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Meta-evidence review on the impacts of investments in agricultural and rural development on Sustainable Development Goals 1 and 2

by
Jill Bernstein
Nancy Johnson
Aslihan Arslan

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Abstract

The interconnected nature of the Sustainable Development Goals (SDGs) forces the development community to look broadly at solutions and outcomes. By drawing on evidence from systematic and comprehensive reviews, this report provides an overview of the evidence on 10 different intervention types related to agriculture and rural development, and how these intervention types have impacted seven different outcomes associated with SDG 1 (“End poverty in all its forms everywhere”) and SDG 2 (“End hunger, achieve food security and improved nutrition and promote sustainable agriculture”). The seven outcomes of interest are poverty, income, food security (measured by diet quantity), nutrition security (measured by diet quality and/or nutrition), child stunting, child wasting and agricultural productivity. There is a total of 79 systematic reviews included in this meta-review, including 18 reviews that look at poverty, 33 reviews that look at food security, 36 reviews on nutrition security, 24 reviews on stunting, 18 reviews on child wasting and/or overweight, 31 reviews on productivity and 48 reviews on income. For each intervention/outcome combination, a summary of the evidence is provided, including a designation of the direction of impact and the quality of evidence.

We found that cash transfers and agriculture programmes are among the most widely covered intervention types by systematic reviews, but other intervention types showed promising results. The costs and benefits of interventions were rarely studied in a rigorous way, hence the systematic reviews included here repeatedly note the need for more research to support decision-making for policies and programmes aimed at achieving SDGs 1 and 2. Another common message across intervention types is the importance of context in terms of determining the effectiveness of interventions.

Given the number and diversity of interventions, outcomes and indicators, the goal is not to synthesize all the findings to say “what we know” about “what has worked”. Rather, by pulling together evidence that is customarily examined by intervention type or by outcome, we hope to encourage reflection on what it means to use evidence to inform agricultural and rural development programming to SDGs 1 and 2 and to identify implications for future impact evaluations and systematic reviews that are conducted with this goal in mind.

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1 Introduction

The first Sustainable Development Goal (SDG 1) calls for the eradication of extreme poverty and the reduction by half of the proportion of men, women and children living in poverty by 2030. SDG 2 calls for the end of hunger and for ensuring access for all people to safe, nutritious and sufficient food all year round, as well as the promotion of sustainable agriculture. Although great progress has been made in poverty reduction in recent decades, the poorest are being left behind: over 2.1 billion people still live in poverty, about 736 million in extreme poverty and about 815 million in hunger. In the last 25 years, the numbers of extreme poor and malnourished have decreased by 58 per cent and 21 per cent, respectively. Poverty reduction has stalled, however, because of inequality, and the number of hungry has increased recently as a result of climate change, conflict and economic slowdown. Those still in poverty tend to be the chronic poor, facing numerous constraints to addressing poverty and food insecurity. Further gains in poverty and hunger reduction will be more difficult, particularly for this group – the majority of whom live in rural areas and depend (at least partly) on agriculture for food and income. In sub-Saharan Africa alone, more than 300 million of the extreme poor live in rural areas.

Over the next 15 years, the way in which we manage agriculture will be a major determinant of whether or not we reach these – and many other – global goals, although rural poverty reduction and malnutrition require more than just investment in agriculture. The challenges facing agriculture and the institutional environment for agricultural growth and technological innovation are far more complex than ever before. Agricultural investments must now focus not only on increasing yields, but also on a more complex set of objectives, including improving nutrition, preserving natural resources, adapting to climate change, enhancing equity and contributing to structural transformation. The pathways through which agricultural investments contribute to these outcomes are numerous and complex, with opportunities for synergies as well as trade-offs.

Research in agriculture and rural development will play a critical role in meeting the ambitious targets of SDGs 1 and 2. Careful analyses of country-specific contexts are needed to address the underlying causes of poverty, hunger and poor nutrition. Nonetheless, much can be learned from the available evidence on the types of interventions that have been implemented and evaluated, which will contribute to achieving the targets of SDGs 1 and 2 in rural areas.

Recent years have seen heightened emphasis on the rigorous evaluation of development interventions to determine which types of programmes successfully influence change. Not only are sophisticated impact evaluations more common, with randomized controlled trials and quasi-experimental techniques employed with increased frequency, but also systematic reviews and meta-analyses have become commonplace as a means to coalesce the existing

evidence on a given topic, creating resources for readers seeking to understand large bodies of literature and often generating new insights in the process.

Between now and 2030, the international community seeks to tackle the UN's Sustainable Development Agenda, encompassing 17 goals, 169 targets and 232 indicators, all of which are considered "integrated and indivisible". Four key international agencies – Food and Agriculture Organization of the United Nations (FAO), International Fund for Agricultural Development (IFAD), Independent Science and Partnership Council (ISPC) of CGIAR and World Bank – have come together under a Joint Initiative (JI) to develop a common understanding and coordinated approach to managing agricultural and rural development research and investment on achieving SDGs 1 and 2.¹

To support this effort, the JI partners have identified the need for concise and updated mapping of evidence on the relationship between investments in agricultural research and development and reductions in poverty and hunger – including potential trade-offs between SDGs 1 and 2. This meta-review uses data from existing systematic reviews, meta-analyses and comparable comprehensive reviews (hereafter referred to collectively as "systematic reviews") to map and evaluate the evidence regarding the effects of a wide range of development interventions on poverty and hunger.

The questions motivating this meta-review are: (i) What evidence exists regarding the impact of agriculture and rural development interventions on hunger and poverty? and (ii) What does the evidence reveal about which types of interventions have and have not successfully impacted hunger and poverty? The goal was not an attempt to synthesize the findings to identify what works or which interventions are best given the complexity of agricultural and rural development with multiple factors and interactions among them. Rather the goal was to bring together what is known, across intervention types and outcomes, so that appropriate information would be available to researchers and development practitioners who are designing projects and programmes. An assessment of the state of the evidence base could also be useful for identifying which types of future investment in data and evidence would best complement what exists to inform the decisions faced by the JI members and partners as they address SDGs 1 and 2.

The report proceeds as follows: Section 2 describes the methodology for creation of an Evidence Map (appendix 1) and database (appendix 2). Aspects of the methodology include outcomes and indicators used, the types of interventions covered, the search process for systematic reviews and the criteria for inclusion in this study, as well as how studies were reviewed and coded. Section 3 summarizes the results for agricultural interventions and Section 4 does the same for broader rural development interventions. Section 5 summarizes and concludes.

1. For more details on the JI see: <https://ispc.cgiar.org/blog/working-together-realize-agriculture%E2%80%99s-potential-achieving-sdgs-1-and-2>.

2 Methodology

2.1 Outcomes of interest for the meta-review

The outcomes of interest for this meta-review were defined to best fit the needs of the JI, and are based on the targets and selected indicators for SDGs 1 and 2 (table 1): extreme and moderate poverty; average income; food security (diet quantity); nutrition security (diet quality and/or nutrition); child stunting (low height-for-age for children under age 5, indicating chronic undernutrition); child malnutrition, including child wasting (low weight-for-height for children under age 5, indicating acute malnutrition) and child overweight (excess weight-for-height for children under age 5, indicating overnutrition); and agricultural productivity. Because SDG 2 has multiple dimensions, it has more outcome indicators than for SDG 1. However, two of the indicators for SDG 2 are closely related to those of SDG 1 – income and productivity. Therefore, we present and analyse the outcomes and indicators included in this meta-evidence review in the following order:

Extreme and moderate poverty: The indicators of this category are poverty headcount, poverty gap and poverty severity, or taken together, the Foster-Greer-Thorbecke poverty indices. It was common for the reviews included in this meta-review to use other indicators as proxies for poverty (income measures, food security measures, etc.), but reviews were not considered to have evidence regarding poverty unless one of the explicit poverty measures was included.

Average income of smallholders: The indicators of this category are total household income, total per capita income, total household or individual consumption, and total household or individual expenditures, with consumption and expenditures commonly used as proxies for income. Not included are measures of income from just one sector, such as farm income, off-farm income, etc. In terms of beneficiaries, all rural individuals and households are included, without an exclusive focus on the income of smallholders.

Agricultural productivity: The indicators of this category are land productivity (yields per unit land), labour productivity and total factor productivity (TFP). Measures of total production (output) without reference to any input measure are not included.

Food security (diet quantity): The indicators related to diet quantity include calorie consumption, food expenditure, self-reported hunger, skipped meals, and days or months without food.

Nutrition security (diet quality and/or nutrition): The indicators of this category are consumption of micronutrient-rich foods, dietary diversity, anthropometric measures and biochemical indicators of nutrition status. Stunting/height-for-age z (HAZ) scores and wasting/weight-for-height z (WHZ) scores are not included as they are included separately.

Child stunting: The indicators of this category are prevalence of child stunting, HAZ scores and height, for any age group below age 5.

Child malnutrition: The indicators of this category are prevalence of child wasting (moderate or severe), prevalence of child overweight or obesity, WHZ scores and weight, for any age group below age 5. Reviews that exclusively covered underweight (low weight-for-age) or weight-for-age z (WAZ) scores are not included.

Table 1 SDG targets assessed

Targets		Indicators	
Goal 1. End poverty in all its forms everywhere			
1.1	By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than US\$1.25 a day	1.1.1	Proportion of population below the international poverty line , by sex, age, employment status and geographical location (urban/rural)
1.2	By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions	1.2.1	Proportion of population living below the national poverty line , by sex and age
		1.2.2	Proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture			
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	2.1.1	Prevalence of undernourishment
		2.1.2	Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale
2.2	By 2030, end all forms of malnutrition , including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons	2.2.1	Prevalence of stunting (height for age <-2 standard deviations from the median of the World Health Organization (WHO) Child Growth Standards) among children under 5 years of age
		2.2.2	Prevalence of malnutrition (weight for height >±2 standard deviations from the median of the WHO Child Growth Standards) among children under 5 years of age, by type (wasting and overweight)
2.3	By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment	2.3.1	Volume of production per labour unit by classes of farming/pastoral/forestry enterprise size
		2.3.2	Average income of small-scale food producers , by sex and indigenous status

Source: United Nations A/RES/71/313, <https://undocs.org/A/RES/71/313>.

Note: This does not include all the targets and indicators of SDGs 1 and 2, but rather reflects the targets and indicators chosen as focus areas for the JI.

2.2 Intervention types analysed

The review focuses on evidence from development interventions. Intervention is defined broadly to include outputs of a wide range of research and development efforts; however, it is important to note that we do not include observational studies on the importance of things such as agricultural technologies, secure tenure or infrastructure to development outcomes. Rather we focus on the results of specific interventions designed to make changes in a specific

area in ways expected to lead to improvements in one or more SDG indicators. Although not all results can be considered as causal given the methods used, that was the intention of the reviews and we therefore refer to the studies using impact assessment language, recognizing that in many, if not most, cases the studies fall short in terms of methodological rigour. An assessment of the quality of the evidence base is included as part of the reporting of results.

The intervention types included in this evidence review were selected from a large set of interventions relevant for the member organizations of the JI. Details of which interventions were included under each category are discussed below along with the results. Because the agriculture category has such a large number of reviews and such a diverse set of interventions, results are also provided for some subcategories on which systematic reviews had been conducted. Although there are other ways to categorize types of agricultural interventions, in this review we are limited by the way that the authors of previous reviews have organized their reviews and which types of interventions they have chosen to group together. Table 2 shows our intervention categories and subcategories with some examples.

Table 2 Intervention categories analysed

	Intervention categories	Subcategories and examples
AGRICULTURAL INTERVENTIONS	1. Promotion of improved agricultural technologies and practices	a) Homestead food production/home gardens; b) biofortification; c) livestock interventions; d) aquaculture interventions; e) agricultural commercialization; f) extension and advisory services; g) sustainable agricultural practices; h) irrigation; i) agricultural input subsidies
	2. Promotion of groups/organizations	Cooperatives, self-help/savings/women's health/farmers' groups
RURAL DEVELOPMENT INTERVENTIONS	3. Land tenure security	Land rights, land titling
	4. Improving natural resource management at landscape-scale	Community forest management, payment for environmental services
	5. Improved access to financial products	Microcredit, microsavings, formal banking services and insurance programmes
	6. Job creation programmes	Youth/job training programmes
	7. Social protection	Cash transfers, public works and employment guarantee programmes
	8. Information services	ICT infrastructure, digital banking, mobile phone/media information campaigns
	9. Improved infrastructure	Irrigation, roads, electricity and telecommunications
	10. Multisectoral interventions	Graduation programmes; water, sanitation and hygiene (WASH) interventions

Although some of these intervention types relate to policy or institutional issues, we did not specifically include policies as an intervention category. This is not because policy reforms in the agricultural and rural development sectors are not important contributors to SDGs 1 and 2. Rather, we focused on interventions that can be directly linked to SDG outcomes, whereas interventions designed to influence policy will, if successful, indirectly contribute to the indicators studied here, often via implementation of programmes or other interventions that would be covered here.

2.3 Types of reviews included in the Evidence Map and database

Included in the Evidence Map and database are systematic reviews of impact evaluations, comprehensive reviews that provide clear lists and findings from each included impact evaluation, and rigorous impact evaluations that cover interventions in multiple countries. Meta-analyses are also included if they accompany a systematic or comprehensive review of the impact evaluation (IE) literature. If a systematic review did not provide enough information to allow for a simple vote count of results, or provide a meta-analysis of our outcomes of interest, then it was not included in the Evidence Map. An example of an excluded study would be a systematic review that groups together multiple outcomes on agriculture, such as yields, total production and input use, with no specific information about the individual indicators. In this example, if it is not possible to determine how the included interventions affected productivity/yields (our outcome of interest), this review would not be included in the Evidence Map, but would be described in an accompanying online annex (www.ifad.org/research/annex_38) that includes detailed summaries of the literature for each category. Also, literature reviews that simply take a narrative form without a clear list of the included studies and their results are not included in the Evidence Map, but are referenced in the online annex where relevant to provide an overview of the IE literature, particularly where systematic or comprehensive reviews are unavailable.

Reviews were included only if the authors screened for quality of the papers that they included. Reviews were not included in cases where there was no indication of the methodological requirements, or in one case where all papers had only treatment groups and no control groups. We followed the authors' leads on whether or not to include studies with questionable methodology in our counts. If the authors discarded some studies lacking control groups, then we did not include these in our count, but if other authors included similar studies, then we also included them. In the case where it was clear that a subset of the included studies were qualitative and were not included in the authors' analysis, these were not included (or noted separately) in our final count of papers in the database.

Published and grey literature studies were included, publications from 2000 or later were considered to be eligible and the review was limited to English-language studies. Only studies from low- and middle-income countries were included.

2.4 Search process

The search for reviews was undertaken using Google Scholar, 3ie, Campbell Library and the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre). In Google Scholar, the search terms included "systematic review" and terms relevant to the intervention type. For the other three resources, terms relevant to the intervention type were used, and then the results were searched for systematic or comprehensive reviews. The search also included a "snowball" approach, whereby any relevant reviews were searched to see if they mentioned any other pre-existing reviews on the same topic. Also, in Google Scholar, the lists of papers citing the included systematic reviews were searched to identify additional reviews.

2.5 Coding of results in the Evidence Map

The Evidence Map (appendix 1) for this meta-review is designed with the intervention types in the rows and the outcome types in the columns. Reading across the rows gives a picture of the evidence for each intervention, and reading down the columns gives a picture of the evidence for each outcome of interest. Reviews are included by author name(s) and year of publication, with the full citation included in the list of references. If the authors of a review searched for the intervention/outcome combination but found no impact evaluations that met their criteria, the review is noted in the Evidence Map as having “no evidence”. If the review included between one and four impact evaluations, this is noted as “limited evidence” in the Evidence Map. Finally, if the review included five or more impact evaluations for that combination, the reference of that review is simply listed with no additional notation.

In some cases, an outcome of interest for this study is identified incidentally in one of the included systematic reviews, meaning that it was not an outcome included in the objectives of the paper and was not included in the search. In these cases, that systematic review or paper is not included in the Evidence Map for that intervention/outcome combination. Without an intentional search for that intervention/outcome combination, it is not possible to know whether the review provides an accurate representation of the literature on that subject. Only outcomes of interest that were intentionally included in the review are included in the Evidence Map. An example is Burchi et al. (2016), where the focus was on the food and nutrition security outcomes of cash transfer programmes. Some of the cash transfer/food and nutrition security papers that they included also reported effects on poverty, but given that it appears the authors did not intentionally search the cash transfer/poverty literature, this paper is not included in the Evidence Map in the cash transfer/poverty cell. A partial exception to this is child stunting, wasting, overweight and obesity. In cases where the review authors searched for nutrition or related terms and identified studies with these anthropometric measures, these were included in the Evidence Map for those outcomes based on the assumption that the authors searched fully for studies with these impacts.

Each cell of the Evidence Map provides an indication of the direction of the impact for each intervention/outcome combination and the quality of the evidence. The direction of the impact is indicated by the background colour of the cell, whereby a dark blue background indicates that the outcomes are quite consistently positive/beneficial; a light blue background shows that the outcomes are suggestive of a positive/beneficial trend, but less clearly so, either because they had more heterogeneous outcomes or a smaller body of evidence; a grey background indicates that despite the existing evidence, the trend is not suggestive of a significant impact; and a white background indicates that there is insufficient evidence to determine the trend (generally used in the case of five or fewer impact evaluations in total from the included reviews). A pink background would indicate that the evidence leans towards negative/detrimental impacts and a red background would indicate that the evidence is consistently negative/detrimental, although in practice no intervention/outcome combinations fit that description. In cases such as poverty, stunting and wasting where the desired direction of impact is negative, that is poverty goes down, we refer to this as a “beneficial” impact rather than positive to avoid confusion. If poverty goes up, we refer to this as a “detrimental” impact. The decision regarding the direction of impact (and therefore the background colour) is based on the number of positive/beneficial, negative/detrimental, insignificant and mixed impact evaluations relevant to each cell, as well as the assessments of

the systematic review authors. The border colours of the cells for each intervention/outcome combination indicate the quality of the evidence, based on our synthesis of the assessments of the systematic review authors.

