

Evaluation Insights



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This paper draws on a systematic review prepared by the Policy and Operations Evaluation Department (IOB) of the Ministry of Foreign Affairs in the Netherlands. The views expressed in this paper are those of the authors and do not necessarily reflect the policies or positions of the OECD DAC or its members.

Improving Food Security

Emerging Evaluation Lessons

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As food prices nearly doubled from 2006 to 2008, the number of people suffering from hunger soared. By 2009 the world was suddenly confronted with the record number of one billion undernourished. After two decades of gradual neglect of the issue, and a steady drop in investment agriculture, there is now a renewed interest in food security as one of the key themes in international development co-operation. This interest has translated to an urgent need to understand what interventions are most effective in supporting food security.

To support this process, a systematic review was commissioned. The review examined evidence from evaluations of food security interventions. It focused on the impacts of programmes aimed at increasing food production, developing value chains for food products, reforming markets and improving land security. By taking stock of carefully selected evaluation evidence in these four areas, the study aimed to provide better information to guide donors and policy makers working to improve food security in developing countries. This note summarises the key findings from the systematic review. Detailed findings and a description of the methodology can be found in the full report (see Further Reading).

While each country requires a specific set of interventions, this review gives guidance in selecting the most effective and efficient interventions, by presenting specific case study results. The review shows, for instance, that efforts to increase food production through genetic crop improvement and interventions reducing production losses were largely successful, benefiting farmers and poor consumers alike. Value chain development increased farm income, but so far there is little indication that the most vulnerable people benefited from such interventions. Market reform had poor results when it simply consisted of reducing trade barriers and reducing government support to agriculture, but had good results when there was a gradual shift of roles from government to (new) institutions and the private sector. Land tenure security has encouraged farmer investments, and was an important part of the economic reform in China and Vietnam. The best food security results were achieved by combining different approaches, in countries where overall conditions were favourable.



INTRODUCTION: RENEWED INTEREST IN FOOD SECURITY

A gradual decline in investment and official development assistance (ODA) to agriculture since the late 1980s was in some ways camouflaged by economic growth in Asia and Latin America, which contributed to a steady decline in the proportion of undernourished people in developing countries (Figure 1). In the 2008 World Development Report, 'Agriculture for Development', the World Bank warned of this neglect and the threats it could have for food security. The same year, food prices spiked, pushing hunger up to record levels in 2009 (Figure 2).

Since then, food security has become a priority for many development actors. Governments have committed more aid to agriculture, reaching \$8.4 billion in 2010, which represents 5.1% of total ODA.¹

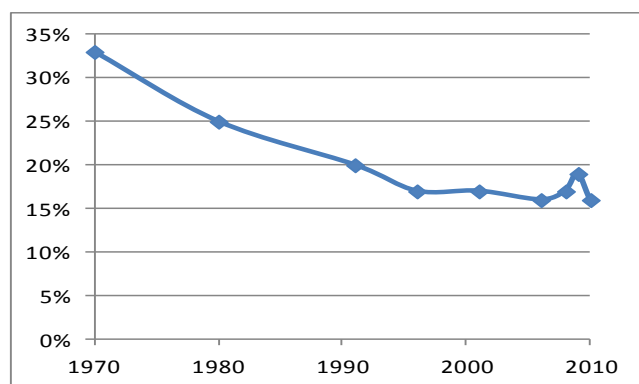


Photo: Fruit and vegetable market in Yogyakarta, Indonesia (Jisse Kranen, 2009)

In order to support future food security policy making, the DAC Evaluation Network meeting in 2010 expressed the need for a review of recent evaluations and other research that would provide evidence-based information on food security approaches. The Netherlands, through its independent evaluation agency IOB, took the lead in preparing this systematic review and the Royal Tropical Institute carried it out. The main research question of this review is: 'what is the evidence for, and nature of, the impact of development interventions on food security in developing countries?' The review examined 38 case studies and 46 other evaluations and reviews, selected based on specific criteria of relevance and rigour.

