

Economic Evaluation of Multisectoral Actions for Health and Nutrition



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Innovative Methods and Metrics for Agriculture and Nutrition Actions

The Agriculture, Nutrition and Health (ANH) Academy Technical Working Groups aim to synthesise innovative methods and metrics to better understand and address complex issues in the area of agriculture, nutrition and health. The Groups explore critical multidimensional issues by bringing together experts from various disciplines including agriculture, environmental science, epidemiology, nutrition, health, food environments, and foodborne diseases. The Working Groups analyse pathways linking agriculture and nutrition using inter-disciplinary approaches.

The ANH Academy Working Group on Economic Evaluations (ANH-EEWG) brings together experts to advance knowledge and scientific understanding among the global research community of economic evaluation methods and metrics related to costs and benefits of agriculture, food and livelihood strategies for nutrition and health.

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Aims

This technical brief was created to advance knowledge and scientific understanding among the global research community of economic evaluation methods and metrics related to costs and benefits of agriculture, food and livelihood strategies for nutrition and health. It was convened by the Agriculture, Nutrition and Health (ANH) Academy in October 2017, in response to growing demands for economic evaluation of agriculture, food and livelihood strategies for nutrition, in order to meet the following specific objectives:

1. **Review current approaches** for estimating costs, benefits and cost-effectiveness of scaling up agriculture, food and livelihood strategies to improve nutrition and health outcomes in low and middle-income countries;

2. **Summarize current gaps and challenges** related to these approaches, and identify opportunities for new methods and metrics for economic evaluation methods in this domain;
3. **Develop principles** for measuring costs, benefits and cost-effectiveness across the range of multisectoral approaches to improve agriculture, health and nutrition, that can be adapted for use under different scenarios.

The brief was created by a technical working group representing a variety of perspectives, and is intended to be readily accessible to individuals with a wide range of expertise. The brief is constructed around a series of visualizations to describe how diverse stakeholders can

best use information on benefits and costs. The brief should help professionals within the SUN movement including national governments, international organisations, NGOs and funding agencies as well as from the private sector and civil society organisations engaged in the development, design and implementation of policies and programs to improve health through multisectoral interventions in agriculture, food and nutrition.

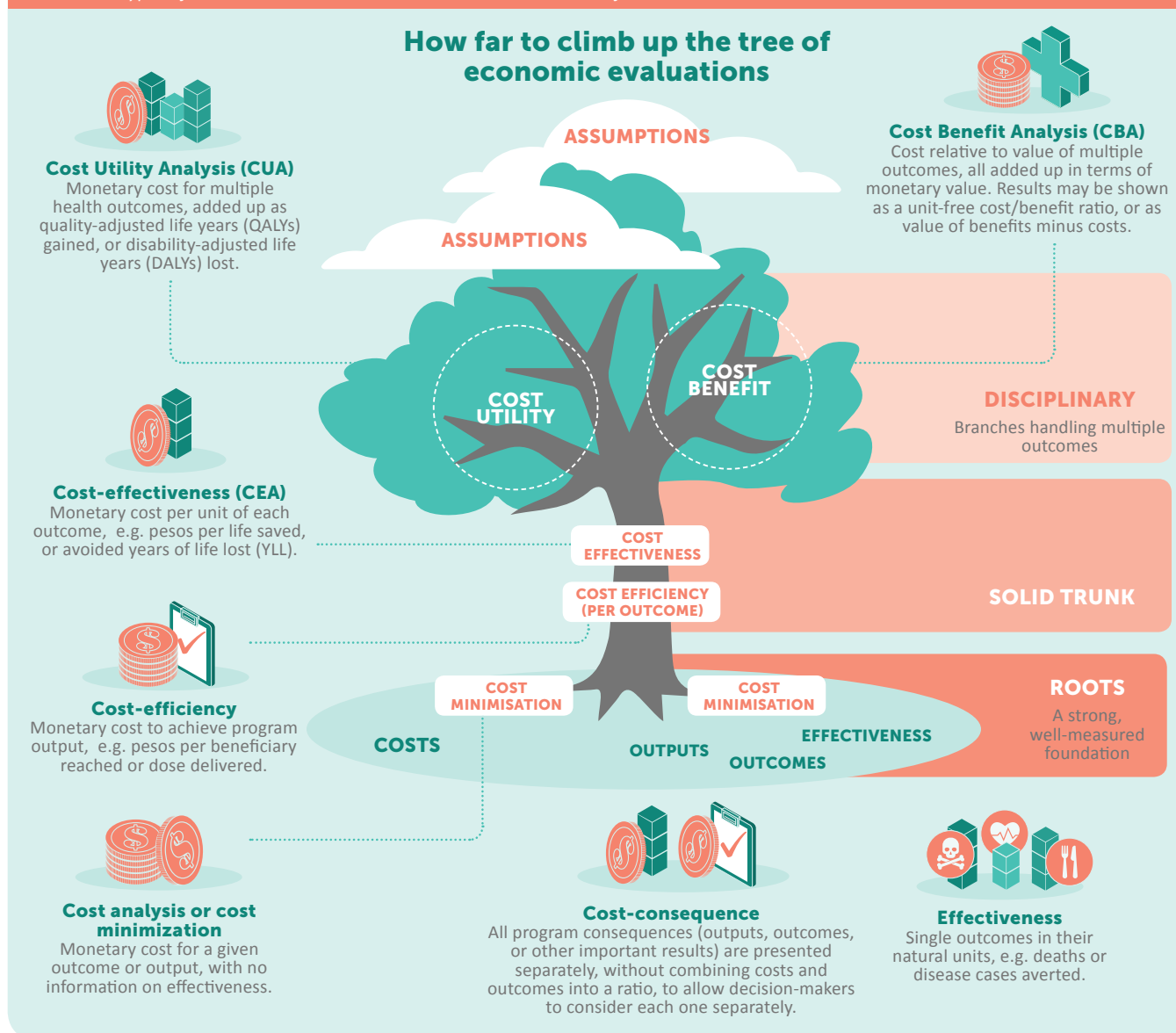
Types of economic evaluations

Economic evaluations can be categorized by what they measure, in terms of costs or resources used and the resulting outcomes or benefits obtained. Figure 1 presents the family of economic evaluation methods, summarizing the major types of evaluations in terms of units used to measure outcomes.

The resources used and results obtained in any effort can be counted in natural units, adding up quantities such as the number of full-time workers or the number of people helped, and then compared to each other using measures such as the effectiveness of each worker in preventing a specific disease. Typically monetary units are used as measurements for inputs such as workers and transportation and office space. These can then be compared to specific outcomes, providing the cost-effectiveness of alternative ways to avert a given disease. To combine different kinds of outcomes, health improvements can be added up over multiple diseases. In the case of improvements in mortality, deaths averted or years of life lost (YLLs) can be used, while in the case of illness the burden of living with each disease can be calculated by weighting years as quality-adjusted life years (QALYs) or disability-adjusted life years (DALYs).

Decision-makers wishing to choose the most cost-effective intervention to improve health, can compare a monetary cost to the deaths averted, QALYs gained or DALYs saved by each intervention. Others may be interested in calculating, combining and comparing health improvement with other kinds of gains, such as girls' education or sustainable agricultural practices. For those comparisons, outcomes are added up in terms of monetary units, so different interventions can be compared in terms of their cost-benefit ratio. Analysts can also subtract costs from benefits, to obtain a net present value. Text box 1 provides additional details on standard economic evaluation methods for measuring costs and benefits

FIGURE 1. Types of economic evaluation discussed in this technical brief



Text box 1: The Family of Economic Evaluation Methods¹

A number of approaches are available to understand the economic costs and impact of programs, policies and interventions on agriculture and health outcomes.



In the health sector, the most common type of economic evaluation is **cost effectiveness analysis (CEA)**. CEA compares the costs and outcomes of two or more alternatives or compares a new intervention or treatment with the status quo. CEA relates the net costs associated with a health outcome, such as cost per disease avoided, cost per death avoided, or cost per additional expected life year. The net cost includes the cost of delivering a specific intervention to prevent a disease or unwanted health outcome minus the treatment and other costs not incurred because of the beneficial effects of the intervention. A ratio is calculated for each alternative intervention: the numerator is the cost, expressed in money terms (dollars); the denominator is the measurable health outcome. Although there are many effectiveness measures that attempt to capture both morbidity and mortality in a single metric, the health outcome is typically expressed in terms of the gain in years of life. The intervention with the lowest dollar value per health benefit is the more cost-effective of the two or more alternatives.



Cost utility analysis (CUA) is often mistaken for Cost Effectiveness Analysis. It attempts to incorporate the dimension of quality of life into the measurement of benefits. Benefits are measured as “quality-adjusted life-years”, or QALYs, in which the gain in expected lifespan resulting from an intervention

is weighted by the quality of that life, as assessed through some type of systematic surveying of the affected (or general) population. Thus, an intervention that leads to a ten-year gain in life expectancy, but implies considerable pain during those years might be estimated to have a lower QALY than an intervention that results in only an eight-year gain in years, but with less pain during that period. Although there is considerable debate about the optimal ways to assess the subjective “quality” dimension, analysts generally agree that QALYs are closer to the fundamental concept of health benefits than are the standard physical measures used in cost-effectiveness analysis. Disability-adjusted life years (DALYs), another type of CUA, is more commonly used in global health settings, representing years of healthy life lost due to mortality and morbidity from a disease. This indicator combines the years of life lost due to early death with the years of life lived with disability. Poor health and nutrition conditions that result in premature death and disability will result in a larger burden of DALYs. DALYs measure the health gap between actual health and a defined ideal health achievement, and thus are typically something we want to minimize (Guinness and Wiseman 2011).



