

4 Enhancing Food Security in the World's Youngest Nation: A Case Study of Agricultural Extension in South Sudan

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Background

History of conflict in South Sudan

Formed from the ten southernmost states of Sudan, South Sudan is a land of expansive grassland, swamps and tropical rainforest straddling both banks of the White Nile (Natsios, 2012). It is highly diverse ethnically and linguistically. Among the largest ethnic groups are the Dinka, Nuer and Shilluk. Unlike the predominantly Muslim population of Sudan, the South Sudanese follow traditional religions, while a minority is Christian (Jok, 2011).

As Sudan prepared to gain independence from joint British and Egyptian rule in 1956, southern leaders accused the new authorities in Khartoum of backing out of promises to create a federal system and trying to impose an Islamic and Arabic identity on the south (Schomerus and Allen, 2010). This tension led to a series of armed conflicts. Collins (2007) indicated that the longest, most destructive and violent of Sudan's five civil wars were the two between the north and south. The first occurred in 1955 when southern army officers mutinied, igniting a civil war between the south—led by the

Anya Nya guerrilla movement—and the Sudanese government. A second conflict—termed the Anya Nya civil war—occurred from 1963 to 1972 and only ended when the Addis Ababa peace agreement of 1972 accorded the south a measure of autonomy.

In 1983 the south again rose in rebellion—led by the Sudan People's Liberation Movement (SPLM) and its armed wing, the Sudan People's Liberation Army (SPLA)—when the Sudanese government cancelled the autonomy arrangements (Belloni, 2011). This was the start of the second southern civil war, which took place between 1983 and 2006. During the second southern civil war, and specifically from 1991 to 1996, an internal 'civil war within a civil war' took place between the Dinka and Nuer tribes and caused massive casualties and human suffering before the SPLA could establish its authority (Collins, 2007: 1783).

The conflict officially came to an end with the signing of the 2005 Comprehensive Peace Agreement. The south was granted regional autonomy and guaranteed representation in a power-sharing government (Dagne, 2011). The agreement included a referendum in the south on independence, to be held in 2011. The people of the south voted 99% to

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1% in favor of splitting from Sudan. The prospect of independence excited the South Sudanese, who were looking for a fresh start, a new country and lasting peace (Christopher, 2011). Consequently, South Sudan broke away from Sudan and became an independent nation in 2011. SPLA officers remained in military leadership positions as governmental reorganization proceeded.

This process was not without its costs. Hanzich (2011) reported that at least 1.5 million people are thought to have lost their lives and more than 4 million were displaced in the 22 years of guerrilla warfare. Food insecurity became a pressing issue as the war escalated (Keen and Lee, 2007). Massive numbers of people fled the conflict either northwards or to adjoining nations and have not returned. Thousands who fled took what livestock they could with them.

In December 2013, the young state again plunged into crisis amid a power struggle between the president and his deputy, whom he had dismissed. South Sudan's president is a member of the Dinka tribe and the former deputy is a Nuer tribe member (Jok, 2011). Fighting between government troops and rebel factions erupted, largely through tribal conflict between the Southern Sudan Defense Forces (SSDF) and the SPLA, which is controlled by the president.

Within weeks the conflict had killed thousands and prompted more than 800,000 to flee their homes (Arnold and LeRiche, 2013). Aljazeera America (2014) reported that nearly 100,000 South Sudanese civilians had been given refuge in UN camps in South Sudan. These civilians fled to escape killings and massacres, and continue to fear returning home. The large populations in the UN camps have given rise to specific challenges related to food security due to problems of access to food, distribution of food aid and the dietary needs of refugees with diverse age groups.

A series of cattle raids between the Nuer and Dinka tribes in December 2013 and January 2014 caused conflict to spread once again. Hundreds of people were killed and thousands were displaced from their homes in retaliation (British Broadcasting

Corporation, 2014). These raids are a long-running cultural practice that exists outside of national issues. Several cease-fire agreements have been proposed recently, but these have broken down since the summer of 2015.

The post-conflict context

South Sudan, like many fragile states, has not yet fully emerged from conflict. Therefore, terming it a post-conflict state is somewhat misleading. Nonetheless, South Sudan has many characteristics that are consistent with other countries facing sporadic and recurring violence following larger conflicts. These characteristics have important impacts on the roles of agriculture and agricultural extension.

