Increasing on-farm storage: innovation, prizes and public mechanisms that benefit small farmers

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ABSTRACT: Post-harvest losses of grain in the developing world lead to lower incomes among smallholder farmers and reduced farm-level food security. This problem is particularly acute in sub-Saharan Africa where post-harvest losses are estimated at US$1.6 billion per year. Moreover, insufficient on-farm storage solutions often lead farmers to sell soon after harvest and receive lower prices when the market is flooded or, even worse, to buy back grain later in the season at a higher price. Private-sector solutions to post-harvest losses exist, but companies often see low-income farmers as a risky and unattractive market. Smallholders do not understand the benefits, nor feel they can afford the solutions. AgResults' Kenya On-Farm Storage Project uses prize competitions to incentivise the private sector to bridge this gap and enter into the market. This project is one of six innovative prize competitions of the AgResults Initiative, a partnership between the governments of Australia, Canada, the United Kingdom and the United States, and the Bill & Melinda Gates Foundation. Prize competitions offer an innovative method for the public sector to use funds effectively and efficiently to engage the private sector. In the case of Kenya, the prize encourages companies to design, develop, market and sell new (or redesigned) on-farm storage devices to smallholder farmers. This presentation describes AgResults' prize competitions, the Kenya On-Farm Storage Project, its impact and its sustainability. It discusses how prize competitions offer the development community an efficient and affordable mechanism to finance development programs in the future.

Keywords: pull mechanisms, private sector, grain storage, smallholders

I am very excited to be here to tell you about a project I am working in which is really my passion – the AgResults Initiative. This is a unique and new initiative which brings together UKaid (part of the UK Department for International Development, DFID) and the Australian Department for Foreign Affairs and Trade (DFAT) and Global Affairs Canada, USAID, the Bill & Melinda Gates Foundation and the World Bank to promote 'pull' mechanisms and innovation in agriculture (Figure 1).

Pull mechanisms vs traditional approaches

Pull mechanisms are incentives to the private sector. They aim to break through barriers that hold back private-sector success. There are situations where private-sector entities 'see' barriers to productivity or trade which they would not be comfortable overcoming. Therefore, 'pull' mechanisms are designed

This is an edited transcript of the presentation, with some of the powerpoint slides shown.

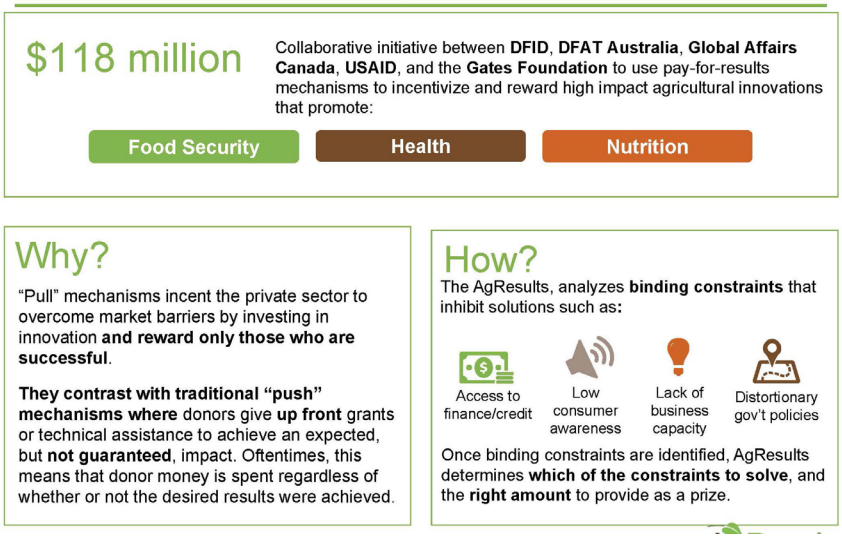

Figure 1. An overview of AgResults and its philosophy and theory of change. AgResults works for innovation in research and delivery.

to motivate these groups to go into new, unexplored markets. This approach, offering incentives, is very different from traditional approaches that I, for instance, have seen during 35 years of my career so far, which use 'push' mechanisms.

Push mechanisms include, for example, technical assistance, grants and study tours. They aim to motivate the target audience to adopt a certain behaviour, and under this mechanism the funding body pays upfront, hoping for results. Whether the target audience achieves the results that the funder is looking for, or not, the funds are disbursed anyway. There is no guarantee of a good outcome from the donor's perspective.

Our approach is different. Sometimes we help the target audience access credit. In other cases, we increase consumer awareness. If there is a lack of business capacity in an area in a developing country, our 'pull' mechanisms can promote that capacity. Frequently we encounter distortionary government policies, and by using a pull mechanism we aim to circumvent or overcome some of those distortionary policies.