Cost benefit analysis (CBA), more commonly applied in agriculture, energy and infrastructure sectors, is an evaluation method in which the benefits of the intervention are expressed in money terms. A ratio of benefit to costs of less than one reveals that the intervention generated less benefit than it cost, while subtracting costs from benefits yields the program’s total value to society. In the health sector, CBA requires monetizing health benefits – i.e., placing a dollar value on the number of deaths averted or the life-years gained.

While CBA is a popular method for decisions about the advisability of allocating resources to investment projects, until recently it has been less well accepted for evaluating investments in the health sector (or other social sectors). Placing a dollar value on health benefits has faced both conceptual and empirical difficulties, which have recently been addressed through a series of guidance papers developed by Harvard School of Public Health (Robinson et al 2018).



Cost minimization analysis, the simplest form of economic evaluation, compares the costs of two or more competing interventions; the cheapest one – regardless of differences in effectiveness – wins the competition for resources. This type of analysis is a sensible approach to allocating resources efficiently when the effectiveness of two interventions is identical, a rare circumstance. The most basic type of economic evaluation is a cost analysis, which is a partial form of economic appraisal because it looks only at the costs of the programs and provides no information on the health outcome of interest. A cost analysis can be used when the effectiveness of an intervention is not yet known. For instance, if we are evaluating a pilot project that lasts two years, but the impact on health outcomes is not expected until several years beyond that, then we may want to have information on cost of reaching intermediate targets. Also, a cost analysis is useful for comparing two interventions where the effectiveness is not the same (Drummond et al 2015, Sanders et al 2016).

Many excellent texts are available for those interested in additional information about economic evaluation methods.

¹ This text box draws heavily from Levin, R. ‘Cost-effectiveness of Immunization: Asking the Right Questions.’ In ed. Bloom, B. and P. Lambert. *The Vaccine Book*, San Diego: Academic Press, 2003, with the permission of the author.

Existing guidelines

for economic evaluation in health and agriculture

A number of existing resources provide recommendations or specific guidance for evaluating and comparing sector-specific investments in health, including both health care services such as vaccination, and public health investments such as anti-smoking campaigns (Walker 2001). These range from general guidance on which costs to include, guidance for calculating benefits in terms of cases of disease averted, lives saved, and DALY or QALY metrics, and guidance for national or international disease-specific programs, such as HIV, TB, or immunization (Kumaranayake, L., et al. 2000, WHO 2002, Walker et al 2010). In an effort to improve the consistent application of economic evaluation methods in low and middle income countries, the Bill and Melinda Gates Foundation has funded a series of reference cases to support cost, cost-effectiveness and benefit cost analyses in global health. The reference case is a standard set of methodological principles aimed at improving the comparability and transparency of cost, CEA and CBA results designed to inform decision-making. It provides guidance for the planning, conduct and reporting of economic evaluations, while allowing analysts flexibility to design appropriate studies given the specific objective for a particular health problem. The methodological principles are generally organized along key components of economic evaluations related to clearly identifying context, comparators, perspective, measurement of the outcome, measurement of costs, uncertainty, budget impacts and equity.

Key reference cases include:

IDSi Reference case on economic evaluation

- Wilkinson, T., Sculpher, M.J., Claxton, K., Revill, P., Briggs, A., Cairns, J.A., Teerawattananon, Y., Asfaw, E., Lopert, R., Culyer, A.J. and Walker, D.G., 2016. The international decision support initiative reference case for economic evaluation: an aid to thought. *Value in Health*, 19(8), pp.921-928.

GHCC Reference case on global health costing

- Vassall, A., Sweeney, S., Kahn, J., Gomez, G., Bollinger, L. and Marseille, E., 2017. *Reference Case for Estimating the Costs of Global Health Services and Interventions*. Seattle, WA: Global Health Cost Consortium.

Harvard School of Public Health BCA guidelines

- Robinson, L.A., Hammit, J.K., Jamison, D.T. and Walker, D.G., 2019. Conducting Benefit-Cost Analysis in Low- and Middle-Income Countries: Introduction to the Special Issue. *Journal of Benefit-Cost Analysis*, 10(S1), pp.1-14.

In addition to the reference cases, landmark publications include:

- Drummond, Michael F., Mark J. Sculpher, Karl Claxton, Greg L. Stoddart, and George W. Torrance. *Methods for*

the economic evaluation of health care programmes. Oxford University Press, fourth edition, 2015.

- Sanders GD, Neumann PJ, Basu A, et al. Recommendations for Conduct, Methodological Practices, and Reporting of Cost-effectiveness Analyses. Second Panel on Cost-Effectiveness in Health and Medicine. *JAMA*. 2016; 316(10): 1093–1103.

Outside of the health sector, a wide range of other textbooks and guidelines address economic evaluation in general, and cost-benefit analysis in particular. Applications to the agricultural sector became an important specialized field in the 1960s, leading to the World Bank's *Economic Analysis of Agricultural Projects* by the aptly named J. Price Gittinger first published in 1972, with new editions through the 1980s. Recent guidance is provided by:

- Boardman et al. *Cost-Benefit Analysis: Concepts and Practice* (4th ed., 2017).

Like the health-sector guidelines, these resources aim to identify which costs to include, what benefits should be attributed to each intervention, and how costs and benefits should be compared. Often their focus concerned the valuation of environmental improvements and other gains for which there is no market price, drawing on the specialist literature in each field.



Costs and benefits

of multi-sectoral actions for nutrition and health

Our focus in this brief is the particular challenge of measuring and comparing the health improvements that come from programs and policies affecting agricultural production, farmers' livelihoods and the food environment of urban and rural households. In low-income settings, most agricultural interventions continue to aim primarily at employment and poverty reduction, but an increasing fraction is focused on other aims. For example, in the Sustainable Development Goals, SDG 2 is to "End hunger, achieve food security and improved nutrition and promote sustainable agriculture". Increasingly, donors and international financial institutions, such as IFAD, want to ensure that their investments maximize the contribution from agriculture and rural development to eliminate malnutrition (de la Pena et al. 2018).

Multisectoral interventions to improve nutrition and health involve different types of cost, incurred in diverse ways by a variety of agencies. Few studies have attempted to add them up (Ruel et al 2018). Much of the existing literature on how agriculture and food relate to health outcomes involves system-wide modeling or

impact assessment of interventions (Finaret and Masters 2019). The few studies that look at cost-effectiveness of agricultural or other interventions for health typically address either biofortification, when crop breeding is used to increase the micronutrient content of staple foods (Meenakshi et al., 2010; de Brauw et al., 2015), home gardens to increase vegetable intake (Puett et al., 2014) or livestock transfer programs to improve incomes and nutrition (Clements, 2012).

Evidence on the costs of agricultural interventions, policies, and programs is also scarce, hindering analysts' ability to compare, measure and consistently incorporate costs across multisectoral efforts to improve nutrition. Many proposed agricultural projects conduct ex-ante cost-benefit analyses as a means of selecting among alternative designs for a particular intervention and numerous books are available to assist in guiding CBA and economic analysis for the sector, such as Gittinger (1995). A recent review (Wessshuhun, et al., 2018) found that 56% of the 171 impact papers on agricultural research published between 2008 and 2016, focused on

economic impacts of the policies, programs, or projects; 42% considered social impacts such as food security or equity. Only a handful addressed environmental or financial sustainability concerns. Agricultural assessments focus on measures such as changes in productivity due to the introduction of an improved variety or other yield enhancing technology (Walker and Alwang, 2015). Many go further to estimate the implications for household income, and how any improvements in income might lead to asset accumulation. A major challenge is that the diffusion of new agricultural technologies typically takes a much longer time than a health intervention like a vaccine. Moreover, if a more productive new variety ends up covering a large area, it can have significant spillover effects over time. For example, research has shown that the poverty reducing impact of the Green Revolution in India was principally due to the lower food prices and increased demand for labor the improved technology package generated, rather than the increase in yields alone (Pingali, 2012).

Bringing together agriculture and health into a single economic evaluation poses conceptual and empirical challenges. Investments in agriculture and livelihoods yield a multitude of benefits, not all easily captured in a single health outcome measure. The benefits of agriculture, food and livelihood improvement range from food security and increased income, to improved dietary diversity, nutrient consumption and nutritional status as well as women's empowerment, social inclusion and subjective wellbeing. Many of these benefits are difficult to measure accurately. There may also be long-term benefits that often go unmeasured, such as reduced risk of chronic disease in later life, intergenerational impacts on nutritional status, and cognitive development. Impact pathways are often interlinked, meaning that benefits overlap and are difficult to isolate. Interventions often work indirectly through households and markets rather than through individual responses, thus the evidence relies on modeling how society as a whole is likely to respond. Most actions cannot be tested by randomized assignment so different kinds of evidence must be used. There are also important trade-offs across the pathways that are not straightforward to assess.

Empirically, estimating the costs of health interventions may focus on inputs associated with service delivery, and more recently activity based costing exercises, however, agriculture interventions tend to be more complex to cost out than health interventions due to the higher variability in components (across individual farms rather than individual facilities) used for an intervention to succeed. Further, health interventions have a direct measurable impact on individuals, which is typically harder to capture for agricultural interventions. For example, contrast assessing the cost-effectiveness of introducing a vaccine compared to a new nutritious crop variety. The vaccine, delivered through a health center or outreach campaign directly, confers a distinct, measurable benefit to that individual of no longer being susceptible to a disease. The costs are clear: the vaccine itself, the storage, transportation, and delivery costs of the vaccine. The determination of the single outcome of, e.g., disability-

adjusted life years saved is relatively straightforward as the number of direct beneficiaries is known, and the former disease prevalence and cost of disease treatment is often available through existing records.

