



An agriculture extension worker stands beside a community garden in Uganda. Integrating agriculture and nutrition into extension work is an ideal way of reaching remote communities with personalized services and education. (Rotary International)

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Building Capacity to Link Agriculture and Nutrition

Suresh Chandra Babu*

*International Food Policy Research Institute (IFPRI),
Washington, DC, and University of Pretoria, South Africa*

* s.babu@cgiar.org

Introduction

Ending malnutrition is critical for both economic and human development (Shekar *et al.*, 2017). To improve nutrition globally by 2025, the international community, as represented by 176 member countries of the World Health Assembly, endorsed the first-ever global nutrition targets in 2012. These targets focus on six key areas: stunting, anemia, low birthweight, childhood overweight, breastfeeding, and wasting. To achieve these targets and reduce malnutrition rapidly, countries need to invest in both nutrition-specific and nutrition-sensitive interventions, the latter involving sectors such as agriculture (Hoddinott, 2016).

Agriculture has traditionally comprised a significant share of national economies. It holds a critical role in low-income countries: in 2016, it accounted on average for 30% of low-income countries' gross domestic product (GDP) and employed a large portion of their population (World Bank, 2016). Growth within the agriculture sector can potentially have a greater impact on people's welfare, including their health and nutrition, than growth in GDP (Webb and Block, 2010; Gillespie and Charlotte, 2016). Agriculture can play three interlinked roles to improve nutrition outcomes by providing nutritious food, being a source of income for people to buy nutritious food and health care, and empowering women, if agriculture interventions are undertaken in a gender-sensitive fashion (Hoddinott, 2016). However, agriculture's potential to reduce malnutrition is currently not being fully realized, due to the large disconnect between agriculture and nutrition. This gap can be attributed to inadequate capacity of both sectors to jointly address the current challenges.

Gillespie *et al.* (2013) argued that three critical factors are essential to build and sustain an enabling environment for nutrition: (i) political and governance; (ii) knowledge and evidence; and (iii) individual, organization and systemic capacity and financial resources. Despite continued interest in agriculture–nutrition linkages, lack of capacity at individual, institutional, and system levels prevents many developing countries from reducing hunger and malnutrition.

Several factors prevent the successful development and implementation of multi-disciplinary

capacity for agriculture, nutrition, and health. First, development goals are often pursued without giving due consideration to the need to integrate the food and agricultural system with health and nutrition outcomes. This is partly due to insufficient development of concepts and methods for analyzing integrated approaches to address food security and nutrition challenges. Equally as important, experts in both fields are usually trained solely within their own disciplines. At the individual level, there is a lack of formal education among graduate students and limited capacity of extension-service providers. At the institutional level, there is a lack of capacity to conduct cross-disciplinary research, provide nutrition-friendly agriculture extension services, and offer university-level education and training on agriculture–nutrition links. This siloed approach to training and education means that the interactions of agricultural production systems with health and nutrition systems are not fully understood by the people responsible for designing and implementing policies and programs.

Such challenges carry over to the global level. At the system level, there is a lack of coordination among stakeholders and integration both vertically (national to local) and horizontally (across sectors) to implement multisectoral policies and programs. To date, there have been very few systematic efforts to strengthen the multi-disciplinary capacity of the development community to address the problems of food and security, malnutrition, and poverty.

This chapter focuses on how building and strengthening capacity at the individual and institutional levels can in turn strengthen agriculture–nutrition linkages. It focuses on two specific aspects of capacity. First, it highlights ways in which universities, organizations, and governments are working to improve cross-sectoral educational opportunities for students. Second, it explores how extension and agricultural services could be made more nutrition-sensitive by improving their content or the capacity of extension workers through formal education and training, in turn improving farmers' understanding of agriculture–nutrition linkages within production, on-farm processing, storage, and marketing; and consumers' purchasing decisions (FAO, 2014). Finally, it reflects on lessons that can be learned from efforts to increase capacity at these critical levels.

The Emergence of Integrated Agriculture and Nutrition Curricula

Nutrition and agriculture interventions and policies are the main avenue for delivering nutrition and agricultural knowledge and services to vulnerable populations, and thus making a dent in malnutrition. These policies and programs are designed and implemented by professionals, most of whom have been trained in formal university settings. Thus, incorporating nutrition education into agricultural educational programs has enormous potential to effect positive change in the way in which these professionals carry out their day-to-day work. By developing cross-disciplinary programs, universities can shape well rounded professionals who can work as extension workers, healthcare providers, or nutrition counselors, and help improve linkages among agriculture, nutrition, and health (Fan *et al.*, 2012).

