

## **Book chapter title: A farmer-to-farmer agroecological approach to addressing food security in Malawi**

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### **1. Introduction**

The current global food system needs an urgent transformation because it is failing to result in sufficient improvements in nutrition. Despite remarkable growth in global food production (Akram-Lodhi, 2013), over 840 million people are chronically hungry and many more suffer from hidden hunger, which is a lack of essential micro nutrients (Bryce et al., 2008; Herring, 2015; FAO/IFAD/WFP, 2015). Most affected people live in Sub-Saharan Africa and south Asia (Herring, 2015; Von Grebmer et al., 2014). According to recent data from the Food and Agriculture Organization, one in every four persons (23.2 % of the population) in sub-Saharan Africa is malnourished (FAO/IFAD/WFP, 2015, p. 12). Undernutrition and hidden hunger kill more sub-Saharan Africans than the combined effects of

HIV/AIDS, malaria and tuberculosis (FAO/IFAD/WFP, 2015). Undernutrition has risen partly because we have a food system that is geared towards large-scale monocultures, with diets that are not only monotonous, but also limited in diversity (Akram-Lodhi, 2013). Alongside not being able to feed the world properly, these large-scale monocultures have negative ecological consequences, including the loss of plant-species diversity, fertilizer runoff, and the silt loading of terrestrial and aquatic ecosystems (McIntyre et al. 2009). In many respects, the current food system is deeply contradictory because it is not only failing to address nutrition, but it is also undermining the very biophysical foundations of agriculture (Weis, 2010). Thus, the contemporary food system needs to undergo significant changes into one that is diverse, sustainable, resilient and healthy.

In this chapter, we discuss a typical example of how such a new food system is being created using farmer-to-farmer participatory research in Malawi. Over the past fifteen years, we have embarked on a project of food systems transformation that focuses on participatory agroecology, social relations, and gender equity. We describe the processes of doing this participatory research and show some significant impacts over time. Our approach is highly participatory, with the active involvement of women, men and vulnerable households whose lives we seek to transform. For us, participatory research includes not only how research problems are defined and investigated, but also how scientific knowledge is produced and disseminated. In view of this, most of our peer-reviewed articles are written and published with the project's staff and farmers (e.g., Bezner Kerr et al., 2008; Bezner Kerr et al., 2010; Msachi, 2009; Patel, et al., 2015), with farmers occasionally serving as lead-authors (e.g. Msachi, 2009). This chapter has been written in that same spirit. The chapter's outline, together with the materials presented here, was drafted based on meetings in June and August 2015 that included researchers, project staff, and farmers.

We begin the chapter by providing a brief background of the research

setting. We then shift our attention to describing the processes involved in our participatory action research with farmers. We describe in detail such strategies as soil fertility management, intercropping, formation of Farmer Research Teams, seed banking, recipe demonstration, and how gender is infused into all these strategies. Next, we share some significant documented impacts over the past fifteen years. In the concluding section, we critically reflect on the challenges of using participatory action research for food systems transformation in rural Malawi.

## **2. The setting**

Malawi is a small landlocked country in southern Africa, bordered by Mozambique, Tanzania and Zambia (Figure 1). It has a current estimated population of 16.7 million, approximately 85 percent of who rely on agriculture for income and food security (World Bank, 2015). Maize is the dominant staple crop, accounting for about 70 percent of all calories intake, and 60 percent of area planted (Ellis and Manda, 2012). The rate of food insecurity is very high, with estimates showing that about one-third of the population lack access to adequate, safe, and nutritious food that meets dietary needs and food preferences for an active life (Ellis and Manda, 2012). Almost half of Malawian children under age 5 suffer from chronic undernutrition, as reflected in current rates of stunting (47%), and underweight (13%) (NSO-Malawi, 2011). The country's higher rates of food insecurity and undernutrition are deeply rooted in a number of historical, political and environmental factors (for a review, see Bezner Kerr, 2010; Vaughan, 1987). These factors include colonial and post-colonial governments that have emphasized maize monocropping, domestic violence and gender-based inequalities between women and men, a higher HIV/AIDS prevalence rate, and climatic variations (Bezner Kerr, 2010; Vaughan, 1987).