The X-prize

Prizes can stimulate private-sector interest. Prizes can add attractiveness to a market that would normally not be attractive. Suitable prizes can create a platform for innovation, which is one of our aims, and also bring in a crowd of potential problem-solvers. Instead of addressing one particular group of innovators, we use prizes to attract and welcome as many problem-solvers as possible. We are technologically agnostic. We really do not care what solutions problem-solvers produce so long as they can meet the objectives of the project.

Probably the best example of pull mechanisms that I can cite is the 'X-prize'. The X-prize launched a US$10 million competition for the private sector to go

into space. Prior to the X-prize, space exploration was all government owned and run. After the X-prize, as a result of this US$10 million prize, there was over US$100 million in private-sector investment in space, and now there is a flourishing private sector in space exploration (Figure 2).

Pilot projects around the world

AgResults is running pilot projects around the world. We are addressing different issues in different countries. In Nigeria, our aim is to eliminate aflatoxins in maize. In Uganda the pilot project is intended to promote diversification in legume seeds and away from maize seed. In Kenya, our pilot is about on-farm storage solutions, as I describe below. In Zambia, our project is attacking deficiencies in vitamin A through bio-fortified orange-coloured maize. In Vietnam, we are launching a greenhouse gases pilot project, aiming to reduce production of greenhouse gases while increasing yields, and this is to be done through using less fertiliser and better management of paddy rice. And for the whole world, about a month ago, we launched a US$30 million prize for the pharmaceutical, biotech and/or animal health industry to produce a brucellosis vaccine that is appropriate for developing country environments and requirements.

These are all very exciting pilot projects, and we are finding they are pulling in substantial innovative thinking.

On-farm storage solutions in Kenya

In sub-Saharan Africa, on-farm post-harvest losses cost about US$1.6 million per year. In Kenya, smallholder farmers will normally crop in two seasons. They will harvest their maize and try to store it till the next season, for their own consumption and also to eventually sell it.

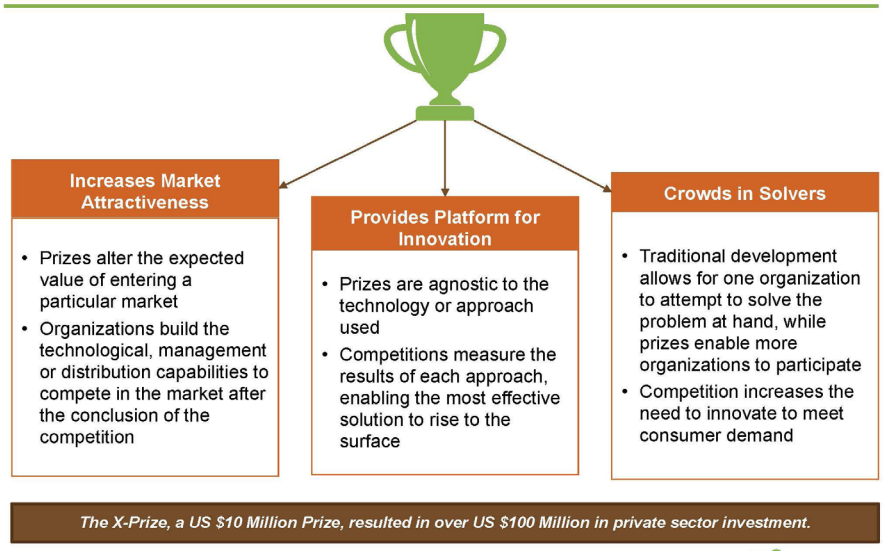

Figure 2. Prizes stimulate private-sector investment by altering the expected return.

If they do not have appropriate storage devices, the Larger Grain Borer and other insects can completely decimate that store of harvested grain. Farmers and their families can be subject to severe food security issues as a result. We find that farmers often sell immediately after harvest, flooding the market and getting a very low price for their grain. Later, when they need that maize for their own use, several months after harvest, they have to buy it, sometimes at a substantial premium.

An on-farm storage solution, instead, allows smallholder farmers to keep their harvested maize at harvest time, and sell it later when the price goes up. They can use their stored grain as a bank as well. When they need money after harvest for school fees and other things, they find that when they open these hermetically sealed storage containers, several months after harvest, the maize is in perfect condition and can command a premium price in the market.

Unfortunately, because of lack of awareness from smallholder farmers, as well as other market barriers, private-sector on-farm storage-solution producers often focus their attention on large to medium farms, and have not produced devices that would be accessible and affordable to smallholders.