In contrast, the introduction of a new crop variety to a household is more challenging to calculate. The household may or may not choose to grow it as they do not know beforehand how it will perform compared to other varieties of the same crop they are growing and whether it meets their own taste preferences or those of the market. The performance of the variety will depend on a variety of factors including the quality of the planting material, the agro-ecology, and the degree of management. Performance can also vary by season. Thus, the cost analysis must cover a much wider range of factors: purchased inputs, labor, etc. that can vary significantly between households and across seasons and years; hence requiring more complex data collection protocols. The potential outcomes are numerous: improved food security and productivity, higher incomes, enhanced diet quality, reduced dependency on purchased food, etc. In addition, the direct beneficiaries are likely to vary within and across households. Moreover, if the variety is sold, the benefits extend beyond the household. The introduction of the variety could also potentially alter the portfolio of crops produced, with the changes among other crops in the enterprise needing to be brought into the analysis.

In summary, the disparate nature of agriculture and health objectives and their methodological differences in how they estimate impact and costs makes it difficult to identify which costs to include, and how to add up the resulting benefits when considering multisectoral approaches. The remainder of this section is aimed at developing a framework that helps to measure the costs and benefits of complex agriculture, food and livelihood strategies aimed at improving nutrition outcomes. We start by defining agriculture and livelihood activities broadly and considering a typology of interventions that can then be broken down into broad categories of activities and inputs.

TYPOLOGIES OF INTERVENTIONS

The links between food systems, diets, nutrition and health are manifold and complex, involving a range of direct and indirect effects and lags (Turner et al 2018). Building on previous research (Hawkes and Ruel 2011), Gelli et al (2015) identify four interlinked pathways through which interventions in food systems and agriculture value chains could have an impact on diets and nutrition outcomes. These pathways are based on leveraging (i) demand of nutritious foods (ii) supply of nutritious foods as well as (iii) enhancing nutrition along the agricultural value chain, and (iv) empowering women. These pathways also provide a basis for measuring costs and benefits of specific interventions, and compare investments across different contexts. The focus on agricultural value chains captures the pathway between agriculture and income, and allows us to link these activities with efforts to stimulate demand for nutritious foods. This framework is general enough to capture many possible activities and results, and can be applied to other sectors, such as social safety nets.

Based on De la Pena et al (2018), a brief summary of each pathway is described below, providing background to interventions and how activities affect the costs and benefits of individuals, government and society.

Pathway 1 – Changing demand for nutritious foods.

This pathway applies when food-related nutritional challenges arise as a result of under-consumption of or low demand for nutritious food, or excessive demand for unhealthy foods. Increased intake of nutritious foods can be promoted through interventions that provide direct transfers and subsidies, or indirect market channels involving behavior change campaigns or social marketing promoting the consumption of, or willingness to pay for, nutritious food, or discouraging excess consumption of unhealthy food. The availability (quantity available on the market), affordability (price) and quality (e.g. nutrient profile and safety) are key issues that influence food

purchase and consumption. The intake of a specific food complements the consumption of other foods in the diet, which may be self-produced or purchased on the market. Improved diets, when accompanied by adequate feeding, health and hygiene practices can then contribute to improved health and nutrition.

This pathway can also influence value chain actors since greater demand for nutritious foods can lead to expanding marketing opportunities (see pathway 2). Moreover, increased demand for nutritious foods can play an important role in stimulating agricultural production, particularly for smallholders who face market access constraints. In addition, by improving knowledge on child health and care practices, behavior change communication (BCC) efforts could also influence the other immediate behavioral and health determinants of child malnutrition and lead to improved nutrition status of children in the first 1000 days of life window.

Pathway 2 – Changing the supply of nutritious foods.

This pathway targets interventions on actors in the upstream segment of a value chain (e.g. producers) who often face multiple constraints in responding to demand from actors further downstream (e.g. retailers, processors) as well as from their own consumption needs. Interventions would look to alleviate these constraints, strengthening market channels while increasing production, reducing transaction costs and risk, leading to increased efficiency and profits, and in time, to improved incomes of the food producers. In addition, the increased supply of foods, increased production and incomes for smallholders could mean that some additional income feeds back into dietary decisions, alongside increased consumption from own production, further increasing consumption and demand for nutritious foods (see pathway 1). Interventions would aim to increase nutritious food production through input provision and/or training on improved management practices, including the promotion of improved production technologies, and increasing access to credit to stimulate investment in production.

Pathway 3 – Enhancing nutrition-related value addition.

In addition to economic value, the nutrient content, food safety or contamination risk of a particular food can also be enhanced or diminished at key points along a food value chain. Moreover, by influencing supply volumes (quantity), price, and quality (including nutrient content and food safety/contamination) of a relevant food, value chain performance can influence diets and nutrition of a broad range of target populations. These effects will be both direct (e.g., on producers through the provision of value chain services) and indirect (e.g., on consumers through market availability and prices). However, for nutrition related value-addition to factor in investment strategies and in value chain transactions requires reliable information (through publicly supported information campaigns or private consumer reporting, for example) on both nutrient content and contamination risk to be transmitted along the chain and for prices to reflect a premium for these qualities.

Pathway 4 – Empowering women.

There is growing evidence that women's empowerment is a fundamental driver of improving nutritional outcomes (see van den Bold 2013 for a review of the evidence). As women play important roles in production and value addition, agriculture has the potential to empower women to make better food-, health- and care-related decisions for themselves and their families. Participation in value chains carries important opportunities to expand benefits to women by increasing women's assets, skills, and decision-making power within both households and communities (Quisumbing et al., 2014). Interventions aimed at minimizing unintentional consequences of agricultural development, especially related to expansion and formalization of markets, including increasing access to credit, on women's time burden, energy balance or control over income are critical to protect women's investments in family health and well-being. Women's empowerment is a crosscutting issue that can comprehensively influence value chain processes, performance and related impact pathways for supply, demand and enhancing nutrition-related added value.

This framework can be used to develop a typology for intervention design as described in the scenarios below. Specifically empowering women to be active participants in these interventions is considered to be fundamental for success.

Interventions to change the supply of food.

In some contexts, where ample demand for a specific nutritious food from consumers may exist but the supply side is constrained, interventions would mainly aim to relax these constraints by, for example, improving the organization of production or introducing new production technologies to enhance supply. The more immediate intended effects of interventions to increase supply involve changes in production and post-harvest practices, mitigating risks from climate and markets, and improving and stabilizing prices of nutritious food. In other cases, interventions could introduce new types of nutritious foods. When introducing a new food within a target population, interventions would aim to develop a stable source of supply while at the same time investing in demand promotion for the food. Such interventions, such as the introduction of bio-fortified crops or new fortified products are generally the most resource intensive on both the production and consumption sides. In other cases, the intervention may aim to reduce the supply of unhealthy foods. For example, by setting nutrient- and food-based standards for the foods available in institutional settings like schools. Another example involves regulation to reduce the sugar, fat and/or salt content of processed food products.

Interventions to change demand for food.

In the context where foods are widely produced but are not consumed by the target populations, interventions would strive to enhance demand for nutritious foods through social marketing or potentially through public procurement programs, like school meals. Behavior change campaigns can combine the promotion of both the consumption of specific foods and healthy behaviors and feeding practices. Nutrition labeling of food products

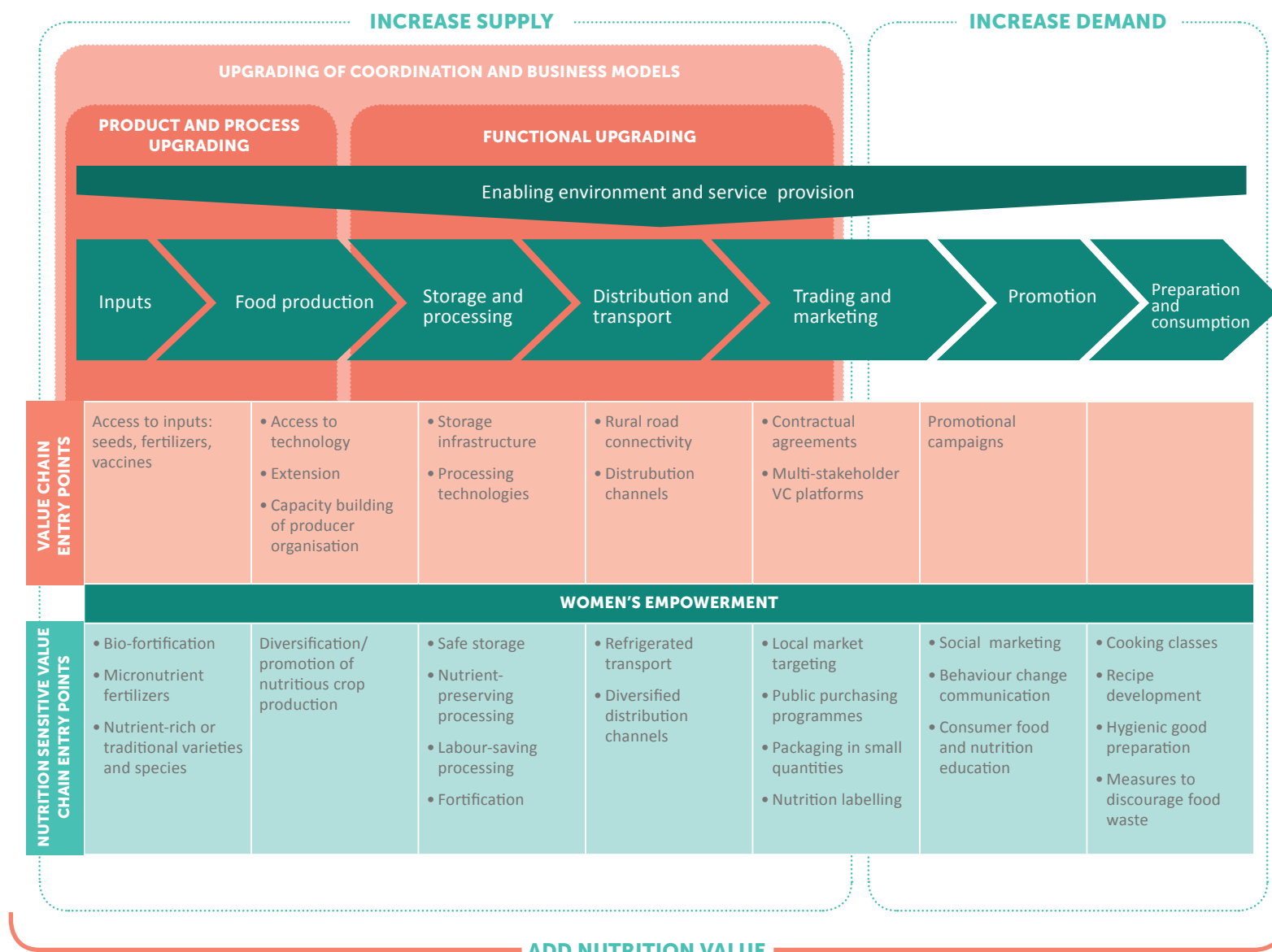
may also facilitate consumers to choose nutritious foods and reduce demand for unhealthy foods. Behavior change campaigns or fiscal policy measures, such as taxes, are examples of interventions that might have the potential to reduce the demand for unhealthy foods.

