

Country Report

Scaling up home gardens for food & nutrition security in Cambodia (IDRC project #107982)

Cambodia home gardens

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June 2018



Signpost to a fish hatchery set up and supported by FF4F, Village model farmer and daughter, home garden produce for sale; Sept/Oct 2017

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Contents

List of tables and figures	2
Acknowledgements & disclaimer	2
Acronyms and abbreviations.....	3
Executive Summary	4
Overview.....	7
1. Introduction.....	9
1.1. Purpose and aims.....	9
1.2 The Project	9
1.2.1. Context and brief history	10
1.3 Methods	12
1.4 Rest of report	13
2. Review of project	13
2.1 Project logic.....	13
2.2 Testing the theories of change	17
2.2.1 Hatcheries and fish nurseries	17
2.2.2 Home gardeners and VMFs	17
2.2.3 Low-income consumers.....	24
3. Assessment	25
3.1 Sustainability and scaling up.....	25
3.1.1 Sustainability a question mark	25
3.1.2 Scale up and spill-over: some uncertainty but strong potential	27
3.2 Specific outcomes	28
3.2.1 Food & Nutrition Security	28
3.2.2 Income	28
3.2.3 Sustainable agriculture	28
3.2.4 Gender.....	28
3.3 Research partnership and policy influence	29
3.3.1 Research partnership	29
3.3.2 Policy influence	29
References	30
Annex: More detail on context, & emerging results.....	32

List of tables and figures

Table 1. General and specific objectives of Family Farms for the Future.....	10
Table 2: Theory of change for fish hatcheries.....	14
Table 3: Theory of change for Home Gardeners (HG) and Village Model Farmers (VMF).....	15
Table 4: Theory of change for low-income consumers	16
Figure 1. Big improvements in home garden horticultural production.....	18
Figure 2. Household and home garden income, before and after phase one, Fish on Farms.....	22
Box 1. In parallel – off-farm work major and growing ..	22
Table 5. Income in the hands of women	24
Figure 3. Home gardeners from phase 1: baseline, to endline, to two years post-endline	25
Box 2. Farmer testimonies about crop preferences	27
Box 3: Filling evidence gaps.....	30
Box A1. Stunting, breastfeeding, diarrhoea, anaemia, and vitamin-A rich food consumption among rural and poor groups, Cambodia: 2000 – 2014	32
Figure A1. Energy supply and share from starchy foods – Cambodia, Thailand, Vietnam, since 2000	33
Figure A2. Depth and prevalence of food insecurity in FF4F areas	33
Map of Cambodia's provinces	33
Figure A3. Snapshots from the fieldwork	34
Table A1. Focus groups and Key Informant interviews held in September and October 2017.....	37
Box A2. In parallel – availability growing through time	38
Box A3. In parallel – big improvements in rural water and sanitation.....	38
Box A4. In parallel – mixed picture for women and girls	38
Figure A4.1 Average time spent on work activities in 24 hours, men and women, Cambodia 2012	39

Acknowledgements & disclaimer

Many thanks to the Helen Keller International (HKI) team in Cambodia for facilitating this review – especially Zaman Talukder, Hou Kroeun, Mey Veata, Sao Sovan Vannak, Lek Sophat, Ly Sokhoing and Keith Porter.

Thanks to other project staff who gave their time to be interviewed, including NGO staff at PVT (Prom Vihear

Thor Organization); ODOV (Organisation to Develop Our Villages) and VSG (Village Support Group).

Particular thanks to those farmers, hatchery owners and villagers who participated in interviews and focus groups and so patiently shared their experiences with us.

We were supported with invaluable research and fieldwork assistance by the CDRI team – Pon Dorina, Sarom Molideth, Koeut Thydalak, Simen Sunday.

Thanks to IDRC for funding the work, and to all the IDRC staff who helped us with their time and expertise.

We are also grateful to ODI staff for comments and suggestions, as well as project management and communications assistance.

The interpretations and opinions expressed in the report are, however, not necessarily those of the above mentioned, nor of the ODI or of CDRI. The authors are solely responsible for any errors and omissions.

Acronyms and abbreviations

AMK	A Cambodian microfinance institution
CDRI	Cambodia Development Resource Institute
CIFSRF	Canadian International Food Security Research Fund
COM-B	Capacity, Opportunity, Motivation – Behaviour change
DHS	Demographic and Health Survey
EHFP	Enhanced Household Food Production
FAOSTAT	Statistical service of the Food and Agriculture Organisation
FF4F	Family Farms for the Future
FIA	Fisheries Administration (Cambodia)
FIA	Fisheries Administration
HARVEST	Helping address rural vulnerabilities and ecosystem stability
HFP	Household Food Producer
HG	Home Gardeners
HKI	Helen Keller International
IDRC	International Development Research Centre
IPM	Insect Pest Management
JICA	Japan International Cooperation Agency
JICA	Japan International Cooperation Agency

MAFF	Ministry of Agriculture Forestry and Fisheries
NGO	Non-Governmental Organisation
ODI	Overseas Development Institute
ODOV	Organisation to Develop Our Villages
PAD	Project Approval Document
PI	Principal Investigator
PPP	Purchasing Power Parity
PR	Public Relations
PVT	Prom Vihear Thor ('Be generous')
SIS	Small Indigenous Species (of fish)
SRI	System of Rice Intensification
SUN	Scaling Up Nutrition
ToC	Theory of Change
ToT	Training of Trainers
UBC	University of British Columbia
UNICEF	United Nations Children's Fund
US\$	United States Dollars
USAID	United States Agency for International Development
VC	Village Chiefs
VHV	Village Health Volunteers
VMF	Village Model Farmers
VSG	Village Support Group
WASH	Water sanitation and hygiene

Executive Summary

This report reviews a project funded under the Canadian International Food Security Research Fund (CIFSRF) Phase 2, a jointly funded program of the International Development Research Centre (IDRC) and Global Affairs Canada. *Scale up of Homestead Food Production for improved nutrition in Cambodia*, also known as Family Farms for the Future (FF4F), is led by Helen Keller International (HKI) in Cambodia, in partnership with the University of British Columbia (UBC), Canada. This study aims to capture FF4F's contribution – and potential contribution – to food security.

FF4F aims to help three main groups:

- 1) Large-scale **producers of fish fingerlings** (fish hatcheries and nursing ponds), to boost availability of fish at a commune and district level
- 2) **Home gardeners** and **village model farmers**, to grow and raise more micronutrient-rich produce, as well as to improve WASH (water, sanitation, hygiene), and child feeding
- 3) **Consumers** in intervention areas, to access diverse micronutrient rich food, and improve WASH and child feeding

Many development, as well as food and nutrition security indicators have been steadily improving in Cambodia in recent decades, including under-five stunting, duration of exclusive breastfeeding, and incidence of diarrhoea.

The main issue tackled by FF4F is *dietary diversity*. Traditionally, food security in Cambodia has been equated with rice production and consumption. Diversity, however, remains a problem, with micronutrient and protein-rich food consumption being too low, especially among under-twos.

HKI has a history of developing home garden projects, most famously in Bangladesh, though they currently operate in 20 developing countries globally, 8 in Asia, 12 in Africa. Since the 1990s, HKI has tailored an approach to home gardens known as 'Enhanced Homestead Food Production', incorporating an integrated package of agriculture, nutrition, WASH, links to health care,

women's empowerment, income generation and advocacy.

This case study is built on two weeks of fieldwork by ODI staff and partners at the Cambodia Development Resource Institute (CDRI), based in Phnom Penh; facilitated by HKI and their implementing partners in Cambodia. Fieldwork has been supplemented by existing reports, as well as interviews with project staff.

Kampot, Prey Veng, and Kampong Cham provinces were visited in the field, where key stakeholders interviewed included village model farmers (VMFs), target farmers, village health volunteers (VHVs), village chiefs, hatchery owners, a nursing pond owner, farmers in target villages not enrolled in the project, farmers in non-target villages, staff of HKI, staff of partner NGOs, and staff of the government Fisheries Administration (FIA).

The most significant limitation of the study is its timing, given it has been prepared while project activities are ongoing.

Review

Through support of the FF4F project, in close collaboration with FIA, successful **fish hatcheries and nursing ponds** have been developed, some from scratch. These can produce and sell large numbers of fingerlings. Owners of these still growing businesses have seen strong improvements in incomes.

Home gardeners and **Village Model Farmers** have benefited from technical assistance – learning how to grow or raise new varieties using ecological practices year-round, as well as benefiting from physical inputs and training in WASH and child feeding. More farmers are producing more varieties of vegetables over more seasons. More are raising fish at home in ponds. These changes have improved people's availability and access to wholesome micronutrient-rich foods and boosted dietary diversity. They have also yielded income improvements, though these have been marginal in most cases. Changes in sanitary practices and child feeding are similarly yielding improvements, such as increased durations of breast-feeding, or improved food hygiene. While it is difficult to quantify health impacts, improvements seen have strong potential to enhance health. Some of those interviewed felt that incidence of

diarrhoea in children had reduced since the advent of the project. This may owe in part to other factors, but the project likely contributed.

Consumers, notably those in treatment villages who were not enrolled as direct project beneficiaries, have also benefited. They have better access to affordable and more regularly available micronutrient-rich food, particularly vegetables and fish. They have also learnt about improved WASH and child feeding practices through the work of the project – e.g. via information from village health volunteers.

The question of sustainability hangs over home garden programmes, and although this study's timing makes sustainability difficult to assess, early findings are promising. Only a small fraction of home gardeners have dropped out. The majority of farmers, carefully selected to maximise buy-in and sustainability, planned to continue beyond the period of intervention: they have the knowledge, and are keen to produce with few chemicals.

A follow-up study by HKI two years after the end of this project's first phase found that most participants sustained their home gardening activities. With improvements to the project in the second phase, sustainability should improve. It is most uncertain for perennial home gardens. Hatcheries and VMFs are likely to continue. VMFs can earn more than HGs, given they have more capacity. They also receive more agricultural training.

Is the time allocated to the project too short to ensure practices are bedded in and HGs will continue? Some of the implementing partners felt so, with one actively seeking another donor to enable them to continue the project in Kampot for a few more years.

In conceptualising FF4F, it was assumed home gardening practices would be adopted by non-target households, aiming for four additional households per target household. While VMFs universally said they were happy to share techniques with anyone, it was not clear many non-target villagers were approaching them. This may reflect a limitation of the field sample; or it may be that spill-over of techniques is less common than hoped. On the other hand, spill-over in terms of non-target households accessing produce has been substantial.

Moreover, potential for scale-up is vast. HKI's close collaboration with FIA will hopefully allow the aquaculture methods developed to be spread more widely across Cambodia, via FIA initiatives: 'One hatchery per commune' and 'One pond, one family'.

Partner NGOs have been influenced in their wider work by HKI's methods. One of these, VSG, has already taken on board elements of the HKI enhanced homestead food production, implementing it through a programme funded by WorldFish. Finally, significant potential for HKI to learn from the experiences of FF4F and to integrate ponds into their home gardens programmes in Asia and Africa exists to be capitalised on.

Overall, **food and nutrition security** of the target population has been materially improved through the activities and consequences of this project. HKI has been able to refine its approach to home gardening further, through this productive partnership with UBC.

A further notable element of CIFSRF – its attention to monitoring, reporting and generating robust evidence adds value. While to some the worth of home gardens is self-evident, others need more convincing; and FF4F is on track to generate evidence about home gardens of a kind that is relatively rare.

In sum, FF4F is delivering. There is also convincing potential for a lasting and widespread legacy beyond the life of the project. The innovations generated by this project are relatively low-tech compared to some others in CIFSRF's portfolio: a mixture of harder approaches (such as mixed fish species pond dynamics or developing home-made fish foods), and softer ones (like tailoring gender and marketing training to the Cambodian context). Nonetheless, even in the context of a highly dynamic rural environment, where farm incomes decline in importance while rural out-migration forms a major source of rural incomes, the relevance of a home garden project like FF4F is clear. Households in target villages continue to practice agriculture, largely for subsistence means, even as they become wealthier and nutrition indicators improve. The project's baseline survey showed much remains to be done on behaviour change around water, sanitation, hygiene, child feeding and care. While processed snack foods are becoming more prevalent and affordable, micronutrient dense

food remains insufficient. Though there are laudable government vitamin drives, supplements are not enough. It is hard, almost anywhere in the world, to argue with a project that increases availability of and people's access to good quality horticulture and fish

products, while also tackling food security from a health, child-feeding, and hygiene angle.