There is currently much room for progress. For example, Babu *et al.* (2016) evaluated the curricula of three state agricultural universities in India (in Tamil Nadu, Andhra Pradesh, and Bihar). Results of their study showed the absence of nutrition as a subject in all three curricula, a critical oversight when considering that these universities are responsible for training current and future agriculture extension agents in very populous Indian states. The study also found that mid-level training of agricultural extension workers did not include courses on nutrition either, resulting in a 'nutrition vacuum' within the extension system. This study provided a conceptual framework for developing a curriculum to improve agriculture–nutrition linkages, a strategy to develop a nutrition-smart agricultural extension curriculum, and a curriculum strategy at the district level using the nutrition security conceptual framework. The authors also provided lessons for developing countries to integrate nutrition transformation objectives into extension and advisory services (EAS).

The University of Ghana hosts a 4-year-long extension program focusing on nutrition education and income-generation activities. Along with theory, this program integrates practical aspects of EAS, including a semester-long practical training exercise where students engage with families in rural communities. Graduates

from this program work with agriculture EAS departments and support extension agents focusing on nutrition education at the grassroots level. Despite this effort, results from a study examining agriculture–nutrition linkages in Ghana showed that a narrow view of nutrition persisted within government bodies. There was still an inadequate capacity of nutrition trainers working at the Ministry of Agriculture, limited or lack of formal nutrition courses, lack of diversity in topics covered within the courses available, inadequate infrastructure for nutrition training, and a vague understanding of the role of agriculture and its impact on nutrition (Fanzo *et al.*, 2013).

In addition to incorporating nutrition courses into agricultural curricula where nutrition content is currently absent, programs that do include nutrition content need to strengthen their assessment of nutrition-sensitive agriculture competencies among current and recently graduated students. Abebe *et al.* (2017) assessed the level of nutrition-sensitive agriculture competencies of graduating agriculture students in Ethiopia. Results of the study showed that only 49% of the students demonstrated mastery of nutrition competencies. Female students and students from regional colleges scored much lower than their male counterparts and those studying in federal institutions. These findings point to a need to strengthen curriculum, build the capacity of educators, and provide additional support to female students and students studying at regional universities to improve their contributions to multisectoral efforts to end hunger and malnutrition.

In Burkina Faso, with the support of the German Ministry of Food and Agriculture, the Food and Agriculture Organization (FAO) implemented the Education for Effective Nutrition in Action (ENACT) project, which developed a professional training course in nutrition education for undergraduate students. In 2015–2016, a pilot course was developed in collaboration with local universities; evaluation of this course showed that 95% of students adopted better eating habits. The same online course was piloted in Egypt by Senghor University (Dia *et al.*, 2017). These experiences show that training in nutrition education can be integrated into agriculture courses already available in local universities. Implementation of such courses will strengthen

local capacity in planning, implementing, and evaluation in nutrition education among students at the undergraduate level.

Apart from traditional training on nutrition at universities, regional colleges, and secondary schools, education through online sources has also increased over time. Massive open online courses (MOOC) provide learning opportunities to over 12 million students worldwide. These include 60,000 students from India, 60,000 students from other Asian countries, 33,000 students from African countries and 32,000 students from Latin American countries. These types of courses are popular among developing-country students because they are easily accessible, relatively cheap compared with university-level courses, and flexible. Many of the courses offered on MOOC focus on food and nutrition (Geissler, 2015). Such courses can be used to strengthen capacity and provide training to current or mid-level extension agents.

Integrating Nutrition into Agricultural Extension

Approaches that improve the content and delivery of knowledge on agriculture–nutrition linkages, such as EAS, also have the potential to make strides in the field (Davis *et al.*, 2014). Sigman *et al.* (2014) assessed agricultural extension, nutrition education, and integrated agriculture–nutrition extension services in Malawi. The review showed that some progress had been made: the system relied on stakeholder panels to articulate farmers' needs and demands to the Department of Agricultural Extension; and made use of farmer and model villages, community volunteers to promote nutrition at the household level, and a 'positive deviance' program that identifies beneficial nutrition practices used by mothers of well nourished children from poor families. However, challenges remain, including a lack of program capacity, infrastructure and budget, program quality, and coordination and harmonization. Similar results were presented by USAID (2014), which reviewed three Feed the Future Activities in Ethiopia.

Some approaches have focused on direct training of extension agents. In 2011, the government of Malawi initiated the Improving

Food Security, Nutrition Policies and Program Outreach project with the aim of improving agriculture–nutrition linkages by enhancing the capacity of rural extension agents. Extension agents facilitated community-based demonstrations, teaching participating households new recipes and preparation techniques. The evaluation of this project concluded that households improved their diets by consuming locally available foods (Fanzo *et al.*, 2013).