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In this context, we initiated the Soils, Food, and Healthy Communities (SFHC) project in northern Malawi in 2000, as a collaboration between Canadian researchers and staff at the Ekwendeni Hospital. A major aim of the project was, and still is, to help farmers address a number of crucial socio-ecological challenges that affect food security, nutrition and health (Msachi, 2009). Our initial focus was around the Ekwendeni catchment area in Mzimba district, northern Malawi (Figure 1). Due to remarkable impacts of our participatory research in this region, we later extended the project to Kasungu and Dedza districts in the central part of the country. From a humble beginning working with roughly 130 farmers, our program expanded to work with over 10,000 farming households and is currently working with over 6000 farmers. Below, we describe our participatory approach and other key aspects of the project.

### **3. Our approach: farmer-to-farmer participatory research**

Our farmer-to-farmer participatory research can be considered as a very concrete example of a move towards food sovereignty (Bezner Kerr, 2013; Msachi, 2009). We foster equity and social justice through a deliberate focus on food insecure, poor, and vulnerable households. The promotion of food security and nutrition in this project has been approached in a holistic manner. We start with improving soil fertility and diversifying crop production, which contributes to diet diversification, and then increase knowledge and skills related to food utilization. To improve soil fertility and crop diversification, we promote agroecological methods that rely on local sources, including intercropping with legumes, integrating crop residue, and increasing varietal and crop diversity (Figure 2). We also encourage farmer exchange visits, which allow participants to meet other

farmers from regions they may have never visited before, and discuss their challenges and successes.

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As part of our participatory approach, we do not use a top-down approach to impose farming methods on households. Instead, farmers experiment with a range of practices to determine the best option that can suit their skills, knowledge, resources and labor demands. Based upon several years of experimentation, farmers have recommended that the most effective intercropping methods for northern and central Malawi include groundnuts with pigeon pea, maize with pigeon pea, maize with beans or soya beans, and millet with pigeon pea (see Figure 2). Farmers working with us have also confirmed that through its long tap root, pigeon pea in particular plays a greater role in intercropping and soil fertility management. It improves aeration and is able to syphon leached nutrients up from lower levels of the soil. Farmers have been sharing these results with fellow farmers.

The use of organic materials is being promoted in two ways; firstly, compost making and application; and secondly, burying of crop residues. Once legumes are harvested, the remaining roots, stems and leaves are incorporated into the soil to enhance organic matter. Another way of bringing back organic matter to the soil is through compost making. Composting is a process of breaking down organic materials into humus by using macro and microorganisms. Some of the leguminous plant materials that are not incorporated in the soil are used to prepare compost manure, combined with other materials.

In order to facilitate agroecological experimentation and farmer-to-farmer exchange of knowledge, we have formed Farmer Research Teams (FRTs). These FRTs are a group of farmer leaders from each of the communities we work in who lead the experimentation of farming methods, including legume intercropping, and the use of organic manure. They provide peer support and mentoring to the

farmers we work with and relay information about training and how to use a variety of farming techniques (Figure 3). Using this type of participatory approach that provides information, training and support empowers the farmers to decide the best possible methods to adopt for their own context.

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FRT members are selected using a participatory approach that ensures equal opportunity for every member of the community. Farmers elect their representatives through a democratic process, ensuring women hold a minimum of 50% of all FRT positions (Table 1). Farmers are selected as FRT based on multiple factors including if they are hardworking, their willingness to try new methodologies, and their ability to teach other farmers. All new FRT members receive training from project staff and other FRTS who are experienced in the use of agroecological farming methods.

**<< Insert Table 1 Here >>**

Beyond experimentation with natural systems of replenishing soil fertility, good seed varieties are important for the success of smallholder agriculture. We therefore work with participating farmers to access local varieties of seeds that can promote soil health and improve yields. We have built a seed bank where we assist farmers to sort, grade, process and store local seeds for each planting season. Women and men farmers volunteer to provide labour in sorting and grading seeds for storage (Figure 4). Our participating farmers currently manage two seed banks, one built in 2005 in Ekwendeni, and another one built in 2013 in Lobi. Over the past ten years, we have seen a significant increase in the storage of and access to local seed varieties (Table 2). Additionally, we hold seed fairs in the communities we work in and invite farmer participants and other community members to participate and showcase their seeds. Farmers meet and discuss the varieties they are using and what benefits and difficulties they have experienced using these seeds. These seed fairs have also enabled project staff to explore

multiple varieties of seed that they can consider when purchasing seed for the next year's participants.

