Nutrition Indicators in Agriculture Projects: Current measurement, priorities, and gaps

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Funded by the EU-FAO Improved Global Governance for Hunger Reduction Programme (2012-2015)
Engaging agriculture to improve nutrition: how to measure impact

In the past several years, there has been a movement from an exclusive focus on nutrition specific – targeted nutrition interventions for preventing/treating conditions of malnutrition towards expanding into nutrition sensitive interventions – especially in agriculture with focus on improving diets to improve nutrition.
Recent reviews demonstrate little impact on nutritional status but do not critically examine the choice of outcome indicators.

This paper investigates which nutrition impact indicators are currently used in agriculture-nutrition projects, and highlights priorities and gaps in measurement.
We contacted principle investigators of projects identified from the DFID-funded LCIRAH mapping study.

Online survey (SurveyMonkey) covered:

- Indicators chosen
- Reason for choosing indicators
- Program Impact Pathways
- Study Design basics
  - Sample size
  - Evaluation design
Results: Response

- 76 project PIs contacted
- 67 responded (88%)
  - 7 of these excluded (incomplete data, project cancelled)
- 60 with complete data

Respondents affiliations:

- University: 35%
- NGO: 32%
- CGIAR: 32%
- FAO: 1%
72% of the Agriculture projects surveyed use anthropometric indicators for impact assessment. However most did not have activities directly related to individual nutritional status and none had sufficient power to detect a reduction in stunting of < 15%.

RESULTS of a survey carried out on 80 agriculture intervention projects worldwide, with an average duration of 4.2 years. Each project had several objectives and used various indicators to assess impact.
# Examples of Indicators

<table>
<thead>
<tr>
<th>Type of measure</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutritional status</td>
<td>stunting, underweight, wasting, BMI, anemia, serum retinol</td>
</tr>
<tr>
<td>Food consumption or diet</td>
<td>Many measuring dietary diversity; MAD; intake of specific foods</td>
</tr>
<tr>
<td>Food access</td>
<td>HFIAS, HHS, seasonality, coping strategies</td>
</tr>
<tr>
<td>Economic outcomes</td>
<td>of these, 2/3 disaggregating by gender</td>
</tr>
<tr>
<td>Women’s empowerment or labor</td>
<td>Decision-making, sales or assets, time use, qualitative assessments; a couple using/testing WEAI</td>
</tr>
<tr>
<td>Natural resource management</td>
<td>Few indictors described; e.g. use of soil and water conservation practices</td>
</tr>
</tbody>
</table>
What will we learn about impact on nutritional status (in particular, stunting)?

Probably not much

Only 6 studies with counterfactual have adequate power to observe a 20% decline in stunting over 5 years

- Sample sizes of 1,200-2,700 in each comparison required
- No study has adequate power to observe a decline in stunting of <15%

In most studies, improving diets or child feeding is the main hypothesized pathway towards improving nutritional status
What will we learn about impact on diet?

Sample sizes more appropriate for dietary impact

– Most medium to large studies in review would be able to detect a 50% improvement in prevalence of children achieving minimum dietary diversity (4 of 7 food groups).

– Sample sizes of 190-590 in each comparison required (depending on baseline prevalence)

Pathways to dietary change clearer and more linked to agricultural intervention
We won’t learn enough about some impacts: Need to develop indicators

• **Food environment**
  – Most current evidence and research stops at farmgate
  – Do these projects improve availability & affordability of nutritious food?

• **Health and sanitation environment relevant to agriculture/nutrition**
  – Very little systematic thinking about this so far; only 4 projects measuring
  – Water quantity and quality, food safety, exposure to agrochemicals, risk of zoonotic or water vector-born diseases, etc.

• **Women’s empowerment**
  – Developing indicators of various aspects of empowerment separately (e.g. measures of women’s income) could improve the project’s ability to attribute improvement to project activities.
Recommendations

Select indicators that link closely the program impact pathway

– do not select indicators measuring outcomes that the project is not designed to affect

– Indicators that measure food access and dietary consumption reflect appropriate levels of nutrition impact for most projects

Apply newer, validated impact indicators such as MDD-W, FIES
The MDD-W is defined as:

- A dichotomous indicator of whether or not women 15-49 years of age have consumed at least five out of ten defined food groups during the previous day and night.

- The proportion of women 15–49 years of age who reach this minimum threshold of dietary diversity (i.e. five or more food groups) as a proxy indicator for micronutrient adequacy, an important dimension of diet quality.
Guide available at:

**FAO website**
[http://www.fao.org/3/a-i5486e.pdf](http://www.fao.org/3/a-i5486e.pdf)

**FANTA website**
The FIES uses information from a set of 8 questions getting at food-related behaviors and experiences associated with **difficulties in accessing food** due to resource constraints.