South Sudan remains a resource-rich nation with poor infrastructure and continuing tribal conflicts that hinder agriculture and the conservation and responsible use of natural resources. Efforts to develop agriculture have been negatively impacted by the conditions surrounding the conflict. For example, much of the direction of economic activity in South Sudan is managed by generals and other leaders of the former SPLA. Given their backgrounds and the importance placed on security, approximately 40% of the budget of South Sudan is allocated to maintaining military infrastructure. This reduces the budget available for agriculture and other activities. In addition, military leaders have a de facto role in identifying and encouraging various endeavors and enterprises important to South Sudan, in terms of both economic viability for the nation and logistical considerations (e.g. food supply) for the military. Agriculture therefore has a unique role in this context of militarization and priority-setting.

Funding for agriculture is additionally compromised by the composition of the South Sudanese economy and reliance on oil revenues. Years of civil war have prevented the development of any effective infrastructure, and crude oil represents the only reliable revenue stream for the government.

Personal property taxes or income taxes are not a possible source of governmental funding, and the nation is not yet stable enough to allow for any significant income from tourism. However, the sporadic and ongoing conflicts, together with the current low price of oil, have led to a dramatic fall in oil production in South Sudan. The budget assigned to agriculture has decreased considerably as a result of the lowered oil revenues. This reduction has had a ripple effect, influencing the resources—human and other—that would typically have been devoted to food security.

Access to and the use of natural resources are also factors that affect agriculture in South Sudan. As Sudan—and later South Sudan—endured multiple civil wars between 1956 and the present, these conflicts reduced the country's access to natural resources and consequently its production of agricultural commodities (Collins, 2007). For example, restricted access to and the strain on water supplies during the civil wars led to decline in agricultural productivity (Fegley, 2009). In addition, managing South Sudan's water supply in the current period remains important in the fight against food insecurity (Rai *et al.*, 2012). Water conservation programs in South Sudan are paramount for agricultural production, due to domestic pressures on the Nile River and the needs of other countries that rely on the Nile. Meanwhile, the swamps in the southern part of the nation are in danger of being drained for cultivation, leading to a loss of biodiversity and soil fertility (Salman, 2011). Gorsevski *et al.* (2012) have also indicated that the conflicts have had a negative effect on forests and other natural resources.

Agricultural Extension Providers and Actors

The system of agricultural extension in South Sudan is largely disorganized and includes a range of actors with varied roles and operational statuses. Public sector programs and institutions from both the South Sudanese government and its military provide extension services. In addition, due to the

youth of the nation and the corresponding lack of institutional capacity to serve farmers, a wide variety of non-state entities work to assist South Sudan with agricultural development. All provide crucial services and fill unique roles.

SPLA Agricultural Extension Battalion

Following independence in 2011, the SPLA was faced with the question of how to engage its fighters in productive activities that would provide food for the military but also serve the development goals of the country, while providing employment to a group of military officers lacking many marketable skills. At the same time, South Sudan's population was heavily reliant on agriculture as a livelihood and food production strategy. Given that many SPLA fighters came from agrarian backgrounds, an early concept of a post-conflict extension system for South Sudan was that a battalion from the SPLA would serve as extension officers. Efforts were made to create this agricultural battalion, which does provide limited services to farmers. However, the system was not fully developed due to the further uprising in December 2013. Nonetheless, the SPLA agricultural battalion is still a proposed model for agricultural extension services in South Sudan.

Ministry of Agriculture, Forestry, Tourism, Animal Resources and Fisheries

The Ministry of Agriculture, Forestry, Tourism, Animal Resources and Fisheries (MoAFTARF) also plays a major and central role in South Sudan's extension system, particularly as related to the development of the agricultural sector. The MoAFTARF has a broad mandate that includes efforts to:

- Establish and manage an effective agricultural extension service.
- Formulate legislation, policies, standards and plans for the development of agriculture and forestry in South Sudan and ensure adequate food availability.

- Promote and, where necessary, regulate the efficient production and marketing of agricultural and forest products.
- Conduct demand-driven research and collect data on production and its socio-economic impacts on incomes and well-being.
- Rehabilitate and expand training and research institutions.
- Develop the capacities of farmers and other stakeholders in the fields of agriculture and forestry, especially related to the development and adaptation of appropriate technologies.
- Provide technical assistance and training to state and local governments to build their capacity to assume responsibilities for agriculture and forestry.

