

## Seed: hope for smallholder farmers?



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There is an interesting paradox at the centre of farming: it is that an activity – indeed, an industry – which involves so much bulk and heavy lifting should be controlled to such an extent by a thing as tiny and delicate as the seed that is planted into the soil. Yet it always has been this way, as we learned when hybrid maize genetics and the breeding of semi-dwarf grain crops permanently altered the physical and social landscape of the American Mid-West, Mexico, India and Asia in the wake of the introduction of revolutionary types of crop varieties in the 1930s, 1950s and 1960s. Seed is the ultimate reach-through technology because its effects in the future extend far beyond immediate applications and intentions.

Africa's farmers are as alive as any in the world to the paradoxical magic of good seed. After more than a quarter of a century of trying to deliver improved seed and better crop management practices to farmers in Africa there is still, for me,

nothing equal to the thrill of seeing a smallholder farmer reaching out to receive a new batch of improved seed. That moment always seems to bring a sparkle of hope to the eyes of even the most downtrodden farmer.

I can still recall vividly the days of war in Mozambique when we were distributing 'emergency seed' to farmers affected by the fighting there. The farmers would line up for hours, often in the rains of the new planting season, some of them clothed in tatters and some of them wrapped only in pounded tree-bark, since their clothes had long since rotted away after years of being trapped in the bush. But the gleam in their eyes when they walked away with the seed packs we were distributing always betrayed them: somehow there was hope within the despair brought on by unspeakable hardship. These were people who had lived and died by the viability of the seed all their lives. They understood the magic that could be embodied within a seed, and they had new seed! Sure, the rebels could still push them off the land before they could harvest. They might even wait until the harvest was ready, and then attack. They might burn the crop just as it was drying, along with their homes. But maybe not! Maybe this time the rains would come and the crops would flourish and the forces that had been tearing the country apart from the inside out would go somewhere else. For the moment, there was hope. They had seed. They would plant. New hope for better life would sprout along with the green shoots.

Today things are better. Today Africa's farmers, by and large, are no longer standing in lines to receive free seed. Today, more often than not I see that sparkle in the eyes of exiting customers as I'm entering an agro-dealer's shop where certified seed of any one of the hundreds of new, higher-yielding crop varieties

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To get to this point has taken its own good time. First, there was the breeding. We knew from our travels and analysis that Africa's demands on the new seed would be very different from those that worked wonders in Latin America or Asia. Second, there was no irrigation. Only a meagre 4 per cent of African farmland was irrigated, and it wasn't increasing with any great rapidity due to the very high cost of installation. We would simply have to focus on getting more out of rain-fed agriculture. As one farmer poignantly said, 'We don't have drought every year.' But even in the good rainfall years, the yields of farmers growing traditional crop varieties were still miserable. Third, Africa's sheer diversity of agro-ecologies was enough to boggle the mind. How does one breed for conditions as diverse as the Congo Basin, with its fishbowl-like humidity and depleted soils, the Sahel, with its suffocating heat interrupted by intermittent downpours, the highlands of East Africa, which throw at crops almost laboratory-specific conditions for the development of fungal diseases, and the coastal lowlands, with sandy soils and a propensity for droughts?

The problem was the crops themselves, or more precisely, the genetics within those crops, causing the sorghum varieties of the Sahel, for example, to grow 4 metres tall, and causing some local maize varieties to produce ears with a scant eight rows of grain. Many rice varieties also grew nearly 2 metres tall and their flowering was strictly controlled by daylength sensitivities again built into the plant's genetics. That genetic diversity was wonderful from a geneticist's perspective, and included within that diversity were some crucial traits for

developed in the past few years is being sold. Africa's farmers, along with thousands of African seed entrepreneurs, have discovered the value of improved higher-yielding seed.

adaptation to local conditions, local taste and texture preferences, and diseases. But the overall crop itself was hopelessly out of synch with the need to feed rapidly increasing numbers of mouths. Few had ever sifted through that diversity to separate the valuable traits from the detrimental ones, and combine them with varieties of higher yield potential, which responded to fertiliser and other improved crop-management practices. The task appeared nothing short of monumental.

We decided to go local. A popular theme at the time among breeders was to involve farmers, themselves, in the design and then the selection of new varieties. We borrowed from that theme, but moved forward one generation and asked about the children of those farmers, who had probably spent a good portion of their childhood and adolescence planting and hoeing and harvesting the current generation of crops. What about the portion of that generation of farm-born and -bred young people who went to school and had studied agriculture? Wouldn't they have a pretty good notion of what constrained yields in their parents' fields? And if we could find them, and give them a top-notch education in crop genetics and breeding, wouldn't they then know both how to identify and how to deal with those constraints from a breeding perspective? And what if we could find enough such young people interested in pursuing such a career to cover all the major constraints of each major food crop? Might that not be the best way to deal with this seemingly endless diversity of crop breeding challenges?

After a few years we had a few good varieties. That is when we discovered we had a second, perhaps

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even bigger, problem: We had no idea how to deliver the seed to farmers. It is one thing to have one bag of seed of a new crop variety that can transform yields and, with them, farmers' lives. It is quite another to deliver that seed to thousands and eventually millions of farmers living in isolated villages strung along dirt roads hundreds of kilometres from the nearest city. The Green Revolutions in Latin America and Asia happened during an era when governments planned and implemented huge national agricultural programmes. In Asia, the governments had largely delivered the new seed to farmers, along with fertiliser, through massive logistical efforts. But the world had changed since the 1960s. Government coffers around the world had been reduced to make way for the private sector. Putting our limited funds into public agencies at a time when they were being phased out made no sense. This Green Revolution, it seemed, would have to be driven by a private seed sector.

That meant building a seed industry from the ground up. Again, we decided to err on the side of local. We reasoned that, as the new varieties were bred and demonstrated to farmers and the public at large, local entrepreneurship would engage through the minds and actions of local business people, and we would have the opportunity to invest in the resulting seed businesses.

With few exceptions, that is how we now come to be working in partnership with over 80 public breeding teams working with 70 private, independent seed companies delivering approximately 40,000 metric tons of seed to farmers every year: local breeders plant demonstrations of new crop varieties to inform farmers of the new opportunities available through new seed, and local business people decide to risk their savings and assets on developing a business around production and delivery of that seed to local farmers. Annual sales of most of these companies are still below 1,000 metric tons but are rising steadily

as we train their staff in production and processing techniques and train their leaders in seed company management.

It's a fascinating story of the local use of science to improve the lives of local people, most of whom are very poor, combined with local entrepreneurship for the benefit of the community. There is no telling yet whether this is a real revolution, but the results so far are very promising – most seed companies report selling out of their stocks every year and still being unable to meet demand for their seed. Meanwhile, the US Department of Agriculture (USDA) data show that crop yields in Africa have started to climb.

Stay tuned!

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