Overview

	Fish Hatcheries	Home Gardeners & Model Farmers	Consumers on low incomes
Project activities, deliverables and results			
Theory of change	Establishment of hatcheries boosts fish production & consumption	Extension of agricultural, water and sanitation, and hygiene, child feeding practices, gender and marketing training to poor farmers enhances their food security	Consumers more widely benefit from better access to micronutrient-rich food
Activity	Hatcheries established in partnership with Fisheries Administration	With their NGO partners, programme has been unrolled	Village health volunteers have promoted messages. Other forms of outreach (e.g. radio, TV) not assessed
Changes to capacity, behaviour	Hatcheries are running as successful businesses, expanding	More farmers are raising fish. Farmers are growing more varieties of vegetable over more of the year. Agricultural techniques are put to use. Capacity around WATSAN, hygiene, child feeding, gender and marketing has improved and is altering behaviours.	Non-participating households in target villages are able to access fish and vegetables more readily
Results	Hatchery owners report strong and increasing earnings. This becomes the main business of the household.	Farmers report increased consumption of vegetables and fish. Increased output and (marginal) earnings from vegetable and fish sales. Improved outcomes for children from changes to feeding practices and sanitation	More diverse diets rich in micronutrients are adopted
Impact	Fish are sold not only to participating households, but more widely across the district.	Farmers families are seen to be healthier (e.g. mentions of less diarrhoea in children)	Positive impacts on health
Sustainability and scaling up			
Sustainability	High	From available evidence, practices appear to be maintained by most, particularly among those who previously grew vegetables. Some question mark over seed availability	Should be as sustainable as the hatchery, VMF, and HG elements
Scaling up	Hatcheries are growing business. Further scaling through gov't scheme to increase hatcheries nationally is possible	Spill-over of techniques to non-participating farmers may be lower than envisaged. Strong potential to expand within Cambodia and internationally where HKI operates, contingent on funding	Largely dependent on success scaling up hatchery, VMF, and HG elements
Specific outcomes			
FSN	Boost to dietary diversity and improved micronutrient intake. Improved child feeding practices and improved WATSAN and hygiene practices likely yield nutritional benefits.		
Income	For hatcheries and those raising large numbers of fish, improvements to income can be substantial. Marginal though welcome improvements to incomes for the majority of participating farmers.		
Sustainable agriculture	Practices promoted require low chemical inputs of fertiliser and pesticide.		

Gender	Gender training likely to have a strong contributory effect. Inclusion of women in project activities noted as particularly welcome.
Contribution of CIFSRF project	
Capacity building	Active collaboration between UBC and HKI, generating research that would not have been possible without the partnership
Research contribution to policy or wider results	Much interaction has taken place with the Ministry of Agriculture, particularly with the Fisheries Administration. HKI influence on government food and nutrition security strategies is notable.

Colour coding:

Unsatisfactory: very little achieved	Some gains, but achieved less than expected	Some progress: about half of what was expected	Largely successful: most objectives achieved	Highly successful: all objectives achieved, in some cases by more than expectations
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White: not assessed

1. Introduction

1.1. Purpose and aims

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. 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.

CIFSRF set the parameters of the Phase 2 research projects by requesting certain similar elements, such as a need to have: a team of diverse partners (including at least one private sector or business partner, at least one Canadian partner and at least one developing country partner) in order to scale-up pilot-tested agricultural innovations; a scaling up plan; a business model with a proof of concept and value proposition; a gender strategy; rigorous research plan and methodology to test the scaling up; policy uptake plan; as well as a comprehensive exit strategy. All projects needed to address the 3 cross-cutting themes of the program: gender equality, environmental sustainability, and good governance. While the projects were autonomous, the strategic calls allowed for a level of consistency across the projects

While 18 projects were funded as independent projects in CIFSRF Phase 2 through competitive calls, the projects received significant group training and capacity building from IDRC over their duration, including specific workshops and mentoring on: scaling up, research methodology, gender integration, communications, and monitoring and evaluation. The overall quality of the various project strategies (e.g. scaling strategy, gender strategy, etc.) was not

consistent across projects, reflecting the variable capabilities in each project team. IDRC Program Officers provided specific support on the development and implementation of these strategies, through workshops and direct technical advice. The group workshops facilitated by IDRC also allowed opportunities for cross-project collaboration and the sharing of lessons.

This report concisely reviews one of the CIFSRF phase 2 projects. *Scale up of Homestead Food Production for improved nutrition in Cambodia*, also known as Family Farms for the Future (FF4F), is a joint endeavour led by Helen Keller International (HKI) in Cambodia, in partnership with the University of British Columbia (UBC), Canada. This study aims to capture FF4F's contribution – and potential contribution – to food security, with particular reference to:

- sustainable **food production**
- people's **incomes** and ability to afford food
- people's **nutrition**

as well as two elements central to the CIFSRF endeavour:

- **sustainability** of current and further **scale up** – potential to capitalise on legacy of the project; for benefits to continue, expand, and multiply; and
- **gender** – especially any impacts on women's status and empowerment.

Part of a wider portfolio review of CIFSRF Phase 2 projects, this is one of six case studies purposively sampled for its likelihood of showing early impacts. This analysis forms one strand of a wider study of the contribution of CIFSRF's Phase 2 portfolio to food security. Five sister case studies are being prepared concurrently, looking at CIFSRF projects in Colombia, Ethiopia, India, Nepal, and Tanzania.

1.2 The Project

FF4F was approved in March, 2015; a 3-year-long food security research and development project built around scaling up home gardens. This report has been prepared around six months shy of its completion (scheduled to run until May, 2018). At the project's core are home gardens which, where possible, integrate horticulture with aquaculture and poultry production. They use a hub

and spoke model, with satellites: that is, the hub of each village is a Village Model Farmer (VMF), selected for having more land (around 100m²) and capacity than the average farm family, with the ability to maintain a demonstration vegetable farm, fish pond, and chicken coop. Associated with each VMF are some 20 to 25 target farmers – who may raise vegetables and/or fish and/or poultry (on around 80m² of land) depending on their assets, capabilities, and desires. To provide these stakeholders with a reliable source of fish fingerlings, the satellites – that is fish hatcheries and fish nursing ponds – are also established and supported by the project. This project's approach to food security is wider than food production, incorporating aspects of nutrition, water/sanitation/hygiene, linkages to health care,

women's empowerment, income generation, and advocacy.

The FF4F project, with a budget of 4.4M Canadian dollars, aims to benefit some 135 thousand people directly or indirectly, while creating a sustainable legacy. General and specific project objectives defined by the project implementers are set out in Table 1.

FF4F is a follow-on to a 30-month CIFSRF phase one project, approved February 2012, which focused largely on a) developing the mixed fish species pond technology; b) integrating it into the enhanced homestead food production model of HKI Cambodia and c) testing aspects of its roll-out and impacts in Prey Veng Province, Cambodia.

Table 1. General and specific objectives of Family Farms for the Future

Objective		Description
The general project objective		To improve household food security and nutrition outcomes, livelihoods and women's empowerment in Cambodia through innovative models of Homestead Food Production
Specific objective	1	To refine promising technologies, methodologies and practices for Homestead Food Production (i.e. the combination of vegetable gardens and/or fish and/or poultry production) and adapt them for different geographic regions, contexts and scale.
	2	To develop and evaluate approaches for social impact investment models and training by women and men farmers to expand the reach of Homestead Food Production.
	3	To scale-up optimal models of Homestead Food Production with local and national governments in Cambodia, local and international Non-Government Organisations, private enterprises, and research and academic institutions.
	4	To use the evidence base to inform Cambodia's National Strategy for Food Security and National Agriculture Policy and contribute to nutrition strategies and policies supported by national and international stakeholders.

Source: IDRC, 2015

1.2.1. Context and brief history

Many food and nutrition, as well as general development indicators have been steadily improving in Cambodia over the last few decades. Real GDP per capita grew 150% from 2000 to 2016, going from US\$1,376 to US\$3,463 constant 2011 international US\$, PPP (FAOSTAT database). Good progress is also being made on nutrition indicators like stunting of under-fives and exclusive breastfeeding of children under 6 months old, even among rural people and those in the poorest quintile. Annex Box A1 shows largely positive trends in indicators closely linked to food and nutrition for rural people and those in the poorest wealth quintile, with

strong improvements from the early 2000s in under-five stunting, duration of exclusive breastfeeding, and incidence of diarrhoea in children particularly notable.

The **main food security issue tackled by this project** is *dietary diversity*. Traditionally, food security in Cambodia, particularly from the government's perspective, has tended to equate with rice production and consumption. Nationally however, diversity remains a problem. While average dietary energy supply has improved from the turn of the new millennium (growing from 98% to 112% adequacy from 1999-00 to 2013-15 – blue columns in Annex Figure A1, panel a) share of energy from cereals and starchy foods (panel b),

remains persistently high — above 70% in 2011–13; much higher than neighbouring Thailand or Vietnam.

On top of this low dietary diversity at a national level, when vulnerable groups are considered (e.g. pregnant women, poorer people, or under-fives), issues of quality and amount can be added. While availability is not considered a significant problem in many rural areas, access is. Protein-rich food consumption is generally too low, especially in under-twos³, as is access to micronutrient-rich food, especially animal-source products.

Nationally in recent years Cambodia has seen progress in scaling-up some nutrition interventions, namely Vitamin A and iron supplementation. A government plan to introduce universal multi-micronutrient powders for children which was under consideration when the Project Approval Document for this project went through in 2015 was subsequently shelved as too expensive (at around US\$7M a year). This lack of readily accessible multi-micronutrient supplementation makes food sources of micronutrients even more important.

FF4F works in three provinces of Cambodia and one district of Phnom Penh, which have varying degrees of food insecurity (Annex Figure A2).

Long before CIFSRI, HKI had a history of working and developing home garden projects, perhaps most famously in Bangladesh, though the NGO currently operates in the US and 20 other countries globally, 8 in Asia, 12 in Africa⁴. In 19 of these 20 countries (except China) they work on nutrition.

Since the 1990s, HKI has tailored an approach to home gardens known as 'Enhanced Homestead Food Production' – beyond gardening, this incorporates an integrated package of agriculture, nutrition, water/sanitation/hygiene, linkages to health care, women's empowerment, income generation and advocacy.

Recent evaluations of home gardens in Nepal and Bangladesh reported in Haselow et al., (2016) have shown demonstrable impacts on nutrition indicators. HKI estimates that since 1990 their enhanced home gardening programmes, have reached more than 1.2 million families in Africa and Asia⁵. In Cambodia, HKI began its first home-gardening project in 1998 among 300 poor households. Since then they have helped an estimated 150,000 households across 14 provinces (HKI, 2016).

A systematic review in 2011 of agricultural interventions aiming to improve children's nutritional status concluded the evidence base for assessing their impact was poor; not that the interventions didn't work; rather the lack of rigour in methods and insufficient sample sizes made for insufficient evidence (Masset et al., 2011). Another systematic review in 2012 on effects of household food production on health and nutrition of women and young children (Girard et al., 2012) contended:

"Overall the evidence base for the potential of agricultural strategies to improve the nutrition and health of women and young children is largely grounded in a limited number of highly heterogeneous, quasi-experimental studies, most of which have significant methodological limitations. While household food production strategies hold promise for improving the nutrition of women and children, the evidence base would be strengthened by additional research that is methodologically robust and adequately powered for biological and dietary indicators of nutrition."

More recently, some have argued that it may be too much to expect to see impacts on nutrition indicators like stunting from agriculture-nutrition projects such as home gardens: programme activities may not necessarily be designed to achieve it, or impact surveys may be too small to detect meaningful improvements, even where they exist. Moreover, most evaluations limit

³ HKI, in line with the Government of Cambodia has shifted their focus from under-fives to under-twos, following the 1000 days initiatives of the Scaling Up Nutrition (SUN) movement <http://scalingupnutrition.org/>

⁴ In Africa: Burkina Faso, Cameroon, Cote d'Ivoire, Guinea, Kenya, Mali, Mozambique, Niger, Nigeria, Senegal, Sierra Leone, and

Tanzania. In Asia: Bangladesh, Cambodia, China, Indonesia, Myanmar, Nepal, Philippines, and Vietnam.