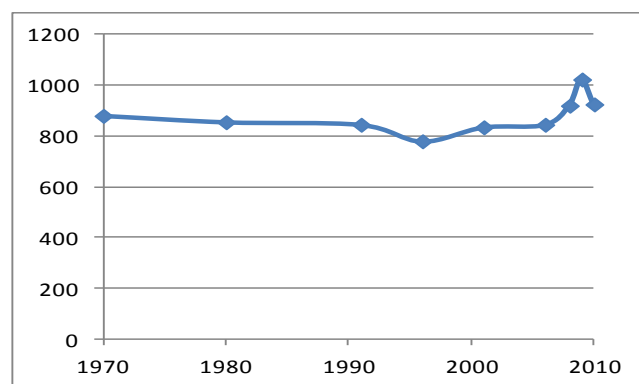
The following section describes different ways of achieving food security and how these were analysed in the systematic review. Then the key findings in each of the four intervention areas are presented, with examples from the case studies. Finally, there is a look at costs and benefits of different interventions and a discussion of the conclusions and overall results.

Figure 1. Proportion of undernourished people in developing countries, 1969-71 to 2010



Source: FAO, 2010

Figure 2. Number of undernourished people (millions) in the world, 1969/71 to 2010



Source: FAO, 2010

¹ OECD QWID: ODA commitment to agriculture without forestry and fisheries, in current US dollars, in 2010 (stats.oecd.org)

WAYS TO ACHIEVE FOOD SECURITY

Food security is achieved when all people, at all times, have physical, economic and social access to enough food of good quality for a healthy and active life. This definition covers four fundamental aspects of food security: availability, access, utilisation and stability. The ultimate goal (highest level objective) of food security interventions is individual food utilisation, for which not only food access is required, but also food quality, safe drinking water and hygiene. Individual access, in turn, depends on household access and intra-household distribution, including gender-based discrimination. Stability in access depends on the availability over the year and between years.

At the proxy-impact level, household food access depends on a combination of families' own food production, income, food prices, and household buffers (money, food storage capacity) to bridge food shortage periods, for example between harvests. Food availability, at the local or national level, is a condition but no guarantee for food access, as households may not be able to afford or access needed food. At the national level, food availability is the sum of domestic food production, food imports, food stocks and international food aid, minus food exports. Export earnings allow food import. Natural resource management, land tenure security, and financial services also support household to maintain their productive capital.

To address all dimensions of food security, international partners and governments use a variety of approaches. Activities range from funding research on disease resistant crops, to developing markets for farm products or educating families on good feeding practices for young children. For this systematic review, the researchers first identified different ways of supporting food security and described each intervention's impact pathway (Figure 3). The interventions were ranked, using the hierarchy of food security described by the United Nations Food and Agriculture Organisation, and grouped into 11 broad categories of food security work (see Figure 3). This review focused on four of these intervention areas: increasing production, developing value chains, reforming markets, and improving land security.

Overall conclusions

Interventions improving land tenure security scored mostly positive, especially when combined with other interventions.

Interventions increasing agricultural production scored generally positive, except for sustainability.

Value chain development scored well on increasing trade, but the most vulnerable people did not benefit.

Market regulation reform interventions score lowest, due to the combination with reduced support to the agricultural sector in several African countries.

Success was most likely where different interventions were combined in a favourable national climate.