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**<< Insert Table 2 Here >>**

Our participatory project is also predicated on the understanding that food production and access is important, but that alone is not sufficient to ensure well-nourished children. Other crucial factors include sufficient knowledge of healthy child care and feeding practices, and adequate time to care for children. To further promote a more diverse diet and provide information about using different crops, community recipe and demonstrations days are held so that farmers can participate in preparing and tasting a wider range of foods produced on their own farms (Patel, et al., 2015). At each recipe day, farmers prepare different recipes using a diverse range of crops from their farms and share with other farmers. In doing this, skills and knowledge are passed on from one farmer to another, thereby providing an effective local-based approach to improving nutritional wellbeing among the communities. Other activities during recipe days include the provision of nutrition messages that support child feeding and caring, as well as hygiene and sanitation. Attention is also given to nutrition during pregnancy and lactation periods. The recipe days target both men and women. Men are especially encouraged to be more involved in food preparation, as one of the goals of our work is to foster gender equity in the division of labor, decision-making and leadership (Figure 5; Chilanga, 2013). The first recipe demonstration was organized in 2003 and since then, the FRTs and farmers have organized over one hundred recipe days.

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Gender issues are incorporated at all levels, including the household, community, and project structures (Figure 6). Women are particularly encouraged

to take up leadership positions, as they are especially marginalized and at risk in Malawi with regards to food security, nutrition, health, livelihoods and domestic violence (Bezner Kerr, 2008). We have active women leaders at all levels of our project, from Principal Investigators, to project team members, as well as members of the FRT, and have an explicit policy of a minimum of 50% representation of women when selecting beneficiaries. We also ensure our research methods are gender-sensitive, including gender and age-specific focus groups, and interviews. We have found that this approach allows men and women to speak freely about complex gender issues affecting food and nutrition.

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#### **4. Some significant impacts**

What has changed since the inception of SFHC? Using the approaches just described, we have seen significant impacts over the past fifteen years. These impacts have been seen in improved maize yields, soil fertility, seed sovereignty, food security, dietary diversity, child growth, intra-household gender relations, and greater resiliency to climatic variability. Using farmer-led experiments, we have shown that maize yields can be increased significantly without the use of fertilizer, but rather using nitrogen-fixing legumes like pigeon pea and groundnut (Snapp et al., 2010). Moreover, we have seen that farmers who use legume residue to manage soil fertility are significantly more likely to be food secure than those who do not (Bezner Kerr et al., 2015; Kangmennaang, 2015). Many farmers have also shifted from maize mono-cropping to cereal-legume intercropping, with positive nutritional outcomes. Over time, we have seen that those farmers with greater crop diversity, including a mixture of cereals and legumes, are more likely to be food secure than those with monocrops (Bezner Kerr et al., 2015). Dietary diversity, which is the number of different food groups in a diet, is also



significantly higher among our project participants than non-participants (Bezner Kerr et al., 2015).

We have documented significant improvement in child growth (Bezner Kerr et al, 2008), one of the most persistent and challenging problems in rural Malawi (NSO and ICF Macro, 2011). Between 2001 and 2007, we collected data on the height and weight of more than 3500 children before and after their households joined the project (Bezner Kerr et al, 2010). Our results showed that weight-for-age Z scores and height-for-age Z scores increased significantly among children whose households have had long-term participation on the project (Figure 7). These scores were also significantly greater in communities where project involvement has been greatest (Bezner Kerr et al, 2010; Figure 7). Indeed, within the Ekwendeni catchment area, rates of malnutrition 'have declined substantially in the region, to the extent that the Nutrition Rehabilitation Centre at Ekwendeni Hospital has closed, due to a lack of acute cases' (Patel, et al., 2015, p.38).

**<< Insert Figure 7 Here >>**

In 2010, we extended the SFHC project to specifically target vulnerable groups such as HIV-affected households, including widows and orphans. Our recent qualitative research with these households showed that their food security and dietary diversity have improved considerably (Mambulu, 2014; Nyantakyi-Frimpong et al., 2015). As a result of legume-intercropping and stubble mulching, which significantly reduces weed growth, HIV-affected households have reported a significant reduction in labour constraints (Mambulu, 2014). For these households, reduced labour constraints has been a major relief due to the need to allocate time not only to farming, but also in caring for household members who are ill. Additionally, our research shows that by using agroecological approaches to suppress weeds, many HIV-affected households are able to counter the side-effects of ARV treatments, which limit one's physical ability to work harder and longer (Mambulu, 2014; Nyantakyi-Frimpong et al., 2015).