Interventions to enhance value chain organization and performance.

Where both demand and supply exist for a nutritious food, interventions may be needed to enhance 'nutrition' added value or optimize transactions in the existing value chain. This could be achieved by reducing the overall costs per nutrient output, for example, through fortification, by combining different foods, or by reducing contamination and food safety risks. Intervening can increase efficiencies or reduce nutritional leakages or threats to food safety. Interventions may be related to improvements of information flows and the provision of quality assurance and regulatory guidelines. These interventions can result in increased efficiency (e.g., enhanced nutrient content or reduced contamination per unit price of food) or increased knowledge and willingness to pay for a nutritious and safe food.

The diverse examples described above can be brought together in a single diagram through Figure 2, illustrating the range of interventions that might be subject to economic evaluation.

FIGURE 2. Interventions in agriculture for nutrition and health








How do non-farm investments relate to multisectoral pathways and interventions?

So far, the intervention typologies have focused on agriculture. However, there may be other interventions that improve nutrition through improvements or diversification of households' non-farm livelihood strategies. Drawing from the DFID livelihoods framework, we include evidence on cost-effectiveness evaluation of interventions that could support non-farm livelihoods interventions by increasing any of five different types

of livelihood capital (Scoones et al 1998): human, social, natural, physical, and financial. In turn, these interventions can improve nutrition outcomes through one or more of the key pathways (demand and supply of food, value chains, and women's empowerment). Examples of livelihood capital, non-agricultural interventions to increase this capital, and the main pathway through which they may improve nutrition, are given in Table 1.

TABLE 1: Types of non-farm interventions and links to pathways for improved health and nutrition

Type of livelihood capital	Examples	Types of non-farm interventions to support rural livelihoods	Main pathway
 Human capital	Skills, knowledge, and ability to pursue different livelihood strategies	<ul style="list-style-type: none"> Education programs Technical and vocational training schemes 	Pathway 2 – Changing the supply of nutritious foods
 Social capital	Social networks, including political power and affiliations	<ul style="list-style-type: none"> Women's groups Mentoring schemes 	Pathway 4 – Empowering women Pathway 1 – Changing the demand of nutritious foods
 Natural capital	Natural resource stocks (e.g. soil) and environmental services (e.g. pollination)	<ul style="list-style-type: none"> Reforestation programs Conservation interventions 	Pathway 2 – Changing the supply of nutritious foods
 Physical capital	Inputs in production, like land or machinery	<ul style="list-style-type: none"> Land titling programs Provision of equipment for off-farm livelihood activities (e.g. provision of sewing machines) 	Pathway 2 – Changing the supply of nutritious foods
 Financial capital	Capital base, such as cash, credit, and savings	<ul style="list-style-type: none"> Credit and savings groups Microfinance Cash transfers 	Pathway 2 – Changing the supply of nutritious foods



TYPES OF DATA SOURCES

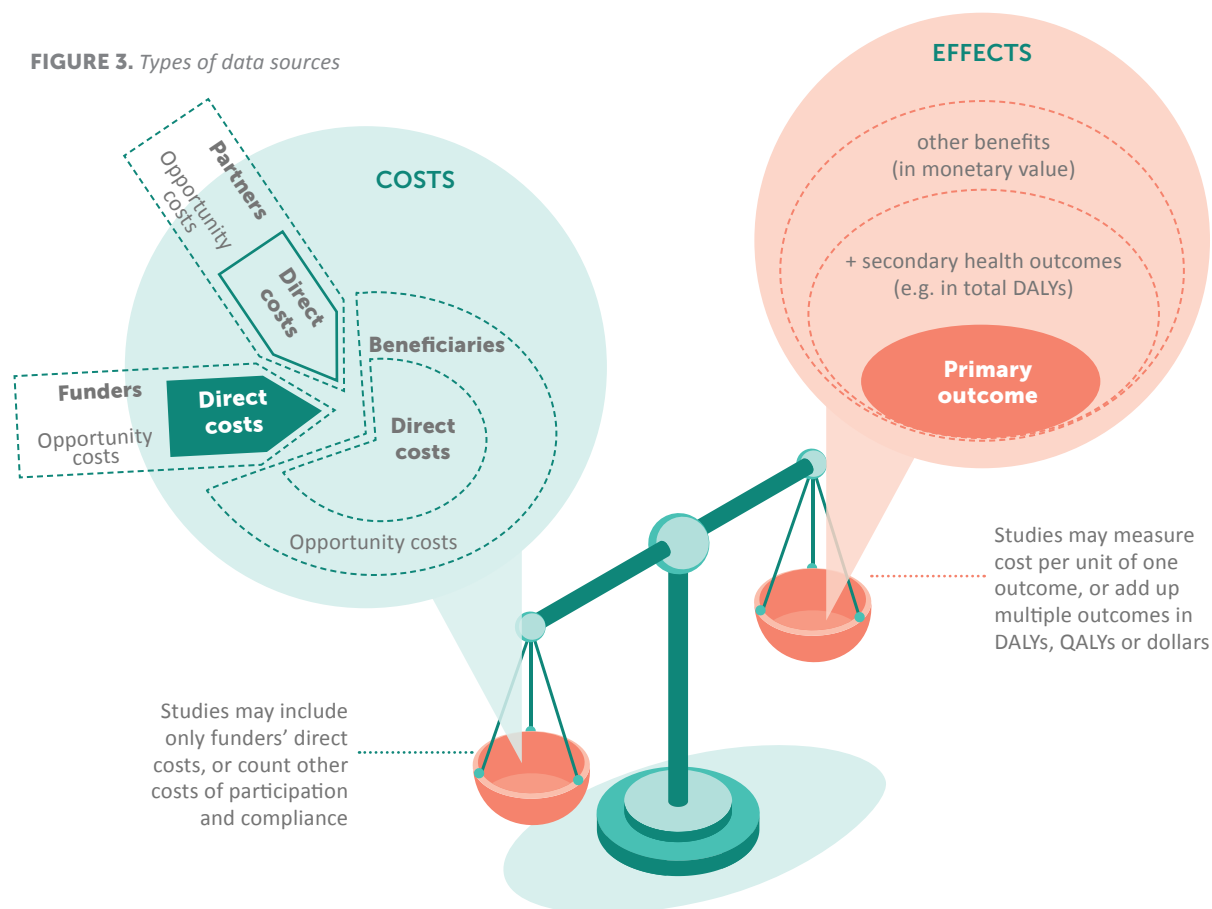
On the cost side, evaluation often begins with the direct costs of the funder or provider. In global health and development, frequently an external donor provides financial resources for a specific program or project, and thus one source of cost data is in the form of an expense report with specific line items for that initiative (Figure 3). Typically, the donor's institutional costs of deciding to support this activity instead of other activities is not usually counted, if only because those opportunity costs do not differ across the projects being compared. When there are multiple funders or partners in the project, including national governments, international agencies and international or local NGOs, it is critical to identify all the activities that involve their direct costs, as well as capturing opportunity costs of staff time from all implementing partners. To evaluate projects that require very different amounts of partner involvement, for example that include both collaborative activities and budgetary transfers, it is recommended to include the opportunity cost of all partner's staff time being devoted to that project instead of other activities. A similar choice arises for the beneficiaries themselves who choose to participate in the targeted activities as opposed to other opportunities they may have. For government partners, local NGOs and beneficiaries, capturing information on resource use and costs may require data collection activities using interviews, observations and administrative record review. It is critical from the outset to create a set of activity and input codes that differentiate between major categories of activities and inputs that the finance officers understand and use.

