

Canadian International Food Security Research Fund

Understanding the CIFSRF Phase Two portfolio's contribution to generating income

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The authors of this report are, however, solely responsible for the opinions and ideas in this synthesis, including any errors and omissions. The views expressed do not necessarily reflect those of IDRC or ODI.

Abbreviations

Rs	Indian Rupee. Rs65=US\$1 in December 2017
CIFSRF	Canadian International Food Security Research Fund
DHS	Demographic & Health Survey

FNS	Food and nutrition security
IDRC	International Development Research Centre
<i>paiche</i>	Arapaima gigas: a very large fish found in Amazonian rivers

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Summary

Introduction

In July 2017, IDRC commissioned the Overseas Development Institute to assess CIFSRF's contribution to changes in agricultural productivity, incomes, nutrition for participants in CIFSRF projects, most of them smallholder farmers.

This paper synthesises income effects of the eighteen CIFSRF Phase 2 projects. The overarching question is that of the contribution of CIFSRF projects to generating income for project participants, and the lessons that may be derived from that experience. It addresses the following questions:

1. Did the projects address issues to be expected, given current knowledge about income increases? Were any significant issues overlooked?
2. Did they promote technologies and techniques compatible with the livelihoods of intended beneficiaries?
 1. Who benefited, in what form and to what degree? Who did not benefit? Were any negative outcomes seen?
3. What impact did income increases have, and how sustainable are they anticipated to be?
4. What lessons can be drawn from early impacts? What factors made for success or prevented success? How effective were the research partnerships formed under CIFSRF in generating results and impacts?

This paper forms part of a set of three syntheses of impacts on income, nutrition and sustainable agriculture, plus an overall synthesis of all results and impacts of the CIFSRF Phase 2.

To gather data to address these questions, six of the Phase 2 projects were visited between September and November 2017 to interview project participants, project staff and other stakeholders and to see activities in the field. In addition, desk reviews were carried out for the other twelve projects in the Phase 2 portfolio, drawing mainly on original proposals and technical reports. Most of the data for this review were collected by end December 2017. They have been

complemented by final technical reports received from most of the projects that were available by mid-May 2018.

Key findings

- All but three of the CIFSRF Phase 2 projects saw significant income gains to some, or all, of the project participants;
- In most projects (9/15), income gains resulted from sales of crops and fish that were possible owing to increased production arising from innovations promoted by project teams. Typically, the increased production was of a crop or fish known to the participants, or something very similar, and was generally sold into existing markets. In some cases, input suppliers, traders and processors in the associated supply chains were trained or advised on business skills to improve their performance;
- Four projects achieved, or will achieve, income gains through reducing losses of crops and livestock to disease or to spoilage of fruit. These projects were necessarily closely focused on the specific technical challenges of disease and spoilage;
- Two projects promoted processing of novel food products using produce from smallholders, generating income for small-scale manufacturers;
- For many of the participants, and especially those farmers and fishers who increased output, the income gains were quite modest, often of less than US\$100 a year;
- Those modest gains, however, often were to women producers and in some cases arose in off-seasons, making them disproportionately valuable;
- Those who were producing high-value crops or fish, however, realised considerably larger cash gains, as did some of the food processors. The value of avoided losses was high for farmers and packers using nanotech to reduce spoilage: similar gains are likely for those facing coconut disease and losses of livestock.

Lessons and discussion

Most income-generating activities were relevant and effective

Most activities that were likely to generate income did so: measures taken were effective. They worked

because they were relevant and accessible to many of those low-income households targeted.

In the nine projects that raised production, the technical innovations involved incremental changes to the production of known crops and fish, which could be readily sold into existing markets. They usually did not require major changes to the farming system, or large capital injections — labour was usually the main factor demanded. They very largely drew on the existing resources of participating households, above all their skills and experience as farmers.

The two food processing projects worked with existing small-scale processors, making incremental and accessible technical improvements. Similarly, the four projects focused on avoiding losses used techniques that were accessible to small-scale farmers and herders.

Project succeeded also because the field teams provided appropriate and effective support, made every effort to accompany the participants, and were prepared to revise ideas when they encountered obstacles. The partnerships between Canadian researchers and local counterparts functioned well. Most collaborations were marked by mutual learning, and by pragmatic application of innovations to circumstances seen in the field.

Because many activities were dealing in already known crops and fish, most did not encounter significant challenges in policy and regulation. Those activities that were most novel, above all those concerned with avoiding losses, were using significantly novel innovations that required approval.

Few activities failed: only two out of the many carried out in 15 projects were apparent, very much exceptions to a norm of success.

Were income gains too small?

Although most participants saw only modest gains in cash incomes, they were often valuable because they were earned in off seasons when cash was short, and accrued to women producers who are more likely to spend cash on food, health and hygiene for the household than men.

Large income increases are not always necessary to achieve food security. Buying additional food such as vegetables, fruit, eggs, etc. to complement home grown food usually costs less than US\$20 a month.

Moreover, few of the CIFSRF projects depended on cash incomes alone to improve food security: most focused on helping participants increase their production of nutritious foods.

Not all gains from business are monetary

Some of the producers selling items such as fish, vegetables, or millet-based snacks met during fieldwork reported gains other than cash earnings. For example, they spoke about their satisfaction in selling healthier items to their neighbours and fellow villagers, in raising horticulture or livestock through more environmentally sustainable means, their pride in improved capacity and knowledge in terms of food preparation or running small businesses, and their improved standing in households or communities.

Could more have been done to raise incomes?

In the nine projects focused on raising production from farms and ponds, increased earnings mostly came from technically straightforward improvements to production for known, or similar-to-known, activities. Within the context of projects designed to improve food security largely through direct means of encouraging production of nutritious food for household consumption, what was done seems reasonable.

Could the projects have achieved more by paying more attention to complementary measures to boost earnings, such as enterprise management and marketing, or by lobbying for policy that might have raised such earnings? Not that IDRC necessarily could have ensured this: CIFSRF projects came from calls that purposely were quite open to the suggestions of applicants.

More can always be done in any development programme: the relevant question, however, concerns the ratio of returns to costs at the margin. CIFSRF projects did pay attention to management and marketing in the cases where it mattered — new enterprises, novel products. In other cases, the project teams were making commendable efforts to improve physical production: asking them to try and further improve enterprise management and the like of participants would not clearly have raised returns by more than the costs of the additional effort.

Sustainability and context

Most gains seen are likely to be sustained, although that will depend for some participants on the ability to continue to access quality inputs, obtain technical

advice, and thereby continue to improve their performance.

That said, what will be sustained depends on how rural economic and social systems evolve, and the importance of changes engendered by CIFSRF in those future systems.

It was clear in several countries visited that rural livelihoods have changed considerably over the past ten to twenty years. In rural Nepal, the incomes remitted by migrants on construction sites across the Gulf and Asia have brought in resources unimaginable from local farming, however productive. Cambodian villages have significant numbers of households that depend on migration and commuting for incomes from services and manufacturing. Within the peri-urban pull of Pasto, Colombia, rural youth prefer to commute to urban building sites, rather than work on the farm, since they earn more.

In such cases, farm household food security is increasingly underwritten by non-farm earnings that are much higher than what might be obtained from the farm. Indeed, it may only be a matter of time before some such households give up on their farms, renting the land out to neighbours while they concentrate on more lucrative activities. For these households, training in how better to grow vegetables on home gardens may be a marginal gain to their livelihoods.

IDRC — and other development partners — should not, however, worry too much about this. Not all village households have access to the new sources of income: many depend on their farms and may well continue to do so for some time. For them, CIFSRF innovations can be far from marginal. In the broader context, actions that expand the range of abilities of rural households are welcome. Sustainability is not about being able to continue to do the same things: ultimately, it is about human capacity to make the most of whatever opportunities present themselves — or conversely, to adapt to whatever threats materialise. Sustainable systems are characterised by diversity and the ability to change with circumstances. Those CIFSRF activities that boost cash incomes contribute to the adaptive capacity and hence sustainability of ecosystems, communities and households.