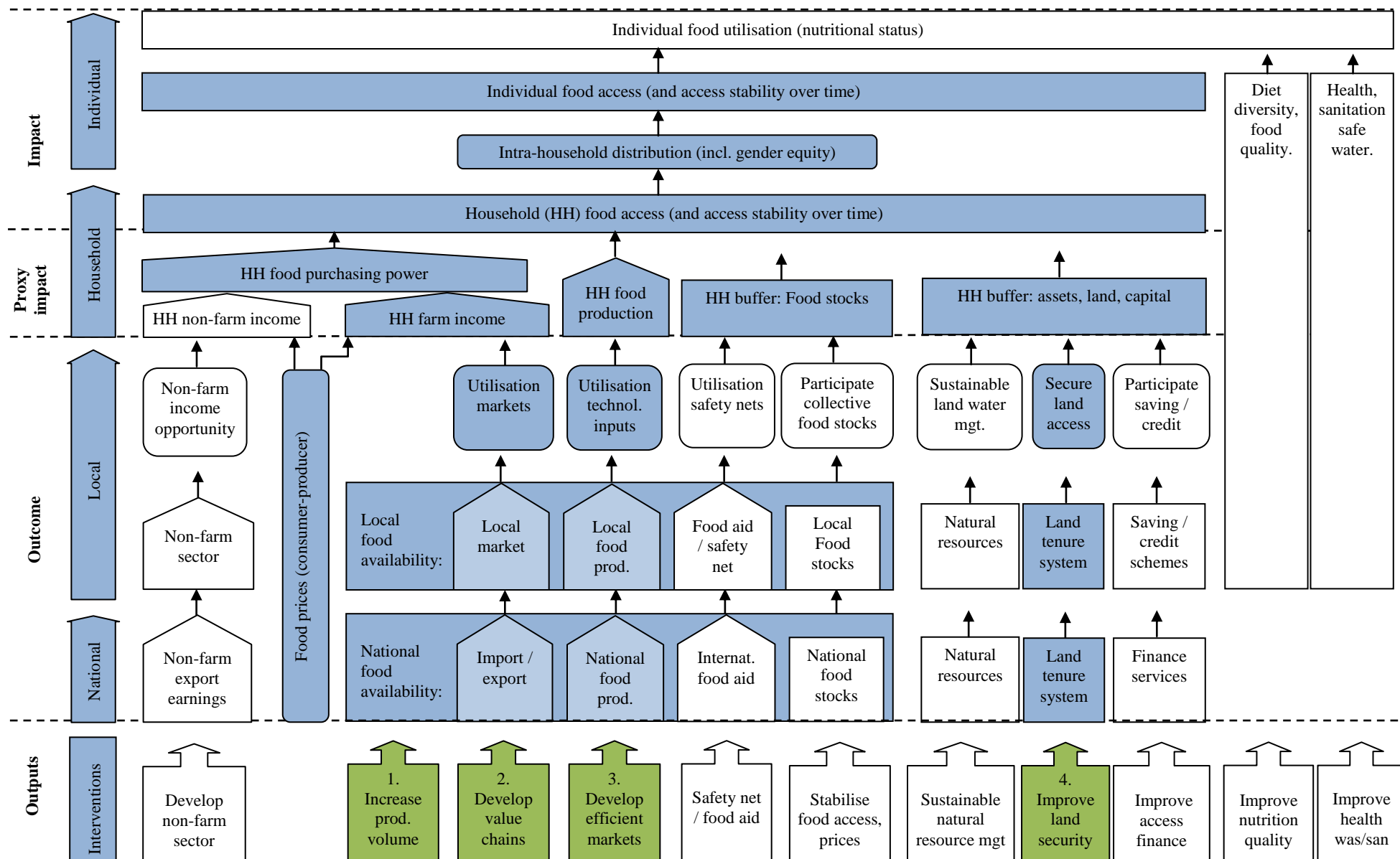
Systematic Review: Emerging Lessons

A systematic review examines evidence by looking at studies in a particular field or on a specific topic. It first delimits the subject and sets inclusion and exclusion criteria for studies based on subject and study quality. Following a transparent search strategy, a selection of case studies is then collected, coded and analysed. The advantages of this approach are that the transparent search and analysis procedures minimise bias, and that the selection criteria allow better comparisons among studies, and a more credible basis for drawing conclusions.

Food security is a large subject for a systematic review. A systematic review works better when the subject is not too broad and when selected cases are relatively homogeneous in complexity, scale and indicators used. In this systematic review the ways in which interventions can achieve food security (impact pathways) were identified. Then researchers prioritised four pathways (Figure 3) to help narrow the field of analysis. This systematic review applied a hybrid methodology, confronting and balancing the results of the 38 selected case studies with the results from 46 other reviews, which helped broaden the analysis.

To convincingly attribute impact to an intervention, analysis of what would have happened in the absence of the intervention (counterfactual) is needed. Many studies did not meet this criterion and had to be excluded.

