

## Pathways: Additional Resources

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The SPRING project has written a series of briefs that elaborate on the agriculture-to-nutrition pathways. Throughout these briefs, short vignettes from agricultural activities highlight how the pathways and principles can be applied in diverse contexts. The conceptual frameworks of the pathways and principles for improving nutrition through agriculture are described in Brief 1. Each subsequent brief explores a different route between agriculture and nutrition: food production, income generation, and women's empowerment. Read the briefs at: <https://www.spring-nutrition.org/publications/series/improving-nutrition-through-agriculture-technical-brief-series>

Additionally, SPRING has compiled several resources that are building the evidence base in support of the pathways.

### Household food production

Some examples shared at the Leverhulme Centre for Integrative Research on Agriculture and Health (LCIRAH) conference in June 2015:

- In Ghana, children in households that kept chickens, ducks, or other birds were twice as likely to have minimum dietary diversity as compared to those in households that did not. (Saaka, referenced in LCIRAH 2015).
- In Burkina Faso, households collecting wild foods, as well as those producing food rather than cash crops, had better dietary diversity compared to those that did not (Ruiz, Dury, and Prevel 2015, cited in LCIRAH 2015).
- Also in Burkina Faso, a homestead food production program that promoted micronutrient-rich food consumption saw improvements in child dietary diversity; production of and consumption of fish, seafood, meat, poultry and/or fruit; and women's thinness decreased (Olney 2014/2015, cited in LCIRAH 2015).
- HarvestPlus found that Rwandan students consuming high-iron beans had improved hemoglobin ( $P < 0.01$ ) and serum ferritin ( $P = 0.015$ ) (De Moura 2014, referenced in LCIRAH 2015).

### Processing and storage

In addition to producing nutritious foods, the way that we harvest, process, and store foods can also impact nutrition. The following studies have noteworthy findings:

- Micronutrient fortification is considered a nutrition-specific intervention, but it is incorporated into agricultural commodities, and it improves nutrition (Eichler et al. 2012; Martorell et al. 2015).
- Per some SPRING and World Bank reviews, education about and access to better processing and storage can increase year-round access to nutrient-rich foods (Du 2014; Herforth et al. 2012).

- Poor harvesting, processing, and storage can make individuals ill and perhaps even cause stunting. Aflatoxin exposure starts in utero and continues as complementary foods are introduced. Major studies demonstrate strong relationships between aflatoxin, birthweight, stunting, and/or underweight (Turner et al. 2013).
- Reducing levels of aflatoxin in the first year of life can improve stunting by about 1 standard deviation, which is significant for a child (Turner et al. 2007).
- In Guinea, aflatoxin was controlled through improved post-harvest handling, such as rapid collection of nuts at harvest, proper drying, and storage in breathable bags raised off the ground (Turner et al. 2013).
- Foods that are not produced, processed, or stored properly are often consumed by the poor, who cannot afford not to eat them. In Kenya, aflatoxin levels in women from the lowest socioeconomic group were 4 to 7 times higher than those in the highest (Leroy and Sununtnasuk 2015)
- In Mali, milk that did not meet a required quality standard ended up in the small-scale producers' own homes or communities (Roy 2013).

Beyond risks related harvesting and storage, food production has occupational risks that can impact nutrition. For example:

- In a 2013 Global Learning and Evidence Exchange , Jeff Griffiths from Tufts University talked about increased malaria where irrigation water is stored. He also talked about rotavirus, hepatitis, E. coli, shigella, and salmonella in agricultural wastewater (Griffiths 2012).
- Certain value chains, such as livestock value chains, have risks, such as zoonosis from contact with livestock, infection during slaughter, and cancer from smoking meat (Grace et al. 2015).

## Income

What does the literature tell us about the linkages between income and nutrition?

- In a macro analysis of 29 countries, Webb and Block (2012) positively associate support for agriculture, increased income (GDP per capita), and reduced stunting and wasting. This positive result unfortunately is also associated with increased obesity, even in rural areas.
- In Ghana, farm production diversity and access to markets are associated with household dietary diversity and household wealth, suggesting an income pathway to better diets (Delaporte et al. 2015). Greater income from agriculture is also associated with food purchases (Jones and Moffitt 2015).
- In Ethiopia, a national survey showed a positive association between income from agricultural sales, cash crop production diversity, and household dietary diversity, especially for female-headed households (Coates and Galante 2015).
- During the lean season in Burkina Faso, women's non-agricultural income is strongly associated with food diversity (Ruiz, Dury, and Martin-Prevel 2015, referenced in LCIRAH 2015).