1. Introduction

1.1 Background: the Canadian International Food Security Research Fund (CIFSRF)

The Canadian International Food Security Research Fund (CIFSRF) was designed to address global problems of food and nutritional insecurity through applied, collaborative, results-oriented research. CIFSRF is a program of Canada's International Development Research Centre (IDRC) undertaken with the financial support of the Government of Canada, provided through Global Affairs Canada.

CIFSRF operated by funding studies that looked to develop and apply innovations in specific locations. They took the form of research-for-development projects where innovations were tested, assessed and further developed in the field, with the active participation of the small-scale farmers, fishers and processors for whom the innovations were designed.

Phase 1 (2009-2014) focused on *testing innovations*, while Phase 2 (2013-2018) aims to both *test scaling up methods/mechanisms and to scale up practical solutions to: increase food production, raise income for farming families, and improve nutrition*. The emphasis in Phase 2 was to harness the best of the private, public and not-for-profit sectors to expand CIFSRF's research portfolio so innovations reach more people and have a greater impact globally to improve food security.

1.2 Questions and methods

In July 2017, IDRC commissioned the Overseas Development Institute to assess CIFSRF's contribution to changes in productivity, incomes, nutrition for participants in CIFSRF projects, most of them smallholder farmers, and for other persons who may also have benefited from the projects.

This paper reviews the extent to which CIFSRF Phase 2 projects led to participants — for the most part, farmers, fishers and small-scale food processors — in CIFSRF projects, and to any others also affected, gaining cash incomes. Gains in home-consumed produce which would normally be considered as income-in-kind are not considered here. Such gains in kind have been excluded because almost all these gains took the form of food, and hence are examined in the companion synthesis on nutrition.

Because nine of the eighteen CIFSRF projects aimed primarily to increase food production by farming households for home consumption, gains in kind were in these cases usually greater than increases to cash incomes. Hence this review understates the totality of income increases.

The overarching question addressed is that of the contribution of CIFSRF projects to generating cash income for project participants, and the lessons that may be derived from that experience. It addresses the following questions:

2. Did the projects address issues to be expected, given current knowledge about income increases? Were any significant issues overlooked?
3. Did they promote technologies and techniques compatible with the livelihoods of intended beneficiaries?
4. Who benefited, in what form and to what degree? Who did not benefit? Were any negative outcomes seen?
5. What impact did income increases have, and how sustainable are they anticipated to be?
6. What lessons can be drawn from early impacts? What factors made for success or prevented success? How effective were the research partnerships formed under CIFSRF in generating results and impacts?

This paper forms part of a set of three syntheses of impacts on income, nutrition and sustainable agriculture, plus an overall synthesis of all results and impacts of the CIFSRF Phase 2.

To gather data to address these questions, six of the eighteen Phase 2 projects were visited between September and November 2017 to interview project participants, project staff and other stakeholders and to see activities in the field. Selected after being identified by IDRC staff as likely to show significant and revealing results, these were: Cambodia homestead food; Colombia potatoes; Ethiopia pulses; India small millets; Nepal terrace farming; and Tanzania fortified sunflower oil.

In addition, desk reviews were carried out for the other twelve projects in the Phase 2 portfolio, drawing mainly

on original proposals and technical reports. [See Annex A for a list of these projects, with their full titles.]

Most of the data for this review were collected by end December 2017. They have been complemented by final technical reports received from most of the projects that were available by mid-May 2018.

The rest of this paper is set out as follows:

- Section 2 sets out how increased in money incomes can contribute to food and nutrition security; then considers the ways that CIFSRF projects helped raise (Questions 1 and 2);
- Section 3 assess results achieved, impacts seen, and their sustainability (Questions 3 and 4);
- Section 4 concludes with the lessons that can be drawn (Question 5).

2. Income increases for food and nutrition security and the relevance of CIFSRF projects

2.1 The potential contribution of income to food and nutrition security

The main way that increased cash income can lead to better food and nutrition security is through improving people's access to food.¹ With more income, the household may buy more food, and food with nutritional content that previously was lacking from the household diet.

Households on low incomes tend to satisfy their demand for dietary energy by consuming foods that are least costly to produce or buy, usually grains, roots and tubers. As incomes rise, typically more is spent on meat, fish, dairy, fruit, vegetables, oils and sugar. The share of carbohydrates in the diet gives way to more protein, fat, sugar, vitamins and minerals (see Popkin 2003 on diet transitions). The result is that diets become more diverse, and potentially more nutritious.

¹ Until the early 1980s, it was widely thought that hunger and famine were caused primarily by declines in food availability. Sen (1981) did much to correct that, by emphasising the importance of entitlement to food in

Contrarily, however, it can lead to excessive consumption of fat, salt and sugar contributing both to people becoming overweight and obese, and to much greater exposure to the risks of non-communicable diseases such as cancer, diabetes, heart disease and strokes. The risks of income leading to poor diets rise when processed food rich in energy, salt and sugar but low in fibre, minerals and vitamins is readily available, at a low price, and promoted by advertising. Risks also rise when people adopt more sedentary lives. (Keats & Wiggins 2014)

These dangers are not that high when rural households on (very) low incomes spend more on food: rather they apply to households that have achieved incomes that lift them above the threshold for moderate poverty — around US\$5 a day per person — and whose members have left agriculture for more sedentary occupations. More important for low-income farm households is the fraction of increased income that gets spent on a better diet.

Control over income then becomes important. Women are more likely to use any increased income to spend on food for the family and for the care of their children

Women have consistently been shown to be more likely than men to invest in their children's health, nutrition, and education.' (World Bank 2007)

Extra income not only has the potential to improve access to food, but also it may lead to better utilisation of food when its spending leads to an improved health environment — such as by allowing the household to invest in safer water, cleaner sanitation and hygiene.

Increased earnings can help stabilise food security of rural households on low incomes. Farming households grow food that is harvested seasonally: for most grains, roots and tubers this will be at most twice a year, and, in areas with a single growing season, just once. As the months from the last harvest pass but before the new harvest, food supplies dwindle resulting in a hungry season when households have to cut food portions or skip meals. With increased cash earnings, they can buy in food at such times.

In the medium term, additional income may allow households to send girls to secondary school — since

explaining the causes of famine. Entitlement to food has two sides: one is the cost of food, the other side is income and assets.

they have the means to buy uniforms, school materials and if necessary, pay boarding fees. Girls' secondary schooling correlates with improved child nutrition (Smith & Haddad 2014) — owing to a combination of better education about diet, hygiene and child care; women having more opportunity to earn; and to a rise in the status and empowerment of educated young women.

Most agricultural and rural development programmes implemented by governments and their donor partners, by NGOs and by collective action aim to raise rural incomes — to raise rural welfare, to reduce poverty and to end hunger. Those programmes that emphasise improved food and nutrition security typically accompany measures to raise incomes with those that provide education on nutrition — diet, food preparation, child care and feeding, hygiene, etc.; which improve the health environment through investments in water and sanitation and primary health care; and, for farming households, those that promote nutrition-sensitive agriculture. Food and nutrition security programmes that depend on raising income alone are few, if they exist at all.

2.2 Income increases seen in the CIFS RF Phase 2 portfolio

Of the eighteen Phase 2 projects, fifteen included activities that generated significant cash income for participants.²

Nine of the projects generated cash incomes through **increases in agricultural output**, at least some of which was sold — although in only five projects was it clear that increased production was destined mainly for sale. (Table A) In these cases, the route to increased earnings was through raising the productivity and production of crops and fish, through application of innovations on fields, in fish ponds and in river fisheries. In two projects, Bolivia Amazon fish and West Africa vegetables, income gains had been boosted by price increases as well as production gains. Increased prices corresponded to better quality produce and to marketing campaigns.