For the AgResults contest in Kenya, we are working in two very different regions of the country. The Rift Valley traditionally has not had Larger Grain Borer. Here, essentially, it is good farming practice to store maize from one season to the next. Therefore, we are offering the prize to private-sector participants who can reach a threshold of 21,000 metric tonnes of storage capacity sold. The winning participant will get US$750,000 as a prize, and all the companies that reach that threshold by the end of the contest period will share proportionately in a US$1 million additional prize. This is a great incentive to the private sector there, and they are moving quickly in response.

In the Eastern region of Kenya, which is where there is a prevalence of Larger Grain Borer, it is different. Innovators there will be competing for a US$3 million prize at the end of the period, which will be distributed in proportion to their sales during that period.

The end result of this approach in Kenya is that we can expect minimum crop losses from smallholder farmers in future. The prize is helping to capitalise and develop a sustainable market for farming solutions specifically tailored to the smallholder farmer context, which was not the case in the past. By offering these prizes, we are creating strong incentives to develop new technologies. There are now several different types of storage solutions in use in Kenya: metal silos, plastic tanks and storage bags, among others (Figure 3).

We have also collaborated with a research institution, the International Center of Insect Physiology and Ecology, and developed a ‘penetration protocol’ for testing these devices, to ensure efficiency. The protocol comprises three stages:

- *Insect damage test*: to assess the efficacy of storage devices in protecting the grain from insects that enter during the storing process.
- *Penetration 1 test*: to determine if Larger Grain Borer can breach storage device materials.
- *Penetration 2 test*: to assess whether insects released outside a full-size storage container can penetrate the device within a four-week period.

Figure 3. The Kenya Pilot Implementers are marketing and testing the use of plastic tanks, metal silos and hermetically sealed bags as storage devices.

The protocol has been a substantial contribution because up till now there really was no testing protocol to determine the efficacy of either resistance to the pest or proof of protection against the pest. If you are interested in the details of this protocol, we would be willing to share them with you.

To date, the pilot has attracted six local and international sellers, and two more are applying (Figure 4). There has been a tremendous amount of interest. The

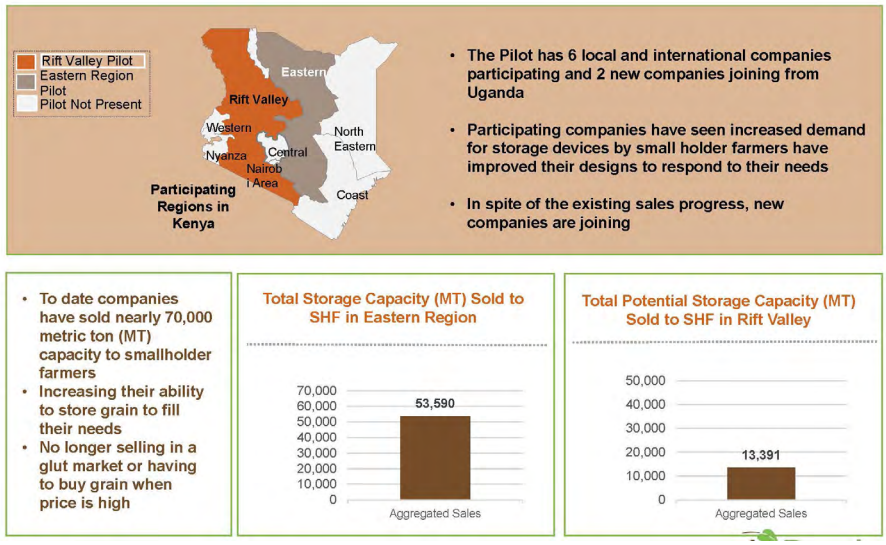

Figure 4. Increased market participation by various on-farm storage providers leading to increased sales to smallholder farmers (SHF).

smallholder market was a completely undeveloped market, and as a result of this initiative more and more farmers are realising that they can afford these devices, and that the devices can make a significant difference to their livelihoods and food security. They are no longer selling in a market where they are at the mercy of highs and lows of prices.

We expect the impact of this pilot will be (Figure 5):

- benefits to about 480,000 smallholder farmers;
- about 172,000 metric tonnes of storage capacity;
- a gain of about US$14 million to the smallholders.

In addition to the impact on smallholder farmers' ability to store and sell their crop at better times, the Kenya pilot has also found that airtight storage significantly reduces aflatoxin contamination of the maize.

Summary

In summary, we have created a virtuous circle with the private sector (Figure 6). The makers of storage solutions are innovating and adapting to a new and developing market. Agro-dealers are being set up and they are helping in the distribution network. Smallholder farmers have already identified and bought into this idea, and we at AgResults feel that there will be a viable and sustainable market once our pilot finishes, three years from now.