⁵ <http://www.hki.org/our-work/improving-nutrition/helping-families-grow-better-food>

themselves to the farm families involved, while impacts may be much broader affecting consumers in local markets. This can result in the false perception that agriculture projects are not effective means of influencing nutrition (Herforth and Ballard, 2016). More appropriate outcomes to expect from agriculture-nutrition projects, they argue, are more proximal – improved food access and dietary consumption (ibid).

Given the literature all tends to agree on a need for more high-quality evidence, the focus of CIFSRF on monitoring and generating evidence around this project is particularly welcome. For example, in the first phase, a randomized control trial was used to evaluate the impact of home gardens on production, income, and anaemia. A sophisticated dietary recall study is underway as part of the second phase.

1.3 Methods

This case study is largely informed by two weeks of fieldwork by London-based ODI staff and independent partners at the Cambodia Development Resource Institute (CDRI), based in Phnom Penh; facilitated by HKI and their implementing partners in Cambodia (see some snapshots from the field in Annex Figure A3). Fieldwork was supplemented by existing studies, reviews, and reports linked to the project, including those generated by the project, that are currently available, as well as interviews with HKI, University of British Columbia (UBC), and IDRC staff.

A comprehensive range of key stakeholders were consulted in the field, with three provinces visited: Kampot, Prey Veng, and Kampong Cham⁶. Key stakeholders interviewed included village model farmers (VMFs), target farmers, village health volunteers (VHVs), village chiefs, hatchery owners, a nursing pond owner, farmers in target villages not enrolled in the programme, farmers in non-target villages, staff of HKI, staff of partner NGOs, and staff of the Fisheries Administration (FIA), Ministry of Agriculture, Forestry, and Fisheries (MAFF). A full list of stakeholders interviewed are available in Annex Table A1.

Questions posed to these stakeholders were developed around their participation in project activities, changes to their capacity, their opportunities, and their motivation, leading to changes in their behaviour and subsequent results or implications for food-security, following Theory of Change (ToC) methodology.

Some limitations arose from practical methodological constraints and timing. Firstly, given the resources available, it was not possible to design and undertake an unbiased, fully representative study. Instead, the ODI/CDRI team attempted to sample a range of project experiences, relying on steers from the implementing organisations to collect information on time and in budget.

Secondly, it relies on impressions and recall from the recent as well as more distant past, where questions about changes through time were posed (for instance, changes in agricultural practice over the last few years, or changes in children's health over several more years). For some participants recall may be more accurate than for others.

Finally, although most of the intended activities have been rolled out, implementation was ongoing at the time of the study, making it difficult to test some results. For instance, the likelihood of people's behaviours continuing beyond the end of the project for sustainability was difficult to gauge. The existence of previous home gardens from the first phase, however, provided a good opportunity to test for some aspects of sustainability three years on; a feature on which this study has been able to capitalise.

Furthermore, the timing of the study means some key research being undertaken by the project was still underway, such that even preliminary results were not available. For instance, a no doubt highly interesting set of data on diets has been collected by the project to test for changes through time; however, the data was not yet processed and could not feed into this review.

⁶ The project also operates in Khan Meanchey district of Phnom Penh.

While methodological and practical limitations influence interpretation of the findings, several points were reiterated among key informants or groups interviewed, giving them significance. Some of the more anecdotal findings also paint intriguing pictures.

1.4 Rest of report

A review of the project follows, with a series of nested theories of change (ToC) for its main actors being used to test the project’s process and achievements. The final section is an assessment, with reference to sustainability, scaling up, CIFSRF’s contribution, gender, and other reflections.

2. Review of project

2.1 Project logic

How was the FF4F project designed to address the food security problems diagnosed? Nested Theories of Change, constructed for the main beneficiaries of the project, structured around a COM-B narrative – whereby

interventions of the project influence beneficiaries’ capacities, opportunities, and motivation (COM), leading to behaviour change (B) — can be used to illustrate the project logic. Parallel to these processes, theories of change also record flanking narratives.

Table 2 sets out the ToC for hatcheries in this project, while Table 3 sets out the ToC for home gardeners (HG) and Village Model Farmers (VMF). Finally, Table 4 sets out a ToC for low-income consumers. These theories are constructed from the bottom-up, with the central column holding the intervention narrative; so that **Activities** in the end row, lead to **Capacity changes**, which in turn drive **Behaviour changes** and yield **Results**, and finally **Impacts** captured in the top two rows. The left-hand column records the enabling narrative – where actions or activities by others (not necessarily associated with the project) helped contribute to it; while the right-hand column records assumptions — things largely beyond the control of the project. Horizontal linkages also exist between the ToCs (for instance, as outputs of hatcheries feed into home gardens); these are depicted in red.

Table 2: Theory of change for fish hatcheries

Enabling narrative: where the project benefited from what others had done	Intervention narrative	Assumptions: things outside the project's control
	Impacts [Better availability of and improved access to fish rich in micronutrients for low-income consumers in the commune and district]	
	Results Hatchery owners generate income Their families are better nourished [Enables VMF/HG ToCs and Low Income Consumers ToCs]	
	Behaviour changes Hatcheries are set up and sell fingerlings [VMFs, Home gardeners and others buy and raise fish]	
Prior research on fish pond models.	Capacity changes C: Hatchery owners can run a hatchery business O: Sales to market M: Higher income, healthier children Reach: Two hatcheries were established in phase I as well as 10 brood ponds in selected VMF. Minimum 8 hatcheries established in phase II. MAFF expected to spread hatcheries more widely (e.g. "One hatchery per commune, one pond per family" scheme)	The chance of selling inputs more widely than Homestead Food Producer farms exists (this may be influenced by the programme facilitating linkages further along the value chain)
Hatchery owners are selected from among those interested based on criteria such as their financial, land, and labour capacity. Local and acceptable varieties of fish (large species for sale, small species for home cons are used	Programme subsidises establishment of hatcheries for several fish species Technical advice to hatchery owners on aspects of fish rearing. Subsidies to set up nursing ponds, and technical advice to nursing pond owners Business development help and training to hatchery owners	

Table 3: Theory of change for Home Gardeners (HG) and Village Model Farmers (VMF)

Enabling narrative: where the project benefited from what others had done	Intervention narrative	Assumptions: things completely outside the project's control
	Impacts Children (and everyone in families) are better nourished and health improves Women gain more control over their lives	
<p>Good transport services to markets exist</p> <p>More limiting factors to women's empowerment and to people's nutritional status are being addressed concurrently – e.g. general progress in the regions helping to drive falling rates of anaemia and stunting, women's status etc. [Though if the programme is successful, it will be contributing, it may not be the chief avenue]</p>	Results Women produce more food for home consumption, sell more to market, get higher income	<p>Increases in income will bring improvements for women's status, (bargaining position), while income is not co-opted by men. Might be influenced by gender training.</p> <p>Women will use any increases in income to further the welfare of their children (and themselves and other family members) [Income in the hands of men may not yield equally strong welfare improvements].</p> <p>Unusually bad weather will not unduly influence harvests.</p> <p>Local markets accommodate sales without undue price falls</p>
	Behaviour changes Women/households set up home gardens and ponds, applying techniques learnt in training Parents feed children better, practice better sanitation and hygiene	<p>That cultural constraints don't prevent women accessing markets (freedom of movement) – possibly influenced by gender training</p>
<p>Existence of health centres, clinics and government or NGO programmes promoting health, nutrition, WASH, and gender issues.</p>	Capacity changes C: Farmers learn how to grow or improve techniques in growing veg, raising poultry and fish C: Mothers understand better practice for child feeding, sanitation, hygiene C: Understanding of gender issues among women and men improves O: Inputs can be accessed at low cost O: Sales to market M: Higher income, healthier children Reach: Farmers, mostly women. In Phase II, at least 4,500 HG across 3 provinces: expect further approx. 18k neighbouring households will adopt aspects, benefiting approx. 135k people. Potential for greater reach beyond life of project.	<p>That home gardeners seek to improve incomes e.g. via growing household enterprises. This could be influenced by the programme's provision of business development training.</p>
<p>Fish hatcheries and nursing ponds help provide inputs for home gardens</p>	Activities Selecting and signing up VMF and HG Provide inputs (subsidised and/or microfinanced for fish/ poultry/ horticulture production).	

	<p>Provide technical assistance (including refresher courses)</p> <p>Provide training in and assistance with business development; training and microfinance for further processing of garden produce.</p> <p>Provide training in gender issues.</p> <p>Educate primary carers on child feeding, nutrition, sanitation, and hygiene.</p> <p>[VMFs may include brood ponds for large and small fish species, and/or small poultry businesses for egg production, and/or producing seeds/seedlings for fruit and vegetable production.]</p>	
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Table 4: Theory of change for low-income consumers

Enabling narrative: where the project benefited from what others had done	Intervention narrative	Assumptions: things completely outside the project's control
<p>That good transport services exist to get products and sellers to market, as well as to allow consumers easy access.</p> <p>More limiting factors to people's nutritional status are being addressed concurrently driving falling rates of anaemia and stunting, women's status etc. [Though if the programme is successful, it will be contributing, it may not be the chief driver or avenue]</p>	<p>Benefits</p> <p>Consumers and their families are better nourished (healthier and able to utilise nutrients)</p>	<p>Pricing – produce can be priced within reach of (especially) poor consumers, while for those selling, profits are sufficient. (also reports of sufficient profit to afford gifting to poorer neighbours).</p> <p>That market factors, e.g. as any sudden glut of product from elsewhere, or any sudden drop in demand will not add undue volatility to prices.</p>
<p>People are able to access micronutrient rich food at low cost [see HG/VMF TOC]</p>	<p>Behaviour changes</p> <p>Consumers access micronutrient rich foods</p> <p>Parents feed children better, practice better sanitation and hygiene</p>	
<p>People are familiar with preparation of foodstuffs (programme implementers have selected locally acceptable varieties/breeds)</p> <p>Producers are adept at marketing products owing to training etc.</p> <p>Produce is regularly available in expected places, at expected times for expected cost. Links established between producers and processors down the value chain boost availability.</p>	<p>Capacity changes</p> <p>C: Through health and nutrition messaging, people have a better idea of nutrition, health, hygiene practices</p> <p>O: Desire to improve diets/health</p> <p>M: Healthier selves, children, cost, taste</p> <p>Reach: Low income food consumers in regions where HKI operates.</p>	
<p>Home garden / VMF / hatchery production has increased availability of affordable, micronutrient rich food</p>	<p>Village Health Volunteers are trained in benefits of HG and pond products and disseminate information to villagers.</p>	<p>People have access to media outlets and see behaviour-change messages. This can be influenced by the choice of messaging strategy employed by the programme.</p>

	Health and nutrition messaging for wider population: Media (radio, TV, newspaper, billboards, texts, pamphlets, brochures, banners, t-shirts; Blogs, Twitter, Facebook, YouTube and mHealth messaging), community mobilisation (skits, schools outreach), PR/Advocacy (media already mentioned plus community meetings)	
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2.2 Testing the theories of change

2.2.1 Hatcheries and fish nurseries

Activities

Hatchery owners have received physical inputs, financial support and training from HKI and partners. They have had grants, loans, and technical advice to help set up infrastructure required for the business of hatching and raising several different fish species, and training on its complexities – techniques like injecting fish with hormones to produce eggs, or producing home-made fish food from rice bran.

Fish nursing farmers, who raise fingerlings from eggs purchased from the hatchery, have also received inputs and training necessary for the business. Training included pond cleaning and preparation, lime and fertilizer application, and techniques for transferring fingerlings between ponds.

Capacity and behaviour change

Hatchery owners' capacities to produce eggs and raise fish have been built. They are now running successful hatchery businesses, which form the main enterprise of each participating household.