² The three projects that did not generate significant income gains were: India double-fortified salt, Tanzania fortified sunflower oil, and Vietnam therapeutic foods.

³ For one crop, this was well beyond the control of the project. In August 2017 India banned the import of

Almost all cases included products that were either already being grown, or which were similar to something already produced — such as a new variety of a known crop, or a new vegetable. In six cases, the project was not focused on a single crop, but was raising production across a range of crops or fish. Sales of these were largely to existing markets through established channels.

In one case, Tanzania legumes, one of the crops promoted, soybeans. was expected to be sold into new markets, although they were not always accessible to farmers who were left with unsold produce.³

Just a few projects increased the output of novel products. Colombia potatoes promoted new, improved varieties of yellow potato; Ethiopia pulses included processing of novel snacks based on chickpeas; West Africa vegetables was reviving cultivation of indigenous vegetables, and finding ways to add these vegetables to processed foods to raise their nutritional value. Bolivia Amazon fish promoted a completely new activity, for new markets: fish leather tanning and crafts.

Some of these projects complemented measures to raise production with improvements in the supply chains. West Africa vegetables worked with traders to improve their business skills to generate more returns to the businesses, as well as to make marketing more effective. Nepal terrace farming developed supplies of inputs, tools and seed, to farmers by working with an input supply company and their distribution networks of agro-dealers. Bolivia Amazon Fish engaged with traders and retailers to improve the handling of fish, both for food safety and to reduce losses. Kenya Farm Shop focused on developing the farm input shops so that farmers could get quality inputs and advice.

Four projects raised incomes by **reducing losses of crops and animals**. These projects were characterised by an intense focus on a technical innovation to mitigate or eliminate disease, as seen for Côte d'Ivoire coconut disease, CBPP vaccines and novel livestock vaccines; or to slow the processes of ripening and decay as in Nanotech for fruits.

cowpeas from Tanzania, leading to a collapse of prices in the domestic market. The ban was apparently lifted in May 2018.

In these cases, the focus was on reducing losses of an existing product that would be sold to an existing market, except for Nanotech for fruit that had promoted the sale of banana stems in Sri Lanka. The same project was also working on improved marketing chains.

A third set of two projects concerned **processing foods into novel products**: East Africa fermented foods

producing yogurt with probiotics added, and Indian small millets promoting new snacks made from millet. These were novel products: sold into existing markets, and in the case of the millet snacks, looking for sales among urban consumers who may not previously have consumed these snacks.

Table A Means of increasing incomes

	Existing product for existing market	Existing product for new market	New product for existing market	New product for new market	Improved efficiency from better business skills, etc.	Improved function of the supply chain
Increased agricultural output						
Ghana ICT extension	X					
Cambodia homestead food	X					
Tanzania legumes	Common bean X			Soybeans: mostly new crop for new market		
Colombia potatoes	X		Improved varieties of yellow potato			
Ethiopia pulses	X		Snack food			
West Africa vegetables	Revived indigenous veg X		Processed foods with indigenous veg.	Frozen vegetables	Vegetable traders	
Nepal terrace farming	X					Input supply
Bolivia Amazon fish	X	<i>Paiche</i>		Fish leather crafts		Handling of fish, business skills
Kenya farm shop	X				Farm shop franchisees	Input supply
Reducing losses of crops and livestock						
Nanotech for fruit	X			Sri Lanka: sales of banana stems		Longer life of produce during marketing
Côte d'Ivoire coconut disease	X					
CBPP vaccine & Novel vaccines	X					
Food processing						

East Africa fermented food		Yogurt with probiotics				
India small millets		Millet snacks	Millet snacks		Snack producers	Retailers of millet snacks

Note: Tan shading = some of the increased production sold, some home-consumed; Orange shading = all or the bulk of the increased output was sold.

The income-raising activities were highly relevant to project participants. They concerned for the most part products that the participants knew, and where they knew how and where to sell any increased output. Projects participants were, for the most part, not expected to take their chances with novel products or new markets.

The innovations were thus mainly in improved techniques of production and processing. Most such changes were incremental to current practices of farmers, fishers, and processors; and in most cases did not require large additions of capital or expertise. This made them highly accessible to the targeted participants, including women farmers and processors.

3. Results, impacts and sustainability

3.1 Results of income increases and impacts

Table B summarises results and impacts for the 15 projects.

Who gained income?

Most of those who gained income, or who were expected to do so, are primary producers: crop farmers, fish farmers, livestock keepers, and fishers. Only two projects — did not expect to generate incomes for primary producers.

These participants were mainly small-scale producers with low incomes. In most cases where the statistic was reported, women producers made up half or more of the participants.

Other participants expected to gain income were working in the supply chains, either upstream, providing inputs to primary producers, or downstream processing, trading and retailing produce. They included:

- storekeepers supplying industrially-produced inputs [Kenya farm shop, Nepal terrace farming], Tanzania legumes;
- growers of seed or fish hatchlings [Cambodia homestead gardens, Colombia potatoes, Ethiopia pulses, West Africa vegetables];
- equipment manufacturers [India small millets];
- dealers and traders in the supply chain downstream of the primary producers [Nanotech for fruit, West Africa vegetables];
- processors of foodstuffs [Bolivia Amazon fish, East Africa fermented foods, Ethiopia pulses, India small millets, West Africa vegetables]; and,
- retailers of food, including processed food [India small millets].

One group who may have gained income was only occasionally mentioned in the documentation: hired labourers working in primary production or in the supply chains. Given that many of the projects involved some form of intensification of production, it is likely that at least some participating households, and quite possibly most of those who fully adopted innovations, would have had to hire extra labour — at very least, during peak seasons. For example, for Nanotech for fruits it was reported that in India, post-harvest treatments typically created 12–17 more days of employment per farm in every harvest season; jobs that were mainly taken up by women. In West Africa vegetables, more labourers were hired on the plots, especially by women growers.

To what degree?

Income gains, for the projects for which such statistics were reported, showed a considerable range.

Most participants who gained income saw fairly small increases, of less than US\$100 a year. These were typically the proceeds from sales of small quantities of vegetables from home gardens, of fish from ponds, or of increased fish catch from rivers.

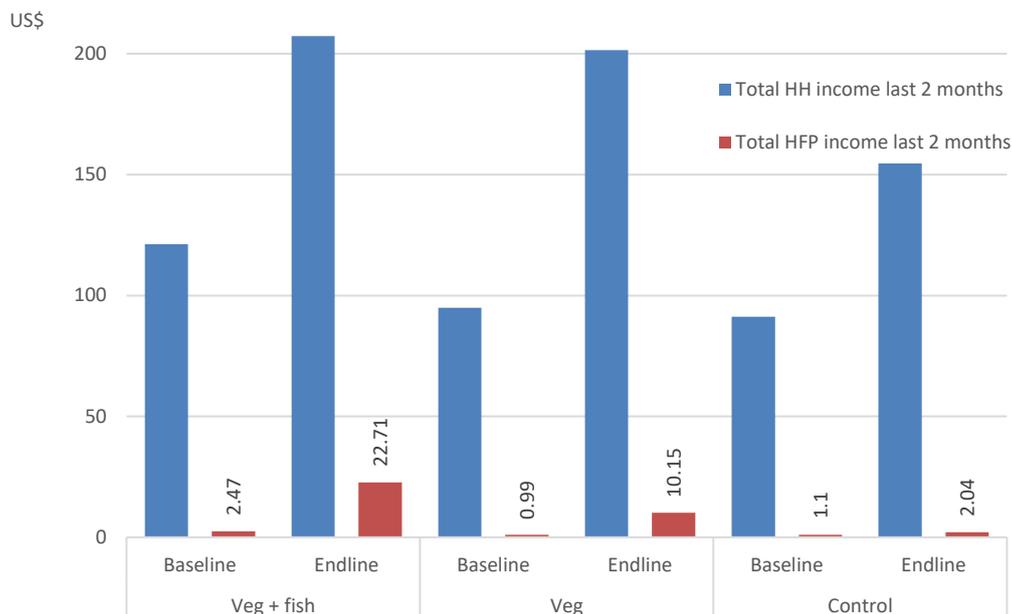
For example, in Nepal, women farmers growing ginger as an intercrop typically realised sales of US\$30.

