Agriculture and nutrition: what does the evidence show?

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Outline

- How agriculture affects nutrition (pathways)
- What do we know about the role/contribution of agriculture in improving nutrition
  - Reviews of evidence
  - Recent systematic literature reviews
- Remaining gaps and how to address them
Figure X: Conceptual framework depicting causes of malnutrition, highlighting links between agriculture and nutrition.

**Immediate causes (individual)**

**Underlying causes (household and community)**

**Basic causes (national/societal)**

- Nutritional status
  - Dietary intake
  - Disease/health status
    - Access to health, water, sanitation services
    - Access to food
    - Maternal and child care
      - Agriculture
      - Non-agricultural
        - Household income generation
          - Food for market
          - Own consumption
            - Quantity, quality, control and use of resources (incl. governance, policies etc)
            - Education
            - Potential resources – agro-ecology, technology, people
Interacting socioeconomic factors [possible leakages]


Policy drivers of inequality: land policies, financial policies, infrastructure investments, education policies, empowerment policies for women & SCTs.

Policy drivers of nutrition: health, nutrition, social protection & education.

Household assets and livelihoods

Food output

Nonfood output

Food prices

Food imports

Sectoral linkages

Supply side effects

Demand side effects

National Level

Household Level

Individual Level

Food produced and consumed

Income from food sales

Other income

Farm/nonfarm employment

Nutrient consumption

Health care expenditure

Caring capacity & practices

Female employment

Non-food expenditure

Food expenditure

Nutrient intake

Health status

Female energy expenditure

Child nutrition outcomes

Mother’s nutrition outcomes

National nutrition outcomes

Intrahousehold inequality: gender bias, education, family size, seasonality, religion, SCTs.

Drivers of “taste”: culture, location, growth, globalization.

Interhousehold inequality in assets, credit, access to public goods & services

Drivers of inequality:

Policy drivers of growth: land policies, financial policies, infrastructure investments, education policies, empowerment policies for women & SCTs.

Policy drivers of nutrition: health, nutrition, social protection & education.

Female employment

Health care expenditure

Nutrient consumption

Health status

Female energy expenditure

Child nutrition outcomes

Mother’s nutrition outcomes

National nutrition outcomes

Household Level

National Level

Source: Gillespie et al., TANDI project
Interacting socioeconomic factors [possible leakages]


Policy drivers of inequality: land policies, financial policies, infrastructure investments, education policies, empowerment policies for women & SCTs.

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Source: Gillespie et al., TANDI project
Income-food expenditure pathway

**Household assets and livelihoods**

- Food output
  - Supply side effects
- Nonfood output
  - Demand side effects
- Food prices
  - Sectoral linkages
- Food imports
  - Supply side effects

**National Level**

- Food income: consumption
- Food income: from markets
- Non-food income
  - Farm/nonfarm employment
- Female employment
  - Caring capacity & practices
- Health care expenditure
- Health status
- Nutrient intake
- Nutrient consumption
- Health status
- Mother’s nutrition outcomes
- Female energy expenditure

**Household Level**

- Non-food expenditure
- Health care expenditure
- Health status
- Nutrient intake
- Nutrient consumption

**Individual Level**

- Child nutrition outcomes
- Female energy expenditure
- Health status
- Nutrient intake
- Nutrient consumption

**Intrahousehold inequality**

- Gender bias, education, family size, seasonality, religion, SCTs.

**Public health factors**

- Water, sanitation, health services, education.

**Interhousehold inequality**

- Assets, credit, access to public goods & services.

**Drivers of “taste”**

- Culture, location, growth, globalization.

**Intrahousehold inequality**

- Gender bias, education, family size, seasonality, religion, SCTs.

**Policy drivers of inequality**

- Land policies, financial policies, infrastructure investments, education policies, empowerment policies for women & SCTs.

**Policy drivers of nutrition**

- Health, nutrition, social protection & education.

