Canadian Foodgrains Bank Occasional Paper

Abundance through Mulch and Hoe

Conservation Farming in Zimbabwe – a case study

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A Christian Response to Hunger

Acknowledgements

The authors would like to thank Christian Care Zimbabwe staff for providing much of the information used to write this case study. Christian Care is recognized for its leadership in the Canadian Foodgrains Bank network for training thousands of smallholder farmers in Conservation Farming (CF), as well as in building the capacity of Canadian Foodgrains Bank members and partners in CF project implementation. This case study would not have been possible without the dedication and commitment of Christian Care field staff who worked tirelessly to introduce CF and improve food security to the Nkayi District.

The success and sustainability of this project is captured in the following refrain from CF farmers in Nkayi during a recent evaluation of the project:

"We are never turning back, we'll do it [CF] 'till we die."

Conservation Farming (CF) is a minimum tillage system adapted to smallholder maize based farming systems that emphasizes mulching, using locally available manure and digging planting stations rather than ploughing fields. This technology has transformed many farmers' livelihoods in the Nkayi District in Zimbabwe. Once food aid beneficiaries, these farmers now produce enough maize to cover family cereal needs, and some even produce an excess for sale. This project also empowers farmers to produce their own maize seed year after year and has helped them form community seed banks as a seed source for new CF farmers.

Location

Nkayi District, Matabeleland North, Zimbabwe

Challenge

Maize, the staple food and main crop of virtually every Nkayi household, has become increasingly difficult to produce during the past few decades**.** There are many reasons for this drop in production.

- The majority of maize production is done using conventional farming practices that require ploughing fields with oxen prior to planting. Ploughed fields are more susceptible to soil erosion and have less available moisture due to high soil moisture evaporation rates because the soil is not covered. In addition, vulnerable households have to wait to prepare their land until later in the growing season when their neighbour's oxen are available. This delay means that crops are often planted too late to make most efficient use of the early season rains.
- Droughts appear to be more frequent and intense, based on observations from smallholder farmers.
- Chemical fertilizer and seed inputs are difficult to procure and often priced beyond the reach of the smallholder farmer.
- Plants often show nutrient deficiencies, especially nitrogen, which reduce yield. Plant nutrients in the form of chemical fertilizer and manure are often limited or not accurately placed near the plant to increase their use efficiency.
- Poor seed quality reduces yields because of low germination that results in less than ideal plant densities to maximize production.
- Weed competition reduces crop yields. Women are often tasked with weed control and are not able to weed in time or don't recognize the importance of weeding.

All of these factors lead to reduced maize yields, making hunger commonplace.

Response

With support from Canadian Foodgrains Bank and The United Church of Canada, Christian Care, a Zimbabwean development agency, responded to this challenge in the 2006/7 farming season with a CF smallholder production system based on minimal tillage using a hoe and open pollinated variety (OPV) maize seeds. Increased production is achieved by digging carefully spaced 'planting stations' to which manure is added to boost fertility. Mulch is spread over the field leaving small openings at each planting station. After a significant rainfall during the beginning of the rainy season, farmers plant three maize seeds per planting station. Later in the season, the plants are thinned to an average of two plants per planting station to achieve the ideal plant density for maximum yield and to improve the quality of the OPV maize seed production.

Established planting stations on first year CF plot

Well mulched CF plot

Christian Care began working in five wards[1] on a three-year CF program, growing from 50 households in the first year to 200 in the second and 500 households by the third year. All project farmers participated equally in CF and OPV seed production components of the project.

The project's two main goals were to help farmers increase maize yields and produce quality OPV maize seed that are made locally available through community seed banks.[2]

[1] A ward typically covers between 5 and 10 villages in a district.

[2] Hybrid maize seed is not produced by smallholder farmers in Zimbabwe. Farmers who rely on hybrid seed are vulnerable to unstable economic and political systems. In order to overcome this dependency, household production of OPV maize seed is promoted. Under ideal soil moisture and fertility conditions, the hybrid maize seed can produce significantly greater yields than OPV maize seed. However, under typical cropping conditions in Nkayi where moisture and soil fertility are limiting factors, yields between hybrids and OPVs are often comparable. For these reasons, the project introduced OPV seed and trained smallholder farmers to maintain seed purity year to year in order to break the cycle of dependency. The community seed banks help spread the use of OPV seed in the community and between regions and assure seed availability in times of drought when seed stocks are limited.

Main Activities

- Participant farmers (69% of whom were women) and their spouses participated in CF and OPV seed production training through community workshops, as well as follow-up training by the project staff and community promoters.
- Annual farm exchange visits helped to showcase the most successful CF plots.
- Christian Care established community seed banks in each ward. During the first three years of the program, participants agreed to donate a minimum of 10% of their annual harvest or 50 kilograms (kg) of seed-quality grain, whichever was smaller.
- Community and district celebrations created awareness and enthusiasm for the project. These events also included local and district authorities which provided high-level project support.

Main Inputs

- Farmers used their own hand-hoes for land preparation, hard-wood stakes and twine to mark their plots and manure. Each farmer was required to fence their plot to protect against livestock, often using locally harvested brambles and branches.
- Animal manure was the main crop nutrient promoted. Many of the poorest farmers do not own livestock, but there were enough cattle and goats in the area to make manure readily available, usually in exchange for labour.
- In the first and second project years, Christian Care provided OPV maize seed to the new project farmers. By the third year the seed banks had sufficient seed to make an initial distribution to new CF farmers, who were then responsible for saving their own seed.

