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AGRICULTURE FOR NUTRITION AND HEALTH PRE-PROPOSAL FOR PHASE 2 (2017-2022)



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Abbreviations and Acronyms

A4NH	CGIAR Research Program on Agriculture for Nutrition and Health
ACIAR	Australian Center for International Agricultural Research
AFS-CRPs	Agri-Food Systems - CGIAR Research Programs
AMR	Antimicrobial Resistance
ANLP	African Nutrition Leadership Programme
APTECA	Aflatoxin Proficiency Testing for East and Central Africa
ARS	Agricultural Research Services
ASF	Animal Source Foods
ATONU	Improving Nutrition Outcomes through Optimized Agricultural Investments
AU	African Union
AU-IBAR	African Union Inter-African Bureau for Animal Resources
BCC	Behavior Change Communication
BMGF	The Bill and Melinda Gates Foundation
CAADP	Comprehensive Africa Agriculture Development Program
CCAFS	CRP on Climate Change, Agriculture and Food Security
CCEE	CRP Commissioned External Evaluation
CCT	Conditional Cash Transfer
CIP	International Potato Center
CIPIP	Convergent Innovation and Pulse Innovation Partners
COMESA	Common Market for Eastern and Southern Africa
CORAF	Conseil ouest et centre africain pour la recherche et le développement agricoles
CRP	CGIAR Research Program
CRS	Catholic Relief Services
CSRS	Centre Suisse de Recherches Scientifiques
CTA	Technical Centre for Agricultural and Rural Cooperation
DDG	Deputy Director General
DFATD	Department of Foreign Affairs, Trade and Development (Canada)
DFID	Department for International Development (U.K.)
DG	Director General
EAC	East African Community
ECD	Early Child Development
ECOWAS	Economic Community of West African States
ERC	European Research Council
EU	European Union
EVIDENT	Evidence-informed Decision-making in Nutrition and Health
FANRPAN	Food, Agriculture and Natural Resources Policy Analysis Network
FANTA	Food and Nutrition Technical Assistance
FAO	Food and Agriculture Organization of the United Nations
FBD	Foodborne Disease

FERG	Foodborne Diseases Burden Epidemiology Reference Group
FIPS	Farm Input Promotions Africa
FTH	Feed The Hungry
GAIN	Global Alliance for Improved Nutrition
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GNIE	Gender-Nutrition Idea Exchange
GNR	Global Nutrition Report
GSMA	Groupe Speciale Mobile Association
HANCI	Hunger and Nutrition Commitment Index
HKI	Helen Keller International
IARC	International Agency for Research on Cancer
ICN2	The 2 nd International Conference on Nutrition
ICRISAT	International Crop Research Institute for the Semi-Arid Tropics
I-CRPs	Integrative-CGIAR Research Programs
IDOs	Intermediate Development Outcomes
IDS	Institute of Development Studies
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
IMMANA	Innovative Methods and Metrics for Agriculture and Nutrition Actions
IPES-Food	International Panel of Experts on Sustainable Food Systems
IPGs	International Public Goods
IRD	Institut de Recherche pour le Développement
ISC	Independent Steering Committee
ISPC	Independent Science and Partnership Council
LAC	Latin America and the Caribbean
LANEA	Leveraging Agriculture for Nutrition in East Africa
LANSAs	Leveraging Agriculture for Nutrition in South Asia
LCIRAH	Leverhulme Centre for Integrative Research on Agriculture and Health
LMIC	Low- and middle-income countries
LSHTM	London School of Hygiene and Tropical Medicine
MLA	Monitoring, Learning and Action
MNC	Multinational Corporations
MRC	Medical Research Council
NARS	National Agricultural Research System
NCDs	Non-Communicable Diseases
NEPAD	New Partnership for Africa's Development
NGOs	Non-Governmental Organizations
OIE	World Organization for Animal Health
PACA	Partnership for Aflatoxin Control in Africa
PEPFAR	United States' President's Emergency Plan for AIDS Relief

PHFI	Public Health Foundation of India
PIM	CRP on Policies, Institutions and Markets
PM2A	Preventing Malnutrition in Children under 2 Years of Age
PMC	Planning and Management Committee
POSHAN	Partnerships and Opportunities for Strengthening and Harmonizing Actions on Nutrition in India
PPP	Public-private platforms
PROGRESA	Program de Educación, Salud y Alimentación
R4D	Results for Development
R&D	Research and Development
RCT	Randomized Controlled Trial
REACH	Renewed Efforts Against Child Hunger and undernutrition
ReSAKSS	Regional Strategic Analysis and Knowledge Support Systems
RTB	CRP on Roots, Tubers and Bananas
RUFORUM	Regional Universities Forum for Capacity Building in Agriculture
SACIDS	Southern Africa Center for Infectious Disease
SADAC	Southern Africa Development Community
SGA	Strategic Gender Assessment
SLOs	System Level Outcomes
SMEs	Small and Medium Enterprises
SPRING	Strengthening, Partnership Results and Innovations Globally
SRF	Strategy and Results Framework
SUN	Scaling up Nutrition
TANGO	Technical Assistance to NGOs
TOC	Theory of Change
UN	United Nations
UNICEF	United Nations International Children's Emergency Fund
USDA	U.S. Department of Agriculture
VSF	Vétérinaires Sans Frontières
WASH	Water, Sanitation and Hygiene
WEAI	Women's Empowerment in Agriculture Index
WEF	World Economic Forum
WFP	World Food Program
WHO	World Health Organization
WLE	CRP on Water, Land, and Ecosystems
WUR	Wageningen University and Research Centre