Within the context of this mandate, the priority objectives of the Ministry are: (i) to establish and maintain an effective agricultural extension service; (ii) to develop the human resources of stakeholders working in agriculture and forestry; and (iii) to rehabilitate and expand training and research institutions. To accomplish these objectives, the Ministry is supported by the USA, the EU and the Ministry of Agriculture of the People's Republic of China. However, to date the MoAFTARF does not support or provide training for any type of extension system in South Sudan. Only the SPLA's agricultural battalion performs this role.

These three Ministry objectives align with US Department of State and SPLA agricultural battalion goals for agricultural development and extension in South Sudan. However, historical and political barriers—such as perpetual tribal and political conflicts—keep the leaders of the SPLA's agricultural battalion and the Ministry from working together. At the time of this case study, the Ministry had no working relationship with the extension efforts provided by the SPLA. Over time, international organizations may be able to help improve working relationships between the Ministry and the SPLA for the benefit of the rural poor, but more effective collaboration is not expected in the short term due to internal socio-political conflict and

reduced involvement from foreign governments. Instead, other organizations are anticipated to provide agricultural extension services in South Sudan to address institutional weaknesses and gaps due to poor coordination between the MoAFTARF and the SPLA.

Agricultural non-governmental organizations (NGOs)

Several NGOs provide extension services in South Sudan. The specific objectives and approaches of different non-state actors are both similar and dissimilar to governmental efforts, although they share the common mission to increase food security in South Sudan.

Catholic Relief Services (CRS)

CRS has been working in the southern part of Sudan—and later South Sudan—since 1983. After independence in 2011, CRS supported development and recovery in parts of the country where post-conflict remedial services were otherwise entirely lacking. Against a background of political and economic turmoil resulting from the conflict that flared up in December 2013, the CRS website for South Sudan announced: 'The presence of Catholic Relief Services in South Sudan is needed now more than ever to strengthen these relationships and promote healing, while continuing to deliver lifesaving emergency and development assistance' (Pozniak, 2015).

CRS South Sudan offers programs in agriculture, civil society and governance, disaster response, microfinance, peace building, and water and sanitation. The immediate goal of the CRS South Sudan agriculture program is to improve family well-being through agro-economic development and environmental stewardship. The agency's long-term goal is to strengthen the capacity of local agencies and farming communities to take control of their own development. The formal objectives of the agriculture program are: (i) to engage with vulnerable communities to meet their long-term food and

livelihood needs; (ii) to foster sustainable socio-economic development; and (iii) to promote agricultural practices that link production to conservation, using local sources where available.

World Vision International (WVI)

WVI has been involved in South Sudan for over 25 years. It has provided numerous agricultural extension programs during this time and in 2014 worked with approximately 128,000 people. World Vision's South Sudan country program reported in 2015 that their organization was the only entity combating food insecurity in the northernmost state, the Upper Nile.

World Vision South Sudan provides training on improved agricultural practices such as soil conservation techniques, no-till farming techniques, native tree regeneration and the development of small seed-saving banks (Africa CSA Alliance, 2014); post-harvest handling and packaging; agricultural marketing; and financial management. Extension programs focus on commodities that include sesame, pineapple, fish, tomato and maize, among many others.

Besides teaching farmers, the organization also provides inputs such as hoes, seeds and fishing equipment. The organization donated approximately 174 oxen to farmers in Warrap State to increase food production (World Vision–South Sudan, 2013). In South Sudan, World Vision has had an impact on farmers' yields, income and well-being as a result of these efforts (Oxfam, 2014).

African Centre for the Constructive Resolution of Disputes (ACCORD)

ACCORD is one of several agricultural NGOs that are still operational despite past and current conflicts in South Sudan. It has been involved in South Sudanese agricultural extension work for approximately 30 years. ACCORD operates in the Central and Eastern Equatoria States.

ACCORD offers extension programs related to conflict resolution, leadership development, fishery production, animal management and water conservation. The organization

maintains collaborative relationships with evangelical Christian groups, the United States Agency for International Development (USAID), the Konrad Adenauer Foundation and the Norwegian Institute for International Affairs.

