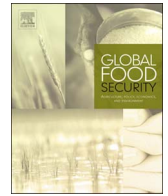




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Nutrition-sensitive agriculture: What have we learned so far?

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ABSTRACT

A growing number of governments, donor agencies, and development organizations are committed to supporting nutrition-sensitive agriculture (NSA) to achieve their development goals. While consensus exists on pathways through which agriculture may influence nutrition-related outcomes, empirical evidence on agriculture's contribution to nutrition and how it can be enhanced is still weak. This paper reviews recent empirical evidence (since 2014), including findings from impact evaluations of a variety of NSA programs using experimental designs as well as observational studies that document linkages between agriculture, women's empowerment, and nutrition linkages. The paper summarizes existing knowledge regarding impacts, but also pathways, mechanisms, and contextual factors that affect where and how agriculture may improve nutrition outcomes. The paper concludes with reflections on implications for agricultural programs, policies, and investments, and highlights future research priorities.

1. Introduction

A growing number of governments, donor agencies, and development organizations are committed to supporting nutrition-sensitive agriculture to achieve their development goals. Nevertheless, nutrition-specific interventions alone, even if implemented at scale, will not meet global targets for improving nutrition (Bhutta et al., 2013; WHO, 2014). Other sectors need to contribute as well, and agriculture has strong potential due to the many ways in which it can influence the underlying determinants of nutrition outcomes (Black et al., 2013), including through improving global food availability and access and through enhancing household food security, dietary quality, income, and women's empowerment. Globally, the need for agriculture to support better nutrition and health has been recognized and was reflected in the discussions leading up to the United Nations' 2030 Agenda for Sustainable Development (United Nations, 2017), and regionally, it is reflected in the growing number of initiatives to support countries in integrating nutrition interventions into their agricultural investment plans, as illustrated by the Comprehensive Africa Agriculture Development Programme investment plans (Rampa and van Seters, 2013). Countries like Nigeria and Ethiopia, for example, have recently developed nutrition-sensitive agricultural plans, a clear manifestation of the greater political priority being given to improving the nutritional impact of investments in the agricultural sector.

Making agriculture more nutrition-sensitive (See Box 1 for definitions of nutrition-specific and nutrition-sensitive interventions or

programs), however, requires a new way of thinking, planning, implementing, and partnering, as well as the active engagement of a variety of stakeholders from multiple sectors. It also requires identifying critical entry points where nutrition goals can be incorporated into agro-food systems (Jaenicke and Virchow, 2013). Some of the initial steps undertaken to bring the relevant stakeholders and sectors together include designing and agreeing on conceptual frameworks that identify the multiple pathways by which agriculture can impact nutrition. This topic has been the subject of an extensive body of work including the development of several conceptual frameworks that highlight the dynamic and multifaceted linkages between agriculture, health, and nutrition (Headey et al., 2012; Herforth and Harris, 2014; IFPRI, 2011; Jaenicke and Virchow, 2013; Kadiyala et al., 2014; Pinstrup-Andersen, 2012; World Bank, 2007). Ruel and Alderman (2013) identified six pathways through which agricultural interventions can impact nutrition: (1) *food access* from own-production; (2) *income* from the sale of commodities produced; (3) *food prices* from changes in supply and demand; (4) *women's social status and empowerment* through increased access to and control over resources; (5) *women's time* through participation in agriculture, which can be either positive or negative for their own nutrition and that of their children; and (6) *women's health and nutrition* through engagement in agriculture, which also can have either positive or negative impacts, depending on exposure to toxic agents and the balance between energy intake and expenditure. The characterization of the pathways by which agriculture and nutrition are linked and of the unequivocal mediating role of

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Box 1

Definitions of nutrition-specific and nutrition-sensitive interventions or programs.

Nutrition-specific interventions or programs are those that address the *immediate determinants* of fetal and child nutrition and development—adequate food and nutrient intake, feeding, caregiving and parenting practices, and low burden of infectious diseases.

Nutrition-sensitive interventions or programs are those that address the *underlying determinants* of fetal and child nutrition and development— food security; adequate caregiving resources at the maternal, household and community levels; and access to health services and a safe and hygienic environment—and incorporate specific nutrition goals and actions

Source: Ruel and Alderman (2013).

women's status and empowerment in these linkages has been instrumental in stimulating the development of new initiatives and investments to leverage agriculture to improve nutrition.