Figure 3. Impact pathways between interventions, from outputs (interventions) up to outcome, proxy impact and final impact on food security



Note: Diverse impact pathways can lead from interventions through national or local level outcomes and household level proxy impact to impact food security of individuals. This figure distinguishes eleven pathways, of which four (shown in green) were the subject of this systematic review. (Source: IOB 2011)

INTERVENTIONS AIMED AT INCREASING AGRICULTURAL PRODUCTION

The interventions aimed at increasing production followed different strategies including research and extension, irrigation and input provision. Modern crop varieties developed through research were the basis for increased supply, resulting in improved food security, especially in Asia where food production increased faster than population growth. International collaboration and free germplasm exchange were key aspects explaining these production successes. This fact should warn against privately owned patents that could limit access to these modern varieties.

Research on avoiding production losses has also been successful, especially in Africa, where, for example, biological pest control increased cassava production by more than 10%. Irrigation in Asia not only increased production but also improved the stability of production between years and seasons, which in turn reduced food price fluctuations, bolstering household access.

The spectacular food production increases in Asia are explained not only by increased yields, but also by increased labour productivity, which reduced production costs and food prices, benefiting poor consumers. Increases in yield and labour productivity reduced production costs and farm gate food prices in Asia. This improved food security for consumers, while farmers compensated their lower prices with higher yields and off-farm income, resulting in an overall improvement in food security.

Compared to the progress in Asia, sub-Saharan Africa lags behind. In Africa, crop yields are low and stagnating, due to the low use of irrigation, complex agro-ecological environment, high input costs, and limited market, extension, and financial services. In part, this is because of Africa's agro-ecological diversity and high transaction costs, notably in land-locked countries. Government research, extension and agricultural credit services have been cut back during structural adjustment programmes. Interventions lowering input prices had substantial effects on increasing production. For example, in Malawi, a fertilizer subsidy increased production by 500kg per household and poverty declined from 52% to 40%.

INTERVENTIONS AIMED AT DEVELOPING VALUE CHAINS

Developing Value Chains: Emerging Lessons

Value chain projects have successfully increased trade and farmer income.

Domestic and regional markets potentially benefit many more farmers than high requirement export markets.

There is little indication that the poorest farmers benefited from value chain development.

The review also looked at evaluations of interventions aimed at developing value chains for the domestic market or the export market (most of the interventions targeted the export market). Value chain development successfully increased farmer net income when farmers were supported by experienced commercial partners and when gradual improvements were well planned. For example, organic coffee farmers in Uganda increased overall income by 12%, while sesame farmers in Mozambique reduced the 'hunger period' (when food supplies dwindle between harvests) from 4 to 1.5 months per year.

Substantial numbers of farmers participated in domestic and export value chains of simple bulk products, while only a few farmers participated in the export of perishable products, such as horticulture, or in domestic high quality markets, such as dairy. Compared to

specialised high-requirement export markets, domestic and regional markets will likely benefit more farmers. One warning: there is only little indication that the poorest farmers specifically benefited from value chain development.

The risks associated with volatile markets required flexibility in products and buyers. For example, in Mozambique, where the paprika buyer did not show up the second year, farmers were forced to diversify. The mitigation of such risks requires special attention.

Increasing Agricultural Production: Emerging Lessons

Convincing results have come from genetic crop improvement and interventions reducing production losses. In Asia there was synergy between modern crop varieties, irrigation, functioning markets, and extension and financial services.

INTERVENTIONS AIMED AT REFORMING MARKETS

Market regulation reform, in its simplest form, meant reducing trade barriers, with the hope that trade would bolster growth, lower prices and/or increase access to food. This often coincided with an abrupt reduction of government support and aid to the domestic agricultural sector. The review did not find much evidence on the revenue effects of such tariff changes, nor on specific efforts to address non-tariff trade barriers.

Market reform has benefited countries that were competitive in the export market, but has discouraged farmers in many African countries where agriculture was not competitive. These countries now rely even more on food imports than before and are more susceptible to food price increases on the global market.