Results

For hatchery and nursing pond owners, changes to income are significant. The hatchery visited in Kampot, set up in July 2016, now sells around 10k fingerlings a month, for around US\$250. The owner indicates his income has increased 200% since joining. Findings were similar for the hatchery in Prey Veng, whose owner said he can earn money easily with around 130,000 fingerlings sold each year since establishing in 2013. The nursing pond owner in Kampong Cham felt the fish nursing business was easy to do and very profitable. She buys 70,000 fish eggs from the HKI hatchery for around

\$100, and within one month of nursing can sell batches of 40 fingerlings for around US\$1. If three quarters of these survive to sale, she could make over \$1,300 for a \$100 investment.

2.2.2 Home gardeners and VMFs

Activities

Home gardeners and **VMFs** have received inputs and training from HKI and their partners. Material inputs home gardeners have received include subsidised high-quality seeds and propagative materials, some tools (e.g. buckets, hoes), and in some cases fish fingerlings, chickens, earthworms, and free drinking water filters. VMFs have received all these, as well as plastic bags for grafting.

Both HG and VMF receive technical training and refresher training on agricultural techniques, with VMFs accessing about double the amount of training as HGs. On top of training sessions in agricultural techniques, they have participated in training on child feeding, hygiene, sanitation, gender, and in some cases further processing or food marketing.

Some of those interviewed mentioned that male VMFs tended only to join the technical agricultural training, with female VMFs participating in all the training. For the home gardeners, training uptake by women and men seemed more balanced: in some cases, husbands participated in gender or nutrition training when their wives were not available and fed back the information to them. In terms of food processing training, HKI provides it only to those farmers who are interested and these have so far been only women; food preparation being widely regarded as a woman's task.

Capacity and behaviour change

For HG and VMF, material inputs are being put to use, while learning is translating to practice — particularly with respect to agricultural production, but not limited

to this, with respondents saying new learning was changing their practices in child feeding, hygiene, and gender.

Horticulture, fish, and chickens

In terms of **horticulture**, VMFs and home gardeners are planting in raised beds for the wet season, intercropping as part of an insect-pest-management (IPM) approach, and practicing vermiculture. Production techniques promoted, moreover, are more environmentally sustainable than many conventional practices. For example, techniques facilitating use of fewer chemical inputs through production and use of composting/manure, IPM techniques, live fencing, and use of locally appropriate varieties. The resultant vegetables (but equally fish and chickens reared under this project) are widely regarded as better quality than the imports available in local markets. These, often produced in Vietnam, are said to have been grown or raised with excessive chemicals.

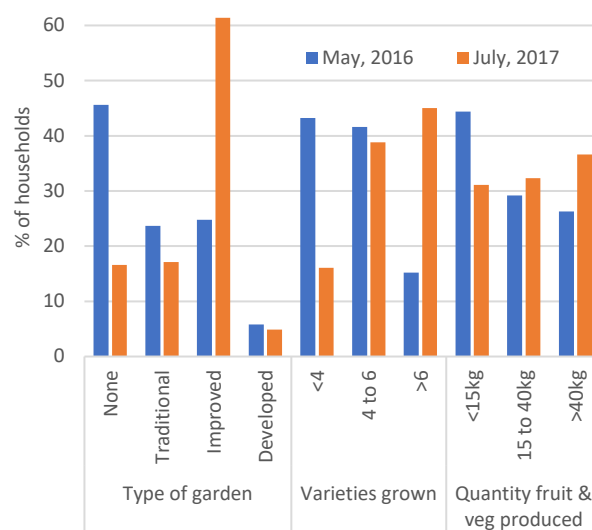
Both home gardeners and VMFs agreed that having access to high quality seeds and propagative material had been critical. As well as growing an increased quantity of horticultural products, more varieties are now being grown. Most home gardeners or VMFs interviewed who previously grew vegetables concentrated on two varieties. Home gardeners now grow around 4 to 6, while VMFs grow as many as 8. Some are totally new to them, and some they grow on a smaller scale, being unfamiliar.

Production is now taking place in the off-season as well. Techniques like using raised beds allows this in many places. In addition to boosting availability in the off-season, this is an attractive proposition for farmers who may achieve higher prices. This new activity in particular however has met with variable success. In one former control village⁷, wet-season vegetable production was failing for most. Though they had planted on raised

beds, much of the land was very low-lying, and unusually heavy rains every day had taken their toll.

HKI's monitoring has recorded improvements in line with observations from the field. Comparing first-round surveys (of 447 households in May 2016) to the eighth round (386 households in July 2017⁸) showed big improvements in home gardens. Households without gardens fell from around 46% to just 17%, with large transitions to improved types, greater varieties grown, and more production – see Figure 1.

Figure 1. Big improvements in home garden horticultural production



Source: Figures 1 to 3 in Porter et al., 2017

This was despite households reportedly spending the same median amount of time – 60 minutes daily – on HFP activities in the early and later survey rounds. Over a third of participating households were also cultivating year-round. (Porter et al., 2017)

In terms of **fish and aquaculture**, many of the households enrolled did not raise fish at all before the project, even if they had ponds — main reasons including: lack of knowledge about techniques, lack of

⁷ These villages were used as controls for the purposes of project monitoring procedures early in the project cycle – on the understanding they would receive the same intervention subsequently. Thus they have not had support for as long as the non-control villages visited.

⁸ They sampled more households in the eighth round than this, but excluded some from the analysis as they were the 'former control' villages which only latterly received any intervention.

opportunity to buy fingerlings, or lack of funds to buy them. As well as households now being able to raise fish at home and in some cases produce home-made feed, more varieties of fish are available, with around 4 species provided through FF4F. Most of the home gardeners and VMFs new to fish rearing reported practices were going well, though not all experiences were problem-free. Some hiccoughs included people failing to properly prepare ponds to receive fingerlings (predators such as snake fish remained in the ponds and ate them), while others lost fish when walls of their ponds broke. These were however, isolated incidents.

Another aim of the project was to educate people about the nutritional benefits of small indigenous species (SIS) of fish, which resulted in some places in SIS populations in rice fields dropping as people learnt of their desirability and sought to catch more of them.

After witnessing the project, demand for fish-rearing ponds increased among non-participating households in the villages. Even in participating households, some without fish mentioned they would like to pursue this option, only lacking suitable ponds. These can be costly to dig, as much as US\$1,000; depending on the size. Microfinance did not get many mentions among the farmers met; few had loans, all unrelated to the project. This may have been a feature of the sample⁹.

Improvements in **chicken** raising techniques were less evident over the course of the fieldwork. This seems to

have been a relatively minor element of the project, with each eligible home gardener or VMF receiving five birds. Several families preferred to use them for meat rather than eggs¹⁰, while for some, issues of mortality were significant¹¹. The team struggled to source local chickens in numbers required for the project and had only recently finished distribution at the time of the field visit, while some former control villages did not receive any. Most villagers interviewed already kept a few chickens, which they tended to reserve for guests, it taking 6 months for the traditional free range Khmer chick to reach 1 to 1.5kg.

Hygiene and nutrition

Moving on from agriculture, capacity and practice changes related to **health and nutrition** were notable. Farmers interviewed agreed they had benefited from the training around clean water practices, child-feeding, and sanitation, in terms of learning new skills.

In villages where HKI provided water filters for free to those participating households who didn't have them¹², people were able to filter the rainwater or surface water they used for drinking¹³.

HKI messages about hand-washing with soap were being received – extended by village health volunteers as well as implementing partners, with some respondents confirming they now have improved knowledge of hygiene and sanitation practices. For instance, one woman mentioned she had known

⁹ The HKI baseline survey recorded some 53% of households with credit from formal lenders, 20% with loans from relatives, 17% from informal money lenders, groups, or community banks, 8% from AMK a microcredit organisation, and 1% from NGOs. Median amounts of loans were around US\$500. Most were towards houses or vehicles (14% and 13% respectively), with 11% for starting or expanding businesses, 10% for buying livestock, 8% for buying land, 6% for preparing land, and 6% for acquiring inputs. Other uses included paying back debts, medical needs, celebrations, and unspecified. (HKI, 2017a)

¹⁰ In some villages visited, ducks seemed more popular than chickens, with strong availability of eggs from local duck farmers.

¹¹ Possibly linked to unsanitary conditions in coops promoted by the project, arising through lack of time to clean them; also perhaps owing to chickens being unhealthy upon arrival (in some cases they were transported over long distances, which implementing NGOs felt had affected their health.)

¹² Filters were not provided for free to former control village participants. In one village visited, water salinity from groundwater was a problem, causing kidney stones among villagers, however the HKI budget did not allow them to provide free filters here.

¹³ The baseline survey reported rainwater to be the most common source of drinking water in the rainy season (at about 56%), followed by water from drilled boreholes (15%), open wells (10%), surface water (9%), covered wells (4.7%), bottled (2.8%), and piped (2.5%). In the dry season, surface water is still the most common source of drinking water, at 41%, followed by drilled borehole (23%), open well (12%), rainwater (8.6%), bottled water (6%), covered well, 5.4%, and piped (3.8%). More than 80% of respondents also used some method of purification, with boiling most common (78%) followed by settling and filtration at 30% and 20% respectively (HKI, 2017a).

previously about hand washing at critical times, but not with soap, and had formerly only used water. Following the training, she now uses soap. Many reported changing routines in terms of washing and eating safer food, suggesting the programme had taught them things they hadn't known. The baseline survey recorded more than 80% of respondents practicing handwashing with soap, with most doing so before food preparation (83%), but rarely after defecation (35%), or before feeding children (13%) (HKI, 2017a).

Some also reported changes in child feeding practices, such as exclusive breast feeding to six months and longer durations of breastfeeding¹⁴. One mother reported she intends to breastfeed her current infant to the age of two, while she stopped breastfeeding her other children at around one year old. She also commented that her youngest is chubbier than his older siblings. Several respondents also mentioned improving practices like including a wider variety of foods for children and feeding them more frequently.

In other areas, while people are learning new skills, they are choosing not to put them into practice. Enriched porridge is the clearest example. Many mentioned learning about enriched porridge – largely through attending demonstrations which took place around once a month. They appreciated the demonstrations which were unusual compared to other organisations' methods of promoting enriched porridge¹⁵. However, while mothers and grandmothers reported being newly aware such porridge is healthier for the children in their care, they are not cooking it. In some cases, because the preparation is too complex; in more instances because the children do not accept it. One grandmother said she had cooked it once for her granddaughter, but she would not again as the child had refused it.

In terms of knowing what foods are healthy, many respondents mentioned they would now eat whole small fish, including the bones which contain calcium and the heads which have other concentrated micronutrients, where before they might have removed

the heads or preferred to eat large fish. People in the control villages in contrast to the treatment villages did not know about health benefits of eating whole small fish. Several respondents in treatment villages also mentioned learning that orange and dark green vegetables were healthy in terms of nutrients – though they did not remember exactly which nutrients were in each, or specifically why they were healthy. Somewhat surprisingly, the same respondents who mentioned learning of the benefits of whole fish, certain vegetables, and enriched porridge also tended to say they were not sure about what foods were considered particularly healthy for their children and which they should encourage them to eat more of. They stated they would like to feed their children in a way that will make them grow bigger and stronger, but frequently maintained they did not know what foods might be best for this.

Gender

The gender elements of FF4F are front and centre – a focus on women home gardeners and VMFs, inclusion of women in all the trainings, and specific gender training for married couples. The capacity of implementers and participants to extend and benefit from gender training is mixed. Certainly capacity issues in implementing partners exist, who before this project were almost exclusively involved in agricultural extension work. Incorporating gender training into their capabilities has been a sizeable positive change brought about by this project. Senior staff at PVT, the implementing NGO in Kampot province reported they would like to continue with all elements of HKI's 'enhanced homestead food production', and would look to hire staff with more than just agricultural training capacity in the future. Similarly, programme coordinator of VSG also mentioned they were submitting a proposal to Japan International Cooperation Agency (JICA) to continue nutrition and gender projects.

Gender training has been rolled out to participants, both men and women.

fish, vegetables, and oil, is also promoted through the government health centres and by several other NGO programmes, including for instance USAID's HARVEST project.

¹⁴ PVT staff mentioned that some mothers are unable to follow the breastfeeding advice because they work in factories.