2.6 Format of results in the database

The database (appendix 2) includes an entry for each systematic review included in the Evidence Map, with separate rows for each intervention/outcome combination. For each review/intervention/outcome combination, there is a tally of the results from the included impact evaluations. For each impact evaluation within the systematic reviews, the impact is counted as “positive/beneficial” if at least one positive outcome was observed in that category, and “negative/detrimental” if at least one negative outcome was observed in that category. However, if there were offsetting negative and positive results in one category the results were considered to be “mixed”.

A total of 79 unique systematic reviews is included in the Evidence Map and database. This includes 18 reviews on poverty, 33 reviews on food security, 36 reviews on nutrition security, 24 reviews on stunting, 18 reviews on child wasting and/or overweight, 31 reviews on productivity and 48 reviews on income. Given that many reviews cover more than one outcome type, the sum of the reviews per outcome is more than the total number of reviews.

We present the results grouped under agricultural and non-agricultural interventions. The former includes interventions that directly link to agriculture presented first for the overall category followed by specific subcategories, and the latter includes more system-level interventions, although it is likely that these also have indirect links to agriculture.

3 Agricultural interventions

The category on agricultural technology/practice promotion includes reviews that cover multiple types of agricultural interventions. Specific interventions covered in this category include those aimed at generally increasing agricultural production, developing value chains, and enhancing extension and advisory services. Because there are so many types of interventions, and because of their importance to the JI partners, we also look at subcategories of interventions in more detail in the subsequent subsections.

Figure 1 summarizes the findings by intervention type and outcome, including both agricultural and rural development interventions. The figure shows the direction of impact and the quality of the methodology for each cell, and the size of the evidence base is represented by the size of the circle. The size of each circle is determined by the number of relevant systematic reviews in each category, **not the number of impact evaluations**. The border colour indicates the quality of the evidence, and is based on the assessments of the systematic review authors.

The first row of Figure 1 summarizes the findings of the review of the overall agricultural interventions category. Four reviews considered the effect of agriculture on **poverty**. IOB (2011) and Pray et al. (2017) both showed that development interventions aimed at increasing agricultural productivity contributed to poverty reduction, with 4 out of 4 and 10 out of 10 impact evaluations showing beneficial effects, respectively. However, it should be noted that the statistical significance is not given in the IOB review, and Pray et al. do not provide a systematic review per se.² Jayne et al. (2016) included two studies that showed no impact on poverty incidence, but showed reductions in poverty severity. Garbero et al. (2018), in a meta-analysis of improved seed interventions, found a reduction in poverty of 6 per cent. This cell of the evidence review is therefore designated as “leaning positive”. Eleven reviews included impact evaluations measuring the effect of agriculture interventions on **income**, and, for all but one of these reviews, all or most of the relevant impact evaluations showed positive effects, hence this cell is designated as dark blue. With regard to the effect on **productivity** (mainly measured in terms of yields), seven reviews included relevant evidence, and the results overwhelmingly showed positive effects.

Nine reviews included impact evaluations measuring the effect of agriculture interventions on **diet quantity** (including calories or food expenditures), and for all of these reviews, all or most of the relevant impact evaluations showed positive effects.³ This is also designated as dark blue. Thirteen reviews considered the effects of agriculture interventions on **diet quality and/or nutrition**, most often focusing on consumption of specific nutrient-rich foods, and half of these reviews contained 20 or more relevant impact evaluations. The vast majority of

2. For a more detailed description of the findings of each systematic review, see the online annex at: www.ifad.org/research/annex_38.


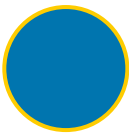





































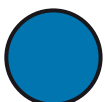
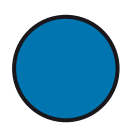
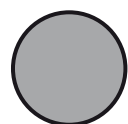






3. The exception here is Jayne et al. (2016), which had so few studies on food and nutrition security and children's anthropometrics that it is not possible to determine the trend.

Figure 1 Visual map of evidence, including size of evidence base, direction of effect and strength of methodology

	OUTCOMES		
	Poverty	Average income	Productivity (per labour unit or per land unit)
AG. technology/practice (crops, livestock, fisheries)			
Home gardens/homestead food production			
Biofortification			
Livestock interventions			
Aquaculture interventions			
Agricultural commercialization			
Extension and advisory services			
Sustainable agriculture practices			
Irrigation			
Agricultural input subsidies			
Organizations and groups			
Tenure security			
Landscape-scale natural resource management			
Improved access to financial products			
Job creation programmes			
Social protection programmes			
ICT			
Improved infrastructure			
Multisectoral interventions and WASH (selected studies)			

Notes: Size of circle corresponds to the number of systematic reviews in each category. Note that this does not show the number of impact evaluations for each category. Inner circle colours indicate the direction of impact of evidence. Dark blue=sufficient evidence of beneficial impact; light blue=suggestive evidence of beneficial impact; grey=despite evidence, impact is in doubt; white=insufficient evidence to determine trend. Border colours indicate strength of methodology of impact evaluations. Yellow=concerns with methodology; black=methodology is generally strong.

ICT, information and communications technology; WASH, water, sanitation and hygiene.

Food security (quantity)	Nutrition security (diet quality and/or nutrition)	Stunting for children age < 5	Malnutrition for children age < 5
			
			
			
			
			
			
			
			
			
			
			
			
			
			
			
			
			

these showed positive effects on at least one aspect of nutrition security, thus we consider that agriculture has demonstrated positive effects in this area. Regarding **child stunting** or HAZ scores, nine reviews had relevant impact evaluations, and of these just four reviews found positive effects in the majority of cases. Regarding child stunting/HAZ, Arimond et al. (2011), Masset et al. (2011), Girard et al. (2012) and Ruel et al. (2017) included four to eight impact evaluations each, and for each of these reviews only one of the included impact evaluations found a beneficial impact on stunting/HAZ. We consider it unclear that there are significant impacts of agriculture interventions on stunting/HAZ despite the existing evidence. Regarding **child wasting** or WHZ scores, nine reviews had relevant evidence, and these were somewhat more promising than the stunting results and leaned slightly positive overall. We designate this as light blue, although we consider it to be a borderline case.

Masset et al. (2011) state that the absence of statistically significant impacts of agricultural interventions on children's nutritional status should not be attributed to the inefficacy of these interventions, and highlight that the lack of power of the studies might have prevented the identification of impact.

3.1 Homestead food production/home gardens

Eight reviews are included in the homestead food production/home gardens category, and all of these are broad reviews that covered agriculture programmes more generally, often with a focus on diet and nutrition outcome indicators, but also including other outcomes in several cases. There were no studies that looked at **poverty** outcomes in this category. The evidence on **income** is drawn from four reviews: Ruel (2001), World Bank (2007), Arimond et al. (2011) and Masset et al. (2011). These reviews had between one and three impact evaluations on income each, almost all of which showed positive results. The very limited evidence on **productivity** comes from Berti et al. (2004), with two impact evaluations both showing positive effects. In terms of **diet quantity** (calories and/or total expenditures), there are four reviews with relevant impact evaluations, three of which had only one impact evaluation each while the other had two impact evaluations. Although all but one of these showed positive effects, the quantity of evidence was so limited that it is not possible to draw any conclusions regarding the effects of home gardens on diet quantity. Eight reviews had impact evaluations on **diet quality and/or nutrition**, almost all of which had more than 10 impact evaluations each, with the vast majority showing positive results. These studies most commonly considered diet quality, including intake of specific micronutrient-rich foods, and to a lesser extent micronutrient status.

Regarding children's anthropometry, the earlier systematic reviews had a small number of impact evaluations that considered **stunting** (and within these there is a good deal of overlap). These tended to show positive results, yet the more recent systematic reviews (Masset et al. 2011 and Ruel et al. 2017) found no significant positive effects on child stunting (out of five and four impact evaluations, respectively). Taken together, the results call into question whether or not homestead food production/home garden interventions are beneficial in terms of child stunting. The evidence regarding **child wasting** is similar, although slightly more favourable, with the main difference being that Ruel et al. (2017) found that two out of four impact evaluations showed beneficial effects on child wasting. Taken together, the evidence on wasting suggests positive effects. It is important to note that the designations for

both child stunting and child wasting are borderline cases given the evidence here, and thus should be interpreted with caution.

3.2 Biofortification

Although the evidence on biofortification is limited, the study quality is on the higher side and the results of biofortification on **nutrition security** consistently showed positive results, especially regarding the effects of orange-fleshed sweet potato interventions on vitamin A intake and status. In terms of the effects on **child stunting** and **child wasting**, the evidence is too thin to discern a trend. There is one study on wasting that showed a positive effect, and two studies on stunting – one showing no change and one with a positive effect. No impact evaluations covering the effects of biofortification on poverty, income, productivity or diet quantity were identified in the systematic reviews.

The studies included here are all effectiveness trials, not efficacy trials, to the extent that this was apparent from the systematic reviews. No systematic reviews were identified that focused solely on our outcomes of interest and biofortification; however, several reviews that looked at agricultural programmes more broadly included biofortification interventions. These include Masset et al. (2011), Stewart et al. (2015) and Ruel et al. (2017). Systematic reviews related to biofortification more generally, but not covering our outcomes of interest, have also been published. These include Talsma et al. (2017) on acceptance and adoption of biofortified crops, De Steur et al. (2016) on willingness to pay and cost-effectiveness and Gera et al. (2012) on efficacy trials.

3.3 Livestock interventions

Livestock interventions are covered by several systematic/comprehensive reviews that considered a range of agricultural programmes, as well as Leroy and Frongillo (2007) and Iannotti et al. (2013), which are specifically focused on livestock and animal-sourced food interventions. No reviews were found that looked into the impacts of livestock interventions on **poverty** and **productivity** outcomes. Three reviews covered the effect of livestock on **income** – Leroy and Frongillo (2007), World Bank (2007) and Masset et al. (2011) – which included four, four and two relevant impact evaluations, respectively, all of which found positive impacts. Six reviews considered the effects on **diet quantity** (total calories or food expenditures) – Berti et al. (2004), Leroy and Frongillo (2007), World Bank (2007), Bhutta et al. (2008), Gibson and Anderson (2009) and Iannotti et al. (2013) – all of which had fewer than five impact evaluations each on diet quantity, but all the impact evaluations found positive effects with the exception of one for which the results were unclear. The same six reviews covered **diet quality and/or nutrition**, along with Masset et al. (2011) and Ruel et al. (2017), and the vast majority of the included interventions from these eight reviews found positive effects. Regarding **stunting**, three reviews covered the effects of livestock on stunting and/or HAZ, but each included only one impact evaluation, all of which showed beneficial effects. Just two reviews included studies on livestock and **child wasting**, with a total of three impact evaluations, all of which showed positive effects, but the evidence base is much too thin to draw any conclusions.

3.4 Aquaculture interventions

No reviews were found identifying the effect of aquaculture interventions on **poverty**. The evidence of the effect of aquaculture and/or fisheries interventions on **income** is suggestive of a positive trend, although the quantity of impact evaluations is quite limited. Kawarazuka (2010) found that four out of five studies covering income showed positive effects and one had unclear results. Three additional systematic reviews – Leroy and Frongillo (2007), World Bank (2007) and Masset et al. (2011) – including just one impact evaluation each regarding income, all showed positive results. Of these, Kawarazuka (2010) is the only systematic review focused specifically on aquaculture and fisheries, whereas the others also cover livestock and/or agriculture more generally. World Bank (2007) was the only systematic review to measure the impact of aquaculture and/or fisheries on **productivity**, and this showed a positive effect, but the evidence was too scarce to constitute a trend in any direction.

In terms of food security, there is very limited evidence in the systematic reviews of the effect of aquaculture and/or fisheries on overall **diet quantity**. Kawarazuka (2010) included two impact evaluations covering diet quantity, and these showed positive effects. Kawarazuka also showed that of the seven studies that evaluated diet quality and/or nutrition, mainly fish consumption, five found positive effects and two did not show significant effects. The other systematic reviews covering the effect of aquaculture or fisheries interventions on **diet quality and/or nutrition** – Leroy and Frongillo (2007), World Bank (2007) and Masset et al. (2011) – each had few relevant impact evaluations and these had mixed results. Taken together, the results are split between positive results and no significant results, thus we do not see convincing evidence of any trend towards significant effects of aquaculture and/or fisheries on diet quality and/or nutrition. Only Masset et al. (2011) had evidence on **stunting** and/or **wasting**, and included just one impact evaluation that found no effect on either indicator.

Allison (2011) provide a general discussion on aquaculture, fisheries, poverty, and food and nutrition security, including the impact pathways between these interventions and outcomes. The authors identified three pathways through which aquaculture and fisheries affect poverty and food and nutrition security: “(1) nutritional benefits from the consumption of fish; (2) income to those employed in the sector and multiplier and spillover effects in fishery-dependent regions; and (3) through generation of revenues from exports, taxation, license fees and from payment for access to resources by foreign fleets or foreign investment in aquaculture”. Several papers have been written making the case that fish comprise an important source of nutrition and income for the poor in low- and middle-income countries, yet these do not focus on impact evaluations of interventions (see Béné et al. 2015, and Joffre et al. 2017).

3.5 Agricultural commercialization

The category of agricultural commercialization contains a variety of programme types, including cash crops, contract farming, certification schemes (organic, fair trade, etc.) and value chain interventions. The reviews included here are also diverse, with some focusing on one of these specific programme types and others that are broad agricultural reviews with impact evaluations of programmes that fall under this category. None of the studies include **poverty** indicators included in this review. Regarding household **income**, overall the studies lean towards positive effects, yet the studies on contract farming, such as those covered by

Otsuka et al. (2016) and Ton et al. (2017), were more consistently positive than the studies on certification schemes, covered by International Trade Centre (ITC) (2011) and Oya et al. (2017). In terms of the effects on agricultural **productivity**, Arimond et al. (2011) and IOB (2011) had just one relevant impact evaluation each with positive results, but ITC (2011) and Oya et al. (2017) on certification schemes found that just 5 out of 11 and 1 out of 5 impact evaluations, respectively, identified positive effects on productivity/yields. This is designated as grey (not suggestive of positive effects), with the caveat that the evidence applies primarily to certification schemes.

Six reviews covered the effects on **diet quantity** (calories or total expenditure), all of which had four or fewer impact evaluations each. The majority of these showed positive results. Six reviews covered the effects on **diet quality and/or nutrition**, with one, two or three impact evaluations each. The majority of these showed positive results, but the quantity of evidence is rather thin. Regarding the effects on **child stunting**, just three reviews included studies on this outcome – Berti et al. (2004), World Bank (2007) and Arimond et al. (2011). These had just one, one and four relevant impact evaluations, respectively. The evidence contained therein was quite mixed, leaving it in doubt that there is a positive trend. Only two reviews covered the effects on **child wasting**, with each only including one impact evaluation (one was positive and one mixed), again prohibitively limited to draw any clear conclusions.

The value chain concept can be used to explore the linkages between agriculture, nutrition and markets to assess the potential role of the private sector in contributing to public nutrition objectives (Poole 2013; Maestre et al. 2017). As development activities, value chain interventions are directed at segments or the entirety of a value chain to achieve particular economic or social objectives through investments and innovations, typically focusing on business processes (Zuberi et al. 2016). Ruel et al. (2017) found just one rigorous evaluation of a value chain intervention at the household level – a Randomized Controlled Trial (RCT) of a dairy value chain programme in Senegal – which was found to positively affect boys' haemoglobin levels (changes in girls' haemoglobin levels and children's anaemia rates were not statistically significant). Allen and de Brauw (2017), in a literature review (not included in the Evidence Map), considered the types of value chain interventions that could lead to improvements in micronutrient intake. On review of the existing literature, they concluded that very few published papers link agricultural interventions in general, and value chain interventions in particular, to nutritional outcomes.

3.6 Extension and advisory services

The evidence from systematic reviews regarding the effects of extension and advisory services on **poverty** is extremely thin. Ton et al. (2013) included just one impact evaluation that showed positive effects of innovation grants for small farmers on poverty. The evidence of the impact on household **income** is suggestive of positive effects, but the quantity of studies is somewhat limited, with just three systematic reviews including one to four impact evaluations each, the majority of which were positive. Regarding agricultural **productivity**, the evidence regarding extension (Davis et al. 2012 and Waddington et al. 2014) is generally positive, although there are concerns regarding methodological rigour and publication bias. The evidence of the effect of capacity strengthening of agricultural research systems on productivity, from Posthumus et al. (2013), is also positive, but very thin. Regarding food

and nutrition security, and children's **anthropometry**, only Ton et al. included evidence in this area, with four impact evaluations showing positive effects, with the exact indicators unspecified.