In contrast, gradual market reform, in combination with support to farmers, local market development or improved land security, has had significant positive results. This was the case with cotton in Burkina Faso and rice in Vietnam. Trade reform has reduced production costs through lower prices for inputs and equipment, for example in Bangladesh, where the import of cheap Chinese irrigation pumps benefited millions of farmers. Acute food production shortfalls are best mitigated by reduced trade barriers and private import of food, which explains in part why Bangladesh recovered much better from floods in 1998 than from floods in 1974 when private import was prohibited.

Market Regulation Reform: Emerging Lessons

The reduction of trade barriers combined with the abrupt abandonment of government support to the agricultural sector discouraged domestic food production in several African countries.

A gradual and negotiated transfer of government roles to new institutions and private sector, such as with cotton in Burkina Faso and rice in Vietnam, has given good results, as have reforms that lowered the cost of importing productive equipment.

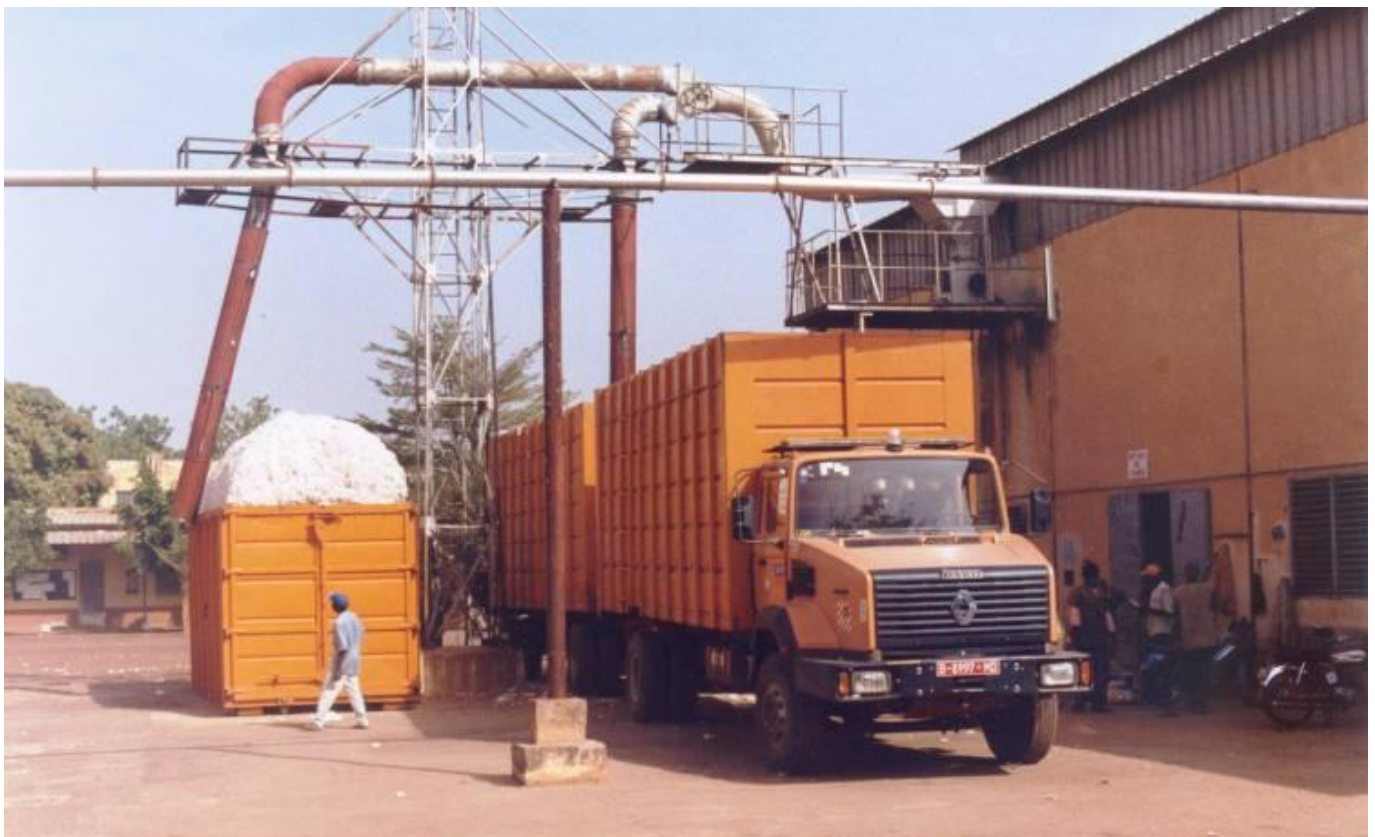


Photo: Cotton factory, Mali (Lucie van Zaalen, 2001)