¹⁵ Enriched porridge, a food for young children which improves normal infant rice porridge by adding ingredients including egg,

That said, incorporating gender training into the project activities takes its toll on the workload of implementers. After phase one, HKI identified two major drawbacks of the gender training: firstly, the time absorbed from project staff's other activities; and secondly, the need for project staff to have skills in facilitating and probing if respondents were to participate actively in the discussions – a factor far from guaranteed (Hillenbrand et al., 2014).

Several respondents described the gender training as useful. One older, unmarried man for instance mentioned more than once that he was keen on the gender training, seeing it had helped him tackle longstanding conflicts in his extended family, promoting harmony. Some other respondents mentioned they had learnt to have calmer discussions with their spouses over disagreements.

Another message from the gender training that participants recalled was the imperative of girls attending school as well as boys. Though enrolment of primary age girls and boys has achieved parity (UNICEF Cambodia, 2011), it seems more common for girls to drop out of secondary school. Indeed, one VMF family visited had a teenage daughter who was engaged to be married the following year and drop out of her last year of secondary school. Though she wanted to be married, she also wanted to finish her last school year, however this was seen as unlikely and something dependent on her husband's wishes rather than her own.

Overall, the bulk of those interviewed were not particularly forthcoming or enthused about the gender training, and few seemed able to recall much about it. The concept of gender, while a known quantity to most of the people interviewed, may not have been five years before¹⁶. Some speaking of the gender training mentioned they did have some familiarity with the concepts before, though they hadn't known to label it 'gender'.

¹⁶ When asked about gender training, one respondent said something like "I know what gender is; is it something to do with laundry?" which was met with laughter from the group.

Results

Shifting diets and improved dietary diversity

What results emerge in terms of people's food security? **Diets** have certainly been influenced. In most cases, HGs and VMFs described themselves and their families eating more vegetables and fish with the advent of the project. In a few cases, people's answers were more ambiguous — for instance, they ascribed falls or rises in consumption of various food groups to changing numbers of household members, or to shifts in personal preferences (e.g. preferring more fruit when pregnant, or less vegetables as they age owing to dental problems). Overall though, participating households reported producing and consuming more micronutrient-rich food per head — vegetables and fish in particular.

Improved incomes

Most participating households interviewed maintained the project had improved their incomes, with improvements felt via a few avenues. First, participating households consume own produce and save on spending at the market¹⁷; also saving on seeds where the project has provided them free of charge, or on chemicals where they have learnt and are practicing chemical-free agricultural techniques such as organic compost and intercropping for IPM. Second, direct income from sales, possibly benefiting from rising prices of vegetables – these reportedly having increased in most villages some two to three times in the last five years, depending on varieties. Increases in production and productivity also contribute. In one village, home gardeners reported selling around half of the vegetables they produce, where before they grew only for home consumption. More widely, the HKI monitoring survey found that about 75 to 80% of households were producing fruits and vegetables for home consumption only (Porter et al., 2017). A third possible impact of the project on income, more difficult to test, might be savings on health care costs if family members are healthier.

¹⁷ The control groups reported they hadn't changed spending on food consumption in the last few years, while those enrolled in the project said they could save money now by not buying as much fish or vegetables from the market.

Unlike the case of hatchery owners, for home gardeners and VMFs, income changes appear marginal. Receipts from ponds may be a bit more significant in some cases. Most home gardeners reported income from vegetable sales to be very small; they might use it for items for their children’s education (while school is free, they still need to buy uniforms, books etc). This was also the case for the home gardener who had received food processing training¹⁸. There is also the issue of competing on prices with cheaper Thai or Vietnamese imports.

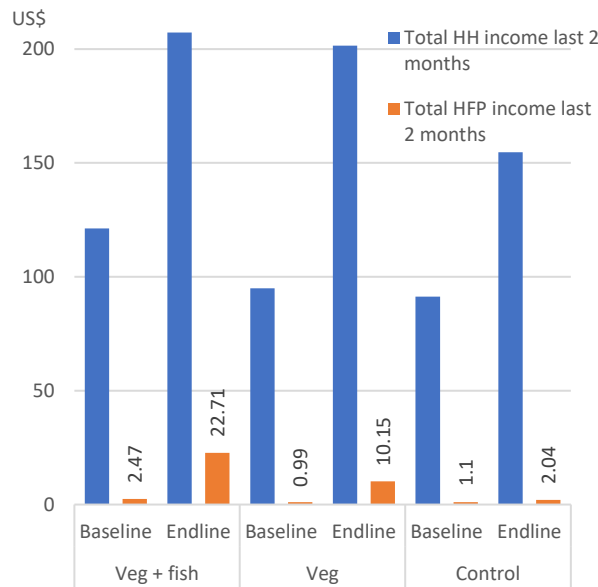
Encouragingly, there were no negative comments regarding incomes. While some had lost production (chickens to disease or vegetables to heavy rains for instance) they were not upset, having received them for free.

A study of first phase participants in the project (Talukder et al., 2017), aiming to explore the enhanced home gardens project’s effects on

- a) production of vegetables and fish;
- b) sales or income from home garden produce; and
- c) the extent to which income was spent on supporting improved nutrition for women and children,

saw encouraging results. Participating households — those growing vegetables alone as well as vegetables plus fish — significantly increased both production and income (see Figure 2).

Figure 2. Household and home garden income, before and after phase one, Fish on Farms



Source: Table 3, Talukder et al., 2017. Note: HH = Household, HFP = enhanced homestead food production. Note: 'veg + fish' means those households who grew vegetables as well as fish, 'veg' refers to households growing only vegetables, while 'control' refers to non-participating households.

Production went from 8.6kg to 51.7kg (in the two months before the survey) for the home gardeners with vegetables, while it went from 15.4kg to 78.3kg for the home gardeners with fish and vegetables. Income from sales went from US\$0.99 to US\$10.15 for vegetable growers, and US\$2.47 to US\$22.71 for fish and vegetable growers. That said, no significant increase in total household income was observed among either the treatment or control groups, though it was shown that increases in production were significantly and positively linked to sales (Talukder et al., 2017).

Delinked from the programme, in parallel, incomes have been growing substantially – driven by off-farm work, largely in construction and clothing industries. Agriculture is increasingly a subsistence activity, with rural outmigration major and rising (Box 1).

Box 1. In parallel – off-farm work major and growing

What else has been influencing people’s incomes and access to nutritious food in the last five to ten years? Off-farm work.

¹⁸ Food processing training was extended only to selected home gardeners who showed the requisite interest and capacity. One food processing home gardener in Kampot interviewed noted she was very pleased to have learnt how to pickle vegetables to a

tasty recipe, and was selling this pickle along with her regular produce: but still for a relatively small income.

Agriculture, centred around rice production, is increasingly a subsistence activity. Main incomes for young men include construction in provincial towns, or further afield (migrants travel to Phnom Penh or other cities in Cambodia, as well as abroad: Thailand, Vietnam, and South Korea were all mentioned), while women and teenage girls frequently find work in provincial garment factories or those in Phnom Penh. It is not uncommon for girls to drop out of secondary school to work in the garment factories.

Rural outmigration is significant and rising, with remittances back to villages (often from sons or daughters to their parents) highly significant for many of the families interviewed. Moreover, they have been growing in importance, now forming the main source of income for those remaining behind. For some these changes have taken place recently; five years ago, agriculture may have been their most important income source; this is no longer the case.

Migration makes for an extremely dynamic population. In their surveys to test production and income impacts from phase I, the HKI/UBC team found greater attrition (in both treatment and control groups) than they had anticipated: 38% of women participating in the baseline were not available for measurement at end line, with researchers citing higher migration than assumed at outset (Talukder et al., 2017)

As well as the road improvements mentioned in Box A2, better access to electricity has also materialised for many rural families, in several cases within the last five years.

Impacts

Health improvements

Though it is not really possible to attribute health changes to the project, most respondents in the treatment villages, including focus group participants and village health volunteers said their health, and the health of their families or fellow villagers had improved in the last few years owing to factors including support from the health centre as well as the HKI project. Many expressed, for instance, that because they can eat more organically produced vegetables, and because they understand the importance of SIS fish, and have changed sanitation practices, they feel they are healthier. People in control villages also felt that their health had improved over the last few years (exceptions in both places were older people who experienced

health deterioration with age), citing health centres, improved ability to access clean water, improved sanitation, and some nutrition training they had received through government programmes. People in control villages also expressed concern about the quality of vegetables available to them in the market, worried about having to rely on those produced with excessive chemicals in neighbouring countries.

In one village in Kampong, as well as several of the focus groups in Prey Veng and Kampong Cham provinces, key informants mentioned diarrhoea in children had declined in the last five years — putting it down to more sanitary practices; though the causation is not clear¹⁹.

Some said the babies were healthier than before because of improved breastfeeding practices. However, for older children, in some cases messages about changes in health were mixed, with different respondents in the same village painting contrasting pictures. For instance, some felt children to be generally healthier now, while others felt they were more prone to sore throats and bronchitis than earlier generations had been²⁰.

In parallel, delinked from the programme, strong improvements in rural water and sanitation are reported over the last five to ten years, along with better government health drives around child nutrition training and vitamin A supplementation (Annex Box A3).

Gender – immediate & reinforcing effects

In terms of gender impacts valued by respondents, their inclusion seems to have had the most tangible effect so far. Many respondents felt the inclusion and deliberate selection and singling out of women to participate in this project was a big positive change from previous agricultural extension projects encountered, where women were expected to pick up information from their husbands who were expected to attend training.

Most maintained that cooperative decision-making between spouses was the norm, with both partners having veto power over big decisions likely to impact the family. This relates to a Cambodian gender norm

¹⁹ Vitamin A drives likely also contribute to diarrhoea reduction

²⁰ This may even be a feature of better child survival: where before, children with weaker immune systems may have died in infancy.

where women are considered as mothers and bosses (creator/boss).

The HKI baseline survey's findings on gender, however, seem less sanguine. For households where the respondent (female head of household aged 18-49) did not report being the primary decision-maker, joint decision making was reportedly uncommon, with women having low personal autonomy on decisions about production, use of income, and household expenditures (HKI, 2017a). Some results from their monitoring survey were however more encouraging, finding the income earned from sales of home garden products to be largely controlled by women (Table 5).

Table 5. Income in the hands of women

Money keeper (%)	Round 1 (n=236)	Round 8 (n=205)
Wife	66.9	92.2
Husband	2.1	1.5
Both husband and wife	30.5	3.9
Other household member	0.4	2.4

Source: Table 2 in Porter et al., 2017. Note: 'other' was always a female relative: e.g. mother, grandmother, daughter, daughter-in-law.

With the chance of women's time being absorbed into home gardening leading to deficits or difficulties elsewhere (linked to utilisation where child care is impacted), no one interviewed indicated this might be the case. While many acknowledged home gardening increased their workloads, all maintained such increases were small and manageable within their existing activities, given they were not at full capacity before joining. None reported big impacts on time for household chores or caring for children²¹. The most common labour issue noted was difficulty finding hired labour for preparing the fields. This is in line with HKI's monitoring, which revealed in the latest survey round (July 2017) that only 1.6% (n=6) of households believed

HFP activities to be hampering childcare; a reduction from 17.0% (n=76) in their first survey round (May 2016) (Porter et al., 2017).

The picture for **parallel improvements** in women's status, delinked from the project is quite mixed: though awareness of gender issues is increasing and discrimination against women is seen to be falling, progress is not especially fast (Annex Box A4).

2.2.3 Low-income consumers

Activities

The fieldwork was not able to assess the advertising activities carried out such as health and nutrition messaging through radio, television, and other media. Interviews with **Village Health Volunteers** (VHVs) however, confirmed they had been trained as expected in health and nutrition specific to the project: e.g. to understand the nutritional benefits of SIS, as well as WASH and child feeding techniques.

Community meetings and demonstrations were also held to demonstrate better nutrition through consumption of enriched porridge.

Capacity and behaviour change

Non-participating households interviewed in intervention villages felt vegetables and fish were now more readily accessible. VHVs also felt that their messages around health, nutrition, sanitation and hygiene were being absorbed and acted upon by community members more broadly than target farmers alone.

Results

Shifting diets and saving some money

Many non-target households had bought vegetables from target households and VMFs; sometimes for cheaper prices than they might have found them in the market. Some had been given or asked for and received vegetables for free. Generally, they felt that vegetable and fish availability and quality had improved in their villages with the advent of the programme.