Indigenous fishers in Bolivia saw their returns from catching *paiche* rise by US\$20–80.

In Cambodia, home gardeners in Phase 1 raising fish and growing vegetables made an extra US\$121 a year,

extrapolated from two months observed, at end line compared to baseline, while those growing only vegetables made an extra US\$55 a year. Control households, by comparison, only made only an extra US\$6. (Figure 1)

Figure 1 Cambodia, Fish on Farms. Household and home garden income, before and after Phase 1



Source: Table 3, Talukder et al. 2017.

Note: HH = Household, HFP = enhanced homestead food production. 'Veg + fish' = households who grew vegetables and fish, 'veg' = households growing only vegetables. 'Control' = non-participating households.

Figure 1 also shows considerable rises in incomes of households in rural Cambodia over just a few years. This may owe in part to improved farm efficiency and greater receipt from traditional activities such as rice farming, but as much or more of the increases probably come from local jobs off the farm or from migration to rapidly expanding urban activities such as construction or textiles. They may also reflect more women entering the workforce.

Larger gains were probable in some cases: where farmers produced high-value items, including seeds and hatchlings; where costly losses were prevented; and where processing took place.

High-value vegetables and fish. Nepali hill farmers using polythene houses of 50 square metres with drip irrigation to grow tomatoes could make gains of US\$200 over three years, net of the costs of the equipment. West Africa vegetables reported half-hectare vegetable plots in Benin and Nigeria producing

net benefits of US\$3,500–4,000. Most fish farmers in Bolivia reported incomes rising by 50–150%, with household incomes from aquaculture rising by over US\$11,000 between 2015 and 2017.

Preventing costly losses. Indian fruit growers conserving their produce with hexane realised a gain of US\$295 per tonne of fruit harvested. Mango famers estimated they made US\$670 more from every acre under fruit by using nanotechnology. The gains from livestock vaccines could be very large, when animal deaths are prevented. In rural Africa, the loss of a cow can be worth US\$500 for local breeds, and three times that for specialised dairy breeds; a sheep or goat lost may be worth US\$100.

Processors. East Africa fermented food reported yogurt makers realising sales of US\$95 a week in Kenya, and US\$193 in Tanzania — although actual income gains will be significantly less, once costs of milk and production are deducted.

Only a little information is available on the effect of employment on income. In India small millets, a manufacturer of millet processing machinery in Coimbatore reported that with increased demand for machines, salaries of workers had risen from around Rs350 a day in 2014 to as much as Rs700 a day, while profits per machine remained the same. Similarly, for an engineering firm in Salem, labour costs had increased more than 50% in the last 5 years, owing to the firm hiring 14 more workers, to add the 6 already employed, as well as wage rate increases.

What impact did income gains have?

Most of the income gains recorded are modest. This should not surprise: CIFS RF aims to improve food and nutrition security, rather than to raise incomes.

The income gains for most households would not lift those living in poverty out of that state: CIFS RF income increases for most participants are measured in the hundreds of dollars; to get out of deep poverty, they would need to be in the thousands of dollars [Box A.]

Box A Raising income to escape deep poverty

How much income would take those in deep poverty to a comfortable level?

The World Bank sets US\$1.90 a day per person as the threshold for deep poverty; other authors set US\$5.00 a day as the threshold for leaving moderate poverty. Daily difference per person is thus US\$3.10. For a household with 5 persons, the difference comes to US\$5,658 a year — increasing total household annual income from US\$3,468 to US\$9,125.

This is what it would take for household that was only just in deep poverty: if they were substantially below

the US\$1.90 threshold, the necessary increases would be larger — to a maximum of US\$9,125 for a completely destitute household.

India millet porridge vending

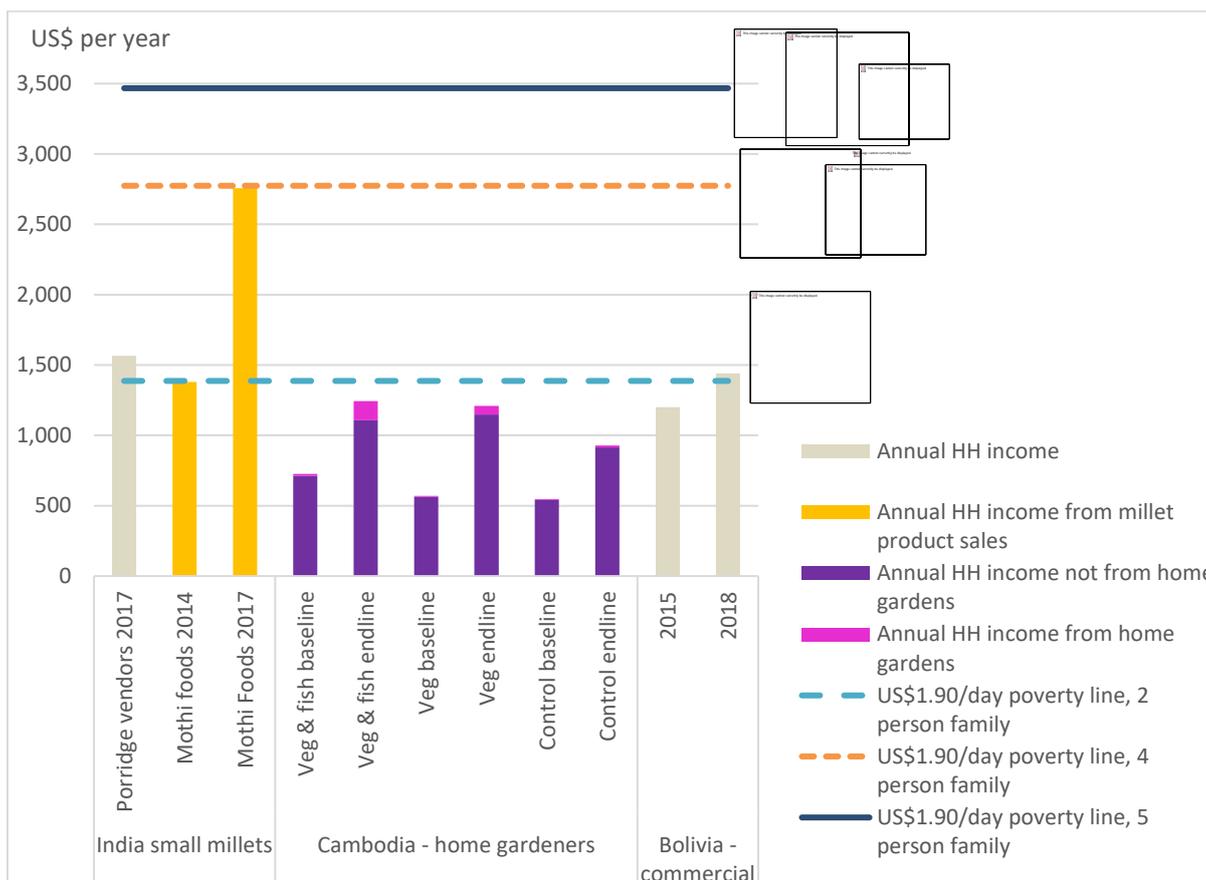
In the India millets case for instance, a millet porridge vendor husband-and-wife team visited during the fieldwork were selling (largely to other poor consumers) from a push-cart at the roadside as their sole occupation. This couple, among the poorest beneficiaries of this project, were able to earn around Rs450 per day in peak summer season, and around Rs250 in the lean season, after project intervention — no baseline available. They spent about Rs200 on millet and Rs150 on side dishes every 5 days. Hence, they have net incomes of Rs280 a day, or US\$4.27: only enough to escape poverty if the couple had no dependants.