Although conceptual frameworks and hypothesized impact pathways are a critically important first step, efforts to support agriculture so that it delivers on nutrition need to be grounded in evidence. A number of reviews of evidence have been published in the past two decades (see, for example, Berti et al., 2004; DFID, 2014; Fiorella et al., 2016; Leroy et al., 2008; Masset et al., 2012; Pandey et al., 2016; Randolph et al., 2007; Ruel, 2001; Webb-Girard et al., 2012; Webb and Kennedy, 2014), and all of them agree that evidence on what and how agriculture can contribute to nutrition is extremely scant. The reviews cover a range of agricultural programs including homestead food production systems; home vegetable gardens; biofortified crops; small animals; livestock; fisheries; dairy; and irrigation projects. In spite of differences in the sets of studies reviewed and the methods and nutrition indicators used in the original studies, the findings from these reviews are surprisingly consistent. Overall, they find evidence that agricultural development programs that promote production diversity, micronutrient-rich crops (including biofortified crops), dairy, or small animal rearing can improve the production and consumption of targeted commodities, and some evidence that such improvements lead to increases in dietary diversity at the household and sometimes the maternal and child level. The reviews report a few cases, especially with biofortified vitamin A-rich sweet potatoes, in which increased production and consumption led to improvements in vitamin A status and health in young children, but little evidence overall of impacts on child stunting, underweight, or wasting; in addition, very few studies have looked at impacts on maternal nutritional status. The inclusion of a strong behavior change communication (BCC) intervention to promote optimal diets and child feeding practices, and a focus on improving women's status and empowerment through agriculture, are consistently reported as key to enhancing the potential impacts of agriculture on diets and other nutrition outcomes. Another main conclusion of the reviews is that most studies so far have had serious methodological limitations that may hamper their ability to demonstrate impacts, especially on anthropometric outcomes. The most common weaknesses include poor evaluation designs, inadequate sample sizes, short duration, and the wrong age group targeted and analyzed for achieving and demonstrating impacts on child anthropometry (Leroy et al., 2016; Masset et al., 2012; Ruel and Alderman, 2013; Webb-Girard et al., 2012).

The links between agriculture and nutrition have also been explored using data at the farm level from observational studies. Motivated by the agricultural household model (Sing et al., 1986), these studies show that when markets are imperfect, the separability between production and consumption decisions breaks down, and farm production can have a direct effect on consumption, and consequently, nutrition. This literature is reviewed in the editors' introduction to a special issue of the Journal of Development Studies on farm-level linkages between agriculture and nutrition (Carletto et al., 2015).

The proliferation of reviews, reports, and special journal issues (for example, Carletto et al., 2015; Strange et al., 2013a, 2013b) focused on the linkages between agriculture, food systems, and nutrition in recent

years testifies to renewed interest in the topic and calls for investments in closing the evidence gap and moving toward more gender- and nutrition-sensitive agriculture and food systems (FAO, 2013; Global Panel on Agriculture and Food Systems for Nutrition, 2016, 2014; Pinstrup-Andersen, 2010). Indeed, a 2012 inventory of agriculture-nutrition research identified 151 planned or ongoing projects being undertaken by 49 institutions throughout the world (Hawkes et al., 2012).

This paper reviews findings from new empirical research published from 2014 onwards that may fill some of the knowledge gaps identified in previous reviews regarding agriculture's contribution to nutrition. It reviews impact results from new studies that were not included in previous reviews and that used experimental or quasi-experimental approaches to evaluate different types of nutrition-sensitive agricultural programs (NSAP), including biofortification, homestead food production systems, livestock transfer programs, value chains for nutritious foods, and irrigation programs. In addition, and by contrast with previous reviews, our review also includes new observational studies that use cross-sectional data to document associations between agricultural practice and nutrition outcomes. These studies do not provide the same level of causal inference as experimental studies, but they are useful in generating hypotheses and helping shed light on key design elements for the success of future NSAP. For both impact evaluations and observational studies, we review information available regarding pathways, mechanisms, and contextual factors that affect where and how agriculture may improve nutrition outcomes. The paper does not review the literature on the topic of food systems and nutrition, which, although critically important, is beyond the scope of this more focused review. Also, the paper addresses issues of maternal and child undernutrition but does not cover the emerging nutrition transition and related problems of overweight, obesity, and noncommunicable diseases. Other excellent reviews and conceptual papers cover these important topics (see, for example FAO, 2013; Gillespie and van den Bold, 2017; Global Panel on Agriculture and Food Systems for Nutrition, 2016; Gómez et al., 2013; IFPRI, 2016; Pinstrup-Andersen, 2011, 2010; Popkin, 2014). The paper concludes with reflections on implications for agricultural programs and investments, and suggests priorities for future research.

2. Methods

This paper updates key reviews of the nutrition impacts of agricultural programs with new empirical evidence published from 2014 onwards, using the definition from Ruel and Alderman (2013), which states that programs and interventions are nutrition-sensitive if they (1) have a clearly stated objective of improving nutrition and (2) incorporate specific nutrition interventions to achieve this goal (See Box 1). We started with the Ruel and Alderman (2013) review, which summarized key findings from reviews of agriculture and nutrition programs published before 2013 (see online Supplementary material, web appendices Table 3 (Ruel and Alderman, 2013)) and consulted new evidence reviews as they became available (DFID, 2014; Domènech, 2015; Fiorella et al., 2016; Pandey et al., 2016; Webb and Kennedy, 2014). These evidence reviews helped formulate the search strategy and identify the types of agricultural programs to include in the review.

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