Land Tenure Security: Emerging Lessons

There was no indication that land rights improved access to credit, but it did encourage investment by farmers.

The poorest farmers need additional agricultural support to benefit from improved land tenure security.

Six of the studies reviewed looked at interventions aiming to improve land tenure security through policy reform. The logic behind these interventions is that secure land access for farmers will protect households' productive assets.

The most spectacular results were achieved in China and Vietnam, where land reform was part of broad economic reform. The transition from collective to

family farms in China and Vietnam strongly encouraged production. However, the effects of land reform cannot be separated from the effects of the larger transition from a planned to a market economy which contributed spectacularly to growth in these two countries and the worldwide progress in food security in the 1980s and 1990s. The efficiency gains in agriculture made labour available that was absorbed in rural industry. In China, poverty declined from 53% in 1981 to 8% in 2001. In Vietnam, poverty declined from 58% in 1993 to 16% in 2006.

Formalising informal land rights through land use certificates in Ethiopia or land titles in Peru did not improve access to credit but encouraged farmers to invest in agriculture. The land redistribution in the Philippines increased land access to poor households. Income was modestly improved especially where the new land owners also received other agricultural support. There is evidence that poor households obtain better access to land from land rental markets than from land sales markets.



Photo: *Farmers working in rice field, Bandung, Indonesia (Jisse Kranen 2009)*

COSTS AND BENEFITS

Some of the case studies provided information about intervention costs, numbers of beneficiaries and quantifiable benefits, from which costs and benefits per household could be calculated. These are presented in Table 1, in order of favourable benefit-cost ratio. It is useful to distinguish interventions that have non-recurring costs – the top 7 interventions, from interventions that have recurrent annual costs – the bottom 3 interventions. Costs per beneficiary varied significantly from as little as \$2 per household per year for breeding disease-resistant crops, which was estimated to benefit 90 million wheat growing households in developing countries, to \$3,660 per household for those receiving a milk cow and access to cooling equipment, which benefited less than 3,000 households. To put costs per household in perspective: if the \$8.4 billion ODA committed to agriculture in 2010 were to benefit approximately 925 million malnourished people that depend on agriculture, about \$9 per person or \$45 per household would be available.

The interventions with the best benefit-cost ratios were research interventions that reduced production losses from cassava mealy bug and cassava brown streak virus, both in Africa, and supported disease-resistant wheat breeding worldwide. These loss-prevention interventions reached many (in some cases millions) of beneficiaries. A large-scale land titling project in Peru also had benefits that exceeded project costs within one year. Good benefit-cost ratios were found in value chain development of traditional export crops.

The lowest benefit-cost ratios were found in the free or subsidised fertiliser and seed programmes in Zimbabwe and Malawi, programmes with high recurrent annual costs. However, project costs were still lower than the costs would have been of importing food aid in case of national food shortage.