In comparison, another small business selling millet-based foodstuffs targeted to middle-class consumers, run as a side-business by a farming family reported monthly sales of around Rs60,000 to 70,000, with margins of around Rs15,000 rupees, or US\$7.70 a day. Their turnover three years ago was around half this amount

The business would thus support four persons to live at just above the extreme poverty line. The business, however was a complement to their farm, so total household income would be more.

Figure 2 sets income gains seen in Bolivia, Cambodia and India in graphical perspective, compared to the deep poverty line of US\$1.90 a day for various household sizes. Income gains from participating in CIFS RF activities can make useful additions to household income, but not sufficiently to lift most households out of poverty.

Figure 2 Annual incomes for selected project participants in India, Cambodia, and Bolivia compared to the US\$1.90 a day poverty line



Source: Constructed with data from field visit to Tamil Nadu in 2017, Talukder et al., 2017, IDRC internal reports on Bolivia.

Notes. Participants in Madurai, India were street-corner millet porridge vendors and Mothi Foods, a family-run millet processing business; in Cambodia they were rural households with home gardens and control groups; and in Bolivia they were commercial fishers of paiche.

A 5-person family is probably an accurate estimate in the Cambodia case – though DHS records a national rural average of around 4.5; the baseline report for the phase two project in Cambodia reported an average household size across the three target provinces of 5.3. DHS records average rural household in Bolivia in 2008 of 4 persons

All that said, income gains need to be appreciated in the context of the projects, and for what they imply for food and nutrition security.

The gains mainly accrue to people on low incomes, to people with little control over or access to cash such as women in smallholder households. CIFSRF has done a commendable job of including women and incorporating gender strategies into their projects. Giving women more control over cash income will probably lead to more being spent on nutrition for the household than if men controlled the cash. Moreover, cash incomes in some cases arise during slack and off-seasons when cash is scarce. For both these reasons, quite small sums can be disproportionately valued by the recipients.

Furthermore, CIFSRF is about food security. Healthy and sufficient diets allow people to realise their potential:

income allows people to access the food they choose, to improve their health when spent on water and sanitation that makes for more hygienic homes. The difference in income between an amount that can pay for a diet that meets energy requirements alone but is deficient in protein, minerals and vitamins, and being able to afford a more diverse diet that fulfils all nutritional needs, is not necessarily that much — a few dollars a week spent on fruit, vegetables, eggs and the like can make a significant difference to diets.

Finally, income is not the only route for most participants in CIFSRF projects to increased access to food high in protein, micronutrients, or both. Most projects also aim to have participants produce more food for home consumption, food that is usually rich in protein, micronutrients, or both.

Hence for most CIFSRF projects, income increases that make a difference to people on low incomes and which are intended to improve their food and nutrition security do not have to be large.

Where income is the prime means for participants to improve their food security — processors of yogurt, fruit farmers and packers applying hexane, vegetable traders, millet processors and vendors, snack manufacturers, specialised seed growers and fish hatchery operators, and those growing coconuts — income gains tend to be large and significant: with several reports of gains of more than US\$1,000 a year to participants.

Scale is a further consideration. Some of the projects are helping make changes that may be taken up by large numbers of primary producers. Home gardens and fish

ponds, for example, can readily be replicated for many thousands of producers in most areas of medium or better agricultural potential.

Two projects have quite exceptional prospects for both scale and income effects: CBPP vaccine and novel livestock vaccines. Between them they cover six livestock diseases affecting cattle, pigs, sheep and goats. As many as 300 million persons, or 60 million households, in sub-Saharan Africa keep one or more of these species. Very broad estimates of the costs of disease run at around 20% of the value of annual output. For 2012/14 the average gross value of livestock production in sub-Saharan Africa⁴ was around US\$36 billion (FAOSTAT estimates), so that disease losses of 20% would be worth US\$9 billion. If the vaccines being developed were able to reduce disease losses by just 10%, the gain to livestock keepers across the continent would thus potentially be US\$900 million.

⁴ UN regions of Eastern, Middle, Southern and Western Africa.

Table B CIFSRR Phase Two project results to incomes of participants

Project Means to raise incomes	People reached	Degree of gain															
<p>Ghana ICT extension Increased production by smallholders, mainly known crops</p>	<p>Project reached 500 farmers across Ghana. 175k adopted at least one improved technique.</p>	<p>Differences in yields seen between radio listeners participating in project and those not participating:</p> <table border="1"> <thead> <tr> <th>Yield: tonne/hectare</th> <th>Maize</th> <th>Rice</th> </tr> </thead> <tbody> <tr> <td>Radio listener participants</td> <td>2.25</td> <td>2.39</td> </tr> <tr> <td>Non-listeners</td> <td>0.99</td> <td>1.95</td> </tr> <tr> <td>Difference</td> <td>0.26</td> <td>0.45</td> </tr> <tr> <td>Value, US\$</td> <td>75</td> <td>177</td> </tr> </tbody> </table> <p>Prices: Ghana Esoko Sept 2017: GHC 288.3 per tonne maize; GHC 452.7 per tonne (milled) rice. Rice conversion at 70%. GHC\$4.40 = US\$1</p> <p>Maize yields up 230%, reports by participant famers, by 1.3 tonnes per hectare in total: an additional 1.3 t/ha would be worth US\$418 [Ghana Esoko prices]</p>	Yield: tonne/hectare	Maize	Rice	Radio listener participants	2.25	2.39	Non-listeners	0.99	1.95	Difference	0.26	0.45	Value, US\$	75	177
Yield: tonne/hectare	Maize	Rice															
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Value, US\$	75	177															
<p>Kenya farm shop Farm shop owners earn profits through more efficient and less risky operations; assistants earn wages Farmers access good quality inputs and equipment, together with training; raise yields; increase income</p>	<p>74 franchised agricultural input shops, with 50% owners women, 54% assistants women 15 more shops being franchised at Feb 2018 26.6k farmers trained, 52% women through 59 village demonstration plots</p>	<p>Reports of improved shop sales and returns; increased production and better returns for farmers, but no specific statistics known.</p>															
<p>East Africa fermented food Processors gain from less waste, improved product, with novel addition of probiotics, with more sales Promotion of yogurt with probiotics to consumers</p>	<p>Small-scale yoghurt processors. By 2017–18 in Kenya, Tanzania & Uganda, nearly half of them women.</p>	<p>In Uganda: Profit from selling one litre of probiotic yoghurt is at least 3 times the profit of selling one litre of fresh milk; Income gains of selling probiotic yoghurt instead of fresh milk is on average US\$95 per production unit per week.</p> <p>In Tanzania: Income gains of selling probiotic yoghurt instead of fresh milk is on average US\$193 per individually-run production unit per week</p>															
<p>Bolivia Amazon fish Fishers manage fisheries better, utilize fish meat and skin — new value chain for leather, increase yields Fish farmers raise more fish more efficiently, increase yields More fish means more jobs in supply chain for traders, retailers, eateries, fish leather works Value chain development</p>	<p>River fishers, 379 indigenous, 393 commercial. Affects 630 households in 40 communities reached. Fish farmers, 335 households in 12 associations Fish vendors, artisans (fish leather crafts), restaurants About half fish farming participants are women</p>	<p>Fishers: 379 indigenous fishers increased their income by 47.5% through meat sales and 32 indigenous fishers improved income by 23% through skin sales (for leather) 393 commercial fishers improved income by 35.5% through meat sales and 5 commercial fishers improved income by 23% through skin sales 56 vendors (retailers) improved income by 28% from fish meat sales</p> <p>Fish farmers: 335 families, in 12 associations 72% of fish farmers consider their income has increased by 50%–100%; 52% claim 50% increase. 2015, producer families from core region made an average of US\$7,705 a year; while by 2017, gross average income had risen to US\$ 19,079, an increase of 148%, [household survey data].</p>															

