps ('MoneyMakers'), but nobody saw this as a serious way of irrigating. People would not be able to irrigate more than half an acre, because the work was so tiring. Now farmers use petrol pumps, and are able to irrigate larger areas with less labour. In 2015, there were 300 wells for irrigation, with each well irrigating 1-4 acres, and new wells were still being constructed.

New technologies and innovation

As farmers started irrigating from shallow groundwater, they innovated and perfected the design of the wells and the use of pumps for different settings:

1. A round well is stronger than a square one.

2. The use of a chamber places the pump closer to the water level which conserves fuel, produces more water and conserves the pump's lifespan.

3. In places where flood occur regularly the well needs to be reinforced with bricks while in other places this is not necessary.

Differentiated benefits of wells

Before the use of groundwater for irrigation farmers cultivated maize and beans during the rainy season. Now, the year-round availability of water makes it possible to farm year-round. However, the inputs required for cultivating cash crops proved to be too expensive for a large group of farmers. 35% of farmers who have a well still only grow maize and beans. They often rent out their land in the dry season to businessmen from town, so-called "telephone farmers". These telephone farmers have the financial resources to hire knowledgeable farm managers, to use the required inputs, and to use their own trucks for marketing their produce if nearby markets offer low prices. Smallholder farmers (even those growing cash crops) on the other hand depend on very limited extension services, on middlemen offering low farm-gate prices, and on input advice from local dealers in agrochemicals. Because of this, the majority of those farming tomatoes did not make a profit.

In summary, using the same irrigation technology, richer farmers (especially telephone farmers) do better because:

1. They can afford to grow crops such as onions, which fetch a good price but require a lot of investment
2. Even when growing the same crops, they harvest more because they have sufficient money and knowledge to cultivate properly
3. They sell their produce at better prices because they can afford to go to alternative markets rather than selling at the farm-gate to middlemen

Government's response and potential for greater impact

There have been no government efforts to either support or control the shallow wells. The irrigation agency does not know of their existence and the water basin authority assumes there are only few wells which do not affect groundwater resources. This shows how farmer-led irrigation development can occur under the radar, even when the combined irrigated area reaches hundreds of acres. If the government recognises this type of irrigation as valuable, then there are clear opportunities for government agencies to support smallholder farmers by providing extension services, improving access to markets for inputs and produce, and helping farmers to access loans. At the same time, monitoring groundwater levels and water quality can prevent negative environmental impacts.

Links for more information https://www.sciencedirect.com/science/article/pii/S0305750X18304248 [open access]

Credits Written by Chris de Bont, based on an article by Chris de Bont, Gert Jan Veldwisch and Hans Komakech, and a booklet resulting from field work done by Chris de Bont and Muthio Nzau.