Measuring the gains from the intervention begin with calculating changes in a number of intermediate outcomes that ultimately yield benefits to individuals. These may be increases in household agriculture or livestock sales, other increases in household income, increased household or individual food consumption or improved household food security. These then result in changes in one or more primary health and nutrition outcomes measured in

their natural units, such as child stunting. While in some programs the primary outcome of interest is food security or dietary diversity, in interventions designed to improve nutrition status, these become an intermediate outcome linked to the primary outcome of improved health and nutrition status. When feasible, primary health outcomes may be converted to health gains measured as deaths or

disability averted, or they may be combined using a single metric such as DALYs. In benefit cost analysis, health gains may be monetized and combined with other gains using monetary values. Evidence on changes in intermediate and primary health outcomes come from a variety of sources, including randomized controlled trials, program or project impact evaluations, or program monitoring.

FIGURE 3. Types of data sources



TYPES OF STUDY DESIGNS

Having decided on the scope of data to be included, a variety of research methods can be used to estimate how much improvement can be attributed to the costs incurred. Figure 4 illustrates the principle that observers can only see what is in view, which may be subject to selection bias about what kinds of evidence has been sought in the past. The geographic and temporal scope of previous studies often limits what can be seen, for example regarding the impact of early life conditions on adult health is visible only after 30 or more years have elapsed, and the impact of rural roads, electrification and markets affects all aspects of the communities they serve. Economic evaluation that uses only evidence from single trials or demonstration projects will, by definition, be able to detect only the effects of relatively narrow interventions with relatively rapid results.

Standards of evidence can also differ greatly in terms of scientific rigor and validity. A single study may be flawed in many ways, so it is only when the same effect is investigated in other locations by other researchers that systematic reviews can begin to draw generalizable conclusions about its magnitude and significance. However, even with systematic reviews, different analyses might come to different conclusions. Since the available evidence is always imperfect, the task for economic evaluations is to consult a variety of experts and draw upon the largest possible set of previous research, whilst maintaining a high level of transparency about which studies were included in calculations of benefits and costs.

FIGURE 4. *Types of study designs*

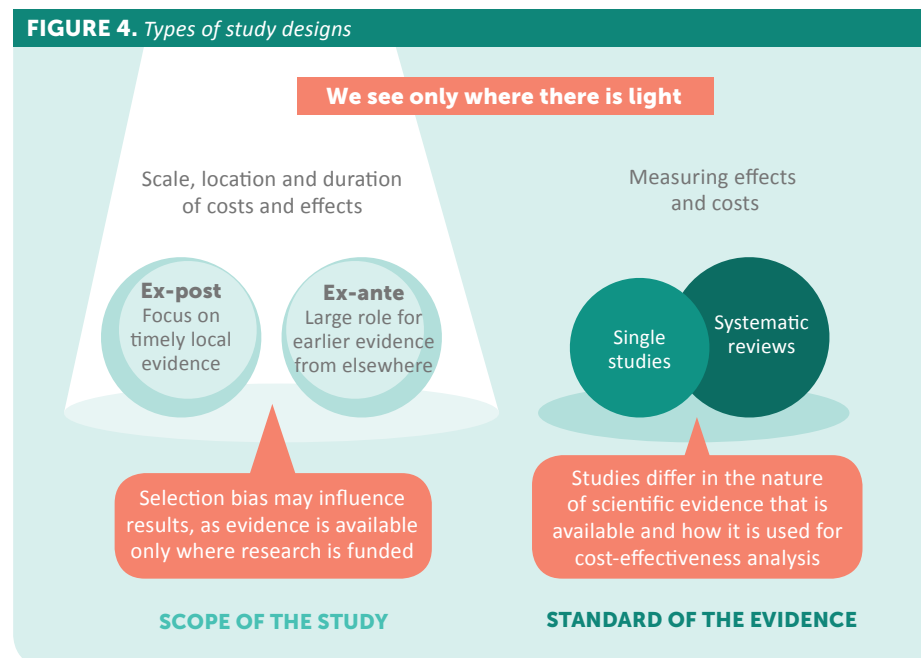
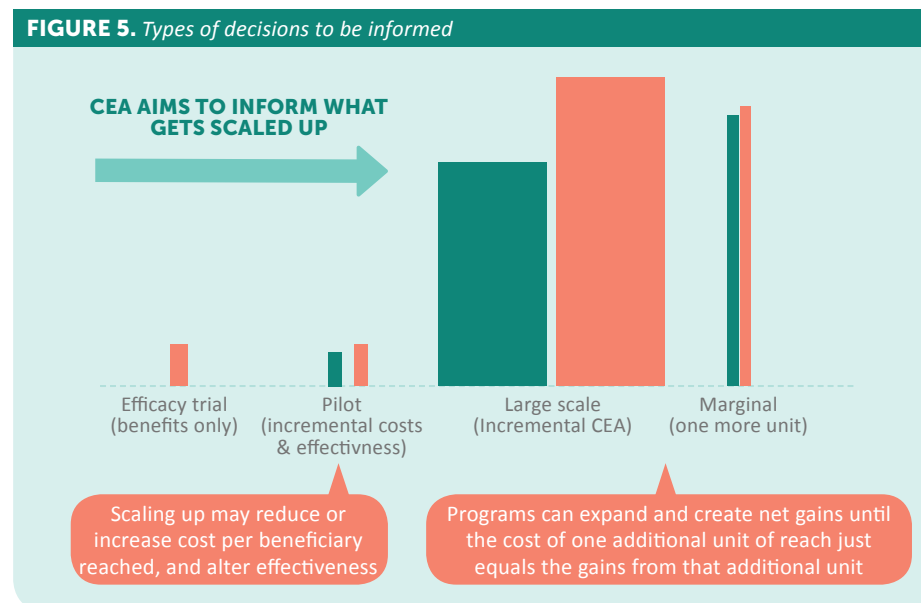


FIGURE 5. *Types of decisions to be informed*



TYPES OF DECISIONS TO BE INFORMED

Another way in which economic evaluations vary relates to the decisions they are required to inform. Figure 5 illustrates the range of cost-effectiveness analysis that can be done, to inform which strategies get scaled up, to serve which populations. CEA may begin with results from efficacy trials, which measure the effects of a given intervention when applied in an ideal setting. Pilot programs or demonstration projects measure effectiveness by measuring the effect of the intervention in real-life settings.

Scaling up beyond the pilot stage often leads to significant changes in cost-effectiveness, because of increased efficiency in some things that become easier to do at large scale, or inefficiency and rising costs for things that face binding constraints. The same intervention may enjoy scale economies up to a certain stage and then diseconomies after. For example, investment in irrigated fruit and vegetable gardens becomes increasingly effective over time as specialist providers develop location-specific skills, up until the point where water constraints limit the potential for further expansion.

Ultimately, once a policy or program exists at scale, decisions about incremental expansion can also be informed by CEA, taking the existing infrastructure as given to guide each additional step. This kind of analysis is often very important in agriculture, food and livelihood programs, for example, regarding the value of seed multiplication programs that might help spread a biofortified variety after it has been developed.

Toward a standard set of metrics

for measuring costs and benefits of agriculture, food and livelihood strategies to address nutrition and health

FRAMEWORK FOR MEASURING COSTS AND BENEFITS ALONG THE IMPACT PATHWAY

The measurement of costs and benefits of multisectoral strategies should follow the principles and best practices outlined in the reference documents provided in section III. However, there is some flexibility within these guidance documents. We present a framework that can help identify standard intervention components, activities and inputs, with the aim of moving toward a set of unit costs and benefits that are roughly comparable across interventions and different settings. The framework uses four steps to combine information from an intervention typology with a generic program impact pathway. The four steps are described below.

Step 1 builds on the generic typology of interventions described above and shown in figure 2. The analyst identifies broad and narrow categories of interventions. For instance, the project may have multiple intervention components to increase both demand and supply. The specific demand component may be a behavior change communication for infant and young child feeding. The specific supply side component may be inputs and training to community farmer groups to support vegetable production. The analyst can identify all relevant broad and more specific components within the intervention.