		<p>Growing local economy, currently valued at approximately US\$4.5M annually in gross sales of fish. Additional associated economic benefits seen in the region, for suppliers, restaurants, and tourism businesses.</p> <p>Processors, transporters, traders, input suppliers</p> <p>Gains to <i>paiche</i> leather tanneries and crafts, to fish pond input suppliers, to transporters and traders trained and guided by the project</p>
<p>Nanotech for fruits</p> <p>Less fruit spoiled in field and in supply chain</p> <p>Marketing season extended</p> <p>Improved production through training</p> <p>New product: banana stems sold for fibre making</p>	<p>Fruit growers: 12k in India</p> <p>Packers & shippers</p>	<p>India: farmers report premium price gains of 15–18%</p> <p>India: income gains to fruit packers of Rs19,000 [US\$295] per tonne of fruit from post-harvest biowax dips. Overall income gains of 10-15% depending on crop.</p> <p>Mango farmers: extra income per acre, US\$297, plus US\$220 from longer harvest period and shelf life, plus US\$156 from increased yield due to high retention. 24% rise in income overall</p> <p>Adoption of improved post-harvest management practices created 12–17 days additional employment per harvest season for women. Post-harvest value added increased household income by Rs240–270 [US\$3.70–4.15] per month.</p> <p>In Sri Lanka, growers benefited from selling banana stems for fibre, worth US\$150 an acre.</p>
<p>Ethiopia pulses</p> <p>Better seeds and techniques for pulses leading to higher yield, increased production, increased sales. Production in off season</p> <p>Processing of chickpea to snack food</p>	<p>Smallholders growing pulses: 51k farmers reached (42% female),</p> <p>Smallholder seed growers</p> <p>Guts Agro processes chickpeas to snacks: has women vendors</p>	<p>Farmers report higher incomes from pulses.</p> <p>Project research in Sodo and Wolayita districts, chickpea farmers earned an extra Birr3,500 [US\$152]</p> <p>Women involved in sale of Guts Agro produce increased their incomes</p>
<p>West Africa vegetables</p> <p>Increased production of existing and revived indigenous vegetables, through micro-dosing and other techniques</p> <p>Intermediaries trained in business skills.</p> <p>Processing of vegetables, addition of green veg to bread and other foods</p>	<p>Smallholder vegetable farmers: 338k, 51% women</p> <p>Vegetable traders: 21k. 65% women in Nigeria, 72% in Benin.</p> <p>Processors: 315 Nigeria, 67% women, 9k in Benin, 95% women</p> <p>Seed growers and sellers: 576</p> <p>Input dealers: 402</p>	<p>Increased output of vegetables, with prices up 35–65% owing to marketing drives</p> <p>Vegetable production based on 0.5ha land area resulted in a net benefit of US\$3,879 and US\$3,650 in Benin and Nigeria, respectively</p> <p>Osun Government Youth Empowerment Scheme (OYES), farmers report profits from sale of indigenous vegetables of up to 300% of investment.</p> <p>Youth groups generated an average of US\$2,197 in Nigeria, US\$2,428 for Benin</p> <p>Vegetable traders: 120% rise in revenues for Nigeria, 90% for Benin. Benefit-costs ratios of 1.42–2.35 Nigeria, 1.22–1.32 for Benin.</p>
<p>India small millets</p> <p>Technical improvements to equipment increased demand, sales</p> <p>Better processing for improved products with more demand and higher prices</p> <p>Support to small businesses</p> <p>Lobbying for through higher Minimum Support Price (MSP) for small millets, regular</p>	<p>Equipment manufacturers: 5</p> <p>Food processors: 814</p> <p>Vendors of millet porridge: 152</p>	<p>Significant for machinery producers and food processors</p> <p>More income and employment for women in processing</p> <p>Millet porridge vendor husband-and-wife team selling from a cart to low-income customers earned net incomes of Rs280 a day, or US\$4.27.</p> <p>Millet products sold to middle class consumers, run as a side-business by a farming family reported monthly sales of around Rs60,000 to 70,000, with margins of around Rs15,000 rupees, or US\$7.70 a day. Their turnover three years ago was around half this amount.</p>

procurement of miller by government		
<p>Cambodia homestead food</p> <p>Improved fish management to boost production</p> <p>Increased output of vegetables, fish — some of which is sold</p> <p>micro-credit support to women so they have a greater financial stake in EHFP leading to more successful farmers.</p>	<p>Fish nurseries and hatcheries</p> <p>Rural households with home gardens and fish ponds</p>	<p>Substantial for hatchery and nursery operators</p> <p>Small gains for home garden and pond operators. Over 2 months prior to survey, sales earnings rose from US\$0.99 to US\$10.15 for vegetable growers; from US\$2.47 to US\$22.71 for those with fish as well. [Annual equivalent increases of US\$55 and US\$122]</p> <p>Earnings very largely in the hands of women.</p>
<p>Nepal terrace farming</p> <p>Improved technology either boosts yields or saves labour</p> <p>Increased sales of seeds, inputs</p>	<p>Smallholders in hill villages with terraced land growing diverse crops:</p> <p>1,057 tested innovation, 782 adopted at least one; 924 farmers reached through farmer-to-farmer extension, 2,137 other farmers have learned of innovations.</p> <p>56k farm households have bought one or more of tools, equipment and seed kits promoted by project</p> <p>Retailers of seeds, tools</p>	<p>Several innovations generate more cash income from higher yields or use of previously unproductive land, such as terrace walls. Extra production used partly for home consumption, but some sales generating small amounts of <US\$50, valuable since often to women, off-season.</p> <p>Terrace wall crops: yams, US\$5 sack; chayote, US\$54 per plant; pumpkin US\$54 per plant</p> <p>Terrace edge crops: rice bean. US\$14 from 7kg harvest [Kaski], US\$19 from 10 kg harvested [Dhading] Cow peas, black gram give similar returns</p> <p>Intercropping: increases in economic returns: maize-cowpea 64%; millet-soybean 154%; mustard-pea 30%; wheat-pea, 30%; ginger-maize-soybean, 11%. Average ginger crop 56kg worth US\$29</p> <p>Poly tunnels with drip irrigation growing tomato and other high-value veg can generate gains net over costs of equipment of US\$ 200 over 6 seasons/3 years for a 50 square metre covered garden.</p>
<p>Tanzania legumes</p> <p>Improved cultivation of legumes leads to higher production, more sales</p> <p>Rural dealers in agricultural inputs trained in technology and business skills with potential for increased earnings</p>	<p>Smallholders: 600 k reached, mainly through radio; 129k farmers adopted at least one technical innovation</p> <p>Agricultural input dealers: 75</p>	<p>No income data</p> <p>Access to output markets for soy bean has been patchy, some smallholders were left with unsold produce. Pigeon pea prices collapsed after India, the main export destination, imposed an import ban in August 2017 [apparently rescinded in May 2018].</p>
<p>Côte d'Ivoire coconut disease</p> <p>Disease control will increase yields for participating farmers, should lead to increases in income.</p> <p>Training farmers for alternative income earning activities</p>	<p>Smallholders with coconut groves: 10 field schools, 6 women's groups (173 members), 9 plant clinics, 8 Women's Coconut Fairs)</p>	<p>No systematic evidence to demonstrate increases in income. Successful disease control will increase yields for participating farmers, which should lead to increases in income. Gains to disease control depend on what would otherwise have happened. Growers whose trees suffer severe attacks from coconut disease may then prevent large income losses.</p> <p>Alternative income-generating activities, especially for women, should also raise income</p>
<p>Colombia potatoes</p> <p>Farmer groups trained to become seed potato growers with commercial enterprise</p> <p>Campaigns to promote demand for new potato varieties</p>	<p>Smallholder groups growing seed potato, 133 growers</p> <p>Smallholder home gardeners, 500 households</p>	<p>4 of 5 seed grower groups (NER) have generated returns of 16% or more: just one was struggling to contain costs.</p> <p>Material benefits for those with home gardens mostly in the form of fruit and vegetables for domestic consumption, although 64% of ECAF participants reported increased incomes.</p> <p>One ECAF group has formed a credit union intended to raise incomes.</p>