*It measures the access dimension of food security.*

Validity of this type of measurement of food access/food security comes from 20 years of using experienced-based scales (HFIAS, ELCSA, USHFSSM)

Target 2.1: By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.

2.1.2 Prevalence of population with moderate or severe food insecurity using FIES

Baseline data for SDG monitoring process provided by FAO through the Voices of the Hungry project.

Country-owned process (countries to collect, analyze and report results on FIES (or similar measures).

Appropriate in Ag2Nut context – strong links between agriculture (improving food access) and nutrition (improving diets).
Compendium of nutrition-sensitive indicators in agriculture
What this document is (and is not)

• **The purpose of the compendium** is to provide a current compilation of indicators that may be measured in nutrition-sensitive investments.
  – Does not provide detailed guidance on how to collect a given indicator but points to relevant guidance materials.

• **This compendium does not represent official FAO recommendations for specific indicators or methodologies.**
  – Intended only to provide information on indicators that may be relevant to consider in the monitoring and evaluation of nutrition-sensitive agriculture investments.

• It is not envisaged that a single project should collect data on all the indicators presented.
  – The selection will be informed by the type of intervention and anticipated impacts
Figure 1. Simplified result chain framework of investment projects. This framework identifies six outcome areas that are directly affected by agriculture, rural development and food systems, and how these can influence nutrition.
Entry points for nutrition sensitivity

<table>
<thead>
<tr>
<th>Investment project types</th>
<th>On-farm Food Availability &amp; Diversity</th>
<th>Food Environment in Market</th>
<th>Income</th>
<th>Women's Empowerment</th>
<th>Nutrition Knowledge &amp; Norms</th>
<th>Health &amp; Sanitation Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture Development</td>
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<tr>
<td>Value Chain Development</td>
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<tr>
<td>CDD / social development</td>
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<tr>
<td>Irrigation and Drainage</td>
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<tr>
<td>Natural Resource Management / Forestry / Environmental</td>
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</tbody>
</table>

Green = Important entry points to leverage and measure
Yellow = Potential contribution requiring attention; measure if addressed
Blank = Typically less of a direct contribution, although linkages may be possible
Overarching considerations in choosing indicators

1. Food access, dietary quality, and/or food environment are often appropriate nutrition-sensitive agriculture indicators
   - Caution with measuring nutritional status
   - Caution with assuming positive nutrition impact from income

2. Depending on the nature of the intervention, the most appropriate type of indicators will vary

3. Use existing indicators where they meet the need
Compendium of Indicators for Nutrition-Sensitive Agriculture
# Key nutrition-sensitive indicators

<table>
<thead>
<tr>
<th>Type of measure</th>
<th>Recommended Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diet – Individual level</td>
<td>Minimum Dietary Diversity scores for women (MDD-W) and young children (MDD age 6-24 mos)</td>
</tr>
<tr>
<td>Food access – Household level</td>
<td>Food Insecurity Experience Scale (FIES)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of measure</th>
<th>Measurable outcomes – various methods available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food availability and diversity on-farm</td>
<td>Production of target nutrient-rich foods</td>
</tr>
<tr>
<td></td>
<td>Diversity of crops and livestock produced</td>
</tr>
<tr>
<td>Food environment in market</td>
<td>Availability and prices of targeted nutrient-rich foods in local markets</td>
</tr>
<tr>
<td>Economic outcomes</td>
<td>Income, disaggregated by gender to reflect intra-household income control</td>
</tr>
<tr>
<td>Women’s empowerment</td>
<td>Women’s access to and control over resources (assets and income); women’s participation in economic activities</td>
</tr>
<tr>
<td>Nutrition knowledge and norms</td>
<td><em>Indicators will be project-specific</em></td>
</tr>
<tr>
<td>Natural resource management</td>
<td>Access to improved drinking water source</td>
</tr>
</tbody>
</table>
Diet Quality indicators (examples)

- Minimum Dietary Diversity – Women (MDD-W)
- Minimum Diet Diversity – Young Children
- Individual Dietary Diversity Score (IDDS)
- Consumption of specific target foods by individuals (Vit. A or Iron rich foods, among others)
- Quantitative nutrient intakes
- Proportion of the diet consisting of processed and ultra-processed foods
- Consumption of 400gr of fruits and vegetables per day

When to use: If the intervention affects food environments or income, women’s empowerment and/or nutrition knowledge, skills and practices with hypothesized impact on diet quality.