Source: Gillespie et al., TANDI project
Demand side effects

Sectoral linkages

Food output

Nonfood output

Food imports

Supply side effects

Food prices

Demand side effects

Household assets and livelihoods


National nutrition outcomes

National Level

Household Level

Individual Level

Food income: consumption

Food income: from markets

Non-food income

Food expenditure

Nutrient consumption

Health care expenditure

Caring capacity & practices

Female employment

Female energy expenditure

Nutrient intake

Health status

Mother’s nutrition outcomes

Child nutrition outcomes

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Intrahousehold inequality: gender bias, education, family size, seasonality, religion, SCTs.

Public health factors: water, sanitation, health services, education.

Household assets and livelihoods

Interacting socioeconomic factors [possible leakages]

Female employment

Income – non food expenditure pathway

Food income: from markets

Non-food income

Farm/nonfarm employment

Interhousehold inequality in assets, credit, access to public goods & services

Drivers of “taste”: culture, location, growth, globalization.

Intrahousehold inequality: gender bias, education, family size, seasonality, religion, SCTs.

Public health factors: water, sanitation, health services, education.

Policy drivers of inequality: land policies, financial policies, infrastructure investments, education policies, empowerment policies for women & SCTs.

Policy drivers of nutrition: health, nutrition, social protection & education

Source: Gillespie et al., TANDI project
Demand side effects
Sectoral linkages
Supply side effects

Food output
Nonfood output

Food imports
Food prices

Food income: consumption
Food income: from markets
Non-food income

Food expenditure
Non-food expenditure
Female employment

Nutrient consumption
Health care expenditure
Caring capacity & practices

Female energy expenditure
Nutrient intake
Health status

National Level
Household Level
Individual Level

Public health factors: water, sanitation, health services, education.

Policy drivers of nutrition: health, nutrition, social protection & education

Policy drivers of inequality: land policies, financial policies, infrastructure investments, education policies, empowerment policies for women & SCTs.

Interhousehold inequality in assets, credit, access to public goods & services
Drivers of “taste”: culture, location, growth, globalization.
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Household assets and livelihoods

National nutrition outcomes

Intrahousehold inequality: gender bias, education, family size, seasonality, religion, SCTs.

Food Price – food expenditure/purchasing power pathway

Source: Gillespie et al., TANDI project

Interhousehold inequality in assets, credit, access to public goods & services

Drivers of "taste": culture, location, growth, globalization.

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Public health factors: water, sanitation, health services, education.

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Policy drivers of nutrition: health, nutrition, social protection & education

National nutrition outcomes

Women employment – time – care

National Level

Household Level

Individual Level

Source: Gillespie et al., TANDI project
Women’s employment – status – IHH decision-making pathway

**National Level**

- National nutrition outcomes

**Household Level**

- Household assets and livelihoods
  - Food output
    - Sectoral linkages
  - Nonfood output
    - Demand side effects
  - Food prices
    - Supply side effects

**Individual Level**

- Nutrient intake
- Health status
- Mother’s nutrition outcomes


**Sources:**
- Gillespie et al., TANDI project

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- **Policy drivers of inequality:** land policies, financial policies, infrastructure investments, education policies, empowerment policies for women & SCTs.

- **Policy drivers of nutrition:** health, nutrition, social protection & education.

- Interacting socioeconomic factors [possible leakages]

**Household assets and livelihoods**

- Food output
  - Sectoral linkages
- Nonfood output
  - Demand side effects
- Food prices
  - Supply side effects
- Food imports
  - Supply side effects
- Food income: consumption
- Food income: from markets
- Non-food income
- Farm/nonfarm employment
- Male employment
- Female employment
- Female energy expenditure
- Non-food expenditure
- Nutrient consumption
- Health care expenditure
- Caring capacity & practices
- Female nutrition/health pathway
- Public health factors: water, sanitation, health services, education.
- Interhousehold inequality in assets, credit, access to public goods & services

**Interacting socioeconomic factors**

- Drivers of “taste”: culture, location, growth, globalization.
- Intrahousehold inequality: gender bias, education, family size, seasonality, religion, SCTs.