Keys to Success

- **Improved Time Management and Early Planting:** During the dry season when farmers had extra time, they prepared their fields by digging planting stations with a hand-hoe and adding manure and mulch. Planting commenced immediately after the first significant rains rather than waiting until the land was ploughed, as was common in the conventional system. During the growing season when time was limited, less time was spent on weeding because the mulch reduced weed populations.

- **Excellent Soil Cover with Mulch Application:** Building an organic layer of mulch, at least three cm thick that covers 100% of the soil leaving the planting stations

uncovered. Mulch was made of local materials, such as corn stalks, dried grass, or forest leaves.

- **Precision Placement of Plant Nutrients:** Applying two cups of manure to each station prior to planting.

- **Ideal Plant Population:** Preparing planting stations (15 cm x 15 cm x 15 cm in size) using row spacing of 90 cm and in-row spacing of 60 cm. Plants were thinned to an average of two plants per planting station to arrive at the ideal plant density for the agro-ecological zone.

Farmer adding manure to planting station

- **Reliance on Local Inputs:** Mulch was locally procured from the fields or from communal grazing areas. In the first years of production, most CF farmers sourced maize stalks, grass, thatching material, and forest leaves to reach adequate mulching levels. In subsequent years, the crop residues from the CF plot provided most or all of the necessary mulching material. Manure was procured from livestock corrals in the communities. Lastly, OPV maize seed from the previous year's production was used rather than having to purchase expensive hybrid seed. By relying on local inputs, the cost of production was reduced resulting in increased returns for the smallholder farmer.

- **Broad-Based Enthusiasm and Community Building:** A number of activities created enthusiasm, camaraderie and community building. The formation of community seed banks created great pride among farmers who became key CF promoters, providing their communities with seed. Farmer-to-farmer visits showcased achievements and even encouraged the highest level district officials (head-men and chiefs) to prepare their own CF plots and participate in field days.

Results

Annual year-end project participant surveys and a program evaluation in 2011 revealed four main results:

Increased Maize Production

Healthy maize canopy above mulch covering

Participants significantly increased their maize harvest per hectare, based on yield measurements by project staff and project participants. Average yields for the conventional fields during the three year period was 0.4 metric tons (MT) of maize/hectare (ha), while the average yield on CF plots was 4.3 MT of maize/ha. The low average yield for the conventional production was related to consecutive years of limited rainfall. Similar CF maize yields have been observed by other organizations (FAO, 2007; Mutsindikwa et al., 2011; Farming God's Way, 2011).

Yield increases with CF were the result of several factors, the most important of which include mulch application (moisture conservation), timely planting and the efficient use of manure. Chemical fertilizer was distributed during the project's first year, and in combination with training on CF techniques, CF maize yield was more than double that of conventional maize (0.8 MT/ha as compared to 0.4 MT/ha). In the subsequent two years, the only plant nutrient source was manure because chemical fertilizer was not available. Surprisingly, CF maize yields increased during this two year time period to an average of 6.5 MT/ha, as compared to 0.4 MT/ha for conventional production. This significant increase in yield is attributed to improved implementation of the key CF practices by CF farmers. However, most significant was the realization by CF farmers that high yields were obtainable without chemical fertilizers.

Under the CF system, farmers needed less land to produce enough maize for annual household consumption. Conventional farming practices using animal traction and a plough required between 1.5 to 2.3 ha of land to provide a household's annual grain needs (between 600 and 900 kg of maize). In contrast, the land area used to produce maize under CF was between 0.1 ha to 0.2 ha. Despite the smaller land size for the CF plot compared to conventional fields, the total amount of maize produced was usually greater with the CF plot. The CF farmers were also less vulnerable to the effects of drought and more likely to have a good harvest even with less rainfall. In addition, CF farmers did not have to rent animals as hand-hoes sufficed for their work.

Increased maize production translated into several positive livelihood impacts for CF farmers. During a recent evaluation of the project, CF farmers stated that they were now were able to feed their families and were no longer reliant on begging from their neighbours for food. Improved household income allowed farmers to purchase kitchenware and animals. With increased maize production, farmers were able to pay school fees and buy school supplies and uniforms for their children. As a result, school attendance increased.

Reduced Labour

Project participants identified reduced labour, especially for women, as a major advantage of CF over conventional production with a plough. The assumption is that vast amounts of additional labour are needed to procure mulch and dig planting stations, two key activities in the CF system. However, given the higher yields obtained under CF, the labour investment per production unit was actually less for CF compared to conventional production according to CF farmers. In addition, less time was spent weeding, and travel time to the CF plots was reduced because of the close proximity of the plot to the home. Farmers recognized these labour savings which then contributed to the spontaneous uptake of CF in the communities.

Self Production of OPV Maize Seed

All participant farmers produced OPV maize seed which was saved for the following planting season and stored in community seed banks. Seed banks grew rapidly, increasing stock from 500 kg in the first year to 3,500 kg in the second year to 4,280 kg in the third year. A year after leaving these wards of operation, these seed banks supplied 3.5 MT of seed for local communities as well and provided 3.1 MT of seed to communities outside their wards where CF was being promoted.

Spontaneous Adoption of CF

Approximately 500 households, representing 15% of the households in the five wards, received training on CF. Currently, about 50% of farmers in these wards are practicing CF, based on a recent project evaluation. Smallholder farmers are spontaneously adopting CF because it results in improved food security and more resilient livelihoods, rather than as a response to external input incentives like chemical fertilizers. This feature of the program enhances the long-term sustainability of CF in the targeted wards.

Collaborating Partners

Canadian Foodgrains Bank, The United Church of Canada, Christian Care Zimbabwe

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