Executive Summary

The CGIAR Research Program (CRP) on Agriculture for Nutrition and Health (A4NH) responds to the global challenge of improving food security, nutrition, and health. CGIAR has a long legacy of building global food security, but ensuring consumers can access enough healthy, affordable, and safe food requires a perspective that encompasses far more than agricultural productivity. A4NH has built on prior work to accelerate progress in improving and enhancing synergies between agriculture, nutrition, and health. In Phase II, A4NH will provide knowledge and evidence for nutrition- and health-sensitive agriculture solutions and will assess how to deliver solutions for improved outcomes at scale through a portfolio of six flagships: **Biofortification, Food Safety, Food Systems for Healthier Diets, Improving Human Health, Integrated Programs to Improve Nutrition, and Supporting Country Outcomes through Research on Enabling Environments**. In addition to supporting gender research across the flagships, the Gender, Equity and Empowerment unit will lead cross-cutting research on strategic issues relevant to the overall program, such as building on the use of the Women's Empowerment in Agriculture Index in the context of impact evaluations. A4NH will have an integrative and convening role in CGIAR in three ways: (1) leveraging the breeding, agricultural production, and value chain research in agri-food system CRPs (AFS-CRPs); (2) coordinating with the integrative CRPs (I-CRPs) to align nutrition and health outcomes with broader agri-food and economic policy; and (3) convening relationships between CGIAR and global and regional nutrition and health communities. A4NH will continue responding to increasing demands from countries and investors to support multi-sectoral, country-led, nutrition and health impacts at scale. These changes will enable A4NH to contribute more effectively to global efforts that shape agri-food systems for better nutrition and health.

Biofortification builds on the strong track record of the HarvestPlus program. During Phase I of A4NH, HarvestPlus transitioned from development to delivery phase. During Phase II, the flagship will deliver outcomes at scale (reaching 20 million farm households by 2020) and conduct research to fill key evidence gaps and to learn lessons from delivery for future research and scaling. As part of building an enabling environment for biofortification in the future, the flagship will engage in policy analysis and advocacy at national and international levels and build capacity of key research and development partners to mainstream biofortification in their research and programming.

Food safety is moving rapidly up the development agenda as major new studies reveal its severely underestimated importance. Solutions that are effective in developed countries or in commercial food systems have not translated well to informal or formalizing markets, highlighting an urgent need for technical solutions to current food safety challenges, and broader policy and regulatory approaches to manage food safety risks in dynamic, developing market contexts. The flagship on **Food Safety** addresses these issues through targeted research on specific food safety issues as well as by generating evidence on what approaches are likely to work and how an enabling environment for innovative approaches to food safety can be achieved and sustained. The high priority food safety issues for Phase II, based on the extent of the health problem and CGIAR comparative advantage in solutions, are biological contamination of perishable products and aflatoxins in staple crops. The flagship will scale-up successfully piloted solutions alongside rigorous monitoring and impact evaluations to increase understanding of the incentives, capacity, and enabling policy environment required for successful delivery at scale. At the same time, it will continue to generate evidence on food safety risks, and their assessment, communication, and management. In close collaboration with the CRPs on Livestock, Fish, and Grain Legumes, this flagship will reach tens of millions of consumers, millions of farmers, and thousands of market agents working in priority countries in Africa and Asia.

Food Systems for Healthier Diets aims to contribute to the goal of healthier diets for poor and vulnerable populations through identifying and enabling interventions and innovations by private, public, and civil society actors in national and sub-national food systems. Food systems will be analyzed from a diet and nutrition outcome perspective, focused on both by filling gaps and by reducing excesses in unhealthy diet components. The flagship builds on research on dietary assessment and methods for improving nutrition through value chains

and places these in a broader agricultural, environmental, social, economic and political decisionmaking framework. The flagship includes a new partnership arrangement with Wageningen University and Research Center to implement this research and links to food system actors through a variety of platforms. In the long term, progress will be evaluated through improvements in diets, particularly for women, children, and vulnerable populations. Near-term progress will be measured through greater knowledge, awareness and systematic attention to diets and dietary transitions by researchers in other CRPs and partner research organizations, by strategic partners from the private sector and civil society, by policymakers, and consumers in target countries.