3.7 Sustainable agriculture practices

For sustainable agriculture, the relevant systematic reviews mainly focused on organic agriculture and conservation agriculture, and **productivity** was the exclusive focus in terms of the outcomes of interest for this paper. The search did reveal systematic reviews of studies testing the nutrition content and effects of organic foods, but these were not included because they were efficacy trials and mostly took place in high-income countries (see Dangour et al. 2009, and Lima and Vianello 2011). It is also important to note that certification schemes, including organic certification, are covered in the agricultural commercialization section of this report and not here, although the connection to this section on sustainable agriculture is clear.

In terms of conservation agriculture (CA),⁴ there were four systematic reviews that met our inclusion criteria – Rusinamhodzi et al. (2011), Bayala et al. (2012), Wall et al. (2013) and Brouder and Gomez-Macpherson (2014). Two found net positive effects, one found mixed and one found net negative effects of CA on yields. The consistent message is that context and local conditions (i.e. enabling environment) are hugely influential in terms of success. Regarding organic agriculture, the evidence is mixed, although recent reviews show that yields are at least somewhat lower than those of conventional agriculture (de Ponti et al. 2012 and Seufert et al. 2012). The two more general systematic reviews in this area (Pretty et al. 2006 and Garibaldi et al. 2017), covering agricultural sustainability projects and alternative farming systems, found positive effects on yield in the majority of included studies. In sum, enough of these reviews found positive effects on yield to consider this suggestive of positive effects (light blue); however, there is huge variability, in part driven by agroecological context and the exact farming techniques that are used.

3.8 Irrigation

The systematic reviews covering irrigation that met our inclusion criteria were all broader studies that included infrastructure or agriculture more generally. The studies on **poverty** are all from Knox et al. (2013), including 15 studies on poverty, and these all show positive effects. Knox et al. (2013) also included 18 studies on **income**, again all positive, along with 1 positive study on income from IOB (2011). Pinstруп-Andersen and Shimokawa (2008), IOB (2011) and Knox et al. (2013) included 3, 3 and 13 studies of the effect of irrigation on **productivity**, respectively, with all but 1 study showing positive effects. In terms of **food security**, just IOB (2011) had evidence – two impact evaluations both showing positive effects. The evidence is also extremely thin on irrigation and **nutrition security**, with Berti et al. (2004) and Ruel et al. (2017) including two and one impact evaluations, respectively, with mixed results. (It should be noted that Domènech (2015), not included in the Evidence Map but described in the online annex (www.ifad.org/research/annex_38), also covered irrigation and food and nutrition security, and found positive results.)

4. CA includes minimum or zero tillage, soil cover (mulch) and crop associations in the form of rotations or intercropping.

3.9 Agricultural input subsidies

The evidence on agricultural input subsidies is very limited, both in terms of systematic reviews and impact evaluations. Chirwa and Dorward (2013) state that “it is notable how difficult it is to find comprehensive reviews of subsidy programmes, despite the substantial number of programmes that have been or are being implemented across Africa and the very substantial investments of public funds in these programmes”. Jayne et al. (2016) declare that there is a “dearth of research” on the topic of agricultural input subsidies and food security. A systematic review protocol from Dorward et al. (2014) states that no systematic review of agricultural input subsidies has previously been published, and that the existing literature reviews have been inadequate.

Included in the Evidence Map are IOB (2011), a systematic review that covers a wide range of agricultural programme types including limited evidence on agricultural input subsidies, and Jayne et al. (2016), the most comprehensive review on agricultural input subsidies that could be located. Regarding **poverty**, IOB (2011) includes evidence from just one impact evaluation, showing a positive effect, and Jayne et al. (2016) include two studies that show no impact on poverty incidence, but reductions in poverty severity. Jayne et al. also include national data from Malawi on poverty, showing that the input subsidy programme brought down the poverty rate. Jayne et al. include three studies from three countries on the effect on **income**, which showed mixed results (one positive, one mixed, one no effect). Regarding the effect on **productivity**, Jayne et al. found that three out of four studies with evidence showed positive effects on yields, and concluded that there is a positive effect, but that it could be made stronger by improvements in programme delivery. IOB (2011) found two studies on yields, both showing positive effects. Only Jayne et al. had studies on **food security**, **nutrition security** and **child wasting**, with just one or two studies for each outcome type, making it impossible to determine the trend.

4 Rural development interventions

4.1 Groups/organizations

This category was broadly defined to include rural development groups and organizations, including but not limited to agricultural cooperatives. One systematic review by Biscaye et al. (2014) that covers self-help groups, savings groups, women's health groups and farmers' groups found 11 studies on **income**, with 8 studies showing positive effects and 3 studies showing no significant effects; however, none of these studies included quantitative effects relative to a control group, and so this is not considered sufficient evidence to constitute a positive trend. Of five studies on agricultural **productivity**, three showed positive effects and two no significant effects. In terms of **food and nutrition security**, Biscaye et al. (2014) also included one study on calorie and protein consumption with positive effects on each, yet the evidence is too thin to draw any conclusions.

The evidence on agricultural cooperatives is surprisingly thin, considered "scarce at best" according to Ragasa and Golan (2014). No systematic reviews were identified that focused exclusively on the impact of agricultural cooperatives on our outcomes of interest. Berkhout et al. (2017) created an Evidence Gap Map including producer cooperatives, and showed that the evidence base on producer cooperatives is limited. Shiferaw et al. (2011), with a focus on sub-Saharan Africa, provide an overview of the ways in which agricultural cooperatives can help farmers improve access to markets and increase adoption of agricultural technologies, with examples from the literature. They also reviewed the factors that contribute to successful cooperatives and to the challenges faced by cooperatives.

4.2 Land tenure security

Several reviews with evidence on tenure security met our inclusion criteria. Lawry et al. (2014) and Higgins et al. (2017) focused specifically on tenure security, Meinzen-Dick et al. (2017) focused on women's land rights, and IOB (2011) and Bouillon and Tejerina (2007) are broader reviews that included tenure security/land rights as one of several intervention types. Evidence of the impact of tenure security on **poverty** is from just one systematic review (IOB 2011), with three relevant impact evaluations, all showing beneficial effects. The evidence on **income/consumption** is from three reviews. IOB (2011) included just one impact evaluation that measured the effect on income, and found a positive effect. Lawry et al. (2014) included four studies on income, two of which showed positive effects and two of which showed no significant effects, yet the author's meta-analysis showed that tenure security increased income by 15 per cent. However, Higgins et al. (2017) included nine studies that looked at the impact on income, and of these just two showed positive effects, one showed mixed effects and six showed no effect, concluding that for land tenure security, there is "a lack

of support for links with productivity, access to credit, and income". Because of this, we designated this category as grey (lack of clear positive effect, despite existence of evidence).

Regarding **productivity**, IOB (2011) included one relevant impact evaluation, showing a positive effect. Lawry et al. (2014) found that six out of eight impact evaluations showed positive effects, and meta-analysis showed a 40 per cent increase in productivity, although the results are not statistically significant given the substantial heterogeneity of the results. Higgins et al. (2017) found that three out of four impact evaluations showed positive effects. Meinzen-Dick et al. (2017) found three relevant studies, all of which showed that increased tenure security positively affects productivity, although in one case the effect holds only for men. We consider this category to be suggestive of positive effects (light blue), yet recommend caution given the heterogeneity of effects detected by Lawry et al. (2014).

Regarding the impact of tenure security on **diet quantity**, three systematic reviews considered this area – IOB (2011), Higgins et al. (2017) and Meinzen-Dick et al. (2017) – with one, two and four relevant impact evaluations, respectively, showing mixed results. The quantity of evidence is insufficient to determine a tendency. The same systematic reviews included studies on **diet quality and/or nutrition**, here with just one to two relevant impact evaluations each, which is again insufficient evidence to determine a trend. Only Bouillon and Tejerina (2007) had evidence on **child wasting**, with just one positive impact evaluation.

In terms of context, Lawry et al. (2014) found that, "Though tenure recognition improves productivity in settings where title is the dominant means for securing land rights, as is the case in much of Latin America and Asia, productivity gains may take time to become apparent, the effects may vary substantially across cases, and they likely depend on other supportive conditions, such as the performance of credit, input supply, and product markets". The authors also describe the reasons why tenure security may be less effective in Africa, including the existence of informal tenure arrangements and the lack of a supportive environment, pivotal to ensure gains from tenure security in other regions. In terms of impact pathways, intermediate outcomes are presumed by Lawry et al. to be increased investment in the land and increased use of land via leasing or sharecropping that is possible with a formal title. The authors did not find evidence that land tenure security provides benefits through increased access to credit, but rather that the investment effect has a positive impact.

4.3 Landscape-scale natural resource management

Several systematic reviews regarding the socio-economic impacts of forestry interventions are motivated by the implementation of the Reducing Emissions from Deforestation and Forest Degradation in Developing Countries framework. A question that is commonly approached in these reviews is whether or not economic and environmental benefits can simultaneously be achieved through these interventions.

Although there is some evidence suggesting positive impacts of forestry interventions on household **income**, the evidence is still weak and the impacts on the poor are cause for concern. Bowler et al. (2010), in a systematic review on community forest management, found two impact evaluations covering income, but the results are inconclusive given methodological issues. Samii et al. (2015a), in a systematic review on decentralized forest management, found that of three studies that considered household welfare, only one looked at total per capita consumption expenditure (positive effect) and two looked at forest income

and found positive effects; however, it was noted that the impact on poorest households is not always positive. Samii et al. (2015b) focused on payments for environmental services and found that of two studies with evidence on income, both showed positive effects. Caplow et al. (2011), in a review of forestry projects, found that of two papers (one project) that looked at effect on household income, the effect was positive. Finally, Pelletier et al. (2016) reviewed community forest management projects and found that of 25 studies that measured the impact on income, two had mixed results, 11 had positive effects, 11 had no significant effects and 1 had a negative effect. However, it is not clear how many of these showed total income versus solely forest income. Taken together, we consider this to be suggestive of positive impacts (light blue in Figure 1), yet we consider Pelletier et al.'s assessment to be important: "In terms of social benefits, there is some evidence of positive outcomes, but it would be prudent to say that, although CFM could provide a contribution to poverty alleviation, it is by no means a panacea to rural poverty. It is also clear that CFM does not deal very well with equity issues at the local level". Therefore, the light blue designation regarding the effect on income must be understood as not necessarily targeted to the poor.

The quantity of evidence in the systematic reviews is much too limited to draw any conclusions on **food security**. Only Caplow et al. (2011) included one impact evaluation covering monthly food expenditures, which found no effect. Bowler et al. (2010) explicitly included food and **nutrition security** outcomes in their search, but found no relevant impact evaluations with control groups that measured food and nutrition security outcomes.

There is a series of systematic reviews on community-based conservation interventions that reports generally on "economic outcomes," along with attitudinal, behavioural and ecological outcomes (Brooks et al. 2006; Waylen et al. 2010; Brooks et al. 2013). However, these are not included in the Evidence Map because the details of what indicators are included in the broad category of "economic outcomes" are unclear.

Finally, there are several existing systematic review protocols on the impacts of forestry. For example, Cheng et al. (forthcoming) will systematically review the literature on the impacts of forests on poverty alleviation, and Miller et al. will review the effect of agroforestry interventions on agricultural productivity, ecosystem services, and human well-being in low- and middle-income countries (Miller et al. 2017).

4.4 Improved access to financial products

This category contains various intervention types, including microcredit, microsavings, formal banking services and insurance programmes. A moderate number of systematic reviews have examined the effects of financial products on poverty, food and nutrition security, and average income, but few have considered child anthropometry or agricultural productivity. Five reviews considered the effects of financial products on **poverty**. Stewart et al. (2010) and Stewart et al. (2012) both covered the effects of microfinance, primarily microcredit, on poverty, with the former study focused on sub-Saharan Africa and the latter covering low- and middle-income countries. Together these include five impact evaluations, with one showing beneficial effects, two detrimental effects and two no effects. The other reviews on poverty – Radermacher et al. (2010) on insurance, Pande et al. (2012) on formal banking services and Biscaye et al. (2015) on rural and agricultural finance – included very few impact evaluations each, and given that they covered diverse aspects of finance, no firm conclusions

can be drawn from them. However, for microfinance, the poor vote count on poverty, along with conclusions drawn by Stewart et al. (2010) and Duvendack et al. (2011) suggesting that microcredit can be detrimental to the poor, lead us to designate this as grey, with the caveat that this conclusion is driven by the microfinance results.

The reviews on **income** also covered a variety of intervention types, but for most of the reviews, the majority of the included impact evaluations showed beneficial effects on income (or expenditures), including the impact evaluations covering microfinance. Thus, we designate this category as light blue, suggestive of positive impacts. In contrasting this with the less encouraging findings regarding poverty, it is worth further investigation to determine whether financial products, including microfinance in particular, lead to short-term gains in expenditure, while failing to realize longer-term transitions out of poverty.

The reviews on food security (**diet quantity**) covered microcredit (Stewart et al. 2010), rural and agricultural finance (Biscaye et al. 2015), and savings promotion interventions (Steinert et al. 2017). Whereas Steinert et al. found positive effects on food security in a meta-analysis, the other two reviews mainly failed to find positive effects, thus we designate this category as grey. Just two reviews cover the effects on **diet quality and/or nutrition**. Stewart et al. (2010) found that four out of five microfinance impact evaluations showed positive effects on diet quality and/or nutrition. Biscaye et al. (2015) found that just one out of two impact evaluations on rural and agricultural finance positively affected diet quality and/or nutrition. We designate this as suggestive of positive impacts, with the caveat that this is driven by the microfinance results. Finally, only Stewart et al. (2010) had one impact evaluation on **stunting** and this showed a beneficial effect of microfinance.

It is notable that the literature on index insurance is quite limited. Cole et al. (2012) systematically reviewed the literature on agricultural index insurance but found no papers with evidence regarding the impacts on income, productivity, or food and nutrition security despite including these in the search. Marr et al. (2016) systematically reviewed the literature on index insurance including takeup, impacts and interactions with credit products in developing countries. They identified only two papers, both with positive results, showing empirical evidence of the effect of index insurance on income/consumption, although they included papers that modelled both negative and positive effects on income. Marr et al. also included papers that showed effects on intermediate outcomes such as investment levels and investment in riskier crops, and found mainly positive results.

4.5 Rural job creation programmes

The systematic reviews on rural job creation programmes focused mainly on the impact on household income. Although there are some suggestions of positive impacts, several of the systematic reviews and meta-analyses found no evidence of impact on **income**. Bouillon and Tejerina (2007), in a review focused on a variety of social programmes in Latin America, included youth training programmes and other job training programmes aimed at increasing the participants' skill levels to prepare for the workforce. Of the seven evaluations that looked at effects of youth/job training programmes on income, four found positive effects, one found mixed effects and two no effects. Holmes et al. (2013) systematically reviewed the evidence of the impact of job creation interventions in fragile states on poverty and stability, and two out of two quantitative studies that looked at income/consumption found

positive effects. Valerio et al. (2014), in a review of entrepreneurship education and training programmes, found that of five studies on income, two showed positive effects and three showed no effect. Kluve et al. (2017) systematically reviewed training, entrepreneurship promotion, employment services and subsidized employment interventions for youth based on 10 studies. Regarding consumption, a proxy for income, the effect was positive but not statistically significant at the 95 per cent confidence interval. At least 7 of these 10 studies were from low- and middle-income countries, for which the authors state that the effects on consumption were greater. Taken together, we consider these to be suggestive of positive impact on income, particularly in low- and middle-income countries.

Just one systematic review (Holmes et al. 2013) considered the impact of these programmes on **food security**, and although all four studies included showed positive effects, it was acknowledged that the studies were not rigorous, and the evidence base is too thin to draw any meaningful conclusions.

There are a considerable number of systematic reviews that consider youth employment programmes, entrepreneurship programmes and other job creation programmes that do not consider our outcomes of interest. These include Card et al. (2015) (employment status, earnings, hazard to new job, other hazard and unemployment status), Cho and Honorati (2014), Grimm and Paffhausen (2015) (job creation), Betcherman et al. (2007), and Tripney and Hombrados (2013).

4.6 Social protection programmes

The literature on social protection programmes is relatively abundant, high quality and is primarily focused on cash transfer programmes, although other social protection programmes such as public works programmes and employment guarantee schemes are also covered. Four systematic or comprehensive reviews included results on **poverty** (measured in terms of incidence, depth and/or severity): Fiszbein et al. (2009), Hagen-Zanker et al. (2011), Independent Evaluation Group (IEG) (2011) and Bastagli et al. (2016). For all of these reviews, the majority of included impact evaluations showed that social protection programmes reduced poverty (4 out of 6, 18 out of 19, 17 out of 20 and 6 out of 9, respectively). Regarding the effect on **income**, seven reviews included studies showing the effect on income and/or expenditures: Bouillon and Tejerina (2007), Fiszbein et al. (2009), IEG (2011), Hagen Zanker et al. (2011), Kabeer and Waddington (2015), Bastagli et al. (2016) and Ralston et al. (2017). These show positive effects on income in 4 out of 7, 5 out of 7, 6 out of 9, 7 out of 11, 3 out of 3, 25 out of 35 and 5 out of 9 impact evaluations, respectively. Because these are less overwhelmingly positive, we designate this as light blue.