Table 1. Costs and benefits per beneficiary for ten selected case studies

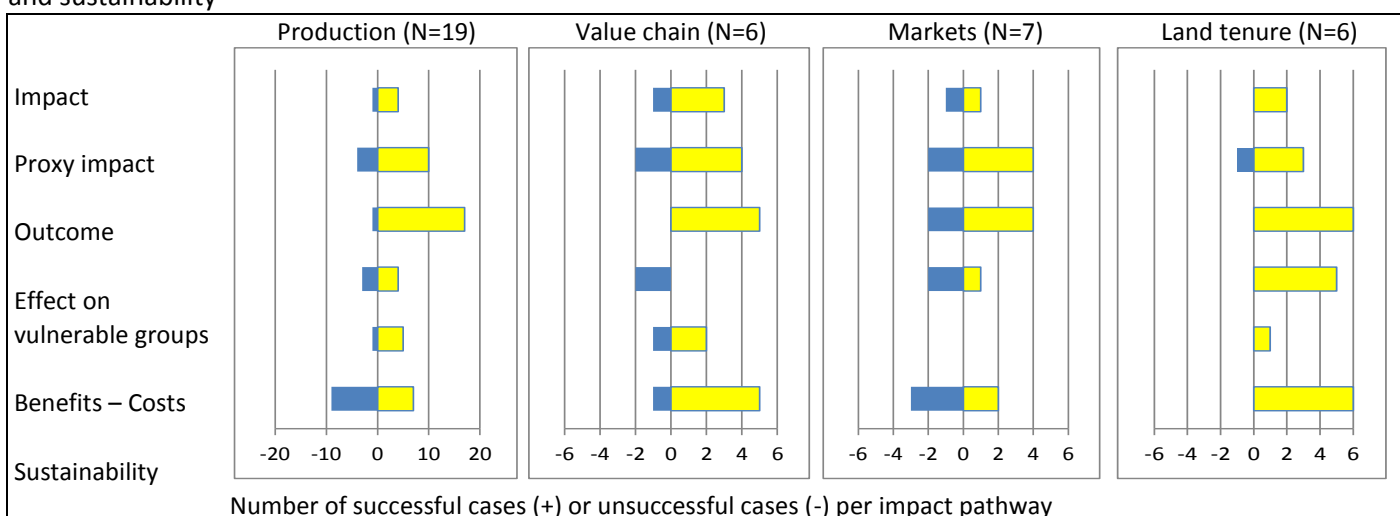
Project evaluation	Country	Cost per household	Benefits per household per year	Benefits: costs	Beneficiaries (households)
Impact biologic control cassava mealy bug (production)	Africa	\$5 total in 34 years	\$19 Avoided losses	+++ break even within one year	10,000,000
Impact brown streak virus tolerant cassava (production)	Mozambique	\$9 total in six years	\$25 Avoided losses	+++ break even within one year	100,000
Land titling (land tenure)	Peru	\$210 in seven years	\$274 Additional income	++ break even within one year	477,000
Impact organic certified coffee (value chain)	Uganda	\$90 total in six years	\$95 Additional income	++ break even in one year	3,870
Impact export sesame, groundnuts(value chain)	Mozambique	\$154 total in five years	\$35 Additional income	+ break even in five years	65,000
Impact irrigation project (production)	India	\$1,840 total in 19 years	\$225 Additional income	+ break even in eight years	212,000
Impact dairy dev't (value chain)	Zambia	\$3,660 total in five years	\$340 Additional income	- break even in 11 yrs.	2,732
Impact breeding rust resistance in wheat (prod.)	Worldwide	\$2 per year	\$13 Avoided losses	+++ break even within one year	90,000,000
Impact fertiliser subsidy (production)	Malawi	\$82 per year	\$122 Additional production	+ Maize cheaper than market and food aid	1,600,000
Drought recovery seed + fertiliser pack (prod.)	Zimbabwe	\$37 per year	\$20 Additional production	- More exp. than market, cheaper than food aid	800,000

(Source: IOB 2011)

OVERVIEW OF CONCLUSIONS BY INTERVENTION TYPE

The relative success of the four impact pathways can be presented in a very simplified way by the number of selected case studies that scored positive or negative on the following evaluation criteria: impact on food security; proxy impact (on food production, income and food prices, outcome – specific for each intervention), effects on vulnerable groups, and the benefits compared to costs, as an indication of efficiency (Figure 4). Interventions aimed at increasing production - the most frequently found interventions - score generally positive except on sustainability, due to water pollution and overexploitation. Value chain development increased trade and income of cash-crop farmers, but there was no indication that the more vulnerable people benefited as well. Market reform interventions score relatively low overall, due to the unfortunate combination of trade reforms and reduced support to the agricultural sector in several Africa countries. Land tenure interventions in the case studies score high on all aspects, but caution is needed: other reviews are not all that positive about the impact of land titling on poorer new land owners.