Improving Human Health will assess and manage health risks created by agriculture in order to improve human health and agricultural productivity. Research will contribute to innovation in three main areas: diseases in agricultural landscapes, emerging and neglected zoonotic diseases, and global challenges on agriculture and health. In Phase II, we propose a new joint partnership arrangement co-convened by the London School of Hygiene and Tropical Medicine and the International Livestock Research Institute, thus bridging agriculture and public health research to identify key opportunities for integrated actions that improve human health. Priorities for cross-sectoral research include health effects of ecosystem changes (such as large scale agricultural water use), shared disease risks and their control between people and animals, and opportunities to increase health benefits by co-locating and aligning health and agriculture interventions. We also note some key emerging challenges, such as antimicrobial resistance and chemical resistance, in which coordinated health and agriculture actions are critical.

Integrated Programs to Improve Nutrition responds to strong demand from governments, donors and program implementers for evidence on the impact of development programs that integrate nutrition and health components with elements from other sectors such as agriculture, social protection, gender, or water and sanitation on nutritionally-vulnerable populations such as mothers and young children. Integrated, multisectoral programs are essential to meeting global nutrition targets, yet to date there is little evidence on what types of programs work, in what contexts, and at what cost. Flagship researchers work in close collaboration with program implementers to ensure the quality of the evaluations as well as to learn about how programs work, what the implementation challenges are, and how program designs can be improved and scaled up. In addition to providing evidence and building capacity among investors and implementers, this flagship also produces data, methods, and tools that other researchers and evaluators can use to continue to build the evidence base on program effectiveness. Areas of expansion for Phase II include a greater focus on children beyond the first 1000 days and on adolescent girls, a broadening of the scope of outcomes and impact indicators (e.g. early child development outcomes, indicators of overweight, obesity and non-communicable diseases) and a focus on programming through a broader range of implementers and in urban as well as rural areas where relevant.

The aim of **Supporting Country Outcomes through Research on Enabling Environments** is to identify, exploit and enhance synergies between agriculture, nutrition, and health policy processes and to promote enabling cross-sectoral policy and investment environments. This will be achieved through a combination of strategic, action-oriented research – guided by a conceptual framework and carried out in target countries, with global and regional organizations – and through coordinated support to other flagships and CRPs in areas where a multisectoral lens could add value to their sectoral policy work. By contributing to improved national enabling environments, the work of this flagship enhances the impacts and sustainability of many investments of A4NH and other research and development organizations in the target countries, resulting in a measurable shift in current trends for key nutrition, health and equity indicators.

Building on the success of investors' interest in the first phase of A4NH and the new demands of the CGIAR Strategy and Results Framework, the program proposes an expanded budget scenario with ambitious targets and outcomes described in the pre-proposal and detailed in Annex 1 of the Performance Indicator Matrix.

Summary Narrative

IN BRIEF

*The CGIAR Research Program (CRP) on Agriculture for Nutrition and Health (A4NH) responds to the global challenge of improving food security, nutrition, and health. CGIAR has a long legacy of building global food security, but ensuring consumers can access enough healthy, affordable, and safe food requires a perspective that encompasses far more than agricultural productivity. A4NH has built on prior work to accelerate progress in improving and enhancing synergies between agriculture, nutrition, and health. In Phase II, A4NH will provide knowledge and evidence for nutrition- and health-sensitive agriculture solutions and will assess how to deliver solutions for improved outcomes at scale through a portfolio of six flagships: **Biofortification, Food Safety, Food Systems for Healthier Diets, Improving Human Health, Integrated Programs to Improve Nutrition, and Supporting Country Outcomes through Research on Enabling Environments**. A4NH's integrative and convening role will include: (1) leveraging the breeding, agricultural production, and value chain research in agri-food system CRPs (AFS-CRPs); (2) coordinating with the integrative CRPs (I-CRPs) to align nutrition and health outcomes with broader agri-food and economic policy; and (3) convening relationships between CGIAR and global and regional nutrition and health communities. A4NH will continue responding to increasing demands from countries and investors to support multisectoral, country-led, nutrition and health impacts at scale. These changes will enable A4NH to contribute more effectively to global efforts that shape agri-food systems for better nutrition and health.*