Cambodian women also tend to spend less time in agriculture when they have young children. (Komatsu et al., 2015)

²¹ Studies have found that having other women (older siblings or grandparents for example) in households, as well as younger boys can help substitute for mothers' caregiving in Cambodia.

Delinked from the project, much has been going on in parallel since CIFSRF began operation, with availability growing owing to imports, and diets also shifting to include more processed snacks – see Annex Box A2.

3. Assessment

3.1 Sustainability and scaling up

3.1.1 Sustainability a question mark

The question of sustainability hangs over home garden programmes in general. In Cambodia's rapidly shifting rural dynamic, is it reasonable to expect families to maintain home gardens for many years as farm labour becomes scarcer and options outside agriculture open up?

Do people remember the techniques learnt and continue to practice them? Can they access seeds or propagative material necessary? In the fieldwork a slight disjuncture appeared: between the intentions of the project (to have farmers or VMFs save seeds and propagative material year-on-year) and the farmers very frequent requests for more seeds.

What of the life of changes in behaviour around sanitation, hygiene, child feeding, and gender roles? Few follow-up studies of home garden projects exist. More studies of this kind would be beneficial; adding to the slim evidence base.

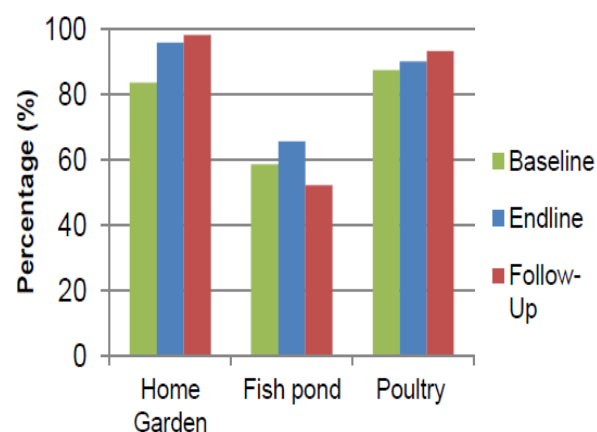
Project staff and partners were careful to select farmers, VMFs, and hatcheries, to maximise buy-in and sustainability. Hatcheries have been especially carefully selected by senior HKI and senior FIA staff, and are probably the most successful business elements of the project.

While some drop-outs of home gardeners have occurred, they are a small fraction – perhaps 10%. Reasons cited include migration, lack of time, feeling aspects of the project to be unfair (e.g. where ponds did not qualify for fish or where they wanted but did not receive chickens, HKI requiring a coop), and even a small number who felt the HKI-sourced seeds were not successful, preferring to return to their own seeds. Project staff have also found replacements for some of the home gardening drop-outs, since in many villages, demand is higher than the capacity of the project.

Many farmers interviewed did say they plan to continue even if they don't receive seeds: they have the knowledge now, and they are especially keen on the option to grow with minimal chemicals. This may be particularly true of families with young children who seek to provide them with more wholesome options than might be available at the market (Takeuchi, 2016). At the same time, several farmers expressed a desire for more agricultural extension; additional sessions on existing crops as well as new training in other crops (for instance, several in Kampot showed interest in learning to grow mushrooms, which can be sold for relatively high prices).

A follow-up study by HKI two years on from the phase one project found that most participants sustained their home gardening activities. Diversity of crops grown and consumed even continued to improve beyond the life of the project, though other indicators, such as amount of food produced, as well as income generated from selling surplus declined after the project end. Nonetheless, their levels were still improvements on the baseline (Talukder et al., 2017b). The same study found VMFs continuing to provide support and inputs to project beneficiaries as well as distributing it more widely among others in their villages. More farmers were cultivating gardens and raising chickens, though fish pond ownership had dropped below the baseline – Figure A6.

Figure 3. Home gardeners from phase 1: baseline, to endline, to two years post-endline



Source: Figure 1 in Talukder et al., 2017b

This strange finding, whereby fewer respondents had fish-raising ponds two years after the endline than even

at baseline appears potentially worrying. Fortunately, a few factors can explain it. Firstly, in phase one, households were not self-selecting, but assigned randomly (within constraints of their possessing a suitable pond) to the pond category to set up the phase one randomised control trial. They therefore may not have been the best candidates. In the second phase, participating households select whether they wish to raise fish or not. Secondly, the timing of the resurvey during a dry season meant some had seasonally stopped raising fish in ponds, and would recommence in the wet season.

All households visited had continued gardening, except two, citing lack of family labour and too many insects. Over half of the home gardeners also reported actively cultivating 9 to 12 months of the year, while most continued practicing agricultural techniques promoted by the project such as seed storing (76%), composting and using fertilisers based on crop needs (83%) (ibid).

The CDRI team were able to visit a few villages participating in the CIFSRF phase one project which had not seen any intervention since 2014. Interestingly, most HGs with suitable ponds had continued growing and raising fish. Most also continued to grow vegetables (most had already grown vegetables before the project), however, all of them grew fewer varieties than with HKI. The main reasons for this were: a) lack of a market, and b) ready availability of greens growing freely around the village (uncultivated) during the wet season. Some also mentioned a lack of seed varieties in the market, high seed prices or poor-quality seeds. In a few villages, HGs had shifted to grow sugarcane in the rice field after harvesting wet season rice because they had found a good market for sugarcane which (when grown on a larger scale than vegetables) proved more lucrative²². One graduated VMF explained that vegetable growing is technical; it is not possible to hire someone else to do it as with other crops such as rice or sugarcane. Compared to the currently enrolled HGs visited, graduated HGs did

not grow much during the wet season, while in the dry season most continued to grow several varieties.

According to VMFs, those who could not grow well (those who did not listen or care during the training) or had a better paid off-farm jobs (including from migration) gave up on home gardening.

One graduated VFM had continued growing the same number of varieties (around 8) because it was her only job. She had been able to sell her vegetables well in the years since HKI left. Few farmers near her grow vegetables, and villagers prefer not to buy their vegetables from the market, thus she has a ready market.

Although most HGs did not raise fish before HKI, most of those who began under the project were continuing to raise fish for consumption and sale. Many, however had chosen to change the type of fish raised to catfish, as this species is easy to rear and feed, requires little care and labour to clean the ponds, and is not eaten by indigenous fish from the rice fields which might also be caught during the rainy season. More importantly, they do have SIS fish in their ponds along with other varieties.

The hatchery established in 2013 in Prey Veng continues selling fingerlings well with around 130,000 sold every year, around 20% of which are to the former HKI HGs. It supplies fingerlings to the whole district however, not only within its village or commune. The hatchery owner plans to expand the business, digging more ponds to hatch fingerlings and raise fish.

While sustainability of perennial home gardens is perhaps the most uncertain, particularly where HGs may have lost production to weather or other factors beyond their control²³, hatcheries and VMFs seem the most likely to continue. VMFs, in contrast to the home gardeners, can earn more money given they have more capacity. They also receive more agricultural training than the home gardeners²⁴. Every VMF interviewed

²² Though the marginal profit of vegetables is higher than other crops, most of the HKI farmers have small land areas for home gardening, with predominantly low land which is not suitable for wet season vegetable growing.

²³ In another village visited, a dam was being built nearby, resulting in flooding and loss of land.

²⁴ VMFs receive 3 days training in district centre, while target farmers have only 1.5 days. Refresher training sessions are also

planned to continue following the end of the project, but they were less sure about the HGs in their villages. It was widely viewed that those who had grown vegetables before were the most likely to continue, while those for whom home gardening was a new pursuit were more likely to drop out. Village chiefs and village health volunteers also tended to share this opinion. In one of the control villages visited, respondents felt such a programme would work only for farmers already growing vegetables. According to the baseline survey, around 58% of respondents already cultivated a home garden, compared to 42% who didn't (HKI, 2017a).

It also seems likely that home gardeners will settle on growing a smaller variety than they may have done through the project, with production decisions based on several factors. Some research conducted at the end of the first phase (Takeuchi, 2016) cited farmers reasons for preferring particular crops (Box 2).

Box 2. Farmer testimonies about crop preferences

"I like kangkong and bunching onion because it gives a big output at harvest";
"I like mustard green because it has a fast harvest. Common cabbage takes too long";
"I like yard long bean because it has a long life";
"I like pumpkin and wax gourd because there aren't many insects";
"I like eggplant, cucumber and yard long bean because they keep a long time, so sellers will buy in large quantities";
"My least favourite is kangkong because it's too difficult to sell out.";
"My favourite is yard long bean because the price remains constant";
"I stopped growing Chinese radish because I can't sell it at a profit."

Source: Takeuchi, 2016

These included yield, time to harvest, shelf life, pest problems, demand and prices achieved in markets. Clearly sustainability to some extent depends on market and environmental conditions as well as farmers personal capacity, family situation (size of household, age of children etc) and preferences. Moreover, where local produce must compete with often more visually attractive imports, people must rely on the sense that

longer for VMFs who may also join the HG training. VMFs also receive more printed materials than HGs.

Cambodian produce grown with fewer chemicals is more desirable.

On the plus side, there are good reasons to suppose sustainability in the second phase will improve on the first phase: in the second phase, the project requires beneficiaries to contribute financially (to improve buy-in), while it also allows farmers to select the models that best suit their preferences, in contrast to phase one where vegetables and fish were randomly assigned (Talukder et al., 2017c).

Is the time allocated to the project too short to really ensure practices are bedded in and home gardeners can confidently continue? Some of the implementing partners felt so, with PVT actively seeking another donor to enable them to continue the project in Kampot for another two to three years, actions the senior staff at PVT felt would give the project a greater chance of sustainability²⁵. If their funding search is unsuccessful, they hope to explore ways to run the model partially as a business, partially NGO-supported.

In some villages where home gardens had been rolled out the first phase, HKI had been able to find follow-up funding to continue supporting farmers until 2016, likely improving their prospects of maintaining the practices learnt.

3.1.2 Scale up and spill-over: some uncertainty but strong potential

In conceptualising FF4F, implementers assumed that home gardening methods would be adopted by non-target households in villages with VMF and HGs. The PAD aimed for practices to be adopted by four additional households per target household. While VMFs interviewed universally said they were happy to share techniques with target and non-target households alike, it was not clear non-target villagers were requiring much of them. This may reflect a limitation of the field sample; but it may be that spill over of techniques is less common than hoped. In one village visited, the VMF noted that some non-target farmers had visited to ask about raising fish, but few other examples of this type of information seeking were encountered. In another case,

²⁵ They suggest 5 years would be optimal to support home gardeners through the process and make it sustainable.

the VMF produced many seedlings, but farmers didn't take them, feeling they would not sell well. Some home gardeners also maintained asking the VMF about techniques was not the clearest way for them to learn; they preferred to attend training.

On the other hand, spill-over in terms of non-target households accessing produce did seem widespread, and is likely substantial. In most villages, the HGs interviewed said VMFs were very famous in terms of vegetable farming.

HKI's close collaboration with the government fisheries administration will hopefully allow the aquaculture methods developed to be spread more widely across Cambodia, via government programmes such as "One hatchery per commune and 'One pond, one family'". The programme coordinator of VSG also described how they took on board elements of the HKI enhanced homestead food production and implemented it in Battambang and Siem Riep, through a programme funded by WorldFish. Before, this programme had focused only on fish, but with VSG as an implementer they had extended it to include nutrition (including through incorporation of SIS fish into their programme) and gender, following HKI's model.

Moreover, the potential for HKI to learn from the experiences of FF4F and to integrate ponds into their home gardens programmes in Asia and Africa also exists to be capitalised on.

3.2 Specific outcomes

3.2.1 Food & Nutrition Security

In sum, food and nutrition security of the target population has been materially improved through the activities and consequences of this project.

People are eating more vegetables and fish, and practicing better child feeding, while improvements in water, sanitation, and hygiene achieved through behaviour change communication are expected to improve nutrient absorption.

²⁶ Some of the training of trainers may also get lost in translation. One respondent mentioned learning that women had 'internal

3.2.2 Income

In sum, incomes have been boosted, for home gardeners, VMFs, nursing pond owners and hatchery owners.

Income improvements for nursing pond and hatchery owners have been significant. For home gardeners and VMFs, income boosts are generally more marginal, but nonetheless welcome and worthwhile.