Our key focus on gender has also yielded significant results. Using baseline and follow-up surveys, we have seen greater improvements in food security for female-headed households, often considered to be at greater risk of food insecurity (Bezner Kerr et al., 2014). Other important social outcomes include improved gender and intra-household relations between husbands and wives, and among co-wives. As a result of our community recipe days, which include education on nutrition and gender roles, we have seen greater involvement of men in childcare and feeding practices (Chilanga, 2013; Patel et al., 2015). Many of our participating farmers have now seen more equitable gender roles and responsibilities in their households in terms of cooking, fetching water, collecting firewood, and attending under-five clinics (Chilanga, 2013). Our participants have confirmed that the success of the project is partly due to the stronger emphasis on gender and social relations, as improved farming practices alone cannot address chronic hunger and undernutrition (Mambulu, 2014).

Beyond the farm household level, we have also seen improved cohesion and social relations at the community level (Bezner Kerr et al., 2014). In participating communities, farmers, including those in HIV-affected households, have started their own seed sharing networks that are independent from the SHFC seed banks (Mambulu, 2014; Nyantakyi-Frimpong et al., 2015). By freely exchanging local seed varieties that are hardy and well-adapted to the local environment, these farmers now circumvent the difficulties in purchasing costly hybrid seeds every farming season. HIV-affected households in particular feel empowered to have control over their own seeds and farming practices (Mambulu, 2014), which could be considered as part of building food sovereignty (Bezner Kerr, 2013).

## **5. Reflections and conclusion**

The significant impacts outlined above have not come without challenges. Since beginning this work in 2000, we have experienced a number of difficulties, both environmental and political economic dynamics, which affect the use of participatory agroecology to transform food systems. For example, the process of improving soil fertility is lengthy. It takes time for farmers to see gradual improvements in soil health and crop yields. We also work in fragile agro-ecosystems in Malawi, with severe climate variations, rainfall failures, and other environmental threats. Thus, if there is poor rainfall or flooding, crops may not perform well even when farmers have invested significant labour in soil improvements. For vulnerable farmers struggling to make a living under difficult conditions, they might be discouraged and impatient with the incremental changes that come with agroecology.

Given Malawi's higher rates of food insecurity and undernutrition (Ellis and Manda, 2012), there is active involvement of NGOs, local governments, and grassroots groups in promoting different 'agricultural solutions.' While some of these stakeholders emphasize local knowledge, experimentation, and incremental learning (e.g., Bezner Kerr, 2012) others are calling for agricultural intensification using high-input methods. The government of Malawi, for example, has been promoting an input subsidy program that distributes free fertilizer coupons to farmers. Our participating farmers therefore have to constantly contend with different 'competing knowledge' (Mambulu, 2014), in terms of how to address issues related to hunger and undernutrition. We always leave it to farmers to determine which available options can best suit their skills, knowledge, resources, and labor demands. Over the past fifteen years, we have come to realize that confronting all these challenges stands at the heart of a commitment to participatory research, rural development and food systems transformation.

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**Table 1. FRT members by year and gender**

<b>Year</b>	<b>Men n(%)</b>	<b>Women n(%)</b>	<b>Total</b>
2015	165 (42)	230 (58)	395
2014	62 (42)	87 (58)	149
2013	75 (50)	75 (50)	150
2012	75 (50)	75 (50)	150
2011	28 (40)	42 (60)	70
2010	30 (43)	40 (57)	70
2009	32 (46)	38 (54)	70
2008	22 (31)	48 (69)	70

*Source:* SFHC FRT Reports, 2008-2015.

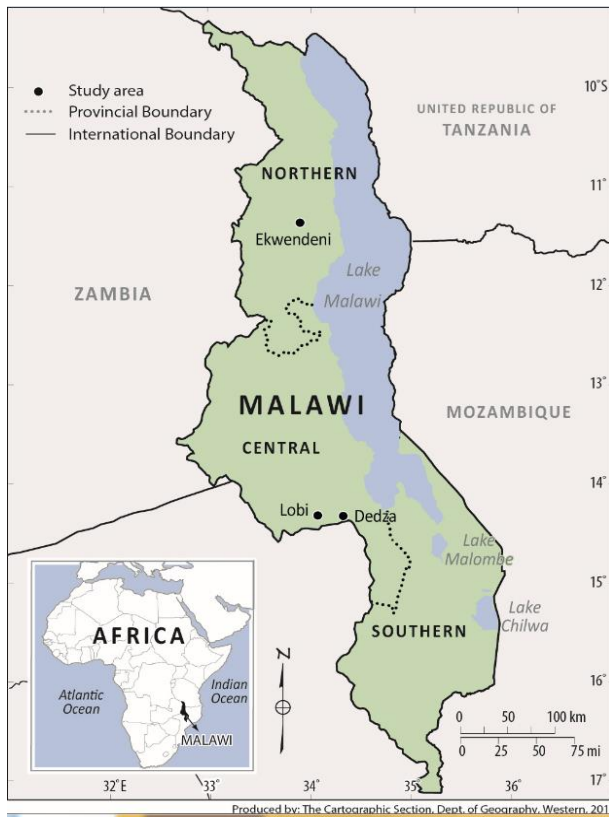
**Table 2. Seed varieties stored in the seed banks (2005-2015)**