STRATEGIC RELEVANCE

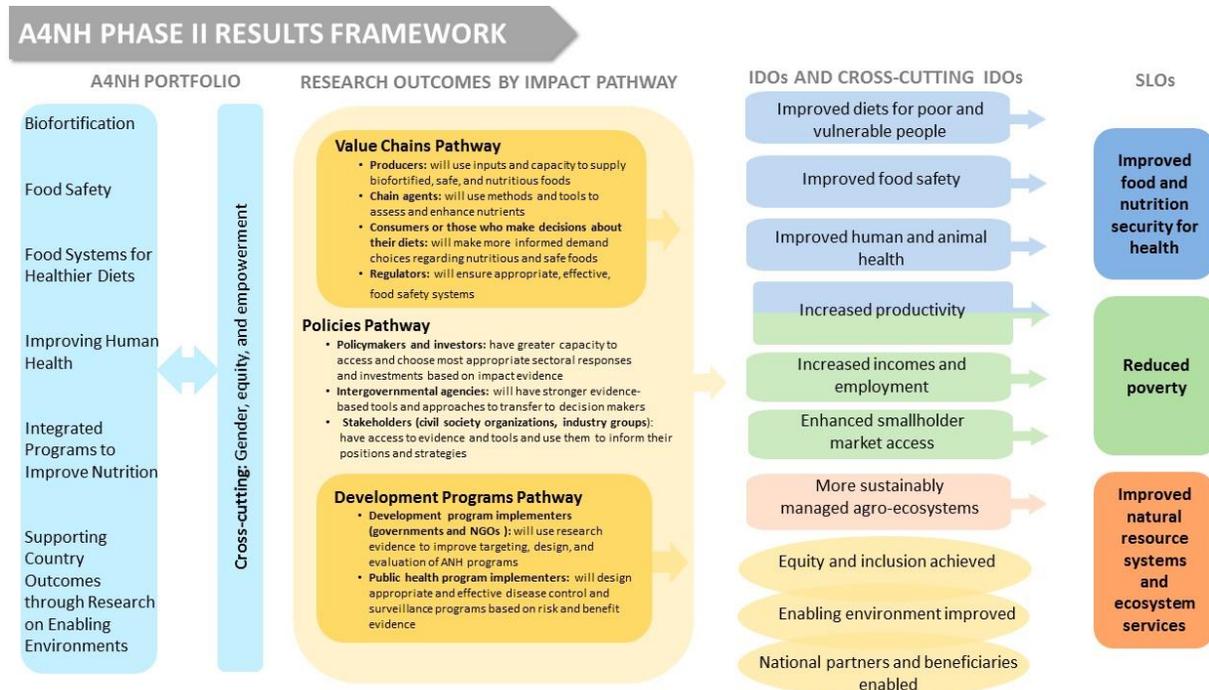
The Challenge. Increasing the productivity of crops and livestock may increase food supply, but does it reduce undernutrition? According to conventional wisdom, agricultural productivity leads to increases in rural incomes and lower food costs, enabling both net producing and net consuming households to increase their consumption of food and improve their nutrition. Unfortunately, this model has not resulted in better nutrition or improved health for all, and needs to be modified, especially to benefit the most vulnerable. The causal relationships between agriculture, food systems (processing, storage, marketing), and consumers are complex and evolving rapidly. Persistent undernutrition as well as emerging concerns with overweight and obesity are now high on the global agenda. There are rising concerns that dietary patterns, even among middle-income households, are shifting in ways that reduce the diversity, nutritional quality, and healthiness of diets. Aligned health interventions to address diarrhea, intestinal worms, the availability of clean water, women's knowledge and empowerment, social protection, and food are all necessary in achieving sustainable nutrition and health goals, such as the dramatic reduction in child stunting.

A4NH has made a solid start on this research agenda in Phase I, building on important pre-CRP work in individual programs and Centers and raising awareness across the CGIAR. In Phase II, we will focus on new demands: assuring food quality and safety; increasing the diversity and nutritional quality of diets, especially in poor households; reducing health risks associated with intensified agricultural production; and supporting the design of effective policies and program approaches to improve the nutrition and health outcomes of agriculture and food systems development efforts. As emphasized in the new CGIAR Strategy and Results Framework (SRF), growing global populations, rapid urbanization, and the threat of climate change, all require transformation of agri-food systems that are effective in making safe, diverse, and nutritionally-adequate diets available in all countries, especially for poor, under-nourished populations in South Asia and Africa. Food system innovations are required across commodities, linking policies, programs, technologies, and systems management. Private sector participants drive and dominate agri-food systems – from farmers, to commodity processors, to retailers—and they must be more effectively engaged to identify opportunities, as well as constraints, to healthier diets. Gender has and will be integrated throughout the A4NH research agenda, recognizing the different roles, responsibilities, and decisions women and men make in agriculture, food systems, and childcare and feeding. The complexity of the A4NH Phase II Results Framework (**Figure 1**) reflects the breadth of challenges that agri-food systems face in their ambitions to contribute to improving

nutrition and health, and the ways in which A4NH research can help inform and shape responses to these challenges at individual, household, community, national, and global levels.

A4NH’s contribution to the CGIAR Strategy and Results Framework. A4NH contributes to all four of the Intermediate Development Outcomes (IDOs) under the System Level Outcome (SLO), of *improved food and nutrition security for health* as well as to specific IDOs under SLO1 on *reduced poverty* and, together with the CRP on Water, Land, and Ecosystems (WLE), specific IDOs under SLO3 on *improved natural resource management and ecosystem services*.