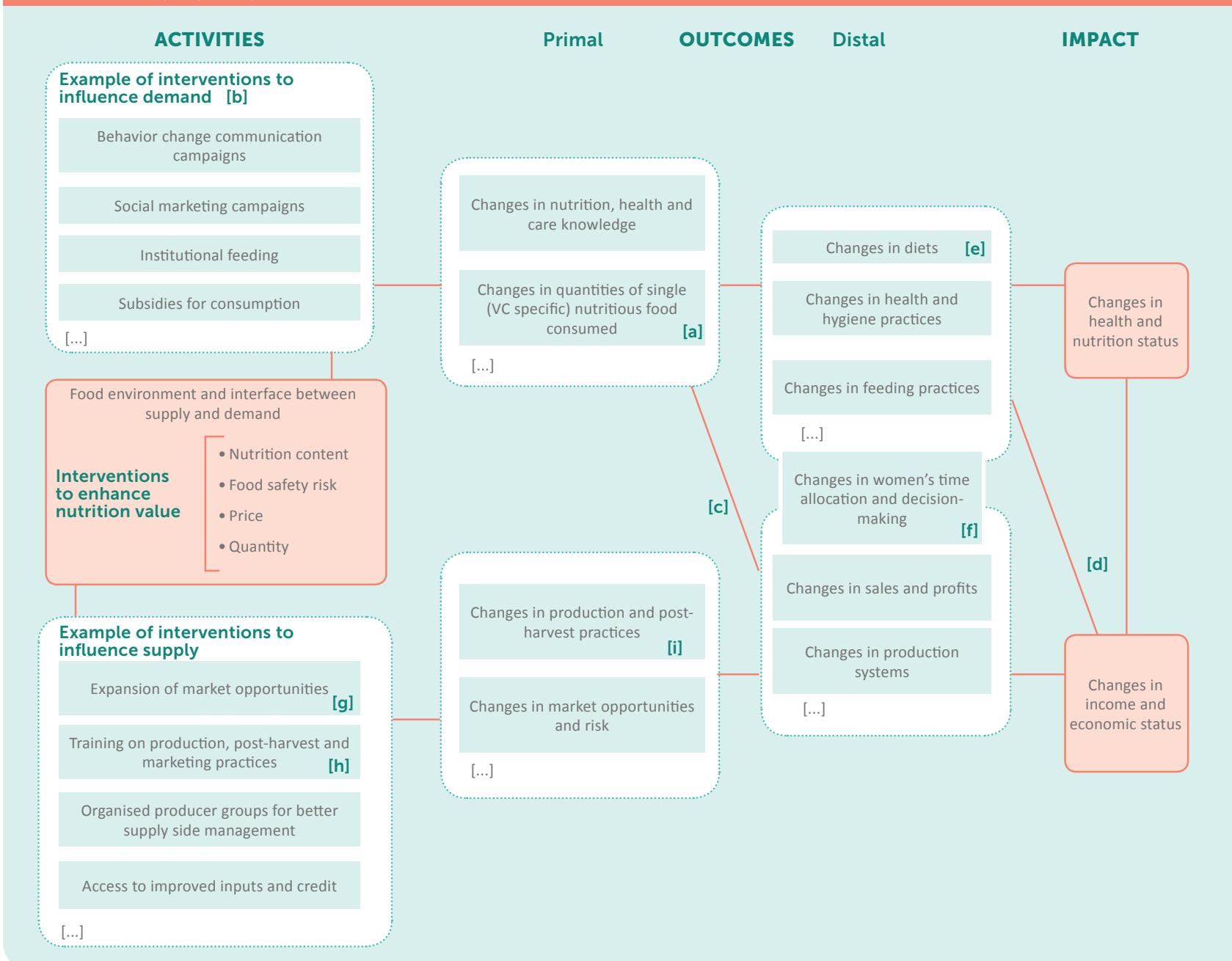
Step 2 maps the program impact pathway for the intervention. A generalized program impact pathway is shown in figure 6. Program impact pathways are a way to operationalize the theory of change and clearly articulate the intervention activities and how they are linked to immediate, intermediate and final outcomes of an intervention. The framework is similar to results frameworks proposed by many donors, such as USAID, DFID and GIZ. It is vital that the program impact pathway must be mapped out before implementation begins, by engaging project stakeholders (government partners, implementing partners, beneficiaries) in an iterative process to operationalize the intervention. Once a program impact pathway is created a priori to implementation, implementers and researchers can use it to guide the choice of methods and tools to evaluate effectiveness, acceptability, feasibility, and costs.

Step 3 identifies activities, costs and inputs along the program impact pathway. Moving from left to right in figure 6, the analyst would identify costs associated with intervention activities, outcomes and impacts. In the case of nutrition sensitive value chains, the broad activity categories might be the processes along the value chain

from production to consumption. After identifying the project activities, the analyst considers what resources are required to deliver the intervention. Resources will be used to achieve changes in behavior, changes in production or market activities, changes in diets and other health or feeding practices.

Step 4 considers the set of activities associated with outputs and outcomes described in the program impact pathway. The four-step framework helps the analyst identify the costs, opportunity costs, health and economic benefits associated with proximal and distal changes in knowledge, food purchases, crop or animal production, market sales, women's time, net income, etc. Once mapped out, the analyst can then use more standard cost data collection and evaluation methods to obtain the relevant information in order to estimate net costs and benefits for use in cost, cost-effectiveness or benefit cost analyses. The next section touches on measuring the benefits and costs along the impact pathway.

¹ See Rawat et al 2013, Avula et al. 2013, Mbuya et al. 2015, Cole et al. 2016 for more on program impact pathways and their applications.

FIGURE 6. *Generic impact pathway*

MEASURING COSTS AND BENEFITS ALONG THE IMPACT PATHWAY

1. Measuring benefits (metrics for outcomes)

Economic analysis is interested in the health and monetary benefits that result from a policy or program. A range of health and nutrition metrics, including assigning monetary values to health outcomes, can measure health benefits. Monetary benefits may refer to savings from averted medical costs or increases in productivity that are valued in terms of the money that is generated, or saved, from an intervention. As we will describe in the following section, multisectoral nutrition programs provide a variety of positive impacts to households and communities. However, not all of these impacts are easily valued and included in economic evaluations. For example, population level improvements in nutrition and health, as reflected in reductions in stunting and increased school attendance, have been translated into increases in labor productivity (Alderman et al. 2017). Production of nutrient-rich foods has been valued by the income received from their sale (Puett et al. 2014). However, improvements in dietary diversity or food security status of individuals and households are difficult to value monetarily. This presents a challenge in fully valuing the diverse impacts of multisectoral nutrition programs in economic analysis. Given that an aim of this brief is to promote the valuation of impacts of such programs for economic analysis, we use the term “benefit” to refer to impacts and outcomes, despite the challenges involved in assigning them monetary value.

A first step in measuring benefits is to estimate the changes in outcome measures due to a program. For multisectoral nutrition programs, changes in health and nutrition status are the final outcomes on the impact pathway. Other benefits arising from these programs are considered “intermediate outcomes”. An example of an intermediate outcome could be an increase in the number of households with an improved Household Food Security Score. Measurement of outcomes typically occurs as part of a randomized clinical trial or from an impact evaluation of a pilot or demonstration project. For some indicators,

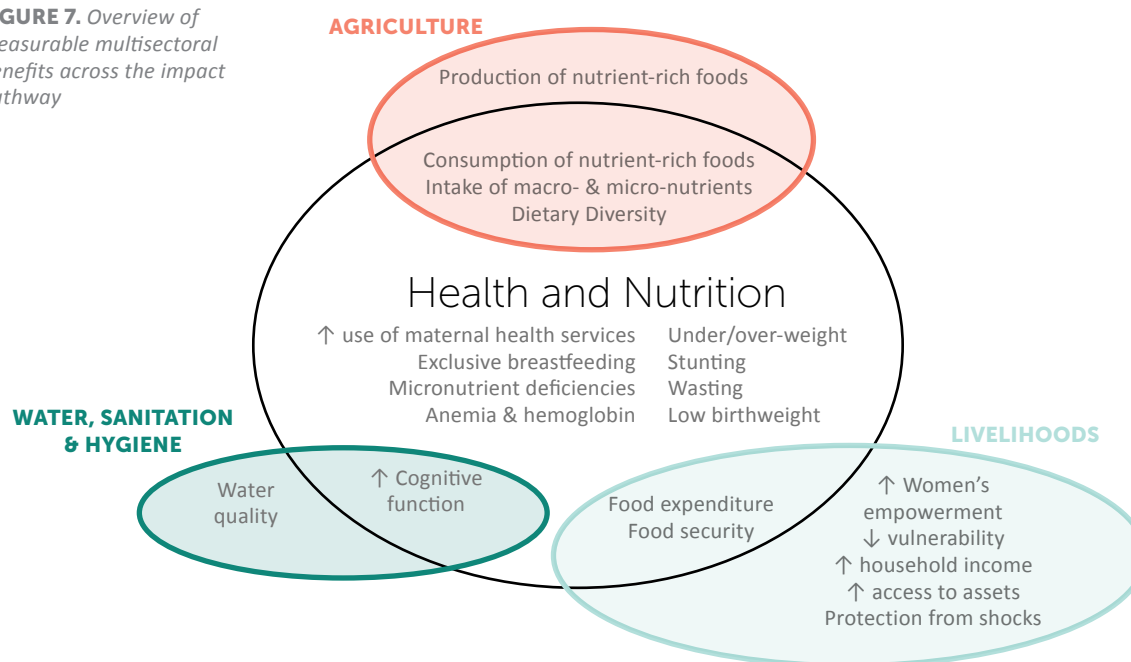
routine monitoring and evaluation can be used to capture changes in intermediate or process indicators. These can be linked to increased supply or demand for goods or services.

In evaluations of health and nutrition programs, typical outcomes measured are anthropometry such as height and weight, morbidity such as cases of diarrhea or malaria, or mortality attributable to different causes. While these primary outcomes are important indicators of program impact, there are a broader set of benefits that also can be attributable to a program. Accounting for these benefits in an economic analysis of multisectoral nutrition programs will provide a broader and more complete picture of an intervention’s effect on communities and households.

Figure 7 presents examples of the various kinds of intermediate and health outcomes that can result from multisectoral actions for health and nutrition. Outcomes are presented by sector, despite well-implemented agriculture programs potentially improving outcomes across sectors, including birthweight, micronutrient deficiencies and others.

Where possible, changes in health and nutrition outcomes can be converted into mortality and disability (including infections) prevented by an intervention; for many diseases these can then be converted into disability-adjusted life years (DALYs) averted. DALYs are a composite measure of death and disability attributable to specific diseases. Estimating DALYs and cost per DALY averted by an intervention provides important information that

FIGURE 7. Overview of measurable multisectoral benefits across the impact pathway



can be used for program design and advocacy. Mortality, disability and DALYs can be measured or modeled, using evidence from primary data, published literature or systematic reviews. A number of potential benefits shown in Figure 7 are not easily converted into DALYs or dollars and analysts should qualitatively assess changes in dietary diversity, food security, vulnerability and women's empowerment, for example.

In the program impact pathway, outcomes are defined as a successful achievement by a program. The step before achieving an outcome is an output. Outputs tell us about a program's reach, but not about its quality per se. Outputs tell us how many people or households an intervention has reached but not whether the program improved the status of these households. For this we need information on program outcomes.