3.2.3 Sustainable agriculture

Sustainable agricultural practices are being promoted through this project. Techniques extended include methods to reduce fertiliser or pesticide requirements.

The project also encourages saving of seeds and propagative material to allow for cultivation in subsequent seasons.

Finally, replacing demand for imports with home-grown foodstuffs is an environmental improvement.

3.2.4 Gender

What changes have been planned and seen for women?

Given the context of the project, it may be unrealistic to expect transformative shifts in gender relations from a few gender training sessions. Gender roles are a relatively new concept to most rural people, which, coupled with limited partner NGO capacity to absorb and pass on gender training given their previous lack of experience²⁶ suggests potential to provoke significant change in a short space of time is low.

Despite this qualification, the gender training sessions have probably been very valuable as a reinforcing tool, especially where messages on gender are also coming from other sources. Social norms do not shift overnight, and employing an approach that talks specifically about gender roles and norms brings it to the forefront of the project in a way that simple inclusion of women does not. If changes are not immediately evident or measurable, that doesn't mean they aren't there.

power' while men had 'external power'; not something that was necessarily intended to be part of the training.

3.3 Research partnership and policy influence

3.3.1 Research partnership

Partnerships add considerable value

Though HKI has been engaged in home gardening since the 1990s, it continually improves and tailors its approach, and CIFSRF, through partnering them with UBC, has enabled further refinement of practices used in Cambodia. The partnership with UBC for instance enabled them to set up and run a Randomized Control Trial to determine, with a high degree of confidence, the benefits of implementing home gardens with and without ponds. It also allowed for market analysis to feed into development of a scalable model.

The addition of village ponds fed by hatcheries and nursing ponds which was the core of this collaboration also appears to be a way to accelerate 'home gardens' impact beyond the immediate sphere of influence, given significant sales from hatcheries to those not participating in the project²⁷.

Nutritional findings from CIFSRF phase one are another meaningful contribution. A key finding from a nutritional study conducted in the first phase was that genetic causes of anaemia exceed dietary causes in the target population. This has implications beyond the project, as do phase one findings that thiamine deficiency is more widespread than anaemia among the target population. This second finding even prompted a PhD student's pilot project fortifying fish sauce with thiamine. While it is difficult to judge just what impacts and results are likely to flow from such unplanned 'spin-offs', they are extra feathers in the CIFSRF cap.

Strong leadership and high-functioning implementing partnerships

The HKI team at the core of this project are a real asset. They have strong professional experience of food and nutrition security programming, and are highly regarded in Cambodian nutrition policy circles, punching well above their weight given the size of their operation. They advised the government on the current National

Strategy for Food Security and Nutrition 2014–2018, and are currently advising on their next five-year strategy (2019–2023). This reflects their high capacity, strong reputation, and sensible, effective approach. They have built very good working partnerships with the Canadian counterparts, as well as their national partners.

Importantly for this project, they have a robust collaborative arrangement with the national fisheries administration (FIA), meeting with senior staff there regularly and seeking their input in the project development, particularly with the establishment of hatcheries. They have partnered with competent local NGOs in implementation, while significantly boosting these NGO's capacity through their 'training of trainers' activities, strongly shaping their understanding of the importance of nutrition and gender in the context of food security.

The team have been ambitious in what they set out to accomplish and have largely been able to deliver, despite this review taking place some six months before the project end. It is a project that has been well-designed and effectively implemented by a highly competent team. Though not without setbacks, it has achieved an impressive scale-up in a very short space of time. While questions of sustainability arise, these owe more to the duration of the project than to its conception, design, or implementation.

3.3.2 Policy influence

Expanding policy influence is a particular interest of CIFSRF, with the IDRC program officer and the project's external advisory group helping to position HKI for greater policy influence. The last Annual Project Review and External Advisory Group Meeting for instance reported:

"External advisory group members shared their expertise on securing government buy-in as a means to ensure sustainability beyond the life cycle of the project. A fruitful discussion was generated on nuances in Cambodia's policy environments and the most impactful courses of action to mobilize political will

²⁷ The phase two hatchery in Kampot for instance sold many more fingerlings to those outside the programme than within it – some

70% compared to 30%. The phase one hatchery in Prey Veng sold 80% to outsiders.

and influence key decision-makers. Next steps were then discussed and a consensus was reached to continue to engage with policymakers and leverage additional opportunities for engagement through networking and dissemination of project outcomes in high profile forums.”

Source: Annex 12 of Talukder et al., 2017c.

A further notable element of CIFSRF – its attention to monitoring, reporting and generating robust evidence adds value. While to some the worth of home gardens is self-evident, others need more convincing; and FF4F is on track to generate useful evidence of a kind that is relatively rare – see Box 3.

Box 3: Filling evidence gaps

The high quality dietary recall data collected through FF4F may now be mined, generating lot of interest among stakeholders in Cambodia (Talukder et al., 2017c). The project also plans (described in Moumin et al., 2017) a two-year randomized controlled trial conducted in 600 households in Kampot, Cambodia to measure and assess: primary outcomes – differences between the treatment groups in mean intake of zinc and vitamin A among women and; secondary outcomes – differences between the treatment groups for other key nutrients and the incremental net monetary benefit of EHFP (enhanced household food production); and additional outcomes – including household food security, women’s empowerment, and hygiene practices. Furthermore, there is some suggestion that HKI Cambodia may find resources to conduct a follow-up study on sustainable impacts (perhaps 5 years on) of their programme, which would be another most welcome analysis.

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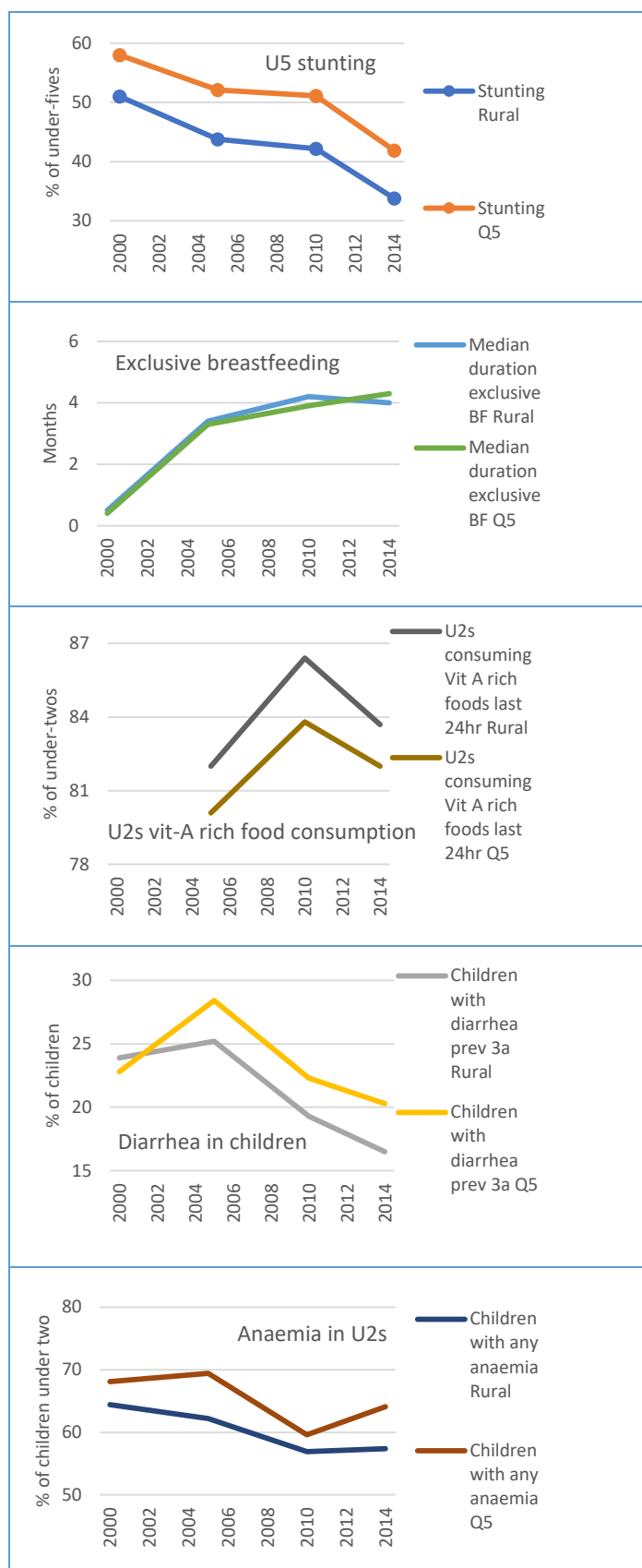
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Annex: More detail on context, & emerging results

Box A1. Stunting, breastfeeding, diarrhoea, anaemia, and vitamin-A rich food consumption among rural and poor groups, Cambodia: 2000 – 2014

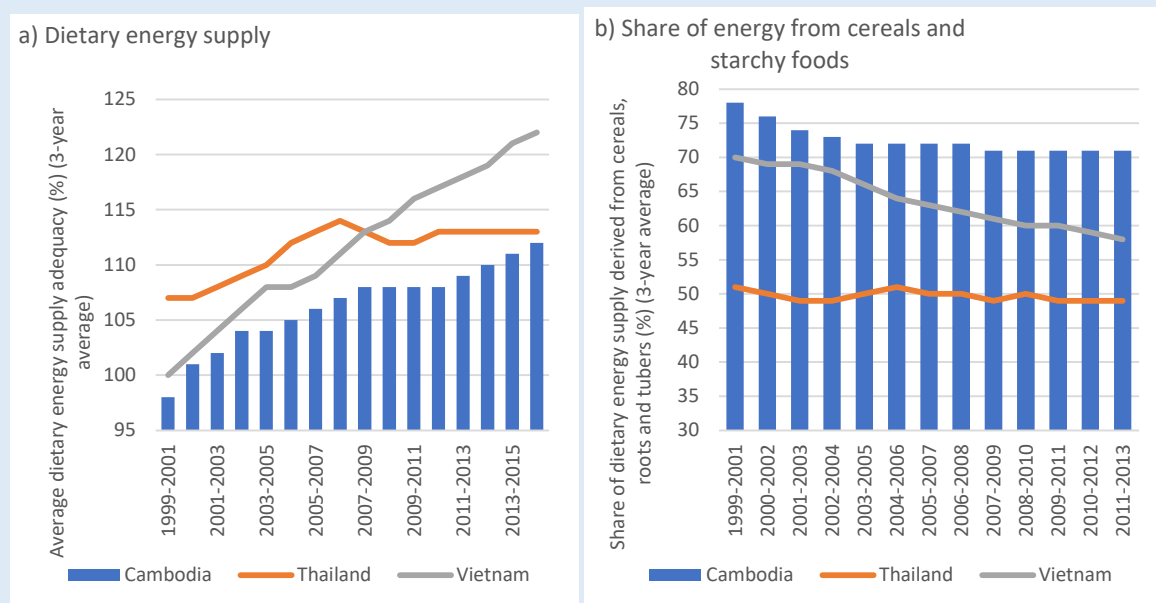


- **Under-five stunting**, an indicator of chronic malnutrition has come down sharply both in rural areas and among the poorest quintile. Despite this overall encouraging trend, levels remain high, with some 34% of rural under-fives stunted in 2014 and even higher – 42% among those in the poorest quintile.
- **Exclusive breastfeeding** has improved dramatically in rural areas and among the poorest quintile, with the median duration rising from under one month in 2000 to around 4 months by 2014.
- **Under-twos' consumption of vitamin-A rich foods** (data not available before 2005) has been relatively high since 2005; saw a small increase from 2005-2010 and a small decline from 2010-2014 among both groups.
- **Diarrhoea** in rural and poor children has been declining since 2005
- **Anaemia** in under-twos remains persistently high for both groups, though slight falls among the rural population are noted.