Farmer field schools (FFS) have traditionally been used to reach farmers with information and support on agricultural production and productivity. Some countries have begun experimenting with integrating nutrition content into this model, with varying degrees of success. Senegal has been implementing FFS since 2001. In 2015, FAO conducted a survey to assess nutrition knowledge among farmers who are a part of the FFS in the Niayes area. Results of this survey showed that 90% of the farmers did not have a basic understanding of nutrition. In response, FAO initiated the Promoting Healthy and Sustainable Agriculture project in four large agroecological zones of Senegal. After 5 months of attending this nutrition-sensitivity FFS, participants exhibited a significant increase in their understanding of nutrition and balanced diets, when compared with the baseline survey. Further, the dietary diversity and meal frequency among children of participants also improved (Dia *et al.*, 2017). Bangladesh also used an FFS program led by facilitators from local non-governmental organizations (NGOs) contracted by Strengthening Partnerships, Results, and Innovations in Nutrition to target pregnant and lactating women (Fanzo *et al.*, 2013). Kuria (2014) analyzed the effectiveness of FFS in eastern Africa. Currently, facilitator trainings include minimal nutrition content and primarily focus on increasing agriculture production. Other areas such as food utilization, preservation, storage, consumption, and preparation are completely neglected. For example, participants in this study were encouraged to consume food produced in their kitchen gardens, farms, or households. However, they lacked knowledge of the nutritional content of the food they were producing, thus resulting in a disconnect between agriculture production and nutrition outcomes.

Recent research has also delved deeply into the content of EAS materials and trainings.

For example, Dia *et al.* (2017) analyzed the integration of nutrition in peer-reviewed EAS materials in Africa. They looked at material focusing on horticulture and crops, livestock and fisheries, food processing, fortification and storage, hygiene, consumers, and gender sensitivity. According to the study, while public universities in Africa initially limited transferring information to farmers, access to knowledge within the past decade has become more decentralized and pluralistic. Nevertheless, the authors found that ineffective training received by extension agents limited their ability to provide nutrition-sensitive agricultural extension.

Fanzo *et al.* (2015b) examined the integration of nutrition content into current EAS around the world. The study showed that efforts to increase the availability of nutritious food was the most common integration of nutrition into EAS. These efforts focused on home gardening, the production of nutrient-dense foods, biofortification, and the reduction of post-harvest losses to preserve nutritional value (by controlling aflatoxin). However, the training received by extension agents was mostly inadequate and focused primarily on technical agricultural skills (Fanzo *et al.*, 2015b).

Apart from traditional extension delivery techniques, new methods such as using media to deliver extension services can successfully integrate nutrition into the current extension messages delivered to farmers, often at a low cost. Kadiyala *et al.* (2014) examined the feasibility of delivering maternal, infant, and young child nutrition information to nutritionally vulnerable groups in rural India through informational videos containing behavior change communication. Ten videos focusing on maternal, infant, and young children nutrition were included and disseminated in 30 villages in India. They found that the nutrition messages were well received by the villages, highlighting the potential of this approach to improve understanding of agriculture–nutrition linkages among rural populations.

To effectively integrate nutrition in the agriculture extension and advisory services provided, there is a need to engage communities, create demand for nutrition, and improve channels of communication (Fanzo *et al.*, 2015b). For example, in Kenya, the government has made an effort to shift toward more participatory and

demand-driven EAS to increase farmer participation and use exhibitions, shows, and farm visits to generate awareness of nutrition (Fanzo *et al.* 2015b).

Capacity for Policy Research

Since policies and programs implemented within the agriculture sector have direct or indirect impacts on nutrition and human health (Hawkes, 2007), it is crucial to design and implement programs and policies that are complementary to both sectors. Food policy research plays a significant role in guiding and improving design and implementation of agriculture and nutrition policies. Despite the global increase in agriculture research spending and capacity since 2000, some countries significantly lag behind due to a lack of qualified researchers to generate food policy research (IFPRI, 2017). A country's capacity to perform food policy research and analysis is determined by its ability to develop, design, and implement evidence-based policies. Babu and Dorosh (2013) surveyed 30 countries to measure the individual, organizational, and system capacity to undertake food and agriculture policy research. They developed a food policy-related index of measures of human capacity, human capacity productivity, and strengthening of institutions. To perform food policy research and implement evidence-based policies and programs, collecting timely and reliable data is crucial. Data collection and analysis remains a challenge for many developing countries. As a consequence of this capacity gap, limited evidence is generated and monitoring and evaluation (M&E) efforts are inconsistent in countries. This can lead to a country's inability to generate context-specific solutions locally rather than depending on external donor organizations.