Ten reviews included studies on **diet quantity** (calorie consumption or total food expenditures): Bouillon and Tejerina (2007), Basset (2008), Bhutta et al. (2008), IEG (2011), Fernald et al. (2012), Manley et al. (2013), Kabeer and Waddington (2015), Bastagli et al. (2016), Burchi et al. (2016) and Ralston et al. (2017). For 9 out of 10 of these studies, the effect on diet quantity was positive for the majority of the included impact evaluations, often overwhelmingly so. The one exception was Ralston et al. (2017), which showed positive effects in 5 out of 11 cases, non-significant effects in 5 cases and negative effects in 1 case. Twelve reviews covered **diet quality and/or nutrition**, and these also showed positive effects in the majority of impact evaluations. Regarding the effects on **child stunting**/HAZ scores,

7 out of 12 reviews showed beneficial effects in the majority of cases, whereas 5 out of 12 reviews showed that the impact evaluations were either evenly split between beneficial results and no results/detrimental results, or that beneficial results were found in less than half of the impact evaluations. Further, in a meta-analysis on cash transfer programmes and stunting, Manley et al. (2013) found the following: “When effect sizes are weighted by the inverse of their standard error on average the 17 programmes increased HAZ by 0.025 with a p-value that the effect is different from zero of 0.38. The programs’ average impact on height-for-age is positive, but small and not statistically significant”. We therefore consider there to be unconvincing evidence that there are positive, significant effects on stunting. Meanwhile, for each of seven systematic reviews that covered the effects on **child wasting**, the majority of impact evaluations showed no effect.

Interestingly, the point is made in both Kabeer et al. (2012) and Leroy et al. (2009) that there is little understanding of the causal pathways by which conditional cash transfers affect the outcomes of interest.

4.7 Information services/information and communication technology (ICT)

In terms of our outcomes of interest, the systematic reviews covering information services/information and communication technology (ICT) are concentrated on impacts on income and diet quality. The evidence on **poverty** comes from just one systematic review (Knox et al. 2013), with three impact evaluations (two positive, one no effect). The evidence of ICT interventions on **income** comes from four reviews. Asenso-Okyere and Mekonnen (2012), in a review of ICTs for agriculture, found two impact evaluations that considered the effects on income, both with positive results. Pande et al. (2012) included an evaluation of just one ICT intervention – the mobile banking service m-Pesa – and found a positive effect on income. Knox et al. (2013) included just one impact evaluation on telecommunications, which does not find a significant effect on income. Biscaye et al. (2015), which also reviewed mobile money applications, found that of the three included studies that looked at household income/consumption, all three saw positive effects. We consider this to be suggestive of positive effects. The evidence on agricultural **productivity** is from just one review (Asenso-Okyere and Mekonnen 2012) with one impact evaluation, and the effect was positive.

Compared to the interventions that evaluated the effect on income, the evidence on the effect of information services/ICTs on **diet quality and/or nutrition** was based more heavily on interventions that conveyed diet and/or health information to beneficiaries, with a focus either on mothers and babies or the general population. Naugle and Hornik (2014) reviewed mass media interventions focused on child health and found that of the nine nutrition studies of moderate to stronger design, all had positive effects, although in some cases this was just on knowledge/attitudes but not practices. Biscaye et al. (2015) had one evaluation of a mobile money intervention, which showed positive effects on diet quality. Lee et al. (2016) evaluated maternal, neonatal and child health interventions delivered via mobile ICT, and found three evaluations on infant feed and/or breastfeeding for which meta-analysis showed a positive and statistically significant effect. The effects on iron supplementation were also positive. Finally, Müller et al. (2016) focused on Internet and mobile technology to influence diet, and found that of the 11 studies that looked at effects on diet, 8 had positive effects. The authors concluded that “most Internet-based

interventions were effective in improving physical activity and/or diet while the evidence for mobile-phone interventions (text messages and counselling) was mixed". Because there are multiple reviews with impact evaluations on diet quality and/or nutrition, 2 of which have 9 to 11 studies each, and showing predominantly positive effects, we consider this area to have sufficient evidence of positive impact (red).

The 3ie Map of Maps (updated 17 April 2017) included "Information and communications technology" as a sector and SDG 1 and SDG 2 as outcome categories. Within this, no evidence maps were included under SDG 1 but two were included under SDG 2: Zewge and Dittrich (2015) and Sabet et al. (2017). Sabet et al. (2017), a 3ie Gap Map on "Science, Technology, Innovation, and Partnerships" yielded just seven systematic reviews in total, only one of which was relevant for our purposes. The relevant systematic review, Lee et al. (2016), "Effectiveness of mHealth interventions for maternal, newborn and child health in low- and middle-income countries: Systematic review and meta-analysis," included the impact of technology on breastfeeding outcomes and is included in the Evidence Map and database. Zewge and Dittrich (2015) is a thesis and was not relevant for our purposes.

4.8 Improved infrastructure

The evidence base regarding the effect of infrastructure projects differs substantially from most of the other intervention types covered by this Evidence Map and review. For one, given the wide-scale nature of many infrastructure investments, the evaluation methods best-suited to determining the impact of these projects are different from the other intervention types. Also, with the exception of Knox et al. (2013), infrastructure evaluations have not been covered by systematic reviews but rather by multi-country reviews that consider the impacts of infrastructure at the national level for several countries. Yet, because the existing evidence suggests positive impacts on some outcomes of interest and several other intervention types point to the state of infrastructure as an important contextual factor that determines programme effects, we consider its inclusion essential for understanding the programme types that influence SDGs 1 and 2.

Regarding **poverty**, Knox et al. (2013) found that for roads, electricity and mixed infrastructure, there were 46 measures on poverty, of which 42 were positive, 3 were negative and 1 showed no effect. Torero (2011) reviewed Fan and Hazell (1999), Zhang and Fan (2000), Fan et al. (2000a), Fan et al. (2000b) and Fan et al. (2002), and stated that these studies in India and China "are among the few works that attempt to link infrastructure, rural growth and poverty alleviation, by highlighting the role of investment complementarities. Their research efforts show that infrastructure investments, particularly in irrigation, roads, electricity and telecommunications, not only contribute to growth in agricultural production, but also a reduction in rural poverty and regional inequality in these countries". Taken together we consider this to be sufficient evidence demonstrating that infrastructure reduces rural poverty. Regarding **income**, the evidence is all from Knox et al. (2013), which included 9 measures on income, of which 7 were positive, 1 negative and 1 showed no effects, and 13 measures of consumption, of which 11 were positive and 2 were negative. The evidence from the literature on the impacts of infrastructure on **productivity** is quite consistently positive. Knox et al. (2013) described the impacts of infrastructure on income as occurring via improvements in agricultural productivity. Pinstrup-Andersen and Shimokawa (2008) found four studies

with measures of the effect of infrastructure on productivity (labour productivity and TFP), three of which showed positive effects and one that showed no change. Knox et al. (2013) included 11 measures on agricultural productivity, including yields, labour productivity and TFP, all of which were positive. Torero (2011) cited one study on productivity that showed positive effects.

4.9 Multisectoral interventions and WASH

This last category of interventions contains a combination of selected multisectoral interventions and Water, Sanitation And Hygiene (WASH) interventions. Regarding the effect on **income**, the evidence is from Banerjee et al. (2015), in a review of six graduation programmes in six countries. They found that in endline 1, impact on total consumption per capita was positive and statistically significant in four out of six countries. In endline 2, impact on total consumption per capita was positive and statistically significant in five out of six countries (although only at the 10 per cent level for two of these). For food consumption per capita per month, five out of six countries showed positive, statistically significant results (although one was only significant at the 10 per cent level). The **food security** index showed positive effects for four out of six countries for endline 1 and for four out of six countries for endline 2 (although two are only significant at the 10 per cent level). The methodological rigour of these studies is high.

The evidence regarding **nutrition outcomes** is primarily from Dangour et al. (2013) on WASH interventions. Of the 12 studies with nutrition measures other than HAZ/stunting or WHZ/wasting (WAZ, Mid-Upper Arm Circumference, Body-Mass Index and haemoglobin), 10 studies found no statistically significant effects, 1 found positive/beneficial effects (on WAZ) and 1 found negative effects (on haemoglobin levels). Meta-analysis from RCTs found no statistically significant effect on WAZ. Regarding **HAZ or stunting**, Dangour et al. (2013) found that of the 10 studies that measured HAZ scores, 9 saw no change and 1 found positive effects. Meta-analysis (on RCTs only) including 4,627 children identified a borderline statistically significant effect of WASH interventions on HAZ score (MD 0.08; 95 per cent CI 0.00 to 0.16). Meanwhile, Remans et al. (2011), in a review of the multisectoral Millennium Villages Project, found the following: “There was a significant (at = 0.05) reduction in stunting prevalence at 5 of the sites and a nonsignificant reduction in 3 additional sites. (One additional site had a nonsignificant increase in stunting.) Furthermore, children younger than 2 years of age had a 43 per cent lower risk of being stunted than before project initiation”. Taken together we consider this to be suggestive of positive impacts on stunting, although this is a borderline case. Of the 10 studies that covered **WHZ or wasting**, again from Dangour et al. (2013), all 10 found no statistically significant effect. Meta-analysis (on RCTs only) including 4,622 children identified no evidence of an effect of WASH interventions on WHZ score (MD 0.02; 95 per cent CI -0.07 to 0.11).

There are multiple systematic reviews of WASH interventions investigating outcomes other than ours, including incidence of diarrhoea in particular. Mbuya and Humphrey (2016) discuss the possible impact pathways between WASH and reduced stunting and suggest that the effect may not be through reduced diarrhoea but rather through reduced enteric dysfunction. Several papers have emphasized the importance of considering a multisectoral approach to combatting stunting: see Ruel et al. (2017), Carmen Casanovas et al. (2013) and

Erismann et al. (2017). Including WASH components along with other nutrition-specific or nutrition-sensitive interventions is an approach worthy of further investigation.

It is worth noting that the 2015 3ie Gap Map on Water, Sanitation and Hygiene, which covers a wide range of WASH interventions, showed just one systematic review covering impacts related to nutrition and anthropometry (Dangour et al. 2013) and no systematic reviews covering impacts related to income/consumption/poverty. Dangour (2013) notes the following regarding previous research: "Cochrane reviews published to date of the impact of WASH interventions have focused only on diarrhoea incidence, and there are no published reviews of the effect of WASH interventions on child nutritional status". A search of all published papers citing Dangour et al. (2013) revealed no additional systematic reviews to date, which would have likely cited Dangour if they existed.

5 Discussion

5.1 SDGs

What is most striking about the evidence base regarding poverty (**SDG 1**) is that for most intervention types it is very limited. This is, in part, a result of the restrictive criteria used to identify the impact on poverty, whereby we included only measures of poverty headcount, severity and depth to best capture progress as measured by SDG 1. Many reviews stated that they assessed the impact on poverty, but used indicators related to health, education and other areas, rather than the poverty measures that are used by the SDGs.

It is interesting to juxtapose the small evidence base on the effects of agricultural productivity interventions on poverty with that on the effect of agricultural growth on reducing poverty using cross-country data and computerized general equilibrium models showing robust evidence (de Janvry and Sadoulet 2010). Demonstrating the impacts of agricultural research and development on poverty is inherently challenging because of the long and complex causal chain between changes in agricultural practices and poverty outcomes (Gollin et al. 2018); however, it is still surprising how few studies tried.

The evidence base is stronger for food and nutrition security (**SDG 2**). As might be expected, the evidence base for impacts of agricultural and rural development interventions on income and productivity, both of which are much more proximate outcomes to an agricultural intervention, is well documented and largely positive.

Food security is covered for the majority of intervention types, although not always with a large volume of relevant impact evaluations. For agricultural and social protection programmes, the evidence shows quite consistently that there are positive effects on food security. This wide base of evidence for nutrition security reflects, in part, the expansive definition we have taken, whereby we have included measures of consumption of micronutrient-rich foods, dietary diversity indices and diet quality analyses.

Undernutrition, and stunting in particular, is like poverty, difficult to influence directly through agricultural investments. However, in contrast to poverty, quite a number of reviews have been conducted on the evidence base for the effects of agriculture on nutrition and stunting. Recent recognition of the importance of stunting as a development priority, and the need for both nutrition-sensitive as well as nutrition-specific interventions to address it, has led to interest in the potential of agriculture to make a greater contribution. This helps explain the relatively large number of reviews, and the focus on subcategories related to production of nutritious foods such as vegetables, animal products and biofortified staples; however, many are inconclusive because of weaknesses in study design and the difficulty of influencing an outcome as complex as stunting.

Had all studies that sought to assess poverty impacts used the poverty measures as for SDG 1, the evidence base would have been larger and more comparable. However, the reality is that impact pathways from agricultural and rural development interventions to poverty, malnutrition or stunting are complex and difficult to document. Ensuring that impact evaluations also include intermediate outcomes along the pathway is important in terms of expanding the evidence base. In the case of SDG 2, the indicators chosen do reflect outcomes along a pathway, whereas in SDG 1 there is only the final outcome. It is likely that some of the SDG 2 indicators, such as productivity and income, are also relevant for SDG 1, and where this is the case, investments that address these can harness the synergies between SDGs 1 and 2.

Despite its importance, **cost-effectiveness** is commonly noted as an area of research requiring further attention according to many of the systematic reviews covered by this report. These include, but are not limited to: Arimond et al. (2011), Basset (2008), Bastagli et al. (2016), Iannotti et al. (2013), Kluve et al. (2017), Lagarde et al. (2009), Landell-Mills and Porras (2002), Müller et al. (2016), Ranganathan and Lagarde (2012), Ruel (2001), Ruel et al. (2017), Samii et al. (2015b), Steinert et al. (2017) and Ton et al. (2013). Some reviews, however, did include a substantial analysis of cost-effectiveness. These include, but are not necessarily limited to: Banerjee et al. (2015), Biscaye et al. (2014), Bouillon and Tejerina (2007), Bowler et al. (2010), Fiszbein et al. (2009), IOB (2011), ITC (2011), Jayne et al. (2016), Pinstrip-Andersen and Shimokawa (2006) and Pray et al. (2017). Other reviews had some mention of cost-effectiveness, but it was either not a major focus of the review or there was limited evidence based on the impact evaluations examined. Finally, a substantial number of reviews did not address cost-effectiveness at all. This lack of evidence may be because our search was for reviews of programme effectiveness, not cost-effectiveness per se. However, the need for more research in this area was a common refrain.

Many of the systematic reviews included here recognized the importance of the enabling environment and the challenge of making generalizations about what types of interventions will be effective. There are some contextual issues that are common to many of the reviews, including the state of the agroecological environment, existing institutions, infrastructure and markets. For example, Ruel et al. (2017) point to various important contextual factors, including market access, whereby crop production diversity has a greater effect on outcomes such as dietary diversity in places where market access is limited. They also underline the importance of the food environment, and suggest that existing frameworks used to categorize food environments and interventions be matched to each context. Jayne and Rashid (2013) discuss the importance of soil quality in determining yield response to input subsidy programmes. Knox et al. (2013) include a long list of “effect modifiers” that influence the results of infrastructure investments, including but not limited to geographical location, initial infrastructure condition and availability of natural resources. It is not within the scope of this paper to thoroughly analyse the contextual factors that influence the success, or lack thereof, of each intervention type. Yet, the message that context is important came through clearly in the process of this review, and more comprehensive study of contextual factors in future research would be worthwhile.

5.2 Interventions

Agricultural and social protection programmes have the strongest evidence base for SDGs 1 and 2. Results are promising for other intervention types as well; for only one – strengthening organizations and groups – is there no evidence from the included systematic reviews of even potentially positive impacts on any of the outcome indicators. Evidence on input subsidies is the next thinnest, with just two reviews that present only limited evidence on productivity improvements. For all but one intervention type – sustainable agricultural practices – reviews looked at multiple outcomes. Even where they did not find impacts, that no negative results were found suggests that there are no trade-offs, at least among the interventions assessed in these studies. That this meta-review found little evidence of negative impacts could be a result of “cherry picking” (conducting studies where impacts are expected) or publication bias, but evidence of what does not work is also important to inform investment decisions and should be considered by the research community.

This review focuses on single intervention types; however, many projects or programmes include multiple intervention types. With the exception of a small number of interventions specifically targeted at nutrition and health, limited evidence was identified regarding the effects of multisectoral interventions on the outcomes of interest.⁵ This could be an important area for future research, with careful attention paid to underlying impact pathways to enhance the generalizability of the results.

5.3 Next steps to expand the evidence base

Most studies reviewed for this meta-review call for greater attention to quality in both measurement and analytical rigour. Given the length and complexity of the impact pathways, this does not just mean more experimental and quasi-experimental studies. Good-quality studies of all kinds are needed,⁶ as are ways of synthesizing findings and extracting operational implications.

Investment is also needed in the kinds of data and data collections systems that will enable long-term, large-scale monitoring and analysis. Long-term panel datasets and geospatial data are increasingly being collected and made publicly available. Greater transparency and availability of intervention data, for example via compliance of International Aid Transparency initiative standards, etc., will enable analysis across interventions and outcomes scales that are relevant for decision makers.

The evidence was compiled to answer the question, “What do we know about the impact of agriculture and rural development on SDGs 1 and 2”? A corollary to this question is “What do we need to know to inform investment decisions in ways that will increase impacts”? To answer that question, we need a better understanding of how investment decisions are made, how programmes are designed and of where the entry points for evidence are found. The

5. The idea of a multisectoral intervention can be broadly defined and a simple search using the term “multisectoral” is unlikely to be an effective search strategy. Thus, we consider this to be an area with promise in terms of its effect on stunting/child height, but by no means definitive. There is a consistent theme and some evidence in the literature that multisectoral approaches can contribute to stunting reduction. Yet, Ruel et al. (2017) caution that in regard to nutrition-sensitive agriculture, evidence of stunting reduction has not been shown, and that although multisectoral approaches including agriculture might be effective, the question of co-location versus integration of complex interventions must be better researched.