United Methodist Committee on Relief (UMCOR)

UMCOR currently conducts up to 69 projects in South Sudan (2015–2016) and has collaborative relationships with USAID, the EU, the US State Department and various UN agencies. Sustainable agriculture and food security are a programmatic focus of UMCOR (2015). Under its food security project, 16 fish farms have been established and over 200 farmers in the Central Equatoria state of South Sudan have been trained in aquaculture and received fish management inputs. An additional 2400 farmers have been trained in cassava intercropping. UMCOR also provides training and advice on water quality for rural people living in the Upper Nile State and Bahr el Gazal/Darfur region (UMCOR, 2015), and estimated that over 40,000 individuals will be impacted by this project.

Agricultural colleges

JOHN GARANG MEMORIAL UNIVERSITY OF SCIENCE (JGMUST). John Garang Memorial University of Science in Bor, the capital of Jonglei State, provides agricultural services and education in the agricultural sciences. The university, in collaboration with the US State Department and the Norman Borlaug Institute for International Agriculture of Texas A&M University, designed the Consortium for Development project to improve agricultural education; create institutional linkages to improve productivity; encourage agricultural development and resource conservation; and develop programs to address youth entrepreneurship, conflict resolution and gender-based education issues. Based on JG-MUST faculty input, a livestock production course was developed and is currently being offered. Curriculum for the course was delivered by three methods: (i) traditional pencil and paper; (ii) separate student and instructor course CDs; and (iii) a basic

web-based format. Challenges relative to maintaining the infrastructure at JG-MUST make it difficult to determine the effectiveness of any of these delivery methods.

Agricultural Extension Projects and Activities

Various efforts have been made by state and non-state actors to provide and strengthen agricultural extension in South Sudan. However, given the influential role of the military, many efforts have sought to engage the SPLA directly. USAID, in particular, has created a number of projects to assist the SPLA in improving food security, working closely with the US State Department and Texas A&M University's Norman Borlaug Institute for International Agriculture to design and deliver these projects.

Enhancing Agricultural Infrastructure for the Military of South Sudan Project

A major collaborative project—funded by the US Department of State—was the Enhancing Agricultural Infrastructure for the Military of South Sudan Project. The project aimed to support the Republic of South Sudan in its efforts to transform its military from a largely guerrilla force to a national army under the newly formed government. Part of the project involved the development of agricultural infrastructure, specifically the building of roads linking farmers to markets, and the development of water points for people and livestock.

Food security, and particularly a sustainable food supply for the SPLA, was another key objective. The SPLA was spending upwards of US\$100 million a year to import food for its troops. Through a grant, the US Department of State worked with the South Sudan Ministry of Defense to establish an agricultural support and training program, which was implemented through the Borlaug Institute for International Agriculture and Texas A&M AgriLife Research. The objective was to allow the SPLA to

develop sustainable food sources for soldiers and their families while stationed at bases or training camps and while deployed on mission. The project designed an approach that engaged military personnel, employed local people in food production activities that contributed to rural livelihoods and utilized available resources to generate food locally for consumption by the SPLA.

In addition, the project focused heavily on designing and delivering basic and expanded agricultural training curricula, with the understanding that the curricula would function as infrastructure by creating a system for knowledge to be transferred from trainer to learner (Knowles *et al.*, 2005). In curricula design, the project team from Texas A&M and the US State Department assessed the needs of participants, developed and provided curricula to meet those needs and evaluated the change in knowledge gained due to the curricula and instruction. Ultimately, the project contributed to improved food supplies for both the SPLA and rural people.

Extended Agricultural Training (EAT) project

The EAT project—conducted with SPLA—was derived from the Enhancing Agriculture Infrastructure for the Military of South Sudan Project. The project was originally a class designed to train members of the SPLA to serve as extension officers and to operate as farmers themselves. Upon graduating from EAT, army officers were provided with a farm and were expected to teach modern farming practices to local farmers through demonstrations and individual consultations, effectively employing army personnel as extension officers through the SPLA's agricultural battalion. Trainees learned the skills needed to teach local farmers the sustainable management and production strategies to improve their food security but also developed the competencies to themselves manage the army's farms, to increase the SPLA's food production and reduce food costs for the army.