Note: No easy indicator currently exists that can capture diet quality holistically in its entirety (i.e. a diet that follows dietary recommendations). The MDD-W is validated and relatively easy to administer, but it does not capture dietary quality completely because it is an indicator of micronutrient adequacy and diversity, but does not deal with unhealthy amounts or components of the diet. Other dietary quality scores have been constructed (e.g. the Healthy Eating Index, Dietary Quality Index), but these require a full quantitative 24-hr recall. More diet quality indicators are under development. Currently there are several indicators that capture some aspects of diet quality:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>What it measures</th>
<th>Population</th>
<th>Data collection</th>
<th>Data analysis</th>
<th>Notes</th>
</tr>
</thead>
</table>
| MDD-W (Minimum Dietary Diversity – Women of Reproductive Age) | A measure of dietary quality which reflects nutrient adequacy and dietary diversity | Women of reproductive age (15-49 years) | Data are collected on the foods and beverages consumed in the previous 24 hours which are aggregated into 10 distinct food groups. Does not require quantitative food intake. | Several indicators can be derived from the basic data, including (i) proportion of women who consume 5 or more food groups out of ten, (ii) mean dietary diversity score, (iii) proportion of women consuming any specific food group such as animal source foods. | VALIDITY
This indicator has been validated as an indicator of likelihood of micronutrient adequacy among women of reproductive age. There is a recent global consensus on this indicator as the best, most valid measure of women’s dietary diversity; it replaces the WDDS (Women’s Dietary Diversity Score) that had been previously developed by FAO and FANTA. Unlike former measurements, it offers a threshold for women’s micronutrient needs.
CGIAR and USAID Feed the Future have mainstreamed the use of this indicator in their evaluations.
CUT-OFF (Available)
Women who consume foods from at least 5 out of 10 food groups have a higher likelihood of micronutrient adequacy.
METHODOLOGY (Standardized)
Standardized methodology for data collection and analysis is available from FAO and FANTA III, 2016. |
Food Access indicators (examples)

- Household Dietary Diversity (HDDS)
- Food Consumption Score (FCS)
- Experience based measures of food security (FIES/HFIAS/ELCSA/HHS/CSI/MAHFP)

**When to use:** If the intervention affects food production, income, seasonal variation of food access and prices. While there are many existing food security metrics, a suite of indicators that measures each dimension of food security (sufficiency, quality, acceptability, safety, certainty/stability) is not yet established (Coates 2013)

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<th>Data analysis</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Food Insecurity Experience Scale (FIES)</strong></td>
<td>Severity of food insecurity experience</td>
<td>Household or individual</td>
<td>8 question survey module</td>
<td>Thresholds set on the score to classify the severity status of respondents</td>
<td>VALIDITY: The FIES has been collected in over 145 countries since 2014 in the Gallup World Poll. Each country dataset has been validated with the Rasch model (Item Response Theory), demonstrating that the scale is accurately and reliably capturing the latent trait of food insecurity (access dimension). Statistical techniques have been developed to equate country results against a global standard that allows comparison across all countries. The global data reveal that the FIES shows significant and high correlations in the expected direction with most accepted indicators of development, including child mortality, stunting, poverty measures and the Gini index. METHODOLOGY: (standardized) Description of the indicator available at the Voices of the Hungry website.</td>
</tr>
</tbody>
</table>


Food Environment indicators (examples)

• On-farm availability, diversity and safety of food
  – Availability of specific foods
  – Production diversity
  – Functional diversity
  – Proportion of staple crops biofortified
  – Grain loss

• Market level
  – Availability & prices of specific foods
  – Cost of a healthy diet
Income

- Wealth indices/Poverty level
- Income or consumption (secondary data, not collected by projects)
- Household asset index
Women’s empowerment

- Women’s Empowerment in Agriculture Index (WEAI)
- Women’s control of income
- Women’s time use and labor
- Asset ownership by gender
- Qualitative assessment
## Nutrition and food safety knowledge and norms

### When to use:
When intervention is promoting certain nutrition behaviours or messages; or, to understand likelihood of consumption of specific foods or overall dietary patterns for various population sub-groups.

<table>
<thead>
<tr>
<th>Indicator</th>
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<th>Data analysis</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Most will be intervention-specific</td>
<td>Nutrition- and health-related knowledge, attitudes and practices (KAP) at the community level</td>
<td>Usually women</td>
<td>Household survey and/or qualitative process</td>
<td></td>
<td>These indicators will be project-specific, depending on what sort of knowledge or behaviour is promoted. VALIDITY Knowledge and attitudes do not refer to physical objects but to psychosocial and subjective concepts. It is therefore not possible to validate the results concerning knowledge and attitudes in KAP surveys because no objective benchmark or reference exists. (FAO Guidelines 2014)</td>
</tr>
<tr>
<td>Changes in specific behaviours promoted with regard to food safety</td>
<td>Awareness about safety at household (consumers’) level</td>
<td>Households or community</td>
<td>Household survey and/or qualitative process</td>
<td></td>
<td>Indicators would be intervention-specific. They could also be built around the concept of the WHO's 5 keys for safer foods (<a href="http://www.who.int/foodsafety/publications/5keysmanual">www.who.int/foodsafety/publications/5keysmanual</a>)</td>
</tr>
</tbody>
</table>