**Policy drivers of inequality:** land policies, financial policies, infrastructure investments, education policies, empowerment policies for women & SCTs.

**Policy drivers of nutrition:** health, nutrition, social protection & education

**Source:** Gillespie et al., TANDI project
Agriculture is a key driver of poverty reduction but...

Pathways to nutrition are diverse and interconnected

1. Agriculture as a source of food
2. Agriculture as a source of income: how income from agriculture/non agriculture is spent on food and non food (other basic needs)
3. Agricultural policy and food prices

Gender dimensions
4. Women’s employment, time and ability to manage young child care
5. Women’s status, decision making power and control over resource allocation
6. Women’s own health and nutritional status

Source: Gillespie et al., TANDI project
Main reviews

- **Ruel, 2001**
  - Focused on impact of ag programs (garden, HFP, livestock, aquaculture, mixed, cash cropping), dietary modification and diversification on vitamin A and iron

- **Berti et al. 2004**
  - Review same types of programs; assessed whether programs invested in 5 types of capital: physical, natural, financial, human and social

- **Leroy and Frongillo 2007**
  - Focused on animal production programs (aquaculture, dairy, poultry)

- **World Bank/IFPRI 2007**
  - Reviewed same types of ag programs; included changing context (policy, technology, food marketing systems, food consumption patterns) and institutional frameworks

- **Leroy et al. 2008**
  - Used impact pathway approach

- **Bhutta et al. 2008**
  - Focused on same programs, including dietary modification and diversification

- **Masset et al. 2011**
  - Systematic review of same programs plus biofortification (without dietary modification/diversification)

- **Girard et al. 2012**
  - Systematic review of studies, post-1990 (36 articles, 27 unique studies)
Main conclusions

- **Ruel, 2001**
  - Little evidence of impact on micronut status (only a few programs actually measured impact on micronut indicators)

- **Berti et al. 2004**
  - Mixed results in terms of improving nut status

- **Leroy et al. 2008**
  - Mixed results; less than ½ studies measured impact on nut outcomes; little measured impact in those that did, except VA

- **Masset et al. 2011**
  - Impact on micronut status unclear, except biofortification on VA; little or no impact on anthropometry (due to small sample size and low statistical power)

- **Girard et al 2012**
  - Limited evidence of impact on maternal or child anthropometry (those that did focused on production of food rich in micronut, energy and protein)
What works better

- Ruel, 2001
  - Stand alone production strategies did not increase MN intake or status.
  - Projects that included well-designed BCC successful at increasing MN intake
- Berti et al. 2004
  - Broader-based investments had greater impact; nut educ is key
- Leroy et al. 2008
  - Impact more likely when strong gender and nut educ approaches; complementary interventions needed to sustain improvements; targeting women works.
- Masset et al. 2011
  - No comment in paper
- Girard et al 2012
  - Impact on MN intake more likely when nut educ, gender objectives included.
Evaluation designs

- **Ruel, 2001**
  - Poor evaluation designs prevent conclusions on program effectiveness.
  - Evaluation difficult: complex programs

- **Berti et al. 2004**
  - Study designs often unsuitable to assess impact on nut status. Heterogeneity makes comparisons difficult.

- **Leroy et al. 2008**
  - Highly variable evaluation designs, generally poor. Unable to detect impacts on nut status due to poor design, sampling.

- **Masset et al. 2011**
  - Poor eval designs, studies too small.

- **Girard et al 2012**
  - substantial limitations in study design and quality of studies reporting nut outcomes. Research limited in quality and quantity, but evidence base growing
2011 Masset: Systematic review

Figure 2.1 Stages of the screening process

Table 3.1 Screening of studies by type of agricultural intervention
Conclusion

- Programs vary; several studies, but very few high-quality.
- Evidence to date is minimal, and mixed
- More rigorous evaluations needed, not more systematic reviews
- “Need research that utilises robust randomised or quasi-experimental designs, evaluates biologically appropriate nutrition indicators, is adequately powered for these indicators and includes appropriate assessment and control for confounding and/or effect modification” (Girard et al 2012)
But also.....

