Food Systems: Pathways for Improved Diets and Nutrition

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Abstract
The United Nations has declared 2016–2025 as the Decade of Action on Nutrition. The emphasis of this decade is on alleviating malnutrition in all its forms. Food systems are 1 of 6 priorities for achieving this goal. This brief uses a food-systems approach to analyze the effects of agriculture production, commercialization, and sex on diet quality and nutrition.

Introduction
The UN has declared 2016–2025 as the Decade of Action on Nutrition (DAN) (1); the official launch of the DAN was held in Rome in December 2016 and outlined a strategy for linking actions at international, regional, and national levels. The initial activities at the country level are focusing on malnutrition in all its forms to include undernutrition, micronutrient malnutrition, and overnutrition. The strategies to combat malnutrition involve both nutrition-specific and nutrition-sensitive approaches. Nutrition-specific interventions have been widely evaluated, but an equivalent body of evidence does not exist for nutrition-sensitive interventions. The focus of this brief is on nutrition-sensitive interventions, defined as approaches involving sectors beyond the health sector that have the potential to improve nutrition outcomes. Nutrition-sensitive approaches are those that specifically incorporate nutrition objectives into their sector strategies; these could include, but are not limited to, agriculture, education, social protection, and transportation. The most widely used nutrition-sensitive interventions have been in the agricultural sector.

Newer Perspectives
In order to capture the nuances of agriculture’s potential influences on diet and nutritional status, researchers and policy officials are increasingly focused on a food-systems approach to better understand 1) pathways of impact and 2) entry points for leveraging improved diet and nutrition effects. As noted in a recent UN report, "A food system consists of all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the outcomes of these activities—namely nutrition and health status, socio-economic growth, and equity and environmental sustainability" (2). This brief summarizes some new evidence from Ethiopia to better explain the agriculture production–diet links. Rather than simply examining total agriculture production at the household level, data are disaggregated by production diversity, individual crop diversity, commercialization, and income control.

Agriculture-Nutrition Linkages: Advances in Understanding Mechanisms
There is a plethora of typologies used to classify food systems (2, 3). These typologies range from the informal-traditional systems to the modern industrialized systems. In the informal-traditional system, individuals live primarily in rural areas, many of the foods are grown locally, and often

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there are limited choices in the market place. For the modern-
industrialized food systems, the source of food is often far removed
from the local farm and villages. The 2015 Global Nutrition Report (3)
highlighted that the informal-traditional system is associated with high
rates of stunting and low weight for age and micronutrient deficiencies,
but low rates of overweight and obesity. The dominant type of food
system in most developing countries is the informal-traditional.

The modern, industrialized food system is associated with low rates
of stunting, underweight, and micronutrient deficiencies, but a higher
level of overweight and obesity than in the informal system (3). It
should be noted that in every country there is a combination of food
systems and, as urbanization occurs, the modern-industrialized food
system will become more prevalent. The Empowering New Generations
to Improve Nutrition and Economic Opportunities (ENGINE) research
was conducted in districts where the dominant food system is a rural,
traditional system and thus our analysis is limited to this food system.

The series of questions posed below will drive the discussion of
ways to enhance the ability of food systems to improve diets and
nutrition. The research presented in this brief is based on data collected
respectively on 600 households in 2 regions of Ethiopia as part of the
larger ENGINE program.

**Does On-Farm Production Diversity Improve Diet Diversity?**

An increasing number of studies have focused on the links between
production diversity and diet diversity. The ENGINE study in Ethiopia
(4) addressed this issue further by asking the question “what is
the relative extent to which household dietary diversity and the
consumption of specific crops are explained by production diversity?”
Production diversity was defined as the number of different crops and
animal-source foods produced in the previous 12 mo, with diet diversity
defined as the sum of the number of food groups consumed by the
household in the past 7 d (4). The relation between production diversity
(number of different crops and livestock) and household dietary
diversity was small and nonsignificant (4). Data from a 4-country
study including Indonesia, Kenya, Ethiopia, and Malawi reported that
production diversity at the farm level was associated with diet diversity
in some but not all cases (5). The ENGINE data and the 4-country study
suggest that the effects of production diversity on diet diversity may,
indeed, be context specific.