6. For example, process tracing methods that are increasingly applied to intervention with social development goals (Beach 2017).

results of this review could be an important starting point for that analysis, which would draw on analyses of current projects as well as consultations with stakeholders.

5.4 Limitations of this review

Given the broad range of intervention types and outcomes covered by this review, along with consideration of the available time and resources for the project, it was necessary to restrict the collection of evidence to that which has already been covered by systematic reviews. This presents the possibility that there are impact evaluations for an intervention/outcome combination that are not represented by this paper. This could happen if there have been impact evaluations produced more recently than the latest systematic reviews or if the systematic reviews for an intervention/outcome missed relevant impact evaluations. Although it is important to keep these issues in mind, it is our view that they are not widespread concerns. Where evidence was scarce for a particular intervention type, we have noted in the narrative summaries statements from other researchers confirming this lack of evidence whenever possible.

There is also the possibility that we have missed relevant systematic reviews. In terms of the number of search terms we used and the number of databases we searched, the search process for each intervention type was less thorough than the searches done by the systematic reviews themselves. However, the possibility that we missed systematic reviews is lessened by the fact that we drew on existing Gap Maps of systematic reviews wherever possible, thereby benefiting from the extent of the search process that drove creation of the Gap Map. Also, systematic reviews that follow strict methodology include a section on previous systematic reviews on the topic. Where available, we have mined those lists for other relevant systematic reviews.

Another issue is that this review does not provide a count of impact evaluations, yet we know that there is considerable overlap and some impact evaluations are covered by multiple systematic reviews, particularly in terms of the agriculture reviews. Also, this report does not indicate the size of impact for most outcomes, which is an important aspect to consider for programme design; however, this goes beyond the scope of this review.

As described in Section 2, we used comprehensive reviews and multi-country impact evaluations, particularly where reviews following strict systematic review methodologies were unavailable. There is a trade-off here. By including reviews that are not systematic per se (e.g. see Torero (2011) on infrastructure or Banerjee et al. (2015) on graduation programmes), we are better able to understand the evidence base for interventions that have not yet been subject to systematic reviews. Given the inherent subjectivity of including some but not all non-systematic reviews across the intervention types, the volume of evidence in the cells is not directly comparable. This was a necessary decision driven by our main objective of providing an understanding of what we know about each type of intervention.

Finally, this review focused only on SDGs 1 and 2 as a first step in providing a broad review of the existing evidence on the impacts of a wide range of interventions supported by the JI members and partners. Notwithstanding their importance for achieving the SDGs, the factors that drive sustainability of the impacts (to any type of shock including climatic, economic or political) are not analysed here using the same methodology. Given the already ambitious goals of this study, an evidence review on sustainability is beyond its scope, but should be explored in future research.

5.5 Conclusion

The strength of this paper is its breadth, providing an overview of evidence on the impacts of a wide range of interventions on a large set of outcome indicators for SDGs 1 and 2. This study might generate more questions than answers for each type of intervention, regarding, for example, the geographic areas and timescales of the interventions that were evaluated and the durability of their results. It is intended to serve as a resource for deeper investigation into the various types of interventions included here, to provide a broad perspective on the research landscape relevant to SDGs 1 and 2, and to contribute to the development of meta-review methodology that can simultaneously consider a broad range of interventions and outcomes.

Finally, when considering the available evidence on the extent to which these interventions have influenced poverty and food security, it is valuable to reflect on the following questions: What factors effectively spark economic development that is inclusive and pro-poor? Macroeconomic policy, microeconomic interventions or accidents of history? To what extent do the types of interventions included here have the capacity to affect structural change or, at best, do they serve to alleviate the challenges of poverty until broader development occurs? It is our hope that this review provides some insight into the role that the included categories of interventions have played in the process of development.

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Appendix 1

Evidence Map: systematic reviews by intervention type and outcomes			
OUTCOMES			
	Extreme/moderate poverty	Average income of smallholders (consumption/ expenditure)	Productivity (per labour unit or per land unit)
Ag. technology/practice promotion/adoption (crops, livestock, fisheries)	 <p>IOB 2011 (limited evidence) Jayne et al. 2016 (limited evidence) Pray et al. 2017 Garbero et al. 2018</p>	 <p>Ruel 2001 (limited evidence) Berti et al. 2004 (limited evidence) Leroy and Frongillo 2007 World Bank 2007 Arimond et al. 2011 IOB 2011 Masset et al. 2011 Stewart et al. 2015 Jayne et al. 2016 (limited evidence) Pray et al. 2017</p>	 <p>Berti et al. 2004 (limited evidence) World Bank 2007 (limited evidence) Arimond et al. 2011 (limited evidence) IOB 2011 Loevinsohn et al. 2013 Jayne et al. 2016 (limited evidence) Pray et al. 2017 Garbero et al. 2018</p>
Homestead food production/ home gardens		 <p>Ruel 2001 (limited evidence) World Bank 2007 (limited evidence) Arimond et al. 2011 (limited evidence) Masset et al. 2011 (limited evidence)</p>	 <p>Berti et al. 2004 (limited evidence)</p>
Biofortification			






Note: Cell colours indicate the direction of impact of evidence. ● Dark blue=sufficient evidence of beneficial impact; ● light blue=suggestive evidence of beneficial impact; ● grey=despite evidence, impact is in doubt; ○ white=insufficient evidence to determine trend. Border colours indicate strength of methodology of impact evaluations. ● Yellow=concerns with methodology; ○ black=methodology is generally strong.

Food security (diet quantity)	Nutrition security (diet quality and/or nutrition)	Stunting for children age <5 (includes HAZ scores)	Malnutrition for children age 5 (wasting and overweight) (includes WHZ scores)
 <p>Berti et al. 2004 Leroy and Frongillo 2007 (limited evidence) World Bank 2007 Bhutta et al. 2008 (limited evidence) Gibson and Anderson 2009 (limited evidence) IOB 2011 Jayne et al. 2016 (limited evidence) Pray et al. 2017 (limited evidence)</p>	 <p>Ruel 2001 Berti et al. 2004 Leroy and Frongillo 2007 World Bank 2007 Bhutta et al. 2008 Gibson and Anderson 2009 Arimond et al. 2011 Masset et al. 2011 IOB 2011 (limited evidence) Stewart et al. 2015 Jayne et al. 2016 (limited evidence) Pray et al. 2017 Ruel et al. 2017</p>	 <p>Berti et al. 2004 (limited evidence) World Bank 2007 (limited evidence) Bhutta et al. 2008 (limited evidence) Gibson and Anderson 2009 Arimond et al. 2011 Masset et al. 2011 Girard et al. 2012 (limited evidence) Stewart et al. 2015 (limited evidence) Ruel et al. 2017</p>	 <p>Berti et al. 2004 (limited evidence) World Bank 2007 (limited evidence) Bhutta et al. 2008 (limited evidence) Gibson and Anderson 2009 (limited evidence) Arimond et al. 2011 (limited evidence) Masset et al. 2011 Girard et al. 2012 (limited evidence) Jayne et al. 2016 (limited evidence) Ruel et al. 2017</p>
 <p>Berti et al. 2004 (limited evidence) World Bank 2007 (limited evidence) Gibson and Anderson 2009 (limited evidence) Arimond et al. 2011 (limited evidence)</p>	 <p>Ruel 2001 Berti et al. 2004 World Bank 2007 Bhutta et al. 2008 Gibson and Anderson 2009 Arimond et al. 2011 Masset et al. 2011 Ruel et al. 2017</p>	 <p>Berti et al. 2004 (limited evidence) World Bank 2007 (limited evidence) Bhutta et al. 2008 (limited evidence) Gibson and Anderson 2009 Arimond et al. 2011 (limited evidence) Masset et al. 2011 Ruel et al. 2017 (limited evidence)</p>	 <p>Berti et al. 2004 (limited evidence) World Bank 2007 (limited evidence) Bhutta et al. 2008 (limited evidence) Gibson and Anderson 2009 (limited evidence) Arimond et al. 2011 (limited evidence) Masset et al. 2011 Ruel et al. 2017 (limited evidence)</p>
	 <p>Masset et al. 2011 (limited evidence) Stewart et al. 2015 Ruel et al. 2017 (limited evidence)</p>	 <p>Masset et al. 2011 (limited evidence) Stewart et al. 2015 (limited evidence)</p>	 <p>Masset et al. 2011 (limited evidence)</p>

CT, cash transfers; EGS, employment guarantee schemes; HAZ, height-for-age z scores; ICT, information and communications technology; IOB, Policy and Operations Evaluation Department of the Ministry of Foreign Affairs; ITC, International Trade Centre; PWP, public works programmes; WASH, water, sanitation and hygiene; WHZ, weight-for-height z scores.

Evidence Map: systematic reviews by intervention type and outcomes (cont.)

OUTCOMES









	Extreme/moderate poverty	Average income of smallholders (consumption/ expenditure)	Productivity (per labour unit or per land unit)
Livestock interventions		 <p>Leroy and Frongillo 2007 (limited evidence) World Bank 2007 (limited evidence) Masset et al. 2011 (limited evidence)</p>	
Aquaculture interventions		 <p>Leroy and Frongillo 2007 (limited evidence) World Bank 2007 (limited evidence) Kawarazuka 2010 Masset et al. 2011 (limited evidence)</p>	 <p>World Bank 2007 (limited evidence)</p>
Agricultural commercialization: cash crops, contract farming, certification schemes, value chains, etc.		 <p>Berti et al. 2004 (limited evidence) World Bank 2007 (limited evidence) Arimond et al. 2011 IOB 2011 ITC 2011 Otsuka et al. 2016 Ton et al. 2017 Oya et al. 2017</p>	 <p>Arimond et al. 2011 (limited evidence) IOB 2011 (limited evidence) ITC 2011 Oya et al. 2017</p>

Food security (diet quantity)	Nutrition security (diet quality and/or nutrition)	Stunting for children age <5 (includes HAZ scores)	Malnutrition for children age 5 (wasting and overweight) (includes WHZ scores)
 <p>Berti et al. 2004 (limited evidence)</p> <p>Leroy and Frongillo 2007 (limited evidence)</p> <p>World Bank 2007 (limited evidence)</p> <p>Bhutta et al. 2008 (limited evidence)</p> <p>Gibson and Anderson 2009 (limited evidence)</p> <p>Iannotti et al. 2013 (limited evidence)</p>	 <p>Berti et al. 2004 (limited evidence)</p> <p>Leroy and Frongillo 2007</p> <p>World Bank 2007</p> <p>Bhutta et al. 2008 (limited evidence)</p> <p>Gibson and Anderson 2009 (limited evidence)</p> <p>Masset et al. 2011 (limited evidence)</p> <p>Iannotti et al. 2013</p> <p>Ruel et al. 2017 (limited evidence)</p>	 <p>Masset et al. 2011 (limited evidence)</p> <p>Iannotti et al. 2013 (limited evidence)</p> <p>Ruel et al. 2017 (limited evidence)</p>	 <p>Masset et al. 2011 (limited evidence)</p> <p>Iannotti et al. 2013 (no evidence)</p> <p>Ruel et al. 2017 (limited evidence)</p>
 <p>Kawarazuka 2010 (limited evidence)</p>	 <p>Leroy and Frongillo 2007 (limited evidence)</p> <p>World Bank 2007 (limited evidence)</p> <p>Kawarazuka 2010</p> <p>Masset et al. 2011 (limited evidence)</p>	 <p>Masset et al. 2011 (limited evidence)</p>	 <p>Masset et al. 2011 (limited evidence)</p>
 <p>Berti et al. 2004 (limited evidence)</p> <p>World Bank 2007 (limited evidence)</p> <p>Arimond et al. 2011 (limited evidence)</p> <p>IOB 2011 (limited evidence)</p> <p>ITC 2011 (limited evidence)</p> <p>Ton et al. 2017 (limited evidence)</p>	 <p>Berti et al. 2004 (limited evidence)</p> <p>World Bank 2007 (limited evidence)</p> <p>Arimond et al. 2011 (limited evidence)</p> <p>Hawkes and Ruel 2011 (no studies found)</p> <p>IOB 2011 (limited evidence)</p> <p>ITC 2011 (limited evidence)</p> <p>Ruel et al. 2017 (limited evidence)</p>	 <p>Berti et al. 2004 (limited evidence)</p> <p>World Bank 2007 (limited evidence)</p> <p>Arimond et al. 2011 (limited evidence)</p>	 <p>Berti et al. 2004 (limited evidence)</p> <p>World Bank 2007 (limited evidence)</p>

Evidence Map: systematic reviews by intervention type and outcomes (cont.)








OUTCOMES





	Extreme/moderate poverty	Average income of smallholders (consumption/ expenditure)	Productivity (per labour unit or per land unit)
Extension and advisory services	 <p>Ton et al. 2013 (limited evidence)</p>	 <p>Posthumus et al. 2013 (limited evidence) Ton et al. 2013 (limited evidence) Stewart et al. 2015 (limited evidence)</p>	 <p>Davis et al. 2012 Posthumus et al. 2013 (limited evidence) Ton et al. 2013 (limited evidence) Waddington et al. 2014 Stewart et al. 2015 (limited evidence)</p>
Sustainable agriculture practices			 <p>Pretty et al. 2006 Rusinamhodzi et al. 2011 Bayala et al. 2012 de Ponti et al. 2012 Seufert et al. 2012 Wall et al. 2013 Brouder and Gomez-Macpherson 2014 Garibaldi et al. 2017</p>
Irrigation	 <p>Knox et al. 2013</p>	 <p>IOB 2011 (limited evidence) Knox et al. 2013</p>	 <p>Pinstrup-Andersen and Shimokawa 2008 (limited evidence) IOB 2011 (limited evidence) Knox et al. 2013</p>
Agricultural input subsidies	 <p>IOB 2011 (limited evidence) Jayne et al. 2016 (limited evidence)</p>	 <p>Jayne et al. 2016 (limited evidence)</p>	 <p>IOB 2011 (limited evidence) Jayne et al. 2016 (limited evidence)</p>
Groups/organizations (e.g. savings/lending groups, coops)		 <p>Biscaye et al. 2014</p>	 <p>Biscaye et al. 2014</p>

Food security (diet quantity)	Nutrition security (diet quality and/or nutrition)	Stunting for children age <5 (includes HAZ scores)	Malnutrition for children age 5 (wasting and overweight) (includes WHZ scores)
 Ton et al. 2013 (limited evidence)			
 IOB 2011 (limited evidence)	 Berti et al. 2004 (limited evidence) Ruel et al. 2017 (limited evidence)		
 Jayne et al. 2016 (limited evidence)	 Jayne et al. 2016 (limited evidence)		 Jayne et al. 2016 (limited evidence)
 Biscaye et al. 2014 (limited evidence)	 Biscaye et al. 2014 (limited evidence)		

Evidence Map: systematic reviews by intervention type and outcomes (cont.)










OUTCOMES





	Extreme/moderate poverty	Average income of smallholders (consumption/ expenditure)	Productivity (per labour unit or per land unit)
Tenure security	 IOB 2011 (limited evidence) Lawry et al. 2014 (no evidence) Meinzen-Dick et al. 2017 (no evidence)	 IOB 2011 (limited evidence) Lawry et al. 2014 (limited evidence) Higgins et al. 2017 Meinzen-Dick et al. 2017 (no evidence)	 IOB 2011 (limited evidence) Lawry et al. 2014 Meinzen-Dick et al. 2017 (limited evidence) Higgins et al. 2017 (limited evidence)
Landscape-scale natural resource management (including forestry, payments for environmental services, and community-based resource management interventions)	Landell-Mills and Porras 2002 (no evidence)	 Landell-Mills and Porras 2002 (no evidence) Bowler et al. 2010 (limited evidence) Samii et al. 2015a (limited evidence) Samii et al. 2015b (limited evidence) Caplow et al. 2011 (limited evidence) Pelletier et al. 2016	
Improved access to financial products	 Radermacher et al. 2010 (limited evidence) Stewart et al. 2010 (limited evidence) Duvendack et al. 2011 Pande et al. 2012 (limited evidence) Stewart et al. 2012 (limited evidence) Biscaye et al. 2015 (limited evidence)	 Bouillon and Tejerina 2007 (limited evidence) Stewart et al. 2010 (limited evidence) Duvendack et al. 2011 Stewart et al. 2012 Cole et al. 2012 (no evidence) Pande et al. 2012 (limited evidence) Awaworyi et al. 2014 Biscaye et al. 2015 Marr et al. 2016 (limited evidence) Steinert et al. 2017	Cole et al. 2012 (no evidence)
Job creation programmes (e.g. youth employment, entrepreneurship programmes)		 Bouillon and Tejerina 2007 Holmes et al. 2013 (limited evidence) Valerio et al. 2014 Kluge et al. 2017	

Food security (diet quantity)	Nutrition security (diet quality and/or nutrition)	Stunting for children age <5 (includes HAZ scores)	Malnutrition for children age 5 (wasting and overweight) (includes WHZ scores)
 IOB 2011 (limited evidence) Higgins et al. 2017 (limited evidence) Meinen-Dick et al. 2017 (limited evidence)	 IOB 2011 (limited evidence) Higgins et al. 2017 (limited evidence) Meinen-Dick et al. 2017 (limited evidence)		 Bouillon and Tejerina 2007 (limited evidence)
 Bowler et al. 2010 (no evidence) Caplow et al. 2011 (limited evidence)	Bowler et al. 2010 (no evidence)		
 Stewart et al. 2010 (limited evidence) Cole et al. (no evidence) Biscaye et al. 2015 Steinert et al. 2017	 Stewart et al. 2010 Duvendack et al. 2011 (limited evidence) Cole et al. 2012 (no evidence) Biscaye et al. 2015 (limited evidence)	 Stewart et al. 2010 (limited evidence) Duvendack et al. 2011 (limited evidence)	
 Holmes et al. 2013 (limited evidence)			

Evidence Map: systematic reviews by intervention type and outcomes (cont.)

