A fertilizer strategy to reduce poverty of farmers in west and central Africa

About 25,000 smallholder farmers in Mali, Burkina Faso and Niger have used microdosing on their nutrient-depleted farms and gained increases in sorghum and millet yields of 44 to 120% and 30% increase in their family incomes between 2009 and 2012. They also adopted the warrantage system to leverage gains.

The challenge

Land Degradation & Poverty

1. Losses due to land degradation are estimated at US$42 billion in income and of 5 million hectares of productive land annually.

2. Clearing new lands for farming is blamed for an estimated 70% of Africa’s deforestation.

3. Farmers are so poor that they are not willing or able to invest in fertilizer as the growing season is very risky. Unless nutrients are replaced, soils are depleted and crop yields decline, leading to widespread hunger and malnutrition.

The interventions

Microdosing

ICRISAT developed a precision-farming technique called ‘microdosing’ that enhances fertilizer use efficiency and improves productivity. Three-gram doses of fertilizer — about a full bottle cap or a three-finger pinch — is placed in the seed hole at planting.

- This technique uses only about one-tenth of the amount typically used on wheat and one-twentieth of the amount used on corn in USA.

Fertilizer in small packets

- Most, farmers cannot afford 50 kg bags of fertilizer commonly sold. ICRISAT negotiated with private fertilizer companies to promote the sale of small packs (1 kg to 10 kg).
- The small-pack approach is also being used to make improved crop seeds more affordable and widely available.
- The small packs of fertilizer are sold in community-managed input stores — linked to agro-dealers — installed in villages for easy access to farmers.

Warranty

Hundred of farmer organizations in the region now use the warrantage system, which links them directly to markets but also to finance institutions.

- The warrantage or inventory credit strategy aims to resolve the farmers’ capital constraint. Farmers place part of their harvest in a local storehouse in return for inventory credit with which they meet pressing post-harvest expenses and engage in dry-season, income-generating activities.
- The stored grain can be sold later in the year at much higher prices and the farmers are able to make a profit.
- The cooperative approach trains farmers to work together to protect stored grain, which is used as collateral to negotiate loans from finance institutions and allow farmers to obtain better interest rates.
**Crop rotation with legumes:** Earlier ICRISAT research shows growing cowpea and millet in rotation allows the millet to take advantage of atmospheric nitrogen fixed in the soil by the cowpea, and that subsequent millet crops can have 500 kg of grain more per hectare than from growing millet alone. – Mamadou Batougoune Sylla – a microdosing champion in Baraouélé village in Mali, who received government recognition.

Since implementing microdosing and joining the warrantage system, my last seasons have been successful. After starting with rice and corn, I went on to apply the microdosing technique on my potato plot. I got a loan through the inventory credit system that allowed me to pay for labor to increase my production. – Allassane Anadaga, Nahouri province, Burkina Faso.

**Intercropping benefits:** Trials also show that a DAP microdose of 50 kg/ha at sowing and 25 kg/ha of urea at ear emergence when maize and sorghum are grown in intercropping greatly improves grain and straw yield worth seven times the input investment for maize and nearly five times for sorghum. Yields for maize and sorghum are, respectively, 900 kg and 600 kg greater than the controls.

**Major constraints to the widespread adoption of microdosing**

1. Access to fertilizer
2. Access to credit
3. Insufficient flows of information and training to farmers
4. Inappropriate policies

Experiences from both west and southern Africa have shown that adoption of microdosing technology requires supportive and complementary institutional innovation as well as input and output market linkages.

**Cutting down drudgery**

Microdosing is time-consuming, laborious and it is difficult to ensure each plant gets the right dose of fertilizer. To address these issues, researchers are looking at:

1. Packaging the correct dose of fertilizer as a tablet
2. Use of seed coatings
3. Animal-drawn mechanized planter

**Longer-term soil health needs to be addressed**

1. Return of nutrient to the soil through crop residues
2. Water regimes
3. Crop rotations for nutrient return

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**Future challenges**

**Future goal** To increase the number of farmers using microdosing and the warrantage system from 25,000 to 500,000 in the next few years

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**Conclusion**

Microdosing is not the ultimate solution to poor soil fertility in the Sahel. It is a first step to move farmers to a level where they produce enough grain and improve their resilience in order to play a major role in the marketplace.

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