**Effects of Production of Crops in Individual Food Groups on Consumption**

Unlike production diversity (which measured the number of total crops
and animal-source foods produced), food-group production measures
the number of food-group categories (e.g., fruits and vegetables,
pulses, and eggs) that households produced. In Ethiopia, in contrast
to the production diversity/diet diversity results, data indicate that the
production of a noncereal food group in the past 12 mo was positively
associated with consumption of that food group (4). Specifically,
households that reported producing pulses, roots, and eggs were nearly
twice as likely to consume those food groups, whereas households
producing fruit and dairy were 2.7–3.9 times more likely to consume
those types of foods than households that did not produce their own
foods. When households in the Ethiopia study produced more nutrient-
rich foods, they were more likely to consume them, indicating that
targeting of increased production of certain crops rather than overall
production diversity is more likely to be useful in improving household
diet quality.

**Does Commercial Agriculture Improve Diet Diversity?**

It is common for a national agricultural policy to encourage commer-
cialization of agriculture. However, the research results on the cash
crop–nutrition link have been mixed (6). Data from Ethiopia found
that agriculture income, as a proxy for agricultural commercialization
(almost all cash income from crop and livestock sales), was significantly
associated with diet diversity (5). This effect was independent of
obvious confounders such as wealth and nonagricultural income.
The data in Figure 1 show that increasing cash crop income has a
significant effect on increasing household diet diversity for farming
families in Ethiopia. Although the differences in mean household diet
diversity scores may seem small, an adjusted Wald $F$ test comparing
the means across agricultural income quartiles was highly significant at
$P < 0.001$, showing a strong positive association between 2 variables.
Cash-cropping households, in general, have more diverse diets than
subsistence farmers (7).

**Does Market Availability Influence Diet Quality?**

The early literature suggested that decisions with regard to pro-
duction and consumption were made by households independently.
Current studies, however, suggest that if markets are not functioning,
then decisions about agricultural production and consumption are
“nonseparable” (8). Data from 93 districts (called woredas) in Ethiopia

![FIGURE 1](image-url)
show that cow ownership is strongly associated with an increased frequency of milk and dairy consumption among children; these effects, however, are 2 to 3 times higher in non-market villages (9). A market village is the closest area where foods are bought and sold. These significant effects, however, disappeared in market villages. In another study, cow ownership had a large and positive effect on dairy consumption and linear growth of preschool-aged children (10). Here again, however, in villages where there were large functioning markets, cow ownership had no impact on linear growth. Milk and dairy may be unique products because they are perishable and therefore must either be sold or consumed. If milk cannot be sold in the market, it will need to be consumed at the household level. Thus, the availability and structure of existing markets influence the decisions on whether to sell or consume.

**Does Sex-Specific Income Control Influence Diet and Nutrition?**

Income and assets controlled by women are used differently than male-controlled income (11). The ENGINE analyses show that female income and asset ownership was associated with a significantly higher probability of consumption of roots, vegetables, oils/fats, sugar/honey, and meat (4). In addition, above and beyond female-controlled income, results document that women’s involvement in decision making was positively, significantly related to better-quality household diets (4).

**Summary**

Agricultural sector initiatives offer enormous potential for improving diet quality and household-level food security. The research summarized in this brief highlights the nuances involved in analyzing agriculture–diet diversity linkages. The apparent modest or weak evidence from many previous studies linking agriculture to diet quality may be related, in part, to the tendency to treat agricultural production strategies as entailing homogeneous approaches. Information presented in this brief disaggregated agriculture and examined production diversity, individual food-group production, commercialization, and sex-controlled income as separate entities that may, independently, influence diet quality.

The ENGINE agriculture–nutrition research influenced the successor project Growth through Nutrition launched in Ethiopia in 2016. Some policy and programmatic recommendations emerged from this brief that suggest possible interventions to enhance the impacts on diet quality. First, the ENGINE data indicate that policies to increase the commercialization of agriculture can have a powerful effect on increasing diet diversity. In order to expand the opportunities for smallholder farmers to participate in cash cropping, governments should invest in infrastructure to provide better linkages to the market economy.

Many of the poorest agricultural households have limited access to inputs into commercial agriculture and also inputs into the adoption of improved seed varieties. The provision of inputs and/or credit can increase the access to important inputs.

Data in this brief suggest that on-farm production of specific, nutrient-dense crops has more of an effect on improving diet quality than simply emphasizing overall production. Agricultural strategies should focus on cultivation of individual crops as one strategy for enhancing diet quality.

Women’s and men’s incomes are often used differently, suggesting that examining the effects of total household income on diet and nutrition may miss important household dynamics. An assessment of different sources of sex-specific control of income may more effectively identify points of entry for improvement in dietary diversity.

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