Figure 1. A4NH Phase II Results Framework



The cross-cutting issues of *gender and youth* as well as *policies and institutions* are central to the Phase I [A4NH Results Framework](#). Our Phase II *youth* strategy will include research on employment opportunities in agricultural value chains and food systems as well as nutrition and health initiatives targeted at adolescent girls, their households, and communities. *Capacity development* is a critical gap in accelerating agriculture, nutrition, and health outcomes and impacts. In addition to capacity in research, there are capacity needs among the actors along each of A4NH’s three main types of impact pathways as outlined in the draft [A4NH Capacity Development Strategy](#). We will collaborate with the CRP on Climate Change (CCAFS) to address the fourth cross-cutting issue of *climate change*, with special emphasis on healthy, sustainable food systems and on creating an enabling environment. The proposed Phase II agenda fits in the proposed Sustainable Development Goals (SDGs) framework, which is described in more detail [here](#).

Evidence of demand for A4NH research. Nutrition is at an historic high on the global policy agenda. Through the [Scaling up Nutrition \(SUN\)](#) movement, donors and national leaders from 55 countries have made commitments to reducing malnutrition. Agriculture and food systems play key roles in the solution. In Africa, there has been an explicit recognition of the important role of agriculture, as evidenced by the food and nutrition security pillar of the African Union’s [Comprehensive Africa Agriculture Development Programme \(CAADP\)](#) which represents 20 of the 34 countries with the highest burden of malnutrition. These high-level commitments bring demands for evidence of what works and what can be cost-effectively scaled out.

Despite close linkages between agriculture and health, and between health and nutrition outcomes, the health sector is not as closely aligned to agriculture development as nutrition currently is. Generating evidence and raising awareness of the potential for agriculture to contribute to improved health outcomes is much more emphasized in the new SRF. Collaboration between the agriculture and health sectors, not only on food safety issues, but also on other emerging global health threats, such as antimicrobial resistance (AMR), vector and pest resistance, and misuse of chemicals, can help meet the growing demand for better evidence and more effective, sustainable solutions.

As a reflection of demand for A4NH research, our bilateral funds have grown dramatically from roughly \$30 million in 2012 to over \$80 million in 2015. Much of this has been in our proven research areas, such as **Biofortification, Integrated Programs to Improve Nutrition, Supporting Country Outcomes, and Food Safety**. Our Phase II portfolio also addresses demands from target countries for solutions that are not yet identified, but urgently needed. Given the complexity of the challenges, the solutions will likely lie outside the traditional areas of CGIAR expertise, requiring new partnerships and investment to build capacity and networks among researchers and other stakeholders. Countries are looking for comprehensive food system solutions, including options for leveraging private sector investments that not only combat undernutrition, but also address food safety concerns in domestic markets and mitigate the growing problem of overweight and obesity. The flagship on **Food Systems for Healthier Diets** will engage directly with these issues. Countries and donors are also placing high priority on preventing and treating infectious disease, an area with minimal effective collaboration between public health and agricultural researchers to date. The flagship on **Improving Human Health**, co-developed and led by agricultural and public health researchers, will address this issue, explicitly addressing constraints that have limited collaboration in the past.

Comparative advantage of CGIAR and A4NH. In Phase I, A4NH research provided knowledge and evidence on pathways for how agriculture can contribute to better nutrition outcomes (Gillespie, Harris, & Kadiyala, 2012a). The framework clarified where CGIAR has a clear comparative advantage in addressing nutrition and health issues. For example, there is a need to increase availability and access to nutritious foods for which CGIAR has a global or regional mandate (e.g. legumes, fish, milk, and meat) and to ensure that all agricultural research benefits women without inadvertently disempowering or overburdening them. In other areas, CGIAR will need to define its role, for example, in increasing production and consumption of fruits and vegetables. This is not a traditional area of focus for CGIAR, but there is technical capacity in specific Centers on productivity and marketing issues, which, in partnership with others, could address this fundamental dietary diversity gap. Many of the pathways from agriculture to nutrition and health are context-specific, requiring local knowledge, presence on the ground, and multi-disciplinary research capacity. The fact that CGIAR works in partnership with a range of other research and development actors in developed and developing countries, and that it plays an important role in capacity building, will also contribute to changing knowledge and practice in the broader agricultural research for development system.