OUTCOMES

	Extreme/moderate poverty	Average income of smallholders (consumption/ expenditure)	Productivity (per labour unit or per land unit)
Social protection (e.g. CT, PWP, EGS)	 <p>Fiszbein et al. 2009 (CT) Hagen-Zanker et al. 2011 (CT and EGS) IEG 2011 Bastagli et al. 2016 (CT)</p>	 <p>Bouillon and Tejerina 2007 (PWP) Fiszbein et al. 2009 (CT) IEG 2011 Hagen-Zanker et al. 2011 (CT and EGS) Kabeer and Waddington (limited evidence) (CT) Bastagli et al. 2016 (CT) Ralston et al. 2017</p>	
Information services/ICT	 <p>Knox et al. 2013 (limited evidence)</p>	 <p>Asenso-Okyere and Mekonnen 2012 (limited evidence) Pande et al. 2012 (limited evidence) Knox et al. 2013 (limited evidence) Biscaye et al. 2015 (limited evidence)</p>	 <p>Asenso-Okyere and Mekonnen 2012 (limited evidence)</p>
Improved infrastructure	 <p>Torero 2011 Knox et al. 2013</p>	 <p>Knox et al. 2013</p>	 <p>Pinstrup-Andersen and Shimokawa 2008 (limited evidence) Torero 2011 (limited evidence) Knox et al. 2013</p>
Multisectoral interventions and WASH (selected studies)		 <p>Banerjee et al. 2015</p>	

Food security (diet quantity)	Nutrition security (diet quality and/or nutrition)	Stunting for children age <5 (includes HAZ scores)	Malnutrition for children age 5 (wasting and overweight) (includes WHZ scores)
 <p>Bouillon and Tejerina 2007 (limited evidence) (CT)</p> <p>Bassett 2008 (CT)</p> <p>Bhutta et al. 2008 (limited evidence) (CT)</p> <p>IEG 2011</p> <p>Fernald et al. 2012 (CT)</p> <p>Manley et al. 2013 (CT)</p> <p>Kabeer and Waddington 2015 (limited evidence) (CT)</p> <p>Bastagli et al. 2016 (CT)</p> <p>Burchi et al. 2016 (CT)</p> <p>Ralston et al. 2017</p>	 <p>Bouillon and Tejerina 2007 (limited evidence) (CT)</p> <p>Bassett 2008 (CT)</p> <p>Bhutta et al. 2008 (limited evidence) (CT)</p> <p>Leroy et al. 2009 (CT)</p> <p>Lagarde et al. 2009 (limited evidence) (CT)</p> <p>IEG 2011</p> <p>Fernald et al. 2012 (CT)</p> <p>Ranganathan and Lagarde 2012 (limited evidence) (CT)</p> <p>Manley et al. 2013 (CT)</p> <p>Bastagli et al. 2016 (CT)</p> <p>Burchi et al. 2016 (CT)</p>	 <p>Bouillon and Tejerina 2007 (limited evidence) (CT)</p> <p>Bhutta et al. 2008 (CT)</p> <p>Bassett 2008 (CT)</p> <p>Fiszbein et al. 2009 (CT)</p> <p>Leroy et al. 2009 (CT)</p> <p>Lagarde et al. 2009 (CT)</p> <p>IEG 2011</p> <p>Ranganathan and Lagarde 2012 (limited evidence) (CT)</p> <p>Fernald et al. 2012 (CT)</p> <p>Manley et al. 2013 (CT)</p> <p>Bastagli et al. 2016 (CT)</p> <p>Burchi et al. 2016 (CT)</p>	 <p>Bassett 2008 (limited evidence) (CT)</p> <p>Lagarde et al. 2009 (limited evidence)</p> <p>IEG 2011</p> <p>Ranganathan and Lagarde 2012 (limited evidence) (CT)</p> <p>Fernald et al. 2012 (limited evidence) (CT)</p> <p>Bastagli et al. 2016 (CT)</p> <p>Burchi et al. 2016</p>
	 <p>Naugle and Hornik 2014</p> <p>Biscaye et al. 2015 (limited evidence)</p> <p>Lee et al. 2016 (limited evidence)</p> <p>Müller et al. 2016</p>		
 <p>Banerjee et al. 2015</p>	 <p>Dangour et al. 2013</p>	 <p>Remans et al. 2011</p> <p>Dangour et al. 2013</p>	 <p>Dangour et al. 2013</p>

Appendix 2

Papers included in the Evidence Map: intervention type, outcome type and conclusions		
Paper name	Intervention type	Outcome type
Arimond et al. 2011	Ag. General	Food security (quantity)
		Nutrition security (quality)
		Stunting
		Wasting
		Productivity (yield)
		Income
	Cash crops	Food security (quantity)
		Nutrition security (quality)
		Stunting
		Yields
		Income
	Homestead gardens	Food security (quantity)
		Nutrition security (quality)
		Stunting
		Wasting
		Income
Asenso-Okyere and Mekonnen 2012	Information services: ICTs for agriculture	Productivity
		Income
Awaworyi 2014	Financial products: microcredit	Income
Banerjee et al. 2015	Multisectoral interventions: graduation programmes	Income/consumption
		Food security (quantity)
Bassett 2008	Social protection: CCT	Food security (quantity)
		Nutrition security (quality)
		Stunting
		Wasting
Bastagli et al. 2016	Social protection: CCT, UCT, social pensions and enterprise grants	Food security (quantity)
		Nutrition security (quality)
		Stunting
		Wasting
		Poverty
		Income

Conclusions

The 5 studies with data on food security (quantity) found positive impacts
17 projects with data on diet quality and/or nutrition showed increases, 2 showed no significant effects and 2 showed mixed results
Of the 5 studies on stunting/HAZ, 2 showed beneficial effects, 1 detrimental effects, 1 mixed effects and 1 no significant effects
The 1 study on wasting/WHZ showed beneficial effects
The 1 study on productivity/yields showed positive effects
Of the 7 studies with data on income, 5 showed positive effects and 2 showed no significant effects
4 projects with measures on diet quantity and all showed positive effects
Of the 3 studies with data on diet quality and/or nutrition, 2 showed positive effects and 1 mixed effects
Of the 4 agricultural commercialization studies on stunting/HAZ, 1 showed beneficial effects, 1 detrimental effects, 1 mixed effects and 1 no significant effects
The 1 study on productivity/yields showed positive effects
Of the 5 studies with data on income, 3 showed positive effects and 2 showed no significant effects
The 1 study with data on food security (quantity) found a positive impact
15 home garden projects with data on diet quality and/or nutrition showed increases, 2 showed no significant effects and 1 showed mixed results
The 1 study on stunting/HAZ showed beneficial effects
The 1 study on wasting/WHZ showed beneficial effects
The 2 studies on income showed positive effects
Just 1 study they identify showed an effect of ICTs on agricultural productivity, and here the effect was positive
2 studies looked at average or net income of beneficiaries compared to controls and found the effect of ICTs to be positive. 1 additional study found positive effects on farm income, and another on income, yet it was unspecified whether this was household income, farm income or other
The authors conclude that the evidence does not show that microcredit improves income or consumption/expenditures, but they do show that access to microcredit has a positive effect on income, yet the effect is weak
In endline 1, impact on total consumption per capita was positive and statistically significant in 4 out of 6 countries. In endline 2, impact on total consumption per capita was positive and statistically significant in 5 out of 6 countries (although only at the 10% level for 2 of these)
For food consumption per capita per month, 5 out of 6 countries showed positive, statistically significant results (although 1 was only significant at the 10% level). The food security index showed positive effects for 4 out of 6 countries for endline 1 and for 4 out of 6 countries for endline 2 (although 2 are only significant at the 10% level). The other results are not statistically significant
4 out of 5 studies found positive effects on food quantity, the other found no significant effect
4 out of 5 studies found positive effects on diet quality and/or other nutrition measures, the other found no significant effect
All 5 programmes had evidence on stunting/HAZ, 3 found beneficial effects and 2 found no significant effects
The 1 programme that evaluated wasting found no significant effect
Of the 31 studies that looked at the overall effect on food expenditure, 23 found a positive effect, 2 found negative effects and 6 found no significant effects
Among the 12 studies reporting on impacts on dietary diversity, 7 show statistically significant changes across a range of dietary diversity measures, all being improvements
5 out of 13 studies showed beneficial effects for stunting/HAZ
1 out of 5 programmes showed beneficial effects for wasting/WHZ
9 studies considered impacts on Foster-Greer-Thorbecke poverty measures (poverty headcount, poverty gap, squared poverty gap). Among these studies, 6 showed beneficial effects of interventions in at least 1 measure, 1 showed consistent detrimental effects (increase in poverty) and 2 showed no significant effects
35 studies included impact on household total expenditure, with 25 showing an increase, 1 showing a decrease, 8 showing no significant effects and 1 not reported

Papers included in the Evidence Map: intervention type, outcome type and conclusions (cont.)

Paper name	Intervention type	Outcome type
Bayala et al. 2012	Sustainable agriculture: conservation agriculture	Productivity (yield)
Berti et al. 2004	Ag. General (home gardens, livestock, cash cropping, irrigation)	Food security (quantity)
		Nutrition security (quality)
		Productivity (yield)
		Stunting
		Wasting
		Income
	Home gardens/HFP	Food security (quantity)
		Nutrition security (quality)
		Productivity (yield)
		Stunting
		Wasting
	Livestock	Food security (quantity)
		Nutrition security (quality)
	Agricultural commercialization	Food security (quantity)
		Nutrition security (quality)
		Stunting
		Wasting
		Income
	Irrigation	Nutrition security (quality)
Bhutta et al. 2008	Ag. General: home gardening, livestock	Food security (quantity)
		Nutrition security (quality)
		Stunting
		Wasting
	Home gardens/HFP	Nutrition security (quality)
		Stunting
		Wasting
	Livestock	Food security (quantity)
		Nutrition security (quality)
	CCTs	Food security (quantity)
		Nutrition security (quality)
		Stunting
Biscaye et al. 2014	Self-help groups (savings groups, women's health groups, and farmers' groups)	Food security (quantity)
		Nutrition security (quality)
		Income
		Productivity

Conclusions

"The study revealed significant variability in cereal yield response (and hence risk) with all the practices examined. Despite the variability, the mean effects of the six CA practices on crop yield were more positive than negative except with parkland trees".

"The intervention group showed improvement and/or better status than the control group in terms of diet (21 of 25 cases), anthropometrics (seven of 16 cases), biochemical/clinical indicators (five of 10 cases) and morbidity (five of eight cases)". "Improved diet did not always coincide with improvements in the anthropometric, biochemical/clinical or morbidity indicators". 2 studies on productivity and 1 study on income found positive effects

The 1 home garden study on diet quantity found a positive effect

13 home garden studies on diet quality and/or nutrition found positive effects, 1 negative, 1 no significant change and 1 mixed

The 2 home garden studies on yields found positive effects

The 2 home garden studies on stunting/HAZ found beneficial effects

The 1 home garden study on WHZ/wasting found beneficial effects

All 3 livestock projects measuring diet quantity found positive effects

Of the 2 livestock projects with data on diet quality, 1 found positive effects and 1 found no change

Of the 3 cash crop studies on diet quantity, 2 found positive effects and 1 found negative effects

Of the 3 cash crop studies on diet quality and/or nutrition, 1 found an increase, 1 found a decrease and 1 found no significant difference

The 1 cash crop study on stunting found a detrimental effect

The 1 cash crop study on wasting/WHZ found a beneficial effect

The 1 cash crop study on income found a positive effect

Of the 2 studies on irrigation, both showed no difference on children's anthropometrics (no specifics were given) and both showed mixed effects on dietary intake or biochemical indicators

The 3 programmes with data on food quantity showed positive effects

24 home gardens programmes and livestock programmes showed improvements in diet quality and/or nutrition, 3 showed no significant change and 1 showed mixed results

3 home garden programmes showed beneficial effects on stunting, while 1 showed no change

3 home garden programmes showed beneficial effects on wasting, while 1 showed no change

22 home gardens programmes showed improvements in diet quality and/or nutrition, 2 showed no significant change and 1 showed mixed results

3 home garden programmes showed beneficial effects on stunting, while 1 showed no change

3 home garden programmes showed beneficial effects on wasting, while 1 showed no change

The 3 livestock programmes with data on food quantity showed positive effects

Of the 3 livestock programmes with data on diet quality and/or nutrition, 2 found positive changes and 1 no significant change

Of the 3 CCT programmes with data on food quantity, all 3 found positive effects

The 2 studies with data on diet quality and/or nutrition found positive effects

CCTs had beneficial effects in terms of stunting in 4 projects, and no effect for 1 project

The 1 study that considered calorie consumption found a positive effect

The 1 study that considered diet quality (protein intake) found a positive effect

Of the 11 studies that looked at income, 8 found positive effects and 3 found no significant effect

Of the 5 studies that looked at agricultural productivity, 3 found positive effects and 2 no effects

Papers included in the Evidence Map: intervention type, outcome type and conclusions (cont.)

Paper name	Intervention type	Outcome type
Biscaye et al. 2015	Financial products: rural and agricultural finance (credit, savings, insurance, payments)	Income
		Poverty
		Food security (quantity)
		Nutrition security (quality)
	ICT: mobile money	Income
		Nutrition security (quality)
Bouillon and Tejerina 2007	Land titling	Wasting
	Social protection: CCTs	Food security (quantity)
		Nutrition security (quality)
		Stunting
	Youth training programmes and job training programmes	Income
	Social protection: public works employment	Income
	Microfinance	Income
Bowler et al. 2010	Landscape-scale natural resource management: community forest management	Income
		Food security
Brouder and Gomez-Macpherson 2014	Sustainable agriculture: conservation agriculture	Productivity (yield)
Burchi et al. 2016	Social protection: cash transfers	Food security (quantity)
		Nutrition security (quality)
		Wasting
		Stunting
Caplow et al. 2011	Landscape-scale natural resource management: forestry	Income
		Food security (quantity)
Cole et al. 2012	Financial products: index insurance	Income/expenditures
		Productivity
		Food security (quantity)
		Nutrition security (quality)
Dangour et al. 2013	WASH	Nutrition security (quality)
		Stunting
		Wasting
Davis et al. 2012	Extension and advisory services: FFS	Productivity (yield)
de Ponti et al. 2012	Sustainable agriculture: organic agriculture	Productivity (yield)

Conclusions

Of the 11 papers that looked at household income/consumption, 7 found positive effects, 1 mixed effects and 3 no significant effects

The 3 papers that report on measures of poverty found that access to financial products had a positive/beneficial effect

Of the 5 papers that looked at food quantity, 1 found positive effects, 1 negative effects, 1 mixed effects and 2 no significant effects

Of the 2 papers that considered measures of diet quality, 1 found positive effects and 1 no significant effects

Of the 3 studies that looked at household income/consumption, all 3 saw positive effects

The 1 study on diet quality saw positive effects

Of the 3 evaluations of land titling, just 1 looked at 1 of our outcomes of interest: child wasting/WHZ scores. The land titling programme in Argentina showed increased weight for height

Of the 3 evaluations with data on food quantity, 2 found beneficial effects and 1 no effects

Of the 4 evaluations with data on diet quality and/or nutrition, 3 found improvements and 1 found no significant change

Of the 4 papers with data on stunting/HAZ, 3 found beneficial effects and 1 no significant effects

Of the 7 evaluations that looked at effects of youth/job training programs on income, 4 found positive effects, 1 mixed and 2 no effects

Of the 7 evaluations that looked at the effects of public works employment creation programs on income, 4 found positive effects, 2 mixed and 1 no effects

Of the 4 evaluations of microfinance on income, 2 found positive effects and 2 mixed effects

The 2 studies that looked at household income do not lead to any definitive conclusions because of methodological issues

The review includes no studies that looked at food security

Based on data from the first 2 years, zero tillage had higher yields than conventional tillage in 36 cases, lower yields in 48 cases, no difference in 5 cases. "Immediately following adoption (≤ 2 year), ZT generally resulted in less yield than CT in the four staple crops (Tables 4–6) but this effect could change in time".

Of the 15 studies that look at some quantitative measure of food security, 14 found positive effects and 1 found no effect

Of the 10 studies with measures of food security related to food quality or nutrition, 5 had positive effects and 5 no effects

Of the 8 studies that looked at wasting/WHZ, 2 found beneficial effects and 6 found no effects

Of the 8 studies that looked at stunting/HAZ/height, 2 found small beneficial effects and 6 found no effects

Of the 2 papers (1 project) that looked at effect on household income, the effect was positive

The 1 paper that looked at food security (monthly food expenditures) found no effect

No papers or conclusions on our outcomes of interest

No papers or conclusions on our outcomes of interest

No papers or conclusions on our outcomes of interest

No papers or conclusions on our outcomes of interest

Of the 12 studies with nutrition measures other than HAZ/stunting or WHZ/wasting (WAZ, MUAC, BMI and haemoglobin), 10 studies found no statistically significant effects, 1 found positive/beneficial effects (on WAZ) and 1 found negative effects (haemoglobin levels)

Of the 10 studies that measured HAZ scores, 9 saw no change and 1 found positive effects. Meta-analysis (on RCTs only) including 4,627 children identified a borderline statistically significant effect of WASH interventions on height-for-age z-score (MD 0.08; 95% CI 0.00 to 0.16)

Of the 10 studies that covered WHZ or wasting, all 10 found no statistically significant effect. Meta-analysis (on RCTs only) including 4,622 children identified no evidence of an effect of WASH interventions on WHZ (MD 0.02; 95% CI -0.07 to 0.11)

FFSs increased yields in 2 out of 3 countries, and in the overall measure aggregated for the 3 countries

In developing countries, based on 33 paired data sets of organic and conventional data, average yield of organic agriculture is 84% of the average yield for conventional agriculture

Papers included in the Evidence Map: intervention type, outcome type and conclusions (cont.)