In cases where there is no data on program outcomes, or if there is interest in assessing the efficiency of program delivery, a cost-efficiency analysis can be conducted. Whereas a cost-effectiveness analysis estimates cost per program outcome, a cost-efficiency analysis estimates the cost per output.

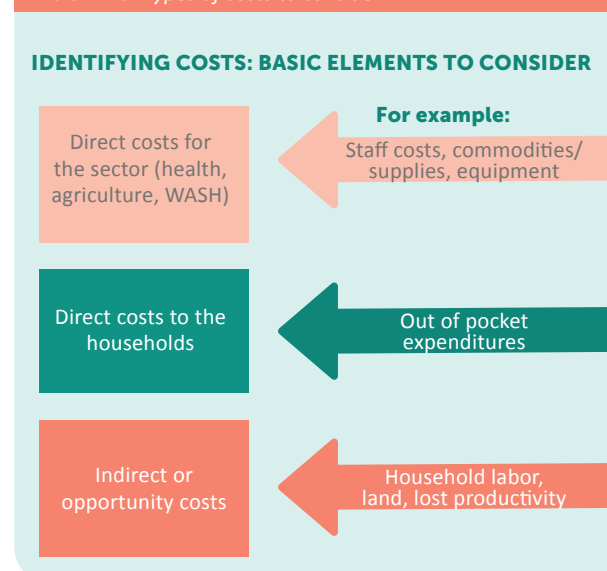
While evaluators measure program impact, health economists value it. Impact information is used as one input into the cost-effectiveness model, in addition to cost data. Costs are measured alongside a program's implementation. Cost analyses assign a value to any inputs that go into a program, both costs to implementing institutions, and sometimes also costs borne by households participating in a program.

Costs can also be valued as an economic benefit of a program. For example, some programs provide productive assets, such as small ruminants which produce milk to be sold, or gardens to produce vegetables for sale or household use. A value can be estimated for the use or sale of these benefits from the program, this can be used as a benefit in a benefit-cost analysis, or otherwise included in a description of economic benefits of a program.

2. Measuring costs (cost metrics)

There are three main categories of costs: direct costs incurred by donors, governments or providers, direct household (or individual) costs, and indirect or opportunity costs (Figure 8). In addition, there are many other ways to categorize costs, which can be used at the discretion of the researcher, depending on the study objectives and perspective. Generally, we think about activity categories, input categories, fixed or variable costs or start up and recurrent costs. These categories are not always mutually exclusive, but rather are different ways to consider the breakdown of total or unit costs. Figure 9 presents an example of broad (activity and resources) to narrow cost categories for a nutrition sensitive intervention that has a combination of activities across the impact pathway to increase the supply and demand of nutritious foods. Information comes from multiple sources and at different levels of data collection to capture resource use and costs from the national level

FIGURE 8. *Types of costs to consider*



down through each administrative level, until reaching the beneficiary at the household level (figure 9). Once data are collected, analysts estimate the value of individual inputs and aggregate them to arrive at total costs, unit costs and cost profiles.

Figure 10 provides an example of unit cost components, when considering the number of beneficiaries reached with the full intervention package. Ideally, data should be collected by sector (health, agriculture, livelihoods) from all implementing institutions and partners, with costs capturing the resource use for technical support, coordination and management both within and across sectors. A key challenge is to decide how to allocate shared program costs when more than one sector is being served by a given activity (figure 7). Appendices 1 and 2 provide an overview of unit costs for a nutrition sensitive poultry project to improve dietary diversity, using the intervention typology and program impact pathway to identify intervention typology, specific intervention details and activities. It identifies the delivery platform and target population, which is likely to vary by project or program and allows for listing the direct unit costs by activity and shared planning or coordination unit costs that are likely to be allocated across activities. The ultimate goal is to clearly define what goes into the unit cost per beneficiary reached. Appendices 3 and 4 provide the typology and examples of inputs and costs for a cash transfer project.

Economic evaluation—either benefit cost analysis or cost-effectiveness—then compares the net costs and net benefits of two or more alternatives. In many cases, the comparison is the status quo, or doing nothing. Since many economic evaluations are derived from smaller trials or pilot studies in a few geographic settings, it is critical to explore the range of estimates for both impacts and costs. When analyzing and presenting results, analysts should be sure to characterize the uncertainty due to assumptions, sampling, data completeness, and under- or over reporting resource use and price distortions. For additional guidance on these steps see the iDSI and GHCC reference cases to follow best practices, including transparent reporting of methods and results.

FIGURE 9. From impact pathway to intervention activity and input cost categories







ACTIVITIES		INPUTS From provider	COSTS To provider, beneficiary and other partners and service providers			
	Extension	Personnel Organisational infrastructure	Direct costs to provider for salaries, incentives, volunteered time, and other staff costs e.g. travel and subsistence	Institutional fixed and variable costs to provider , e.g. personnel management, training, and monitoring systems; office space and utilities; donations	Opportunity cost to participant for time taken to engage with extension service	Direct cost to other service provider of any increased demand for government services
	Production	Physical inputs – e.g. seed, fertiliser, livestock, equipment Labour, land, water	Direct costs to provider for physical inputs	Direct costs to beneficiaries for additional inputs needed, such as fuel to use equipment	Opportunity cost for beneficiary for labour, land use, and water use	
	Storage and processing	Equipment, e.g. thresher	Direct cost to provider for equipment (e.g. thresher)	Direct cost to beneficiary for equipment maintenance and utilities (e.g. fuel), and space for storage and processing	Opportunity cost to beneficiary for labour, space, and water use	
	Distribution and transport	Vehicles, fuel	Direct cost to provider for vehicles / fuel provided	Direct cost to beneficiary for maintenance costs	Opportunity cost to beneficiary for labour	
	Catering, retail, labelling	Supplies, equipment, overheads	Direct costs to provider of supplies, equipment, overheads	Direct cost to beneficiary for additional inputs needed	Opportunity cost to beneficiary for labour	
	Behaviour change	Materials, e.g. manuals, videos, leaflets Platform, e.g. space for meetings, radio airtime, billboards, home visits Personnel, e.g. facilitators / counsellors, management	Direct cost to provider for materials, platform, personnel	Direct cost to beneficiary for changing behaviour	Opportunity cost to participant for uptake of new behaviour	Direct cost to other service provider of any increased demand for government services

FIGURE 10. Example of standard unit costs for a nutrition sensitive value chain investment working across agriculture and nutrition sectors.



Gaps in methods and metrics and future research

Methodologically, the main challenge for conducting economic evaluations in this field is capturing the full range of benefits involved in a nutrition-sensitive agriculture project, or multisectoral nutrition strategy that strengthens (e.g.) WASH, governance and gender empowerment. First, the effects of multisectoral strategies (education, social protection, agriculture) are not always immediate and it is not easy to estimate the spillover effects that may occur in the future. Second, cost-effectiveness analysis focuses on the least costly way to produce a single good or service, considering only one measure of effectiveness, and as a result is likely to miss important social costs and benefits. The costs of any multisectoral strategy will reflect achieving multiple objectives across sectors, rather than a single health outcome. Thus the incremental cost of a multisectoral program that does not capture the full economic value of benefits and costs may penalize programs unfairly. Identifying new methods for quantifying and valuing benefits is a research priority for increasing the use of economic evaluation for multisectoral programs.

Another concern is how to better measure the effects of integrated agriculture and nutrition interventions. Many interventions are likely to result in substitution effects that might occur in decision-making about what to grow, sell, how to use income, and dietary choices. Economic evaluations would benefit from improved methods to estimate the area under different crops, and measuring how these change as a result of nutrition sensitive investments. Linking

interventions to both changes in production and consumption is likely to require improvements in remote sensing technologies and methods for attributing areas to different varieties of the same crop, and being able to link these to changes in quantities of planting material and seed used.

Understanding how program and policy makers will use improved data on costs and benefits for multisectoral strategies is an important input into how to address some of these methodological challenges. Unlike nutrition specific interventions, there are a limited number of models to estimate the costs and benefits of nutrition sensitive interventions and there are few benchmarks comparisons. Helping decision makers and stakeholders understand what share of nutrition intervention program costs their sectors are expected to invest in will require comprehensive assessments of costs and benefits, including improved methods for measuring distributional effects, equity, scalability and sustainability. We hope that by creating a simplified framework and promoting best practices for estimating and reporting costs and benefits of multisectoral strategies that improved evidence and benchmarks will be available in the near future.

See online supplemental resources providing a list of recent economic evaluations for nutrition, agriculture, water, sanitation and hygiene (WASH) and livelihood interventions.