In Phase I, A4NH learned valuable lessons on how to be more efficient in leveraging the broader CGIAR research capacity. We highlight three examples that will be built upon in Phase II. The first relates to impact orientation and research quality. A4NH convened and supported some of the most productive and influential research groups in CGIAR that are unique in their combination of skills (e.g., crop breeding, impact evaluation, risk analysis) and their focus on often overlooked high-priority topics (e.g., food safety in informal markets). Research is guided by ToCs that focus on evidence and capacity gaps, and identify strategic partnerships that make outcomes more likely. Secondly, within CGIAR, A4NH has a recognized role in providing guidance on designing and assessing agricultural research that leads to improved nutrition and health outcomes *and* is gender-responsive. In Phase II, A4NH will expand support to build capacity and provide tools, frameworks, and evidence to improve the quality and impact of agriculture, nutrition, and health-related research in other CRPs through a community of practice (CoP), and other convening initiatives

hosted by the flagships on **Food Systems for Healthier Diets** and **Supporting Country Outcomes**. Finally, building on experience and the recommendations of our external evaluation, A4NH will engage differently with Centers and CRPs in Phase II. We will have a smaller number of core (Tier 1) partner Centers and engage with other (Tier 2) Centers via CRPs and through specific docking platforms to jointly meet IDO and sub-IDOs.

PLANS FOR PHASE II

Phase II builds on successes and responds to increased demand and new research and partnership opportunities. The two largest flagships, **Biofortification** and **Integrated Programs to Improve Nutrition**, made important progress delivering international public goods (IPGs) and have refined their ToCs to better contribute to development outcomes in Phase II, and to document and learn from experience. While **Biofortification** still has important nutrition efficacy and effectiveness research to do, the main research questions for Phase II are not around whether biofortification works, but rather, how it can work at scale for specific crops in specific countries. Innovative research in the delivery phase focuses on identifying and addressing technical, social (including gender), and institutional constraints associated with reaching hundreds of millions of micronutrient deficient women and children. Rarely have agricultural researchers, especially in CGIAR, focused on delivery science,¹ and the HarvestPlus experience represents an important opportunity to generate lessons and methods with potential application well beyond biofortification. **Integrated Programs to Improve Nutrition** includes a solid portfolio of evaluations that will help answer key questions about program impacts and cost effectiveness in Phase II. Methods and findings from impact and process evaluations will have an important influence on future directions of research and investment in this area, as past research did on the current agenda (Gillespie, Haddad, Mannar, Menon, & Nisbett, 2013; Ruel & Alderman, 2013). Informed by an [external assessment](#) commissioned by A4NH to better understand how program implementers access and use evaluation findings, this flagship will increase its investment in research translation² by improving the way it communicates the operational implications of research findings for implementers and investors.

In Phase I, food safety and cross-sector policy processes were research clusters, but will become individual flagships in Phase II. Both build on significant progress and respond directly to new priorities in the SRF: the IDO on *improved food safety* and the cross-cutting IDO on *enabling environment improved*. The flagship on **Food Safety** builds on Phase I achievements related to cross-Center (IFPRI, ILRI, IITA, ICRISAT) and cross-CRP (Livestock and Fish and Grain Legumes) collaboration, which quantified the global burden of food safety and defined an impact-oriented approach to it in markets for staples and perishables through appropriate technologies, market innovations, and policies, and regulations. While there are proven strategies for managing food safety in commercial food systems, these are often inappropriate and ineffective in informal markets, where the majority of poor people buy and sell food – especially nutrient-rich perishables like meat, fish, milk, and vegetables. This flagship will generate research on technological and institutional solutions and appropriate policy and regulatory options that align public health goals with country priorities to ensure that food is both safe and equitable for the poor. The flagship on **Supporting Country Outcomes through Research on Enabling Environments** builds on Phase I research on creating and sustaining enabling environments that deliver impact at scale (Gillespie et al., 2013; Gillespie, Menon, & Kennedy, 2015; Gillespie, van den Bold, Hodge, & Herforth, 2015; Nisbett, Gillespie, Haddad, & Harris, 2014; van den Bold et al., 2015) as well as involvement with the SUN movement, the Africa Union’s [CAADP investment planning process](#), and the [2014 Global Nutrition Report](#). It also responds to an opportunity identified in Phase I to provide more guidance to other flagships and CRPs on cross-sectoral policy process analysis and engagement, and to play a greater role in representing CGIAR in national and regional nutrition and health policy processes.

¹ Delivery science refers to research on how innovations are spread and go to scale. It has more to do with answering questions related to *how* to deliver solutions or innovations, rather than *what* solutions are needed.

² Research translation refers to synthesizing research evidence into advice or guidance for end users or actors along the impact pathway.