Paper name	Intervention type	Outcome type
Fernald et al. 2012	Social protection: CCTs	Food security (quantity)
		Nutrition security (quality)
		Stunting
		Wasting
Fiszbein et al. 2009	Social protection: CCTs	Poverty
		Income/consumption
		Stunting
Garbero et al. 2018	Ag. General: improved seeds	Poverty
		Income
Garibaldi et al. 2017	Sustainable agriculture: 13 alternative farming practices	Productivity (yield)
Gibson and Anderson 2009	Ag. General: homestead gardens, livestock interventions and processing strategies	Food security (quantity)
		Nutrition security (quality)
		Stunting
		Wasting
	Homestead gardens	Food security (quantity)
		Nutrition security (quality)
		Stunting
		Wasting
	Animal-sourced foods	Food security (quantity)
		Nutrition security (quality)
Girard et al. 2012	Agriculture: household food production	Stunting
		Wasting
Hagen-Zanker et al. 2011	Social protection: cash transfers and EGS	Income/expenditures
		Poverty
Higgins et al. 2017	Land tenure security	Productivity
		Income
		Food security (quantity)
		Nutrition security (quality)
Holmes et al. 2013	Job creation in fragile states	Income
		Food security (quantity)

Conclusions

Of the 7 studies that considered food quantity, all 7 found positive effects

Of the 17 studies that considered effects on diet quality and/or nutrition, 14 found positive effects, 1 found mixed effects and 2 found negative effects

Of the 16 papers on height/HAZ/stunting, 11 found beneficial effects and 5 found no significant effects

Of the 4 that considered wasting/WHZ, 1 found beneficial effects and 3 no effects

At the household level, poverty was reduced among beneficiaries in 4 out of 6 programmes (Brazil was excluded because of sampling issues). Cambodia and Ecuador did not show an effect because of small transfer size and/or transfers offset by reduction in income from child labour

For the 7 countries with data on household consumption, 5 saw an increase and 2 saw no change

Of the 6 countries with data on stunting/HAZ, 3 found beneficial effects and 3 found no significant effect

Based on 6 papers, meta-analysis showed a 6% reduction in poverty

13 papers on income and 8 papers on expenditures showed increased income and expenditure by 32% and 14%, respectively, in rural areas

"61% of the comparisons showed greater crop yield for alternative rather than conventional practices, while 20% found the opposite trend and 19% showed no differences".

Of the 3 studies total on the effect of agriculture on food quantity, 2 found positive effects and 1 no effect

17 studies showed positive effects of agriculture interventions on diet quality and/or nutrition and 3 no changes

Of the 5 studies measuring the effect of agriculture on stunting/HAZ, 4 showed beneficial effects and 1 no significant effects

Of the 4 studies measuring the effect of agriculture on wasting/WHZ, 3 found beneficial effects and 1 no effect

Of 2 studies measuring the effect of home gardens on diet quantity, 1 showed positive effects and 1 no significant effects

14 studies showed positive effects of home gardens or HFP interventions on diet quality and/or nutrition, and 2 no changes

Of the 5 studies measuring the effect of home gardens on stunting/HAZ, 4 showed beneficial effects and 1 no significant effects

Of the 4 studies measuring the effect of home gardens on wasting/WHZ, 3 found beneficial effects and 1 no effect

The 1 study on effect of livestock/aquaculture interventions on diet quantity showed positive effects

3 out of 4 livestock/aquaculture projects had positive results on diet quality and/or nutrition, 1 had no impact

Of the 4 studies with results on stunting, 1 showed beneficial effects and 3 were not statistically significant. Meta-analysis showed effect not statistically significant

Of the 4 studies with results on wasting, 1 showed beneficial effects and 3 were not statistically significant (meta-analysis showed effect not statistically significant)

Of the cash transfer studies on income, 6 showed an increase in income and 3 showed a decrease. Of the EGS studies on income, 1 showed an increase and 1 showed a decrease. Weighting by quality of study showed positive and negative impacts to be closer to even. Of the studies of cash transfers on expenditures, 14 saw increases and 4 saw decreases. Of the EGS studies on expenditure, 2 saw increases and 1 saw a decrease

Of the cash transfer studies on poverty, 15 showed a decrease in poverty (beneficial effect) and 1 showed an increase (detrimental). Of the EGS studies on poverty, 3 showed beneficial effects and none showed detrimental effects

4 non-observational studies looked at productivity, 3 showed positive impacts and 1 no impact

There are 9 studies that looked at impact on income, and of these 2 showed positive effects, 1 showed mixed effects and 6 showed no effect

Of the 2 studies on diet quantity, 1 showed positive effects and 1 no effects

Of the 2 studies on diet quality or nutrition, 1 showed positive effects and 1 no effects

2 out of 2 quantitative studies that looked at income/consumption found positive effects

2 out of 2 quantitative studies that looked at food quantity found positive effects

Papers included in the Evidence Map: intervention type, outcome type and conclusions (cont.)

Paper name	Intervention type	Outcome type
Iannotti et al. 2013	Livestock: milk and dairy programmes	Food security (quantity)
		Nutrition security (quality)
		Stunting
IEG 2011	Safety nets: 10 different intervention types, majority CCTs	Poverty
		Income
		Food security (quantity)
		Nutrition security (quality)
		Stunting
		Wasting
IOB 2011	Ag. General	Food security (quantity)
		Nutrition security (quality)
		Income
		Poverty
		Productivity
	Value chains	Food security (quantity)
		Nutrition security (quality)
		Income
		Productivity
	Irrigation	Food security (quantity)
		Income
		Productivity
	Input subsidies	Poverty
		Productivity (labour productivity)
	Land tenure security	Food security (quantity)
		Nutrition security (quality)
		Income
		Poverty
		Productivity
ITC 2011	Agricultural commercialization: certification	Income
		Productivity (yield)
		Food security (quantity)
		Nutrition security (quality)

Conclusions

3 out of 3 dairy production and agriculture evaluations that looked at diet quantity showed positive effects
6 out of 6 dairy production and agriculture evaluations that looked at diet quality and/or nutrition showed positive effects
1 of 1 study that looked at HAZ showed a beneficial effect
Of the 11 programmes that studied poverty headcount ratio, 9 found beneficial effects, 1 no effects and 1 detrimental effects; of the 5 programmes with data on the poverty gap, 4 found beneficial effects and 1 no effects; of the 4 programmes with data on the squared poverty gap, all 4 found beneficial effects
Of the 9 impact evaluations that looked at income, 6 found positive effects, 2 no effects and 1 a negative effect
Of the 20 evaluations that looked at food consumption (quantity), 17 found positive effects, 2 no effects and 1 negative effects
Of the 24 evaluations with data on nutrition outcomes other than stunting/HAZ and wasting/WHZ, 14 found positive effects and 10 found no effects
Of the 14 programmes with evidence on stunting/HAZ/height, 7 showed beneficial effects and 7 showed no effects
Of the 7 programs with evidence on wasting/WHZ, 2 showed beneficial effects and 5 showed no effects
8 positive effects on diet (quantity), 1 mixed results and 1 no change
4 studies on diet quality and/or nutrition, with positive effects in all
9 studies showed positive effects, 2 mixed and 1 no change
4 studies on poverty, with beneficial effects in all
13 studies on productivity, with positive effects in all
3 studies showed positive effects on diet (quantity) and for 1 study the effect was mixed
1 study considered diet quality and/or nutrition and found a positive effect
4 studies found positive effects on income, and for 2 the effects were mixed
1 study considered productivity and found beneficial effects
Both studies showing effect of irrigation on diet (quantity) showed positive effects
1 study showed a positive impact on household income
3 studies included productivity and all showed positive effects
1 study considered poverty and found a beneficial effect
Both studies showed a positive effect on productivity
1 study considered diet (quantity) and found positive effects
Only 1 study considered diet quality and/or nutrition and found positive effects
1 study considered income/expenditure and found a positive effect
3 studies considered poverty and found beneficial effects
1 study considered productivity and found beneficial effects
Of the 14 studies that looked at net income, 8 found positive effects, 4 found no or mixed effects and 2 found negative effects
Of the 11 studies that looked at yield, 5 found positive effects, 3 found no or mixed effects and 3 found negative effects
2 studies looked at food security outcomes (variety and total amount of food consumption) and found positive effects
2 studies looked at food security outcomes (variety and total amount of food consumption) and found positive effects

Papers included in the Evidence Map: intervention type, outcome type and conclusions (cont.)

Paper name	Intervention type	Outcome type
Jayne et al. 2016	ISPs	Poverty
		Income
		Productivity
		Food security (quantity)
		Nutrition security (quality)
		Wasting
Kawarazuka 2010	Aquaculture	Food security (quantity)
		Nutrition security (quality)
		Income
Kabeer and Waddington 2015	Social protection: CCTs	Income/consumption
		Food security (quantity)
Kluge et al. 2017	Job creation: youth employment	Income/consumption
Knox et al. 2013	Infrastructure: roads, electricity and mixed	Poverty
		Income
		Productivity (yield, labour productivity, TFP)
	Telecommunications	Poverty
		Income
	Irrigation	Poverty
		Income
		Productivity (yield, labour productivity, TFP)
Lagarde et al. 2009	Social protection: CCTs	Nutrition security (quality)
		Stunting
		Wasting
Landell-Mills and Porras 2002	Landscape-scale natural resource management: markets for forest environmental services	Poverty
		Income
Lawry et al. 2014	Land tenure security	Productivity of land use
		Poverty
		Income/consumption
Lee et al. 2016	ICTs: maternal, neonatal and child health interventions via mobile ICT	Nutrition security (quality)

Conclusions

2 studies showed no impact on poverty incidence, but reductions in poverty severity. National data: only data from Malawi on poverty and income, showing input subsidy programme brought poverty rate down and incomes up
Effects on income are mixed (1 positive, 1 mixed, 1 no effect) and are from only 3 countries
Positive effect of input subsidies on crop yields in 4 out of 5 countries with data. However, the fifth country showed no difference in yields although lower labour productivity, and the authors did not count Ethiopia because OFSP is not technically an ISP, so more accurately 3 out of 4
2 countries with relevant data, 1 showed no significant effect and the other mixed effects
1 country has data on diet quality and showed no significant effect of ISPs
The 1 study with data on WHZ scores showed beneficial effects
2 studies examined diet in terms of quantity and found positive effects
Of 7 studies that evaluated diet quality, mainly fish consumption, 5 found positive effects and 2 no effects
5 studies showed effects on income, all of which were positive effects
Of the 3 projects with measures of the effect on consumption, all 3 found positive effects
Of the 3 projects with measures of the effects on food consumption and/or total calories, all 3 found positive effects
Consumption: based on 10 studies, effect was positive (effect size 0.07) but not statistically significant at the 95% level (CI: 0.01 to 0.14)
For roads, electricity and mixed infrastructure, there are 46 measures on poverty (42 positive, 1 neutral and 3 negative)
9 measures on income (7 positive, 1 neutral and 1 negative) and 13 measures of consumption (11 positive and 2 negative)
11 measures on agricultural productivity, all positive
Effects on poverty: 2 positive and 1 neutral
Effects on income: 1 neutral
Of the 15 measures of the effect of irrigation on poverty, all 15 are beneficial
Of the 18 measures of the effect of irrigation on income, all 18 measures are positive, and the 1 measure of consumption is positive
Of the 13 measures of the effect of irrigation on agricultural productivity, 12 are positive and 1 negative
3 papers had nutrition measures other than stunting/HAZ/height or wasting/WHZ, and of these 2 found positive effects in at least 1 category, while 1 found no significant effects
Of the 6 papers that considered stunting, HAZ or height, 5 found positive results for at least some age groups, while 1 paper found a mean negative effect
The 1 paper that considered wasting found no effect
In their review of 287 projects, they found virtually no assessments of the impacts of the interventions on poor people
In their review of 287 projects, they found virtually no assessments of the impacts of the interventions on poor people
6 out of 8 quantitative studies on productivity found positive effects and 2 found no significant effects. "The available evidence suggests that de jure recognition of tenure boosts productivity (Figure 5a), as measured in terms of the monetary value of land productivity, by around 40 per cent on average (random effects mean = 0.35, s.e. = 0.10, exp(mean) = 1.42). This is a substantively huge effect, although this estimate masks substantial heterogeneity, and the predictive 95% interval crosses zero".
No evidence
2 of 4 studies with impact on consumption found positive effects, 2 found no effects. "The average effect on welfare, as measured by consumption or income, is about a 15 per cent increase (random effects mean = 0.14, s.e. = 0.04, exp(mean) = 1.15). In this case, the 95% predictive interval is squarely in the positive domain, and the level of heterogeneity is deemed quite low".
3 studies with measures of diet quality (infant feeding and breastfeeding), all positive effects. Meta-analysis of 3 studies on infant feeding showed that prenatal interventions using SMS/cell phone (vs. routine care) improved rates of BF within 1 hour after birth (OR 2.01, 95% CI 1.27 to 2.75, I(squared) = 80.9%) and exclusive BF for 3/4 months (OR 1.88, 95% CI 1.26 to 2.50, I(squared) = 52.8%) and for 6 months (OR 2.57, 95% CI 1.46 to 3.68, I(squared) = 0.0%). Iron supplementation/anaemia (positive for supplementation, no effect on anaemia)

Papers included in the Evidence Map: intervention type, outcome type and conclusions (cont.)

Paper name	Intervention type	Outcome type
Leroy et al. 2009	Social protection: CCTs	Nutrition security (quality)
		Stunting
Leroy and Frongillo 2007	Livestock programmes	Food security (quantity)
		Nutrition security (quality)
		Income
	Aquaculture	Nutrition security (quality)
		Income
Loevinsohn et al. 2013	Agricultural technology	Productivity (yield)
Manley et al. 2013	Social protection: cash transfers	Food security (quantity)
		Food security (diet quality)
		Stunting
Marr et al. 2016	Financial products: index insurance	Income/consumption
Masset et al. 2011	Agriculture: general	Income
		Nutrition security (quality)
		Stunting
		Wasting
	Biofortification	Nutrition security (quality)
		Wasting
		Stunting
	Homestead gardens	Income
		Nutrition security (quality)
		Stunting
		Wasting
	Aquaculture	Income
		Nutrition security (quality)
		Stunting
		Wasting
	Livestock: dairy and animal husbandry	Income
		Nutrition security (quality)
		Stunting
		Wasting

Conclusions

In all 5 studies, diet quality improved, but there was limited evidence of impact on micronutrient status

Of the 5 programmes with evidence on child height and/or stunting, 3 found significant beneficial effects and 2 found no significant effects. Where there was a positive effect on height, the authors point to “a clear tendency” for younger children to benefit more

2 studies on livestock programmes had measurements on diet quantity and both found positive effects

9 out of 10 projects showed positive impacts on diet quality and/or nutrition, with the other project showing mixed effects

Of the 4 livestock programmes with data on income, all 4 showed positive effects

Of the 3 aquaculture programmes with data on diet quality, 1 found no significant changes and the findings for the other 2 were unclear

Only 1 aquaculture project had results reported on income and that was a positive effect

4 out of 5 studies showed positive effects of technology on yields

Of 12 studies on food quantity, 10 found positive effects, 1 no change and 1 found a negative effect

Of the 9 studies on diet quality, 8 found positive effects and 1 no effect

Of the 17 programmes with data on HAZ, 5 found beneficial effects, 3 found detrimental effects and 9 did not find statistically significant changes. “When effect sizes are weighted by the inverse of their standard error on average the 17 programs increased HAZ by 0.025 with a p-value that the effect is different from zero of 0.38. The programs’ average impact on height-for-age is positive, but small and not statistically significant”.

2 studies had field experiment data that looked at the effect of index insurance on income/consumption, and both found positive effects

Of the 5 studies on household income, all 5 showed positive effects (but only 1 considered statistical significance)

Of the 23 studies on diet quality and/or nutrition, 16 showed at least 1 positive effect, 5 showed no effects and 2 showed mixed effects

Of the 8 studies on stunting, 1 found a beneficial effect and 7 no effects

Of the 8 studies on wasting, 2 found positive effects and 6 no effects

Both biofortification studies with data on diet quality and/or nutrition found positive effects

The 1 biofortification study that considered wasting showed a beneficial effect. An additional study found positive effects on the rate of growth of weight

The 1 biofortification study that considered stunting showed no significant change

Of the 2 studies on household income, both were positive but did not show statistical significance

Of the 16 studies that included a measure on diet quality and/or nutrition, 11 showed positive effects, 3 showed no effects and 2 showed mixed effects

Of the 5 studies that considered impact on stunting, none showed an impact

Of the 5 studies that considered impact on wasting, none showed an impact

Of the 1 study on household income, the effect was positive but there was no test of statistical significance

All 3 fisheries studies looked at some measure of diet quality and/or nutrition, 2 had some positive impact and 1 had no impact

The 1 study that considered stunting found no effect

The 1 study that considered wasting found no effect

Both studies considered household income, and both found a positive effect

Both studies considered diet quality and/or nutrition, 1 found positive effects and 1 no effect

The study on stunting found a beneficial effect

The study on wasting found a beneficial effect

Papers included in the Evidence Map: intervention type, outcome type and conclusions (cont.)