Figure 4. Overview of successful and unsuccessful cases of interventions in production, value chain, market reform, and land tenure security, in terms of impact, impact on vulnerable households, proxy impact, outcome, efficiency and sustainability



DISCUSSION

Good results in the past are no guarantee for the future, when working in complex development fields such as food security. Support for food security interventions is required at a political level, where decisions are not primarily driven by strong evidence of results.

Looking ahead, impressive results from research require functional extension services, many of which have been cut back in recent decades. More funding for research thus needs to be accompanied by more support to dissemination of knowledge and inputs. Climate change and more frequent droughts call for more emphasis on water efficiency, including in areas where there is currently no overexploitation of water. Increased land pressure from domestic and international investors requires better protection of local small farmers and improved land tenure security, even in countries where land conflicts were not common in the past.

In Africa, production increases have been achieved mainly by expansion of the cultivated area rather than by agricultural intensification or improved productivity. However, the selected case studies include examples of successful interventions in Africa, notably in reducing production losses by introducing disease resistant crop varieties and control of plant and animal diseases, and by setting up profitable value chains with links to domestic and regional markets. In the future, the expansion potential will decline and intensification will become more important. For this, several conditions need to be met simultaneously, including the availability of new technology, efficient markets for inputs and outputs, land tenure security, improved water management (and irrigation where possible), and financial services.

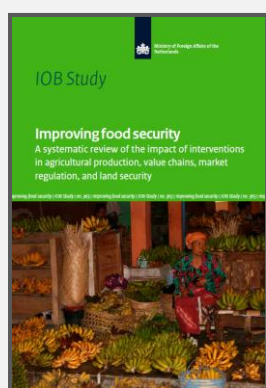
From this systematic review it becomes clear that improvements in food security were often the result of synergies between different interventions and pre-conditions: increased production, expanding markets and improved land security, for example. Each area, country or region has its own unique set of constraints and opportunities, and will thus need a tailor-made set of interventions after a careful analysis of the drivers of food insecurity and potential remedies to underlying challenges, and possibly experimentation. This review can provide background for specific situations, through the 38 examples presented, resisting the temptation to give generalised and simplified recommendations.



Photo: Gumutindo Coffee Cooperative, Uganda (Ferko Bodnár, 2010)

Evaluation Insights are informal working papers issued by the Network on Development Evaluation of the OECD DAC. These notes present emerging findings and policy messages from evaluations and share insights into the policy and practice of development evaluation. This note summarises the findings of a systematic review of the food security impact of interventions aimed at increasing agricultural production, developing value chains, reforming market regulation, and improving land tenure security. It was prepared by Ferko Bodnár, Inspector at the Policy and Operations Evaluation Department of the Ministry of Foreign Affairs, the Netherlands. Contact: ferko.bodnar@minbuza.nl.

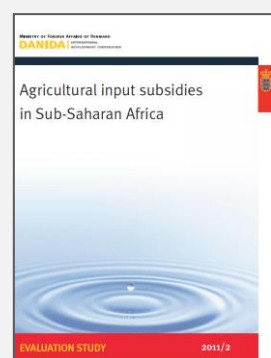
Further reading



Improving food security. A systematic review of the impact of interventions in agricultural production, value chains, market regulation, and land security.

Policy and Operations Evaluation Department (IOB), IOB study Nr. 363
December 2011

The full study summarised in this Insights note: This systematic review used information from 38 selected case studies and 46 other reviews to evaluate the impact of interventions aimed at increasing production, developing value chains, reforming market regulation, and improving land tenure security, on food security.



Agricultural input subsidies in Sub-Saharan Africa

Danish International Development Agency (Danida)
November 2011

This study provides an assessment of the overall performance of agricultural input subsidy programmes in Malawi, Zambia, Ghana and Tanzania, where so-called “smart” subsidies have been introduced in an attempt to maximise effects at the lowest possible costs.



DEReC: the Development Evaluation Resource Centre

www.oecd.org/dac/evaluationnetwork/derec

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