A4NH proposes two innovative new flagships in Phase II that respond to the new SRF, and are informed by Phase I lessons and findings from the A4NH external evaluation. The flagship on **Food Systems for Healthier Diets** responds to concerns about global diet trends and demands from countries for systemic solutions that address problems, such as food insecurity, undernutrition, and overnutrition. By focusing on how food systems influence diets, A4NH will engage with AFS-CRPs and complement the sustainable food systems approaches of CCAFS and WLE. Since this area lies outside CGIAR's traditional expertise, A4NH has invited Wageningen University and Research Centre (Wageningen UR) to lead this flagship. In doing so, this flagship will play an important role in building capacity within the CGIAR in food systems approaches and in integrating diet, nutrition, and gender into the work of other CRPs. This approach draws on past success, including research outputs, such as the framework on value chains for nutrition (Gelli et al., 2015), as well as mechanisms for strengthening integration of nutrition into other CRPs (e.g. work with systems CRPs around nutrition-sensitive landscapes, small-grants scheme, and the gender-nutrition CoP). In Phase II, this flagship will host a CoP on agriculture-nutrition-health research to support and add value to work of other CRPs, especially AFS-CRPs, to help them achieve their nutrition- and health- related IDOs. The CoP will draw on expertise from across A4NH and partners to strengthen capacity through joint, targeted research on priority issues. Phase I included limited research on human health risks associated with agricultural production. Starting in the Extension Phase, A4NH began engaging with a select group of public health research institutes and donors to explore (and ultimately confirm) interest in partnering on a new flagship on **Improving Human Health**. We conducted a [series of regional consultations](#) with public health partners, which culminated in a consultation in London in June 2015. To bridge agriculture and public health research and facilitate integrated actions to improve human health, A4NH has invited the London School of Hygiene and Tropical Medicine (LSHTM) to co-lead this flagship with the International Livestock Research Institute (ILRI). Research priorities include health effects of ecosystem changes (e.g. large-scale agricultural water use), shared disease risks and their control between people and animals, and opportunities to increase health benefits, in addition to emerging challenges, such as antimicrobial resistance and chemical resistance, requiring coordinated health and agriculture actions.

Each of the proposed flagships contributes to the IDOs under *improved food and nutrition for health*, but they do so in different ways—whether by developing and delivering specific agricultural solutions with potential to go to scale, or by improving the pathways through which agricultural research contributes to development outcomes. While each flagship has distinct research questions, impact pathways, and partnerships, there are clear areas where cross-flagship collaboration can enhance efficiency and effectiveness. (More information is in the Annex 3 on A4NH Strategic Links to other CRPs, Coordination, and Country Collaboration).

Working with other CRPs. A4NH proposes three types of strategic linkages with other CRPs: **docking stations** are areas where A4NH and other CRPs conduct joint or closely aligned research to help each CRP achieve its outcomes, through a **community of practice**, we support and add value to work of other CRPs to help them achieve their IDOs, and through a **convening** role, we represent other CRPs in nutrition and health policy processes. More details on what informed the design of these linkages and how we will use them to guide collaboration can be found in Annex 3 on A4NH's Strategic Links to other CRPs.

Target countries within regions. A4NH remains focused on research that targets vulnerable populations in Africa and Asia. During the Extension Phase, a list of focus countries emerged where A4NH expects to achieve research outcomes at scale based on the stage of research, strength of partnerships, and A4NH resource capacity. There are nine countries – Bangladesh, Ethiopia, India, Kenya, Nigeria, Senegal, Tanzania, Vietnam, and Zambia – where at least four of the proposed flagships will work. Overall, A4NH has research in 33 countries, which is described by flagship in Annex 3 on A4NH Strategic Links to other CRPs. The evolving CGIAR country priority list fits well with A4NH's current and planned activities.

Delivering International Public Goods. Some examples of our most influential IPGs from Phase I on biofortification were the [Biofortification Prioritization Index](#), the [2nd Global Conference on Biofortification](#) (and [resulting commitments](#)), progress engaging with Codex Alimentarius, and the World Health Organization (WHO) – Food and Agriculture Organization of the United Nations (FAO) evidence review on biofortification. For food safety, the [Food Safety and Informal Markets book](#) and technical support to PACA’s overall Africa-wide aflatoxin control strategy both highlighted often-neglected issues of incentives, risk, and capacity in informal markets and also provided tested technical innovations. The teams working on integrated programs and enabling environments led and/or made significant contributions to the [2013 Lancet Series on Maternal and Child Undernutrition](#), the [2014 Global Nutrition Report](#), a [Brussels Briefing](#) on ‘Improving nutrition through accountability, ownership, and partnerships,’ and the [2nd International Conference on Nutrition](#) (ICN2). The [Gender-Nutrition Idea Exchange](#) blog is reaching a wider community of researchers and practitioners working on gender and nutrition issues in agriculture.

What is the IPG potential in Phase II? We expect a number of meta-analyses and syntheses of evaluation results on impact and delivery. IPGs are also expected from new research areas, such as the flagship on Food Systems for Healthier Diets, which will characterize the drivers of diet change across a number of countries, increase understanding of food system transformation for improved health in target countries, and (with AFS-CRPs) create lessons on how to develop value chains for nutrition for a number of nutritious foods. Research from the flagship on Improving Human Health will fill important evidence gaps on key global issues, such as agriculture’s role in AMR, and provide important lessons on aligning public health and agricultural interventions to address the complex problems the poor face.