Ensuring that nutrition-sensitive policies and programs are backed up by academic research can also help bridge the gap between agriculture and nutrition in both theory and practice. For example, the Evidence-informed Decision-making for Nutrition and Health (EVIDENT) initiative, established as an international North–South partnership in 2014, aims to enhance the leadership capacity of African researchers, improve knowledge management,

and provide high-quality methodical training and support to decision-makers involved in nutrition. EVIDENT has developed specialized training courses on systematic review techniques and had trained more than 60 stakeholders and researchers as of September 2016. It also developed guidelines on evidence-informed decision-making that will be used for pilot studies in Benin, Ethiopia, Ghana, and South Africa (Holdsworth *et al.*, 2016). Other initiatives that seek to advance evidence-based nutrition-sensitive decision-making include Agriculture for Nutrition and Health (A4NH), the African Evidence Network, Building Capacity to Use Research Evidence (BCURE), Leveraging Agriculture for Nutrition in South Asia (LANSA) and Leveraging Agriculture for Nutrition in East Africa (LANEA), Supporting the Use of Research Evidence (SURE), the SECURE Health Programme, and VakaYiko Consortium (Holdsworth *et al.*, 2016).

Lessons Learned

Despite an increased awareness that policies and programs designed and implemented in one sector, such as agriculture, have implications for other sectors, such as nutrition and health (Fan *et al.*, 2012), cooperation among these sectors in designing and implementing programs and policies that complement and reinforce their goals remain weak (Babu, 2011). In order to address challenges faced, the capacity to understand multisectoral approaches is the first step. However, efforts to develop such multi-disciplinary capacity remain limited (HLPE, 2017).

To address malnutrition, the application of knowledge from different disciplines is crucial. Multisectoral engagement such as including courses from different disciplines (agriculture, food systems, environment, climate change, etc.) in formal education focusing on nutrition and vice versa should be encouraged (Laar *et al.*, 2017). This integration of courses will ensure that graduating students have the necessary skills and both theoretical and practical knowledge of the impacts of agriculture on nutrition (Fanzo *et al.*, 2015a).

To be able to scale up the various initiatives highlighted in this chapter, a system-level approach is necessary. But system-level approaches require an enabling environment for

nutrition-sensitive agriculture. Van den Bold *et al.* (2015) provided stakeholders' perspectives from three South Asian countries (India, Bangladesh, and Pakistan) to understand if there is an enabling environment for nutrition-sensitive agriculture in South Asia. Their results showed that all three countries lacked an understanding about agriculture–nutrition linkages at all administrative levels. Other capacity issues included lack of investment in nutrition training for community-level workers, limited access to information and technology of subsistence farmers, limited capacity of researchers, and lack of coordination among stakeholders. Further, the capacity of researchers also seemed to be deteriorating in some countries due to a brain drain and employment of under-qualified personnel. Similar results were seen for three East African countries: Ethiopia, Kenya, and Uganda (Hodge *et al.*, 2015).

Insufficient human resource capacity has also been considered a significant constraint in improving nutrition-sensitive agriculture, especially in South Asia (Gillespie *et al.*, 2015). In both East Africa and South Asia, efforts to cultivate and strengthen leadership and capacities at different levels have suffered from inadequate funding (Gillespie *et al.*, 2015) and policymakers' inability to understand and implement evidence-based policies. Indeed, lack of funding has been recognized as a major system-level challenge to incorporate nutrition into many extension and advisory services around the world (Fanzo *et al.*, 2015b).

Conclusion

Despite increased recognition of the impact of agriculture on nutrition outcomes, linkages between these sectors remain weak. This gap in cooperation can be partially explained by limited capacity at the individual, institutional, and system levels. This chapter has focused on just two facets of individual and institutional capacity: multi-disciplinary education and extension and agricultural services, the lack of which have seriously hampered coverage, impact, and sustainability of nutrition programs (Shrimpton *et al.* 2016; HLPE, 2017).

But capacity needs are wide and varied. At the individual level, they include technical skills

for data collection, data analysis, and advising on investments and policies. This type of training needs to be provided within multisectoral teams to fully align program and policy developers and implementers (Jerling *et al.*, 2016; HLPE, 2017; Laar *et al.*, 2017). Capacity at the institutional and system levels also needs to be strengthened. At the institutional level, strengthening capacity to improve communication and sharing research findings among

different ministries, intergovernmental organizations, the private sector, and farmers is critical. Consistent efforts to use M&E systems and tools to ensure accountability and tracking progress of programs are needed. Finally, capacity is needed at the system level to improve global-level coordination in the development and implementation of policies and scaled-up initiatives that can start to accelerate progress against hunger and malnutrition.

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