Promotion of home gardens that allow some sales of veg, fruit		
CBPP vaccine & Novel vaccines Less disease, fewer losses of stock and production, increased output	Livestock keepers across much of Africa, potentially in other continents as well	Potential for large income effects to keepers: the death of livestock can be catastrophic for households on low incomes. Loss of output to surviving stock can be significant.

Sources: Reports on country visits to Cambodia, Colombia, Ethiopia, India, Nepal, and Tanzania. CIFSRF project documents, mainly technical reports.

3.2 Sustaining the gains

Income increases seen or likely should be sustained so long as the technical improvements that allow them are sustained, and economic conditions do not move against project participants.

Technical improvements depend to some extent on the continuing functioning of public and private services. For example, improved crop yields may rely on access to quality seed, on getting technical advice when novel pests and diseases attack crops. The concern here is that when projects end, and field visits from project staff end or become less frequent, some practices may be discontinued. Much thus depends on how well local technical services function, and how much capacity has been created and interest stimulated by CIFSRF.

It is difficult to assess this risk. One might imagine that technologies that rely on a diverse set of external inputs and information may be more vulnerable than those that largely use resources available in villages. Then again, the significance and value of innovations plays a role: people can be ingenious in maintaining innovations when they are highly valued. The availability of alternatives may also play a role: managing manure well may have value, but if manufactured fertiliser is readily available and not that expensive, then households with little labour and some funds may switch from the former to the latter. Indeed, this point is broader than techniques. When rural households have access to new sources of income, that often can dwarf that coming from their farms, those parts of the farm system that are arduous to maintain may simply be abandoned — as has

been seen in farming systems in marginal areas across the world.

The literature on technical change in agriculture tends to focus on adoption, rather than discontinuation of techniques.⁵ Agricultural history, however, provides some reassurance. Where innovations leading to higher productivity on farms have been introduced, they are more likely to be sustained than abandoned, even when the initial public investments to kick-start innovation have been reduced. Exceptions may be well publicised — for example, the abandonment of costly irrigation schemes owing to salinization, the retreat from arable farming in semi-arid margins of the USA and the old USSR; but the wider story is that of rising productivity across most agricultures in most parts of the world, sustained for at least half a century in the developing world, and much longer in some high-income countries. That is not compatible with widespread technical regression.

Regarding economic conditions, these may improve for small-scale primary producers in as much as they are likely increasingly to be linked in to rapidly expanding urban markets, increasingly made up of consumers with sufficient income to pay for higher-value foods. In some cases, such as the market for fish in Bolivia, much scope exists to replace imports if domestic supply chains work effectively and economically.

A threat, however, exists. That is that more capitalised producers in activities where economies of scale may apply — such as floriculture, some horticulture, pigs, chickens, possibly aquaculture — set up operations that can serve the markets currently largely supplied by smallholders. So far, this has not happened, but the

commonly cited in the mainstream agricultural development literature, either.

⁵ Studies of agricultural sustainability that look at change in systems over the medium to long run are not common— see for exceptions, the work of John Cary, Abe Goldman, Robert Netting, and Michael Thompson. Those that have been published are not

more successful projects are in creating better returns for producers, the more likely it is that larger operators will enter the market. As and when that happens, then smallholders are likely to come under pressure to use the best technologies, and probably invest more in their operations, if they are to compete. Some will do so, but many will probably not.

This may not matter that much, so long as the smallholders who drop out of certain lines of production live in growing economies where off-farm opportunities proliferate, allowing them increasingly to earn their incomes from off the farm. In more than one CIFSRF project that is already the case: where smallholder households already gain large amounts of income from off the farm; for example, in rural Cambodia, Colombia and Nepal.

In sum, the income gains seen are likely to be sustained, provided that — as is likely — the ratio of benefits to costs remains advantageous; and provided that small-scale producers and processors strive to improve their operations. The latter point is generic to agriculture and primary production the world over: costs of production in almost all branches of agriculture have fallen significantly for many decades now, as technical advances and more effective management of operations have been deployed. No intrinsic reason prevents smallholders from being part of this,⁶ but it does mean that smallholders need information, capital and technical advice so they can regularly improve their operations. Hence, in the longer run sustaining gains depends on developing supporting services for agriculture, both public private.

4. Conclusions and lessons

To recapitulate, the main points can be summarised as follows:

- All but three of the CIFSRF Phase 2 projects saw significant income gains to some, or all, of the project participants;
- In most projects (9), income gains resulted from sales of crops and fish that were possible owing to

increased production arising from innovations promoted by project teams. Typically, the increased production was of a crop or fish known to the participants, or something very similar, and was generally sold into existing markets. In some cases, input suppliers, traders and processors in the associated supply chains were trained or advised on business skills to improve their performance;

- Four projects achieved, or will achieve, income gains through reducing losses of crops and livestock to disease or to spoilage of fruit. These projects were necessarily closely focused on the specific technical challenges of disease and spoilage;
- Two projects promoted processing of novel food products using produce from smallholders, generating income for small-scale manufacturers;
- For many of the participants, and especially those farmers and fishers who increased output, the income gains were quite modest, often of less than US\$100 a year;
- Those who were producing high-value crops or fish, however, realised considerably larger cash gains, as did some of the food processors. The value of avoided losses was high for farmers and packers using nanotech to reduce spoilage: similar gains are likely for those facing coconut disease and losses of livestock; and,
- Most gains are likely to be sustained, although that will depend for some participants on the ability to continue to access quality inputs, obtain technical advice, and thereby continue to improve their performance.

What lessons and reflections that can be drawn from this?

Most income-generating activities were relevant and effective

Most activities that were likely to generate income did so: measures taken were effective. They worked

⁶ Indeed, across much of East and Southeast Asia, very large increases in agricultural output, well ahead of population growth, have been achieved since the late 1960s in regions where the vast bulk of the farm land is operated in smallholdings. Rapid agricultural development began with major public investments and promotion of the

green revolution seeds in the late 1960s, accelerating agricultural growth. The pace of growth, however, has subsequently been sustained over 50 or more years. (Wiggins 2018)

because they were relevant and accessible to many of those low-income households targeted.

In the nine projects that raised production, the technical innovations involved incremental changes to the production of known crops and fish, which could be readily sold into existing markets: they usually did not require major changes to the farming system, or large capital injections — labour was usually the main factor demanded. They very largely drew on the existing resources of participating households, above all their skills and experience as farmers.

The two food processing projects worked with existing small-scale processors, making incremental and accessible technical improvements.