The implementation of the EAT project occurred in stages. First, the project's Training

Impact Specialist—under the direction of the Project Training Coordinator—conducted an observational needs assessment of future participants' training needs and determined whether curricula needed to be developed from scratch, sourced from instructional resources or transformed from existing materials.

The assessment showed that the majority of future participants needed more training on how to teach adults. In technical areas, 67% needed more training in small animal production; 80% wanted to be more knowledgeable in identifying crop pests and diseases; 73% of the participants believed they needed more farm management knowledge to help farmers become more successful; and 93% wanted to better understand evaluation techniques to be able to measure the impact of their teaching. Future participants also requested more visual materials due to their target audience being illiterate (67%); materials that would help them teach soil testing procedures and pest and disease identification (73%); and dictionaries to help them better understand English and thus work more effectively with US and European agricultural development organizations (47%).

Following the assessment, the EAT Training Content Specialist developed new training materials—largely in pictorial formats—to fill gaps in existing curricula and allow better access to information for trainees with varying levels of literacy.

A complete training manual was produced for use with farmers to help them understand budgets, markets, options for improving soil fertility and other relevant topics. The first manual influenced subsequent attempts to develop materials for SPLA extension officers and farmers, many of whom were illiterate in Arabic as well as English.

The EAT project then reviewed its current training methodologies as compared to principles of adult education (Knowles *et al.*, 2005). Recommendations for additional adult training methodologies were developed for use in conjunction with the improved training materials, and resources were sourced from program partners to support their use.

Finally, the EAT project sought to identify environmental factors that could potentially influence the adoption and diffusion of program objectives and educational resources using a political, economic, social, technological, environmental and legal (PESTEL) analysis (Table 4.1). The PESTEL analysis was selected because of its suitability in changing environments and was therefore a more valuable assessment of external factors of influence than a strengths, weaknesses, opportunities and threats (SWOT) analysis. The analysis was completed through interviews and qualitative measurement of extension officers involved in the EAT project.

Ultimately, these themes were exemplified in the actual outcomes of the EAT

Table 4.1. Barriers identified through the PESTEL analysis.

Political (P)	Land ownership disputes; lack of trust in the government and governmental programs; limited education of farmers and officers; difficulties for outsiders in understanding the issues faced by farmers
Economic (E)	Limited incomes of farmers; high food prices; inadequate housing; lack of sustained funding and support from the government for basic needs
Social (S)	Separation from families to attend the training conducted at SPLA headquarters outside of Juba; lack of English skills; health problems; inadequate training facilities; short duration of the training program
Technological (T)	Lack of electricity; insufficient equipment and computers; poor quality of equipment; lack of textbooks/manuals; shortage of livestock inputs
Environmental (E)	Climate; poor living conditions at the school; high transportation costs; lack of medical care
Legal (L)	Inadequate follow-through on commitments from the local government, outside governments and non-governmental organizations

project, which were affected by political influences and sustainability issues related to ongoing conflict in regions affected by the civil war. However, PESTEL factors are useful not only for assessing the EAT project but also for providing insight into the larger context of agricultural extension services in South Sudan.

Conclusions and Lessons Learned

The examples described above provide a range of themes and lessons learned from South Sudan that may have larger importance for other post-conflict countries.

Safety and security

The ongoing conflict between the Dinka and Nuer tribes makes the rebuilding of agricultural extension in South Sudan challenging, to say the least. The safety of trainers, evaluators, curriculum designers, farmers and local government officials involved in agricultural extension projects is a serious worry, both for the individuals concerned and for the organizations that employ them.

Extension actors struggle with the question of whether or not to approve activities in environments where safety cannot be evaluated because the situation changes from one day to the next. Ruiz-Postigo *et al.* (2012) reported that safety concerns prevented NGO healthcare workers from screening South Sudanese citizens for human African trypanosomiasis. Likewise, Spencer *et al.* (2013) found that security issues prevented a health screening team from testing children for the debilitating and potentially fatal nodding syndrome. Similar limitations are found in agriculture. Agricultural development workers with good intentions towards development and farmers' empowerment are often deterred by safety concerns, resulting in needs going unaddressed and depriving people of the hope that conditions can improve.