On this last point - there is a growing understanding that anaemia may not be as closely linked to dietary iron deficiency as previously assumed. In phase I of this project, CIFSRF's Fish on Farms, UBC and HKI's work on anaemia concluded the primary cause of anaemia in Cambodia is not dietary deficiencies, but hemoglobinopathies. This likely limits the impact of food-based interventions on anaemia status (CARD, 2016)

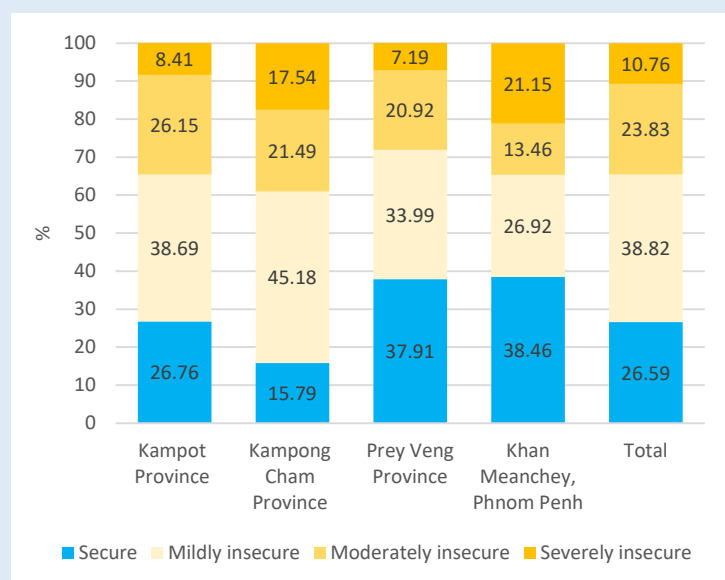
Source: Data from DHS Statcompiler. Surveys in 2000, 2005, 2010, and 2014
Note: Q5 = lowest wealth quintile

Figure A1. Energy supply and share from starchy foods – Cambodia, Thailand, Vietnam, since 2000



Source: Data from FAOSTAT

Figure A2. Depth and prevalence of food insecurity in FF4F areas



Map of Cambodia's provinces



Source: Table 22 in HKI, 2017. Map from Wikipedia

Note: Depth of food insecurity here is determined using the Household Food Insecurity Access Scale (HFIAS) of FANTA (the Food and Nutrition Technical Assistance programme of USAID), which is an adaptation of the approach used to estimate the prevalence of food insecurity in the US. Its methodology assumes the experience of food insecurity causes predictable reactions and responses that can be captured and quantified through a survey and summarized in a scale. (Coates et al., 2007)

Figure A3. Snapshots from the fieldwork

a) Focus group interview with home gardeners and CDRI



b) Part of a village model farm plot



c) Village Model Farmer demonstrates vermiculture



d) Two home gardeners, one with her youngest son she intends to breastfeed to age two



e) Grandmother with granddaughter who refuses enriched porridge



f) Enriched porridge recipe poster on display at a VMF house, Kampot province



g) Hatchery owner near a raising pond



h) Cassava for live fencing



i) Some of the vegetable produce from HKI home gardens



j) The ubiquitous Coca Cola



k) Good quality village road in Kampot Province



l) Intercropping with chives to deter insect pests



m) Washroom, toilet, rainwater storage jars, rural Kampot



n) Home gardener who has received food processing training; she makes and sells pickles



Table A1. Focus groups and Key Informant interviews held in September and October 2017

Stakeholder	Type of interview	Numbers participating	Notes
Village Model Farmers (VMFs)	Key informant interview	6	
Target farmers (TFs)	Focus groups of 5 or 6	25	
A food processing farmer	Key informant interview	1	Food processing training is not universally provided
A farmer having participated in marketing training	Key informant interview	1	Marketing training had only been rolled out on a pilot basis by the time of the fieldwork
Village Health Volunteers (VHV)	Key informant interview.	6	VHVs are pre-existing positions in the village (associated with a national programme). VHVs were also provided with training through this project. Some VHVs were also TFs
Village Chiefs (VC)	Key informant interview.	5	Interviewed for their knowledge of the impacts of the project. VCs were also involved in the VMF selection process. Some VCs are also VHVs.
Hatchery owners	Key informant interview. Visits to hatchery	2	One established in Phase 1, and one in Phase 2
Fish nursing pond owner	Key informant interview.	1	One established in Phase 2.
Farmers in target villages not enrolled in the programme	Focus groups of 5 or 6	18	To get a sense of project spill-over effects
Farmers in non-target villages	Focus groups of 5 or 6	11	To act as a control
Staff of HKI	Key informant interview.	3	Including the PI among others
Staff of partner NGOs	Key informant interview	3	Including PVT, ODOV, and VSG
Staff of the fisheries ministry	Key informant interviews	2	Deputy Director General of FIA and Deputy Director of Department of Aquaculture Development
Target farmers in phase I villages who graduated 3 years earlier	Focus groups of 5 or 6	15	To get a sense of likely sustainability.

Source: Authors

Box A2. In parallel – availability growing through time

Delinked from the project assessed, what else has been influencing availability of diverse food groups? General increases in availability through imports are reported, despite widespread concern about the quality of imports owing to chemicals and hormones used in their production. Varieties are also seen as less desirable in some cases: for instance, ‘red’ chickens from Vietnam which grow much faster than local chickens. Some trends in consumption are being driven by mistrust of imports, with respondents suggesting Vietnamese pork imports may be falling out of favour among young people who have started to opt for fish.

Significant improvements in road and transport infrastructure are also noted; in some villages changes in the last five years have been very significant. Respondents in one village visited noted their roads were largely impassable even in the dry season before; now they are serviceable throughout the wet season.

One factor affecting availability that has gone unchanged in the last five to ten years is the quality of seed markets. These remain poorly developed, with almost everyone who mentioned them noting their low confidence in quality and reliability. This goes for markets for plant seed as well as seed fish. Sometimes the seeds will not germinate at all, while fish fingerlings available in the market may not grow to be the species advertised.

In terms of agricultural training, some had received this, though many years before – from the government, from JICA, or from other NGOs. This was predominantly on the System of Rice Intensification (SRI), but some training on fish and chicken was also noted.

Not only has the availability of fresh foods like fruit, vegetables, and fish been growing for those interviewed: processed snacks and drinks are also. Some focus group participants felt the increased consumption of these snacks among children was contributing to their ill health. Five to ten years ago, there were no small kiosks and shops in the villages that now appear ubiquitous. Processed snacks, produced in Cambodia, are now relatively cheaply and readily available to children, at around 500 riel (less than 10p) each. While in the past children might have skipped breakfast or eaten leftovers from the night before, many are now buying breakfast from the kiosks that exist outside even village schools now.

Box A3. In parallel – big improvements in rural water and sanitation

What else has been influencing people’s health and nutrient absorption in the last five to ten years? Probably most notably,

and in line with improvements in people’s incomes and livelihoods more generally, there have been strong improvements in water and sanitation.

Where people might have sourced drinking water from ponds and surface sources even in the rainy season before, now almost everyone has rainwater collecting jars, and some use groundwater. Where this may have been only boiled before drinking, it is now often also filtered. Private water filter companies are now common, and sell in instalments which means water filters are affordable to many rural families.

Big improvements in toilets have also been seen – some villages noted around 80% of their households now have toilets, where very few had one five years before. The baseline survey of HKI reported 70% of adults using flush or pour toilets with septic tanks for defecation, with 30% using open fields/bushes. For children however, 55% used open fields/bushes, regardless of whether the family had a toilet.

Behaviour change communication messages to do with sanitation and hygiene have been seen by respondents on television (not clear who originated the messages), or through government programmes. Some have also heard messages from their children who receive them at school.

Finally, government health centres, promoted in villages by village chiefs and village health volunteers have been busy with health drives. In some places, education on handwashing with soap occurs through these programmes. Other programmes of note include vitamin supplementation – with a relatively new programme of high dose vitamin A supplementation for children two times a year on heavily publicised ‘Vitamin A days’ – immunisations, recognising and seeking treatment for serious diseases such as tuberculosis, care for pregnant and lactating women including child feeding education, and promoting medically assisted births. In one village respondents felt they didn’t need child nutrition training from HKI as they had already learned it from the health centre, through nutrition training that took place around three times a month

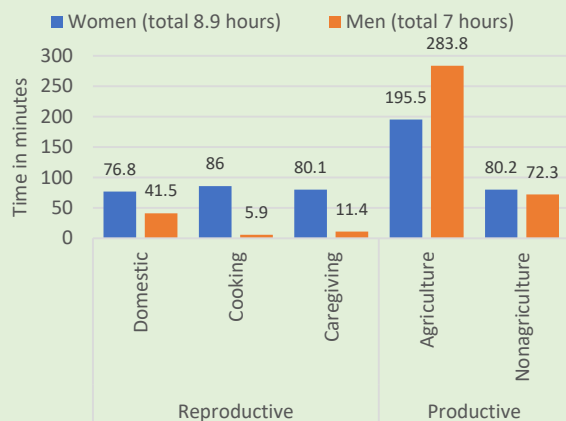
Box A4. In parallel – mixed picture for women and girls

Awareness of gender issues appears to be increasing. Most people in villages are aware of the term *Gender*, likely not the case five years ago. They are informed by the women’s ministry, as well as NGOs like HKI and the TV. The police are also running anti-domestic violence campaigns. In one of the control villages visited, this exercised respondents considerably, who felt it had been a highly visible programme and effective in reducing domestic violence in their village.

Research from phase I on women’s empowerment (using a social relations approach) suggested that owing to interactions

at the macro-economic level, government initiatives, and NGO interventions, the cultural environment in Cambodia had reached a state that was conducive to messages promoting gender equality, with even elders being receptive (Hillenbrand et al., 2014).

Figure A4.1 Average time spent on work activities in 24 hours, men and women, Cambodia 2012



Source: Table 3.2. in Komatsu et al., 2015; using data from Feed the Future surveys from 2012 looking at the past 24 hours

Most people maintained gender roles are not an issue for them, with women feeling they have rights in decision-making within households equal to their husbands. Serious problems that appear elsewhere in Asia, such as son preference, are not reported to be an issue for Cambodia any longer. Hillenbrand et al., (2014) quoted a woman describing outdated views on son preference as backward:

“Before, they said that having a daughter is like a having a pot of fish paste at home, but having a son is like having a piece of gold. If it is dropped in mud, it is still gold and has the same quality. But for the woman, she can drop from a ten karat gold to eight karat if she made a mistake. In the past, they always placed the man higher than women because they didn’t know any better.”

Nonetheless, gendered roles persist, with women continuing to shoulder the large share of domestic and child-work (Figure A5.1). Another trend appears to be more young or teenage girls going out of villages to work than before – leaving school for factory work. After marriage, women often leave work outside villages and return to work on farms (at least two recent cases like this were observed in the field), while their husbands are more likely to work outside the villages.

Discrimination against women is generally seen to be shifting. A Cambodian idiom; ‘Women cannot do anything, they have to do the housework’ is increasingly seen as inaccurate. Where women might have thought five or ten years ago it wasn’t

possible to join commune councils, this is no longer the case. In one village visited in Kampot, women were on the commune council, while in another the deputy village chief was a woman.

Research in the first phase highlighted some shifting gender norms, with men and women welcoming modern dress styles, feeling traditional dress codes and imperatives for women to walk slowly or speak softly were impractical and out of tune with modern lifestyles where women also earned incomes (Hillenbrand et al, 2014). Some opinions recorded highlight change:

“Women can go far away from home now to make an income. The way of speaking has also changed. We don’t speak as softly anymore ... We also need to know how to talk back with reason to other people. And we also walk faster now, because we need to catch up with other people. If they walk this way, we have to walk this way also.”

“When we are home, we get bored, we also need to [visit the neighbours to] discuss ways to make money. Being patient is also hard to do because if the husband keeps on creating conflict, like when he is drunk and angry ... then we need to fight back.”

Other notable changes in family life include shifts towards nuclear families; where people in the past tended to live with extended family, a more common trend for newlyweds now is to buy land in their parents’ village and set up a new household.

Finally, in terms of changes for how women’s time is spent, electricity, cleaner water, and better transportation are time savers, with likely disproportionately strong impacts on women who shoulder the bulk of domestic work. Some modern technologies like rice cookers are even finding their way to wealthier villagers; one woman interviewed, with a husband working in South Korea, had purchased a rice cooker that was saving her time. In agriculture, respondents also mentioned trends towards more use of tractors with fewer families relying on animal traction than five years ago.