Similarly, the four projects focused on avoiding losses used techniques that were accessible to small-scale farmers and herders.

They worked also because the field teams provided appropriate and effective support, made every effort to accompany the participants, and were prepared to revise ideas when they encountered obstacles.

They worked because the partnerships between Canadian researchers and local counterparts functioned well. Most collaborations were marked by mutual learning, and by pragmatic application of innovations to circumstances seen in the field. Local capacity that has been built through the projects should help sustain activity.

Because many activities were dealing in already known crops and fish, most did not encounter significant challenges in policy and regulation. Those activities that were most novel, above all those concerned with avoiding losses, were using significantly novel innovations that required approval. In some projects, policy influence had been used to particularly good effect: in Bolivia, the project had worked with government to change the legal framework for collective management of river fisheries; in Colombia, East Africa and India novel products of potatoes, yogurt with pro-biotics, and millet snacks, respectively, had been extensively promoted; and in India government had been lobbied to include small millets in government procurement programmes.

Few activities failed: in Tanzania soybean producers found difficulties in selling additional output, in southern Colombia one group of seed potato growers were finding it hard to keep their costs down. Compared to

the number of activities carried out in the fifteen projects that generated income, these were exceptions.

Were income gains too small?

Although most participants saw only modest gains in cash incomes, they were often valuable because they were earned in off seasons when cash was short, and accrued to women producers who are more likely to spend cash on food, health and hygiene for the household than men.

Large income increases are not always necessary to achieve food security. Buying additional food such as vegetables, fruit, eggs, etc. to complement home grown food usually costs less than US\$20 a month.

Moreover, few of the CIFSRF projects depended on cash incomes to improve food security: most focused on helping participants increase their production of nutritious foods.

Not all gains from business are monetary

Some of the producers selling items such as fish, vegetables, or millet-based snacks met during fieldwork reported gains other than cash earnings. For example, they spoke about their satisfaction in selling healthier items to their neighbours and fellow villagers, in raising horticulture or livestock through more environmentally sustainable means, their pride in improved capacity and knowledge in terms of food preparation or running small businesses, and their improved standing in households or communities.

The women shopkeepers who excelled in promoting and selling vitamin A fortified oil in Tanzania, for instance, were motivated to be champions of fortified oil not only to improve their own profits, but also to help improve the health of their customers' families.

Could more have been done to raise incomes?

In the nine projects focused on raising production from farms and ponds, increased earnings mostly came from technically straightforward improvements to production for known, or similar-to-known, activities. Within the context of projects designed to improve food security largely through direct means of encouraging production of nutritious food for household consumption, what was done seems reasonable.

Of course, one might argue that had the projects set out to raise incomes first and foremost, and focused on measures to raise household incomes by thousands of dollars, then prospects for food security would have

been transformed. But that is to argue that CIFSRF should have been something very different.

Would the projects have achieved more by paying more attention to complementary measures to boost earnings, such as enterprise management and marketing, or by lobbying for policy that might have raised such earnings? Not that IDRC necessarily could have ensured this: CIFSRF projects came from calls that purposely were quite open to the suggestions of applicants.

More can always be done in any development programme: the relevant question, however, concerns the ratio of returns to costs at the margin. CIFSRF projects did pay attention to management and marketing in the cases where it mattered — new enterprises, novel products. In other cases, the project teams were making commendable efforts to improve physical production: asking them to try and further improve enterprise management and the like of participants would not clearly have raised returns by more than the costs of the additional effort.

The mixed experience of integrated rural development programmes in the 1970s that tried to implement many activities concerning production, health, education, infrastructure, etc., simultaneously suggests these efforts were over-ambitious, demanding too much of project management and the capacity of local people. (Ellis & Biggs 2001, Ruttan 1984)

Sustainability and context

The discussion above on sustainability is necessarily speculative, given the intrinsic uncertainty of the future. What will be sustained depends on how rural economic and social systems evolve, and the importance of changes engendered by CIFSRF in those future systems.

It was clear in several countries visited that rural livelihoods have changed considerably over the past ten to twenty years. In rural Nepal, the incomes remitted by migrants on construction sites across the Gulf and Asia have brought in resources unimaginable from local farming, however productive. Cambodian villages have

significant numbers of households that depend on migration and commuting for incomes from services and manufacturing. Within the peri-urban pull of Pasto, Colombia, rural youth prefer to commute to urban building sites, rather than work on the farm, since they earn more.

In such cases, farm household food security is increasingly underwritten by non-farm earnings that are much higher than what might be obtained from the farm. Indeed, it may only be a matter of time before some such households give up on their farms, renting the land out to neighbours while they concentrate on more lucrative activities. For these households, training in how better to grow vegetables on home gardens may be a marginal gain to their livelihoods.

We should not, however, worry too much about this.⁷ Not all village households have access to the new sources of income: many depend on their farms and may well continue to do so for some time. For them, CIFSRF innovations can be far from marginal. In the broader context, actions that expand the range of abilities of rural households are welcome. Sustainability is not about being able to continue to do the same things: ultimately, it is about human capacity to make the most of whatever opportunities present themselves — or conversely, to adapt to whatever threats have materialised. Sustainable systems are characterised by diversity and the ability to change with circumstances. Those CIFSRF activities that boost cash incomes contribute to the adaptive capacity and hence sustainability of ecosystems, communities and households.

⁷ Most governments, and many observers, are dismayed by migration out of rural areas and households giving up farming. They seemingly see this as an indication of failure to develop rural areas and agriculture. In some cases, it may be — some migration out of rural areas comes from distress; but more often it is the result of development success. All high-income countries are urbanised, with

most economic activity in industry and services. In most developing countries, even the most productive agriculture could never provide incomes on a par with urban incomes for all households currently farming. At some point, some people will move out of agriculture, and some will move to towns, in search of better livelihoods.

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Most of the information for this report comes from reading of project documentation, above all Project Approval Documents, recent Technical Reports and publications from the 18 research studies funded under CIFSRSF Phase 2.

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Appendix A List of CISRF Phase 2 research projects

Full title of research	Shortened version used in this paper
Amazon fish for food (Bolivia)	Bolivia Amazon fish
Scale up of Homestead Food Production for improved household food security and nutrition in Cambodia	Cambodia homestead food
Development of a subunit vaccine for contagious bovine pleuropneumonia in Africa	CBPP vaccine
Scaling up the production of more nutritious yellow potatoes in Colombia	Colombia potatoes
Fighting lethal yellowing disease for coconut farmers (in Cote d'Ivoire)	Côte d'Ivoire coconut disease
Fermented food for life (Kenya, Tanzania, Uganda)	East Africa yoghurt
Scaling-up pulse innovations for food and nutrition security in southern Ethiopia	Ethiopia pulses
Achieving impact at scale through ICT-enabled extension services in Ghana.	Ghana ICT extension
Scaling up the production and distribution of Double Fortified Salt in India	India salt
Scaling up small millet post-harvest and nutritious food products (in India).	India small millets
Farm Shop — Scaling Access to Agricultural Inputs in Kenya	Kenya farm shop
Enhanced preservation of fruits using nanotechnology	Nanotech for fruits
Nepal terrace farmers and sustainable agriculture kits	Nepal terrace farming
Novel livestock vaccines for viral diseases in Africa towards improved food security	Novel livestock vaccines
Promoting locally fortified sunflower oil using e-vouchers (in Tanzania)	Tanzania fortified oil
Scaling up improved legume technologies in Tanzania	Tanzania legumes
Scaling up small-scale food processing for therapeutic and complementary foods for children in Vietnam,	Vietnam therapeutic foods
Scaling up fertilizer micro-dosing and indigenous vegetables production and utilisation in West Africa (Nigeria and Benin)	West Africa vegetables