Security concerns also hinder the growth and development of South Sudan at

the level of farmers. Branch and Mampilly (2005) suggested that until national conflicts are reduced or eliminated, farmers are unlikely to return home to plant and harvest their crops, causing food insecurity to persist. Farmers are also reluctant to participate in group-based programs or meetings commonly employed by extension providers. Only by reducing the number and scale of conflicts in South Sudan will local people feel safer in attending public educational events (Themnér and Wallenstein, 2012).

The safety of both extension workers and farmers must be improved. Unless this need can be met, the challenges of rebuilding agricultural extension in South Sudan will be hard to overcome. However, effective agricultural development can actually mitigate some of these same safety and security concerns. Agricultural extension programs that provide the rural population with the means to improve their own production can help the nation achieve food security and reduce poverty, ultimately lessening conflict and promoting social cohesion. This should, in turn, raise the chances of sustaining peace.

Agricultural training for extension providers

Pre- and in-service training

The lack of a formal extension system in South Sudan underscores the need for consistent and ongoing training for extension officers. Individuals acting as extension officers are often unprepared for the demands of the job. Graduates of JG-MUST, for example, lack the technical and process skills needed to work with farmers. Data from the EAT project also pointed to a number of unmet or inadequately met training needs of army officers preparing to serve as extension officers. The training competencies most needed were in developing and evaluating educational programs for adults. Strengthening these training programs and the institutions that prepare extension officers is therefore crucial.

Ongoing training in teaching, learning and disseminating information to farmers is also needed. EAT graduates will continue to

require professional development and resources to be successful in their roles as extension officers. In-service training is particularly needed on topics related to crop and small animal production; pest and disease control; farm management and agribusiness; and agricultural marketing. Like other post-conflict nations, South Sudan needs the support of international organizations to address its extension training gaps and create competent and excellent agricultural extension programs.

Needs assessment and evaluation for development organizations and extension actors

Experiences in South Sudan—and specifically with the EAT project—illustrate the importance of proper needs assessment and evaluation when training extension professionals. Evaluating existing materials and approaches against learner needs is essential for creating training programs that address knowledge and skill gaps and better prepare graduates for work with farmers.

Using a PESTEL analysis at the onset of developing training programs to determine barriers to learning and the adoption of new techniques can contribute to greater successes and sustainable outcomes. The results of a PESTEL analysis can offer insight into needs likely to continue as issues for extension workers, such as land ownership, living conditions, family needs and insufficient infrastructure. Understanding these factors can help extension programs make strategic decisions and improve services. Consideration of experiences in other conflict regions suggests that identifying these results or external factors may offer insight into issues that may lead to program failure if not properly managed.

Agricultural extension curricula

Effective and appropriate curricula are also crucial to training future extension officers. For example, program leaders and SPLA generals described their training needs in a meeting held at the outset of the EAT project. At the same time, existing curricula and

training materials were predominately written in English and at a ninth-grade (age 14) reading level. However, effective training was confounded by two major factors: (i) literacy levels in the workforce are low due to 50 years of conflict; and (ii) those who were literate mostly read Arabic (over 60% of the population are Arabic speakers) rather than the official language of English.

It was concluded that training materials needed to be bilingual (English/Arabic) to encourage learning in both languages, more pictorial than text-based and with content delivered at an appropriate level of understanding. Materials were supported by teaching through demonstrations as much as possible. Texas A&M University's Instructional Materials Service provided a variety of reference materials and resources to the EAT project, either as PDFs or CDs for instructors and students. The materials were better suited to the audience and helped trainees learn to make decisions in many areas of farm management, including: (i) site location for crop production; (ii) crop production designs, including patterns and rotations; (iii) water management; (iv) tillage and land preparation; (v) the use of inputs such as fertilizer and lime to control soil acidity; and (vi) harvest and post-harvest operations. Extension programs operating in post-conflict settings are most effective when using a similar participatory and needs-driven process for curriculum design.

Agricultural training to farmers

Programmatic targeting

Agricultural extension programs that identify and understand the characteristics and desired outcomes of their target audience are more likely to be successful. There are several examples of extension efforts that have had a positive impact on agriculture in South Sudan. Successful NGO projects working on food security are particularly evident. The common denominator for these successful projects is that they targeted a specific audience or commodity and the organization has a long, positive history in

South Sudan and a strong understanding of the local context.