It is important to note that these studies show correlation and not causation, and only between income and dietary diversity, not nutrition.

## Women's Empowerment

### Control over assets and income

- Income controlled by women has a greater effect on children's nutrition than income controlled by men. The same is likely true for other productive assets. For example:
  - In a Burkina Faso homestead food production program, positive intermediate results included increases in women's control over gardens, produce, and income; production of and household and women's consumption of certain animal products and fruit; and improvements in children's dietary diversity. Ultimately, there were positive impacts on women's thinness, children's diarrhea, and anemia (Olney 2014, referenced in LCIRAH 2015).
  - In Ethiopia, dietary diversity was greater in households where a woman owned at least one large asset (Coates and Galante 2015).

### Time Use and Child Care

- Time constraints can be a barrier to participating in agriculture interventions or adopting a new technology (Webb 2013), and agriculture interventions tend to increase participants' time burdens (Grace et al 2015).
- Time burdened women face tradeoffs that could affect their children's health and nutrition (e.g., they might switch to purchased food and reduce time for feeding and preparing food) (Johnston et al. 2015).
- A systematic review found that a reduction in women's reproductive work time was detrimental to nutrition in poor households, but women's and children's nutrition was less sensitive to these same reductions in non-poor households. Long hours in agriculture revealed mixed results: Women in Ghana and non-poor women in Mozambique experienced reductions in their dietary diversity score (DDS), whereas poor women and children in Mozambique and Nepal experienced increases (Komatsu, Malapit, and Theis 2015).
- The age of a child may affect the relationship between work, childcare and nutrition (Ukwuani and Suchindran 2003). A breastfeeding age child and a 6–8 months-old child starting complementary foods may require more care time (Leslie 1988; Balagamwala 2015).
- In Kenya, a study found that a lower percentage of mothers working in medium- and high-intensity dairy production were breastfeeding children ages 12–24 months and were introducing supplemental foods at an increasingly earlier age than mothers from low-intensity production households (Micere Njuki et al. 2015).
- Despite increasing their income, women's paid employment reduced expenditure on healthcare, as the opportunity cost of the time required in seeking health care increased (Berman et al. 1988, cited in Gillespie et al. 2012; Blackden and Wodon 2006, cited in Herforth et al. 2012).

- The risk of infant mortality can be 50 percent higher if the mother works in agriculture. This may be because their children have been found to be more likely to contract diarrhea and respiratory diseases, and are less likely to be treated and immunized (Kadiyala 2014). Moreover, taking a child to the field can expose him to dangerous conditions (Balagamwala 2015).
- In India, a mother's participation in agricultural activities had negative effects on her child's health (Bhalotra et al. 2010, cited in Gillespie et al. 2012).
- Another tradeoff working women face is providing alternative childcare, which often involves tasking other household members, including children and other women, with childcare and domestic work (Johnston et al. 2015).
- One study found no difference in wasting (yet a moderate connection with stunting) in children cared for by their mothers versus those cared for by others (Headey et al. 2011; Balagamwala 2015).

#### Female energy expenditure

- *Impact on women's body mass index (BMI):*
  - Women agriculture workers in Pakistan are three times as likely to be underweight as women not working or working outside agriculture (Balagamwala 2015).
  - Seasonality affects energy expenditure and food intake of women who are involved in agriculture, decreasing weight and fat stores and increasing physical labor among poor women engaged in agricultural activities during the lean season (Kadiyala 2014).
- *Impact on infant:*
  - Excessive maternal activity during pregnancy may result in increased risk of poor birth outcomes, such as low birthweight, small-for-gestational-age births, and preterm deliveries (Rao et al. 2003; Pitchaya et al. 1998; Barnes, Adair, and Popkin 1991; Herforth et al. 2012).
  - A study in Brazil found lower mean birthweight in infants born to women who engaged in heavy agricultural work throughout pregnancy (Lima et al. 1999; Herforth et al. 2012).
  - Increased physical activity levels may also leave mothers unable to meet the increased energy demands of lactation (Rashid and Ulikaszek 1999; Piers et al. 1995; Guillermo-Tuazon et al. 1992; Herforth et al. 2012).

Lastly, it is important to recognize that all of these aspects are affected by intra-household dynamics —age relations, mothers-in-law, husbands, etc. — all play a key role in influencing food, health and care.

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