- Need to avoid mechanistic approach to reviews
- need to be analytical as well as methodological
- qualitative contextual evidence is extremely important
- discuss pathways, contexts, implications, recommendations...
What evidence do policy makers need to take action?

- **What:** Can agriculture interventions, programs and policies contribute to reducing maternal and child undernutrition? If so what types of agriculture programs/policies have the greatest impact?
- **How:** what are the pathways of impact? Which ones are more important, in which contexts? How can agriculture be leveraged to contribute more to improving nutrition?
- **Where and who** are the populations most likely to benefit from nutrition sensitive agriculture?
- What is the **cost-effectiveness** of agriculture interventions to improve nutrition? What is their sustainability?
- What **design** options and **indicators** do we have for rigorous impact and cost-effectiveness assessments?
Conclusions

- We have some evidence, but need more, and better
- Agriculture has a great potential for simultaneously addressing underlying + immediate determinants of undernutrition
  - Relieve resource constraints at hh level
  - Focus on women (power, time, access, resources)
  - Target direct nutrition interventions to poor hh
  - Strengthen links to health and care inputs
- But evidence of effectiveness is not enough
- Need to know how to work cross-sectorally…
- Consider:
  - Knowledge and evidence
  - Politics and governance
  - Capacity and resources
Thank you
Three examples

- Biofortification
- Homestead food production programs
- Nutrition-sensitive value chains
Biofortification for Improved Nutrition
OFSP in Mozambique and Uganda (HarvestPlus)

- **Intervention:**
  - Seed systems (dissemination of vines, farmers’ training)
  - Demand creation (nutrition education)
  - Marketing and product development

- **Reached:**
  - 14,000 hh (Mozambique)
  - 10,000 hh (Uganda)

Source: Dan Gilligan et al. Biofortification Conference, Nov 2010
Vitamin A intake doubled

Children 6-35 months in Mozambique

Model 1
Model 2
Control

Vitamin A μg RAE per day

Source: Christine Hotz et al. IFPRI; Biofortification Conference, Nov. 2010
Nutrition-Sensitive Value Chains

Photo: Andrew Westby
Bean value chains in Uganda and Rwanda

4 objectives:

- Improve yields and quality of harvested beans
- Enhance nutritional value and appeal through appropriate post-harvest handling + processing
- Increase market access
- Increase demand and consumption

Source: Dry Grain Pulses CRSP, Mazur et al. 2009)
A nutrition-sensitive value chain for beans (Uganda)

Value Chain Steps
- Inputs into production
- Production
- Post-harvest handling/storage
- Processing
- Marketing

Activities
- Field trials with new varieties
- Soil & terrain analysis
- Farmers trainings
- Technologies to ↓ losses (insects)
- Nutrient retention analysis
- Testing sequencing + duration of different processing techniques (nutrient retention, ↓ anti-nutrients)
- Analysis of main market channels, Drivers of market decisions, Presence of nutrient-enhanced foods
- Consumer surveys
- Cooking trainings, Education, Behavior change communications

Source: Adapted from Mazur et al. 2009. Pulses CRSP

Increased availability of, access to, and demand for NUTRITIOUS BEANS

Source: Adapted from Mazur et al. 2009. Pulses CRSP
Homestead Food Production to Improve Nutrition

Photo: One Acre Fund
HKI’s Homestead food production in Bangladesh

Integrating agriculture and nutrition at household and community level

Program:
- Production-focused: micronutrient-rich vegetables, small livestock production
- Nutrition education to promote consumption
- Focus on women: income generation, empowerment
- Nutrition objective: Improve diet diversity, micronutrient intake

Impact:
- Tripled vegetable production; increased income
- 73% of gardens managed by women
- Improved food security for 5 million people

Source: Millions Fed, IFPRI, 2009; www.ifpri.org/millionsfed