Paper name	Intervention type	Outcome type
Meinzen-Dick et al. 2017	Tenure security: WLR	Poverty
		Agricultural productivity
		Food security (quantity)
		Nutrition security (quality)
		Income
Müller et al. 2016	ICTs: e & mHealth for diet	Food security: diet quality
Naugle and Hornik 2014	Information technology: mass media interventions for child survival-related health topics	Nutrition security (quality)
Otsuka et al. 2016	Agricultural commercialization: contract farming	Income
Oya et al. 2017	Agricultural commercialization: certification schemes	Income
		Productivity (yield)
Pande et al. 2012	Financial products: formal banking	Poverty
		Income
	Information technology: mobile banking	Income/consumption
Pelletier et al. 2016	Landscape-scale natural resource management: community forest management	Income
Pinstrup-Andersen and Shimokawa 2006	Infrastructure	Productivity (labour productivity and TFP)
	Irrigation	Productivity (labour productivity and TFP)
Posthumus et al. 2013	Extension and advisory services: capacity strengthening of agricultural research systems for development	Income
		Productivity
Pray et al. 2017	Agriculture (general): R&D	Poverty
		Food security (quantity)
		Nutrition security (quality)
		Productivity
		Income
Pretty et al. 2006	Agricultural sustainability: IPM, integrated nutrient management, conservation tillage, agroforestry, aquaculture, water harvesting and livestock integration	Productivity (yield)
Radermacher et al. 2010	Financial products: microinsurance (life, health, property, funeral, crop, weather, livestock or similar risks)	Poverty

Conclusions

No papers that directly investigate the link between WLR and poverty

Regarding agricultural productivity, 3 studies were found, all of which showed that increased tenure security positively affects productivity, although in 1 case the effect holds only for men

Of the 4 papers that looked at food quantity, 3 found a positive effect of tenure security, but in some cases the differences were only for men or women or for female- or male-headed households

Regarding food quality or nutrition, 1 paper found no effect and 1 paper found that tenure security led to an improvement

"Evidence of a direct association between WLR and full income, however, does not exist, possibly because of the difficulties in conceptualizing or measuring full income".

Of the 11 studies that looked at effects on diet, 8 had positive effects

Of the 9 nutrition studies of moderate to stronger design (according to review authors), all had positive effects, although in some cases this was just on knowledge/attitudes but not practices

Regarding income, all 7 studies that looked at total household income showed a positive effect of contract farming (although the authors suggest that profitability or more thorough studies would be preferred)

Of the 8 studies on household income, 3 found positive effects and 5 found the effect not statistically significant. Meta-analysis showed the overall effect on household income is not statistically significant

Of the 5 studies on yield, 1 found positive effects, 2 negative effects and 2 had no statistically significant results. The authors' meta-analysis showed the overall effect on yield is not statistically significant

The 1 paper that looked at the effect on poverty found that formal banking was beneficial, measured by a decrease in rural and aggregate headcount ratios of poverty

The 3 papers that examined the effects of formal banking on household income and/or consumption found positive effects

The 1 study showed positive effects: M-Pesa usage had a positive effect on consumption smoothing

Of the 25 studies that measured the impact on income, 2 had mixed results, 11 had positive effects, 11 had neutral effects and 1 had a negative effect. However, it is not clear how many of these showed total income versus just forest income

3 measures of the effect of infrastructure on productivity (labour productivity and total factor productivity) showed positive effects and 1 showed no change

All 3 measures of productivity (TFP and output/worker) showed positive effects of irrigation

The 1 study that considered the impact on farmers' income found that capacity strengthening had a positive effect

Of the 4 studies that considered impacts on agricultural productivity, 3 found that the capacity strengthening led to increased agricultural productivity and 1 found no effect

10 studies on poverty, all showed beneficial effects

3 studies on diet (quantity), all showed positive effects

8 studies on diet quality and/or nutrition, 7 positive and 1 mixed

16 studies on productivity, all positive

5 studies on income, all positive

"For the 360 reliable yield comparisons from 198 projects that we now have, the mean relative increase was 79% across the very wide variety of systems and crop types".

The 1 study that looked at an outcome of interest for this report (poverty) found that households with microhealth insurance had a lower rate of increase in the poverty headcount and the normalized poverty gap than control households

Papers included in the Evidence Map: intervention type, outcome type and conclusions (cont.)

Paper name	Intervention type	Outcome type
Ralston et al. 2017	Social protection: predominantly cash transfers	Income: consumption
		Food security (quantity)
Ranganathan and Lagarde 2012	Social protection: CCTs	Nutrition security (quality)
		Stunting
		Wasting
Remans et al. 2011	Multisectoral interventions: Millennium Villages Project	Stunting
Ruel 2001	Agriculture (general)	Nutrition security (quality)
		Income
	Home gardens/HFP	Nutrition security (quality)
		Income
Ruel et al. 2017	Agriculture (general)	Nutrition security (quality)
		Stunting
		Wasting
	Biofortification	Nutrition security (quality)
	Home gardens/HFP	Nutrition security (quality)
		Stunting
		Wasting
	Livestock	Nutrition security (quality)
		Stunting
		Wasting
	Agricultural commercialization: value chains	Nutrition security (quality)
	Irrigation	Nutrition security (quality)
Rusinamhodzi et al. 2011	Sustainable agriculture: conservation agriculture	Productivity (yield)
Samii et al. 2015a	Landscape-scale natural resource management: decentralized forest management	Income
Samii et al. 2015b	Landscape-scale natural resource management: payments for environmental services	Income

Conclusions

Of the 9 studies with measurements on total consumption, 5 had positive results, 1 negative and 3 no statistically significant effect, with a statistically significant mean effect of 74% (95% CI 9 to 139%), meaning that 74 cents are spent on consumption for every dollar that was transferred

Of the 11 programmes for which there were studies on food consumption, 5 showed positive effects, 1 negative and 5 no significant effects. The meta-analysis showed an average of 36 cents per dollar transferred goes specifically towards food (mean effect of 36% [95% CI 0 to 71%] of the transfer size)

3 papers had nutrition measures other than stunting/HAZ/height or wasting/WHZ, and of these 2 found beneficial effects in at least 1 category, while 1 found no significant effects

Of the 4 projects for which there are stunting/HAZ/height data, 3 showed beneficial effects for at least 1 age group (with other groups showing no significant change) and 1 showed detrimental effects

The 1 project with evidence on wasting showed no effect

"There was a significant (at $\alpha = 0.05$) reduction in stunting prevalence at 5 of the sites and a nonsignificant reduction in 3 additional sites. (One additional site had a nonsignificant increase in stunting.) Furthermore, children <2 y of age had a 43% lower risk of being stunted than before project initiation. Information derived from national data sources suggested childhood stunting in countries included in this study has remained largely unchanged between 1990 and 2008".

Of the 12 studies that considered a measure of food security, 11 saw at least 1 positive effect and 1 had a negative effect

Of the 3 studies that considered effect on household income, 2 saw positive effects (1 slight) and 1 no effect

Of the 12 studies that considered a measure of food security, 11 saw at least 1 positive effect and 1 had a negative effect

Of the 3 studies that considered effect on household income, 2 found positive effects (1 slight) and 1 no effect

All 14 papers with data on diet quality and/or nutrition showed positive effects

Of the 5 papers that looked at stunting/HAZ, only 1 found beneficial effects while the others showed no effects

Of the 5 papers that looked at wasting/WHZ, 4 found beneficial effects and 2 no effects

In the 2 studies that looked at food security, biofortification was shown to have a positive effect on diet and micronutrient status

All 8 papers that looked at diet quality and/or nutrition found at least 1 positive impact

Of the 4 papers that looked at the effect of home garden-type programmes on stunting, none found an effect

In the 4 papers that looked at effect of home garden-type programmes on wasting/WHZ, 2 saw beneficial effects and 2 saw no effects

2 papers on livestock had measures of diet quality and/or nutrition, and both found positive effects

Only 1 paper looked at stunting/HAZ/height and found beneficial effects, but just in 1 region (Nepal's Terai)

2 papers looked at child WHZ/weight and both found beneficial impacts for some groups

1 study with statistically significant positive effects on haemoglobin, although the change in anaemia was not statistically significant

1 paper included with positive impact on diet quality and/or nutrition (consumption of nutritious foods)

Mixed: "Our meta-analysis gave the following findings: (1) 92% of the data show that mulch cover in high rainfall areas leads to lower yields due to waterlogging; (2) 85% of data show that soil texture is important in the temporal development of conservation agriculture effects, improved yields are likely on well-drained soils; (3) 73% of the data show that conservation agriculture practices require high inputs especially N for improved yield; (4) 63% of data show that increased yields are obtained with rotation but calculations often do not include the variations in rainfall within and between seasons; (5) 56% of the data show that reduced tillage with no mulch cover leads to lower yields in semi-arid areas; and (6) when adequate fertiliser is available, rainfall is the most important determinant of yield in southern Africa".

Of the 3 studies that considered household welfare, only 1 looked at total per capita consumption expenditure (positive effect) and 2 looked at forest income and found positive effects; however, the impact on the poorest households is not always positive

Of the 2 studies with evidence on income, both found positive effects

Papers included in the Evidence Map: intervention type, outcome type and conclusions (cont.)

Paper name	Intervention type	Outcome type
Seufert et al. 2012	Sustainable agriculture: organic agriculture	Productivity (yield)
Steinert et al. 2017	Financial products: savings promotion interventions	Income
		Food security (quantity)
Stewart et al. 2010	Financial products: microcredit and microsavings	Food security (quantity)
		Nutrition security (quality)
		Income
		Stunting
		Poverty
Stewart et al. 2012	Financial products: microcredit, microsavings and microleasing	Income
		Poverty
Stewart et al. 2015	Ag. General: training, innovation and new technology	Income
		Nutrition security (quality)
		Stunting
	Biofortification/OFSP	Nutrition security (quality)
		Stunting
	Extension and advisory services	Income
Ton et al. 2013	Extension and advisory services: innovation grants	Productivity
		Income
		Poverty
		Food security (quantity)
Ton et al. 2017	Agricultural commercialization: contract farming	Productivity
		Income
Torero 2011	Infrastructure	Food security (quantity)
		Poverty
Valerio et al. 2014	Job creation: entrepreneurship education and training programmes	Income
Waddington et al. 2014	Extension and advisory services: farmer field schools	Productivity (yield)
Wall et al. 2013	Sustainable agriculture: CA	Productivity (yield)

Conclusions

“Comparing organic agriculture across the world, we find that in developed countries organic performance is, on average, -20%, whereas in developing countries it is -43%. (But) In the few cases from developing countries where organic yields are compared to conventional yields typical for the location or where the yield data comes from surveys, organic yields do not differ significantly from conventional yields because of a wide confidence interval resulting from the small sample size ($n = 8$ and $n = 12$, respectively)”.

Meta-analysis/pooled effect sizes show significant increases in households' expenditures and incomes ($g_{pooled} = 0.066$, $p < 0.01$)

Meta-analysis/pooled effect sizes show significant increases in food security ($g_{pooled} = 0.052$, $p < 0.05$). The effect sizes are small but significant

Of the 2 studies that measured the effect on food security (quantity), both found no significant effect

Of the 5 studies that considered food security (quality and/or nutrition), 5 found positive effects and 1 found no effect

Of the 3 studies that looked at household or individual income/expenditures, 1 found positive effects, 1 found mixed effects initially, but negative effects over time, and 1 found no significant change

The 1 study that looked at stunting found beneficial effects

Of the 2 studies that measured the effect on poverty, 1 found no statistically significant effect and 1 found a detrimental effect

Of the 8 studies that looked at household income or expenditure, 7 found positive effects and 1 found negative effects. Of the 2 that looked at individual income or expenditures, both found positive effects

Of the 3 studies that considered the effect on poverty status, 1 found beneficial effects, 1 found detrimental effects and 1 found no change

Of the 6 studies with results on total income (household income or per capita), 5 showed positive effects and 1 no effect

Of the 5 studies with results on nutrition security (quality), all 5 showed positive effects

Of the 2 studies with results on HAZ, both showed positive results

Of the 5 biofortification studies with evidence on nutrition security (quality), all 5 saw a positive effect

The 1 study with evidence on HAZ saw a positive effect

Of the 3 training studies with studies of effect on total income, 2 found positive effects and 1 had no effect

The 1 training study that evaluated effect on productivity showed a positive effect

Of the 4 studies that looked at household or farmer income, 3 had a positive effect and 1 no effect

The 1 study that looked at poverty status found beneficial effects

Of the 4 studies that looked at food security, all found positive effects

Of the 2 studies that looked at productivity/yields, 1 found a positive effect and 1 mixed

For the 8 studies that looked at household income, the pooled effect was positive. “For the eight studies that used household income as the proxy-indicator, the pooled effect size was 1.32 (CI = 1.13-1.54)”.

The 1 study that looked at food security showed a reduction in the length of the hungry season

“Fan and Hazell (1999), Zhang and Fan (2000), Fan et al. (2000a), Fan et al. (2000b) and Fan et al. (2002): Their studies in India and China are among the few works that attempt to link infrastructure, rural growth and poverty alleviation, by highlighting the role of investment complementarities. Their research efforts show that infrastructure investments, particularly in irrigation, roads, electricity and telecommunications not only contribute to growth in agricultural production, but also a reduction in rural poverty and regional inequality in these countries”.

“Aschauer (1997) demonstrated that changes in productivity (i.e., rate of return per unit of private capital and worker) are positively related to government infrastructure spending”.

Of the 5 studies that could be identified as evaluating impact on per capita or household income/consumption, 2 showed positive effects and 3 showed no effect

Of the 11 studies that considered the effects on yields, the review finds overall a statistically significant 13% increase in yields of FFS participants on average relative to a comparison group (this is excluding the studies that had a high risk of bias, following the authors' lead)

For maize, conservation agriculture had higher yields than conventional in 32 cases, and lower yields in 9 cases based on data from farmers' fields. For other crops, 8 studies showed CA had higher yields, 11 showed CA had lower yields and 1 showed no difference

Papers included in the Evidence Map: intervention type, outcome type and conclusions (cont.)

Paper name	Intervention type	Outcome type
World Bank 2007	Agriculture: general	Income
		Food security (quantity)
		Nutrition security (quality)
		Stunting
		Wasting
		Productivity (yield)
	Home gardens/HFP	Income
		Food security (quantity)
		Nutrition security (quality)
		Stunting
		Wasting
	Agricultural commercialization	Income
		Food security (quantity)
		Nutrition security (quality)
		Stunting
		Wasting
	Aquaculture	Income
		Nutrition security (quality)
		Productivity (yield)
	Livestock (dairy and poultry)	Income
		Food security (quantity)
		Nutrition security (quality)

BF, breastfeeding; BMI, body-mass index; CA, conservation agriculture; CCT, conditional cash transfers; CI, confidence interval; EGS, employment guarantee schemes; FFS, farmer field school; HAZ, height-for-age z scores; HFP, homestead food production; ICT, information and communications technology; IEG, independent evaluation group; IOB, policy and operations evaluation department of the Ministry of Foreign Affairs of the Netherlands; IPM, integrated pest management; ISP, input subsidy programme; ITC, international trade centre; MD, mean difference; MUAC, mid-upper arm circumference; OFSP, other food security programmes; OR, odds ratio; RCT, randomized control trial; TFP, total factor productivity; UCT, unconditional cash transfers; WASH, water, sanitation and hygiene; WAZ, weight-for-age z-score; WHZ, weight-for-height z scores; WLR, women's land rights.

Conclusions

Of the 9 studies that looked at household income or expenditures, 7 showed positive effects and 2 no effect

5 studies were positive, 1 mixed and 1 unclear

Of the 28 studies on diet quality and/nutrition, 21 found positive effects, 2 mixed, 1 negative, 2 no effects and 2 unclear

Of the 2 studies that considered stunting/height, 1 showed beneficial effects and 1 mixed effects

Of the 2 studies on wasting/weight, 1 showed beneficial effects and 1 mixed effects

The 1 study that looked at yield showed a positive effect

The 1 study with an evaluation on household income found positive effects

The 1 study on diet quantity saw positive effects

Of the 18 studies that included a measure of diet quality and/or nutrition, 15 showed positive effects, 2 mixed and 1 negative

The 1 study on stunting showed beneficial effects

The 1 study on wasting showed beneficial effects

Of the 3 studies that considered effects on household income, 1 showed positive effects and 2 showed no effect

Of the 2 studies that considered effects on diet quantity, 1 showed a positive impact and the other showed mixed effects

Of the 2 studies that measured diet quality and/or nutrition, 1 showed positive effects and 1 showed no effect

The 1 study with reported evidence on child height showed mixed results based on age

The 1 study that considered the effect of agricultural commercialization on weight showed mixed effects

The 1 study that looked at income showed a positive effect

Of the 3 studies that looked at diet quality and/or nutrition, 1 found a positive effect, 1 no effect and for 1 the results were unclear

The 1 study that looked at yield showed a positive effect

Of the 4 studies that considered effects on income/expenditures, all 4 found positive effects

Of the 4 livestock programmes with data on diet quantity, 3 found positive effects and for 1 the effects were unclear

Of the 5 livestock studies with data on diet quality and/or nutrition, 4 found positive effects and for 1 the effects were unclear

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