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Appendix 1: Standardized unit costs for a multisectoral poultry production intervention to improve nutrition

Intervention specific							Shared program costs	Standard unit cost intervention (I+G+H)
Intervention Typology	Intervention	Intervention details*	Activities/technology	Platform	Population	Standard unit of direct (activity/output) cost	Standard unit cost planning/ coordination	
Increase demand of nutritious foods	Behavior change and communication	Provide information to households (woman, men) on nutritious foods and dietary diversification	<ul style="list-style-type: none"> • Training of trainers nutrition package (NGO facilitators) • Use of training materials, household visits, food demonstrations 	Women's groups, microcredit groups, model champions (community leaders, early adopters, volunteers)	Women, children, households	<ul style="list-style-type: none"> • Cost per nutrition trainings (training of trainers, community groups) • Cost per facilitator or community member trained • Cost per beneficiary reached (women, men, households) 	<ul style="list-style-type: none"> • Cost of assessments • Cost per nutrition planning meeting • Cost per nutrition advocacy and awareness raising (mobilization, sensitization) • Cost of materials development 	Cost per beneficiary receiving full or partial package
Increase supply of nutritious foods	Increased poultry production	Training on improved poultry practices (e.g.improved poultry care, habitation and feeding practices) Access to improved inputs and credit for poultry production, including poultry vaccination	<ul style="list-style-type: none"> • Training of trainers (NGO facilitators), government training of volunteer poultry vaccinators • Use of training materials, distribution of start up kit (inputs) to volunteer vaccinators • Credit group formation • Training of credit group members 	Community, credit groups for poultry production, Volunteer poultry vaccinator	Poultry producers (credit group members), men, women, households	<ul style="list-style-type: none"> • Cost per poultry training • Cost per volunteer vaccinator changed • Cost per vaccinator reached with starter kit • Cost per producer reached • Cost per poultry extension visit • Net cost per poultry producer reached (men, women, household) • Cost per credit group formed • Cost per credit group meeting • Net cost to household participating in credit group • Net cost of obtaining a loan. 	<ul style="list-style-type: none"> • Cost per assessment • Cost per poultry credit group planning meeting • Cost per poultry production improvement advocacy and awareness raising (mobilization, sensitization) • Cost per video • Cost per materials development 	
Enabling environment	Gender empowerment	Training and sensitization to strengthen women's empowerment and intra-household decision making.	<ul style="list-style-type: none"> • Sensitization and advocacy at village and household level • Develop household spending plans (joint spending plans) 	Women's groups, microcredit groups, model champions (community leaders, early adopters, volunteers)	Women, their husbands, children, households, model champions	<ul style="list-style-type: none"> • Cost per materials development package • Shared cost per training • Cost per sensitization activity • Cost per beneficiary 	<ul style="list-style-type: none"> • Cost of assessments • Cost per planning meeting • Cost per awareness raising 	

* In this example, intervention activities were co-located in communities and delivered as separate components to households. Not all households would necessarily receive all intervention components.

Appendix 2: Example of activities, inputs and costs for a multisectoral poultry production intervention to improve nutrition

Activities*	Inputs	Costs from provider perspective	
Nutrition & dietary diversity			
Materials development	Guidance/training package	• Staff	• Production and printing expenses
Community sensitization and mobilization	Community meetings		
Training (Train NGO facilitators, community volunteers)	Paid time of facilitators	• Staff (field coordinators, supervisor) • Group facilitator per diem (training day time and travel)	• Refreshments • Room rent
Household visits	Unpaid volunteer time	• Staff (field coordinators, supervisors)	• Transport costs
Food demonstrations	Unpaid volunteer time	• Staff (field coordinators, supervisors)	• Transport costs
Community level credit/poultry groups			
Materials development	Guidance/training package	• Staff	• Production and printing expenses
Community sensitization and mobilization	Community meetings		
Training (Train NGO facilitators, community volunteers)	Paid time of facilitators	• Staff (field coordinators, supervisor) • Group facilitator per diem (training day time and travel)	• Refreshments • Room rent
Credit and producer group meetings	Resources for group facilitation	• Group facilitator incentives • Staff (field coordinators, supervisor)	• Field equipment (field bag, raincoat)
Technical support to improve poultry production	Cost of input distribution and vaccination services	• Staff (agriculture extension agents, supervisor) • Unpaid volunteer time	• Supply costs for seeds, vaccines • Credit costs
Enabling environment (Women's empowerment)			
Materials development	Guidance/training package	• Staff	• Production and printing expenses
Community sensitization and mobilization	Community meetings		
Training (Train NGO facilitators, community volunteers)	Paid time of facilitators	• Staff (field coordinators, supervisor) • Group facilitator per diem (training day time and travel)	• Refreshments • Room rent
Household visits	Unpaid volunteer time	• Staff (field coordinators, supervisors)	• Transport costs
Shared program costs (occurring above the community level)			
Start up costs: Assessments, planning, advocacy and awareness raising	Paid staff	Staff (program director, site manager, finance officer, admin support, admin assistant, driver)	
	Capital equipment	• Equipment (computer, generator, photocopier, printer)	• Transport (motorbikes, car, bicycles) • Office rent
	Shared/joint costs	• Communications - Internet, Battery expenses, printing, fuel • Meetings - room rent, refreshments	• Transport - Road tax, fuel, air fares, vehicle hire • Recruitment - Job advertisement expenses • Admin - Bank commission, audit fee
Overall program management (occurring above the community level and across all intervention components)			
Shared program start-up activities (recruitment of staff, establish office, procure equipment)	Paid staff	Staff (program director, site manager, finance officer, admin support, admin assistant, driver)	
	Capital equipment	• Equipment (computer, generator, photocopier, printer)	• Transport (motorbikes, car, bicycles) • Office rent
	Shared/joint costs	• Communications - Internet, Battery expenses, printing, fuel • Meetings - room rent, refreshments	• Transport - Road tax, fuel, air fares, vehicle hire • Recruitment - Job advertisement expenses • Admin - Bank commission, audit fee

* In this example, intervention activities were co-located in communities and delivered as separate components to households. Not all households would necessarily receive all intervention components.

Appendix 3: Standardized unit costs for a cash transfer intervention to improve nutrition

Intervention specific							Shared multisectoral intervention costs	Standard unit cost intervention (I+G+H)
Intervention Typology	Intervention	Intervention details	Activities/technology	Platform	Population	Standard unit of direct (activity/output) cost	Standard unit cost integration/ multisectoral actions	
Increase demand of nutritious foods	Participatory women's groups with cash transfers	Community identification of nutrition-related problems, and actions to improve nutrition using women's groups and cash transfers	Women's groups <ul style="list-style-type: none"> Recruitment and regular training of women's group facilitators and nutrition mobilizers Community sensitization and mobilization Rejuvenate existing (or establish new) women's group, and invite women to attend on a regular basis Hold regular monthly meetings Lead and implement collective action among family and community members 	Women's groups at community level	Pregnant women and their children (0-16 months)	<ul style="list-style-type: none"> Cost per women's group meeting Cost per participating woman 	<ul style="list-style-type: none"> Cost per materials development Cost per wider community meeting Cost per supervisor Cost of health system strengthening in participating areas 	<ul style="list-style-type: none"> Cost per contact with pregnant woman Cost per pregnant woman Cost per child
			Cash transfers <ul style="list-style-type: none"> Establish system for identifying and enrolling pregnant women Generate ID cards with barcode for delivery of cash transfers Provide monthly cash transfer at women's group meetings 			<ul style="list-style-type: none"> Cost per woman registered Cost per woman receiving transfer 	<ul style="list-style-type: none"> Cost of establishing and maintaining transfer distribution system (set-up, ongoing data capture to track delivery of cash transfers, accountability system, hardware and software) 	

Appendix 4: Example of activities, inputs and costs for a cash transfer intervention to improve nutrition

Activities*	Inputs	Costs from provider perspective	
Women's groups			
Development of facilitation aids	Pictorial guides and other group facilitation aids	<ul style="list-style-type: none">• Staff (women’s group officer, women’s group coordinator, nutritionist, epidemiologist)• Staff (field coordinators, supervisor)	<ul style="list-style-type: none">• Picture card and printing expenses
Recruitment and regular training of women's group facilitators and nutrition mobilizers	Paid time of facilitators	<ul style="list-style-type: none">• Group facilitator per diem (training day time and travel)• Refreshments	<ul style="list-style-type: none">• Room rent
Community sensitization and mobilization	Community meetings	<ul style="list-style-type: none">• Group facilitator incentives• Staff (field coordinators, supervisor)• Field equipment (field bag, raincoat)	
Rejuvenate existing (or establish new) women's group, and invite women to attend on a regular basis	Community liaison / door-to-door invitations		
Hold regular monthly meetings	Resources for group facilitation		
Lead and implement collective action among family and community members	Resources for group facilitation		
Cash transfers			
Establish system for identifying and enrolling pregnant women	Maintenance of census	<ul style="list-style-type: none">• Staff (ward enumerator incentives)	
	Pregnancy tests	<ul style="list-style-type: none">• Pregnancy kit, urine collection container	
Generate ID cards with barcode for delivery of cash transfers	ID card production	<ul style="list-style-type: none">• Staff (data assistant, data manager)	<ul style="list-style-type: none">• Equipment (data card printer)
Provide monthly cash transfer at women's group meeting	Cash transfer	<ul style="list-style-type: none">• Cost of cash transfer	
	Paid staff	<ul style="list-style-type: none">• Staff (cash supervisor, cash assistant, data assistant)	
	Electronic data entry and checking	<ul style="list-style-type: none">• Mobile phones for electronic data entry• Per diem for training enumerators	<ul style="list-style-type: none">• Staff (data assistant, data manager)
Project management (across all intervention components)			
Management, administration and logistics	Paid staff	<ul style="list-style-type: none">• Staff (program director, site manager, finance officer, admin support, admin assistant, driver)	
	Capital equipment	<ul style="list-style-type: none">• Equipment (computer, generator, photocopier, printer)• Transport (motorbikes, car, bicycles)	<ul style="list-style-type: none">• Office rent
	Shared/joint costs	<ul style="list-style-type: none">• Communications - Internet, Battery expenses, printing, fuel• Meetings - room rent, refreshments• Transport - Road tax, fuel, air fares, vehicle hire	<ul style="list-style-type: none">• Recruitment - Job advertisement expenses• Admin - Bank commission, audit fee
Multisectoral actions			
Health system strengthening	Health system strengthening	<ul style="list-style-type: none">• Staff (officer and supervisor)	



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