### Methodology (standardized)
The guidelines comprise predefined questionnaires that capture information on critical knowledge, attitudes and practices related to most common nutrition topics:
[www.fao.org/docrep/019/i3545e/i3545e00.htm](http://www.fao.org/docrep/019/i3545e/i3545e00.htm)

Note: if agricultural knowledge (e.g. knowledge of improved practices) is sometimes assessed in projects, relevant nutritional knowledge could be added.
Care practices

- Minimum Adequate Diet (MAD) for children under age 2
  - Breastfeeding indicators
  - Minimum Diet Diversity for children under age 2 (MDD)
  - Minimum meal frequency
Natural resources management practices, health and sanitation environment (related to agricultural management practices)

- **When to use**: when intervention affects soil or water management, or livestock-human interactions.
- **These indicators will be project-specific**, depending on what area of natural resources or health environment that the agricultural activities may affect.
- The dimensions of the health and sanitation environment most relevant to agriculture interventions could include water quantity and quality, environmental contamination having an impact on food safety, agrochemical exposure, risk of zoonotic or water vector-borne disease and cleanliness of children’s play areas (Presence of animals in or near the home).

<table>
<thead>
<tr>
<th>Indicator</th>
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<th>Data collection</th>
<th>Data analysis</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to improved drinking water source</td>
<td>See indicator definitions</td>
<td>Household</td>
<td>Household survey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence of animals in/near household</td>
<td>Indicates risk of environmental enteropathy</td>
<td>Household</td>
<td>Household survey</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Nutritional status: anthropometric and biochemical indicators

<table>
<thead>
<tr>
<th>Indicator</th>
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<th>Population</th>
<th>Data collection</th>
<th>Data analysis</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stunting</td>
<td>Height for age</td>
<td>Children under 5</td>
<td>Household survey</td>
<td>&lt;2 Z scores is the cutoff for moderate level, &lt;3 Z scores is the cutoff for severe level</td>
<td>Requires carrying height boards to measure heights of children and specific training for accurate measurement. Requires determining child’s age in months accurately. Would usually not allow to show observable changes in many small-scale interventions and over short periods of time.</td>
</tr>
<tr>
<td>Wasting</td>
<td>Weight for height</td>
<td>Children under 5</td>
<td>Household survey</td>
<td>&lt;2 Z scores is the cutoff for moderate level, &lt;3 Z scores is the cutoff for severe level</td>
<td>Requires carrying height boards and weighing scales to measure heights and weights.</td>
</tr>
<tr>
<td>Underweight</td>
<td>Weight for age</td>
<td>Children under 5</td>
<td>Household survey</td>
<td>&lt;2 Z scores is the cutoff for moderate level, &lt;3 Z scores is the cutoff for severe level</td>
<td>Requires carrying scales to measure weights of children; Requires determining child’s age in months accurately.</td>
</tr>
<tr>
<td>Maternal weight/BMI</td>
<td>Weight in kg/height in m2</td>
<td>Usually adult women</td>
<td>Household survey</td>
<td>&lt;18.5 is the cut-off for underweight; &gt;25 is the cut-off for overweight for many countries; &gt;30 is the cut-off for obesity</td>
<td>Requires carrying scales to measure weights of women.</td>
</tr>
<tr>
<td>Iron status</td>
<td>Whether an individual’s body is deficient or replete in iron</td>
<td>Usually women or children under 5</td>
<td>Requires collecting blood for 3-4 different tests of iron biomarkers and usually also requires tests for inflammation.</td>
<td>Assessing the iron status of populations: report of a joint World Health Organization/ Centers for Disease Control and Prevention technical consultation (WHO and CDC, 2007).</td>
<td></td>
</tr>
<tr>
<td>Anaemia</td>
<td>Haemoglobin level</td>
<td>Blood samples</td>
<td>Compare data to WHO universal thresholds that define levels of public health importance.</td>
<td>Document to assess haemoglobin concentrations for the diagnosis of anaemia and assessment of severity available on WHO website (WHO, 2011).</td>
<td></td>
</tr>
<tr>
<td>Vitamin A status</td>
<td>Whether an individual’s body is deficient or replete in vitamin A</td>
<td>Usually women or children under 5</td>
<td>Clinical signs (Bitot’s spots, xerophthalmia); Blood collection; Breastmilk collection. Usually also requires tests for inflammation.</td>
<td>Reference document for assessing vitamin A deficiency in monitoring and evaluating interventions, available on WHO website (WHO, 1996).</td>
<td></td>
</tr>
</tbody>
</table>
• Workshop on MDD-W at FAO, Sept 2016

• FAO Dietary Assessment - A resource guide to method selection and application in low resource settings. To be released 2016.

June 2016

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