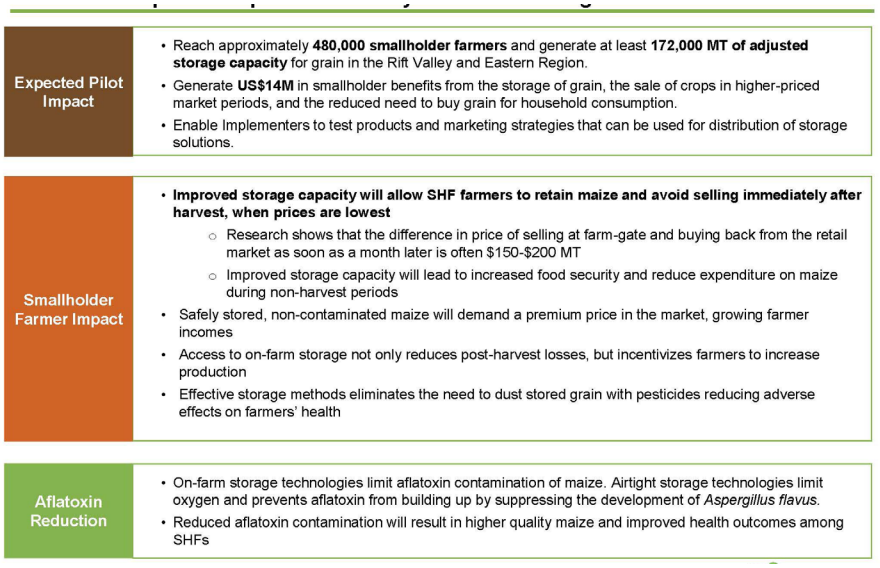

Figure 5. Expected impacts of the Kenya On-farm Storage pilot to smallholder farmers (SHF) and others.

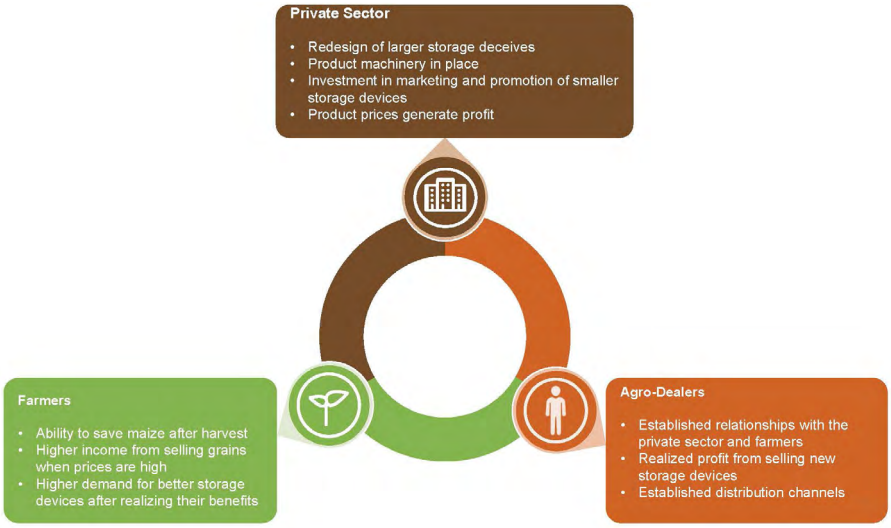

Figure 6. By offering an incentive, this project run by the private sector has created a sustainable new market for devices that fit the needs of smallholder farmers.

Rodrigo Ortiz is the Secretariat Lead for the AgResults Program that implements the Kenya On-Farm-Storage Pilot. He is a senior economic development adviser who specialises in private-sector development in emerging markets, with experience in 74 countries, spanning 40 years. With a proven track record of developing organisations and leading and implementing large and complex technical assistance programs, he has advised economic development agencies, provincial and state governments, and international donor organisations including USAID and the World Bank as well as other public and private-sector organisations. Throughout his career, Mr Ortiz has created and managed world-class economic development, investment and export promotion agencies. These agencies focus on export, trade and investment services, logistics and special economic zones, and industrial, agricultural and service sector projects in Africa, the Middle East, North Africa, Latin American, the Caribbean, and East, Central and South East Asia. Prior to AgResults, Mr Ortiz was with the World Bank, where he headed a technical assistance unit that develop investment promotion capacity for member countries. He was the resident Program Manager for large projects in Jordan, South Africa, Bolivia, Cyprus, and Pakistan and he held strategic roles in technical engagements throughout the globe.