In contrast, some projects observed a lack of these characteristics. For example, the methodology espoused by EAT extension personnel was not congruent with the context of resource-poor and risk-averse small farmers. The project focused on national-level issues and did not adequately consider the needs of local farmers. The EAT project was further compromised because it was instituted by an internal organization and by the military, which was not 'well-perceived' by a large percentage of the South Sudanese.

Alternative approaches to reaching farmers

Given the safety and security conditions that often limit the ability of extension officers to interact directly with farmers, there are useful alternative means of reaching farmers in South Sudan. Many South Sudanese—including EAT officers and farmers—have cell phones, which can be charged using solar power. This indicates that information and communications technologies (ICTs) could be an avenue for delivering educational content to farmers throughout the conflict-torn nation. Cell phones could be used to get information to farmers in remote locations, as well as offering professional development to extension officers, thereby saving on travel time and expenses. The benefit of ICT use for agricultural development efforts in Africa, Latin America and the Caribbean is well documented. This opportunity needs further investigation in the context of South Sudan, but it appears that ICTs could help extension personnel deliver agricultural content to farmers more effectively than current face-to-face meetings, especially when conflict and safety are also factors.

Service provision to women farmers

There is great need and potential to better serve women farmers in South Sudan. Globally, the diversity and number of females in food production is increasing as women become more involved in agriculture (Charlton, 1984), yet extension programs regularly

struggle to reach and benefit women farmers (Meinzen-Dick *et al.*, 2011). Due to the lack of training and educational opportunities for women in production agriculture, women farmers are largely excluded from some business aspects of farming (Kabeer, 2012). However, when women are equally engaged in extension and have equal access to resources they see greater improvements in agricultural production than men (Davis *et al.*, 2012), suggesting greater emphasis on serving women through extension could be beneficial to South Sudan's agricultural sector. Benefits are greater when women farmers are taught by female extension officers, especially in contexts and communities with strict social and gender norms.

However, the EAT project consisted only of male participants, since women were not involved in the agricultural battalion. This raises the question of how women farmers will react to male instructors, whether women will participate in extension programs and if EAT graduates will be able to serve women farmers to the same degree they serve males. This suggests that the benefits of the EAT project to women will be minimal.

In contrast, WVI has effective and well-documented experience serving women farmers in South Sudan. Unlike the SPLA, WVI specifically targets women farmers with their programs and develops programs strictly for women. The primary lessons learned by WVI were the critical importance of identifying the target audience, conducting a needs assessment with that audience and developing educational programs based on those identified needs. These needs assessments can highlight the aspects of agricultural education training most needed by women. In the case of WVI, evaluations were conducted during and after program implementation to help coordinators monitor and improve programs for women farmers.

Agricultural extension organizations—whether governmental or non-governmental—should examine the experiences of WVI in serving women farmers in South Sudan. The organization's approach has proved effective and replication of certain elements may be possible. This would benefit all

extension providers, but more importantly it would benefit women farmers. Increasing their inclusion in extension programming will help improve the food security of South Sudan, assist a new democracy and provide citizens of both genders with a sense of ownership in the nation's future.

Coordination and collaboration

Coordination between providers is an area of concern for agricultural extension in South Sudan, as in many post-conflict countries. As discussed above, MoAFTARF did not collaborate with the SPLA on extension. There could be numerous reasons why these breakdowns in collaboration exist (e.g. tribal differences, socio-political power struggles), although in this case there is no clear single reason.

Regardless of the cause, a lack of coordination between state actors certainly compromises the quality of the services provided to farmers. Building better collaboration within the public sector would enable better solutions

and more focused efforts in addressing food security across the young nation. Collaboration could also foster more national unity and promote peace, improving the lives of all South Sudanese and their descendants.

In addition, despite actively providing agricultural and extension services, many NGOs operate in isolation from state actors. At the time of this case study, collaboration between the SPLA and agencies such as ACCORD, CRS, UMCOR and WVI seems to be minimal. Nevertheless, collaboration between NGOs, the SPLA and MoAFTARF is needed to more effectively train extension staff to train farmers across South Sudan. All extension actors could strengthen each other, creating synergistic relationships in which the impact of the whole system is greater than the sum of its parts. Opportunities for collaboration readily exist, and external and internal NGOs should seek positive collaboration with the government to implement projects that align with respective organizational objectives to help South Sudan become a food secure and peaceful nation.

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