<b>Year</b>	<b>Total Seeds in Seed bank</b>	<b>Groundnut seeds</b>	<b>Soya bean seeds</b>	<b>Bean seeds</b>	<b>Orange maize</b>	<b>Cow pea seeds</b>	<b>Sorghum seeds</b>	<b>P/pea seeds</b>
2015	120	46	111	45	76	1	-	1
2014	182	63	177	36	79	6	-	5
2013	1250	485	806	18	37	4	-	3
2012	624	240	360	9	9	2	2	2
2011	240	102	125	4	-	1	6	2
2010	164	55	94	5	-	1	8	1
2009	110	40	60	3	-	2	4	1
2008	79	30	45	2	-	-	-	2
2007	61	24	36	-	-	-	-	1
2006	47	19	28	-	-	-	-	-
2005	33	15	18	-	-	-	-	-

Note: Each bag weighs 50 kilograms; 2013 to 2015 include data from two seed banks.  
*Data source: SFHC/MAFFA Seed Bank Records, 2005-2015*

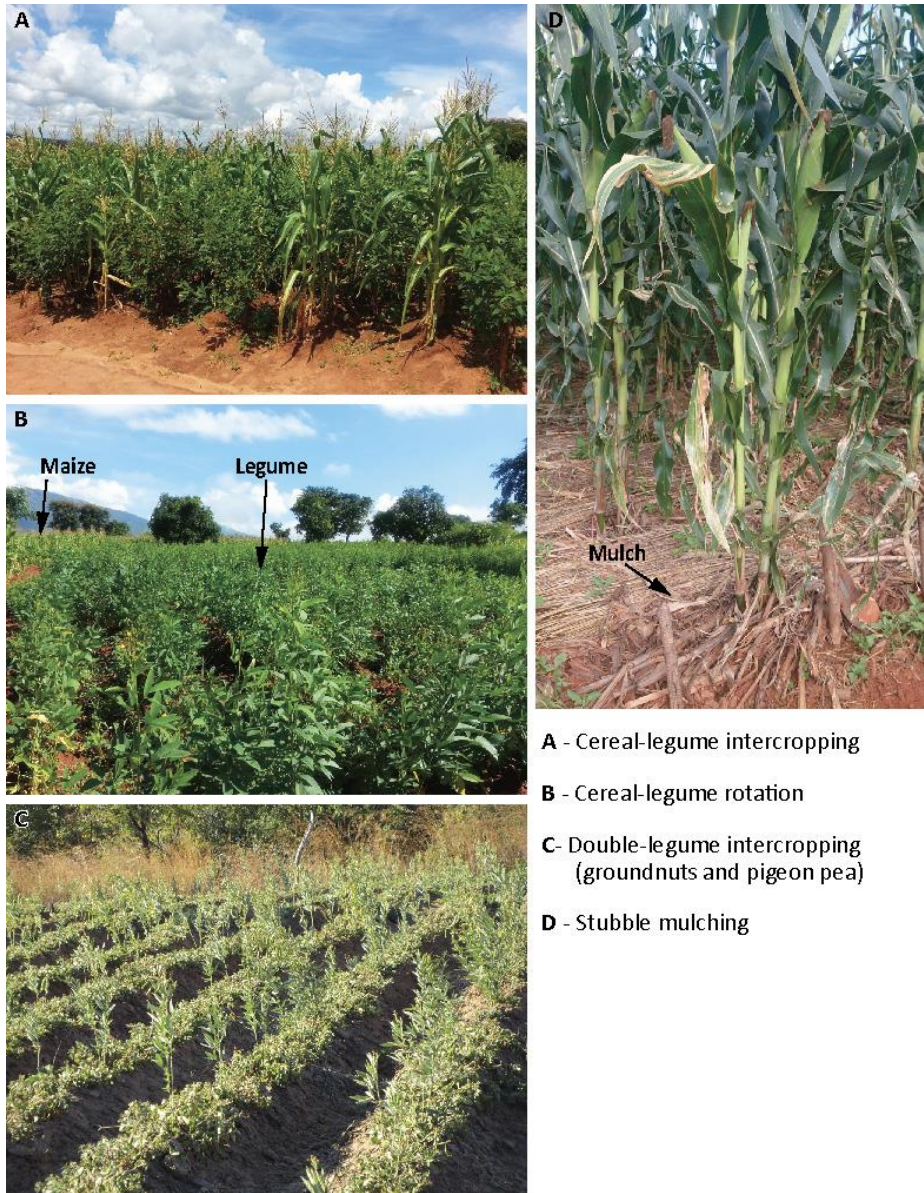


**Figure 1. Location of project sites**



*Source:* Map drawn by Karen Van Kerkoerle, Cartographer, University of Western Ontario, Canada

**Figure 2. A range of agroecological practices**



- A - Cereal-legume intercropping
- B - Cereal-legume rotation
- C - Double-legume intercropping (groundnuts and pigeon pea)
- D - Stubble mulching

*Source:* Photos taken by SFHC staff and researchers, 2013, 2014, 2015.

**Figure 3. Field teaching by Farmer Research Team members about planting methods, Lobi area**



*Source:* Photo taken by C. Hickey, December 2014. Used with the permission project participants.

**Figure 4. Seed grading at the Ekwendeni Seed Bank**



*Source:* Photo taken by E. Lupafya, September 2015. Used with the permission of farmers and project staff.

**Figure 5. Recipe day at Lobi**



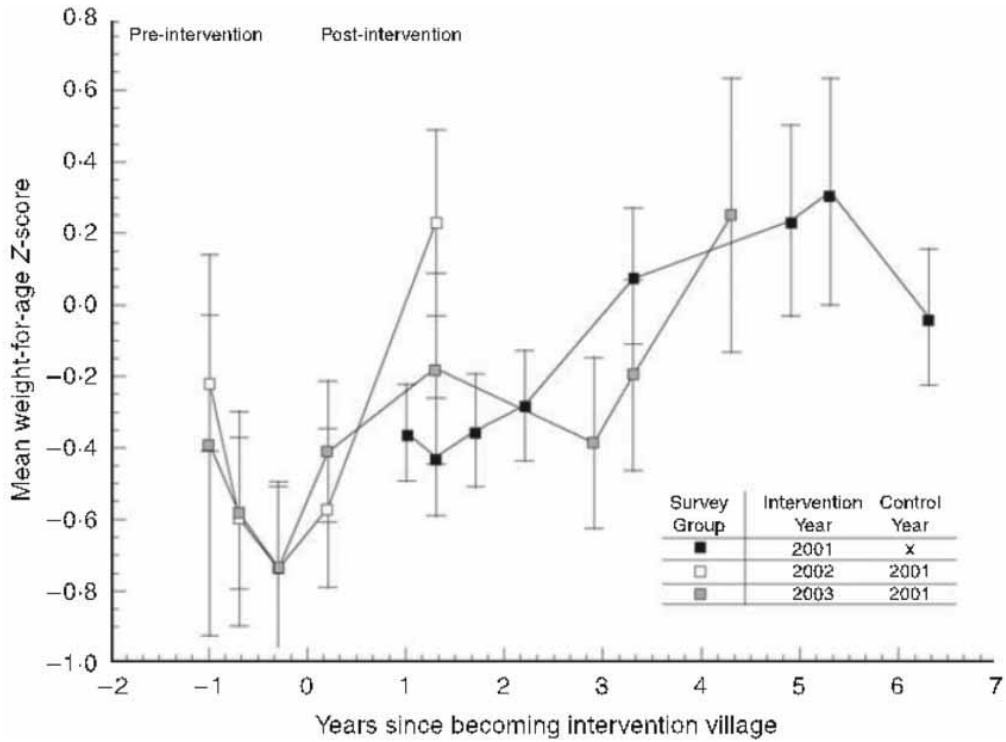
*Source:* Photo taken by C. Hickey, December 2014. Used with the permission project participants.

**Figure 6. Drama about gender inequality during gender campaign, Ekwendeni area**



*Source:* Photo taken by C. Bezner Kerr, March 2014. Used with the permission of farmers and project staff.

**Figure 7. Child weight-for-age Z-score for participating households (2001-2007)**



Source: (Bezner Kerr et al, 2010, p. 1470).