PATHWAYS TO ACHIEVING IMPACT

Our impact estimates reflect the different ways A4NH research activities contribute to outcomes (see Annex 2 Table of Target Beneficiaries and Countries). In some cases, we contribute directly to outcomes through our involvement in the technology development and delivery process. In some cases, we support development implementers with knowledge, technologies, and capacity that increase the effectiveness of their programming. In other cases, we support governments and donors with knowledge and capacity to create better enabling environments and estimates of impact are based on potential changes that would come from better informed, targeted, and implemented policies.

To date, A4NH has developed a results framework, six flagship-level impact pathways (Phase II flagships), and seven ToCs for key research areas. There are [three ToCs for HarvestPlus delivery work](#) (covering specific crop-country combinations); two ToCs for food safety ([aflatoxins](#) and [perishables](#)), one [ToC for uptake of research and evaluation results among NGOs](#), and one on [how research influences cross-sector policy processes](#). More information on current progress on and use of ToCs in A4NH can be found in the [updated ToCs overview](#). In Phase II, we will continue using, updating, and developing ToCs to manage and monitor our work to achieve impact at scale. Following the advice of our external evaluation, we will develop ToCs for our work to support other CRPs, for example through the agriculture, nutrition and health CoP.

PARTNERSHIPS AND CAPACITY DEVELOPMENT

Partnerships and capacity development are driven by the three impact pathways through which we expect A4NH to deliver results: value chains, programs, and policies. We will build upon and expand partnerships with value chain actors, program implementers, and policymakers and investors in Phase II to achieve impact. Reflecting the importance of partnerships, more than 30% of the total budget is expended by non-CGIAR partners. This is expected to increase as A4NH aims to scale up its work in Phase II. Our [Partnership Strategy for Phase II](#) describes the links between partners and capacity development, impact pathways, and ToCs.

A4NH core partners. In Phase II, we will plan for more central management and leadership roles filled by external partners. Core partners (Tier 1) will likely include four CGIAR Centers (Bioversity, CIAT, IITA, and ILRI)

and two global partners (Wageningen UR and LSHTM / Leverhulme Center for Integrative Research in Agriculture and Health (LCIRAH)). Core partners will be represented on the A4NH planning and management committee (PMC), will participate across more than one flagship, will commit to recruit and co-manage researchers, and will actively support CRP-level resource mobilization, communication, and advocacy. Strategic partners (Tier 2), will contribute largely to a single flagship or as key actors in partnerships. Strategic partnerships will be managed through clear agreements and contracts, but will not actively participate in A4NH management.

Building upon progress to date, key regional partners for joint research in our target regions of South Asia and Africa will include the Indian Institute of Management (several campuses); a number of agricultural, public health, veterinary, and nutrition departments of local universities in our target regions; and USAID's Feed the Future Innovation Lab activities in target countries. A4NH will engage as part of CGIAR coordination and integration mechanisms, as well as directly with national governments and NARS in our target regions and with other key regional partners. For example, HarvestPlus works closely with government-sponsored biofortification programs in India, China, and Brazil, and through the AgroSalud program, with a number of countries. A4NH will engage key agencies in implementing programs designed to improve nutrition and health through agriculture (e.g. BRAC, PACA, and Pradan, a self-help group in India). Key global partners for achieving outcomes at scale include the World Food Programme (WFP) and the International Fund for Agricultural Development (IFAD). Key global partners for linking research to inter-governmental actions include the Food and Agriculture Organization (FAO), World Health Organization (WHO), the United Nations Children's Fund (UNICEF), and the World Organization for Animal Health (OIE).

Regional initiatives. A4NH has a strong regional focus in Africa and South Asia, while research in other regions, such as Southeast Asia and Latin America, is limited to certain flagships. In Africa, we will engage a number of African Union entities and initiatives, such as the New Partnership for Africa's Development (NEPAD) and CAADP, PACA, and Inter-African Bureau for Animal Resources (IBAR); in addition to the Common Market for East and Southern Africa (COMESA), Economic Community of West African States (ECOWAS), Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles (CORAF), EAC, and other regional organizations. In Asia, we have strong partnerships through the Leveraging Agriculture for Nutrition in South Asia (LANSA) and Transform Nutrition programs, in addition to relationships with the South Asia Food and Nutrition Security Initiative (SAFANSI). We also belong to regional Ecohealth and One Health Initiatives. Across Asia and Africa, we actively engage countries and civil society through SUN.

Private sector. The private sector drives food system transformation and thus, delivers both positive and negative nutrition and health outcomes and impacts at scale. For low- and middle-income countries, our emphasis is on supporting improvements in small and medium enterprises (SMEs), including social enterprises. Two examples of such partnerships began in Phase I. The first was in the delivery of biofortified seeds and in the processing of biofortified products. The second was in support to SMEs through public-private platforms that include companies, business schools, and researchers. In Phase II, partnerships will deepen our contribution to what and how the private sector can improve nutrition and health outcomes and how public and private partnerships can be more effective. Our major strategy will be to add research value to actors that have comparative advantage in public-private partnerships for food solutions to improve nutrition and health. For Phase II, such platforms include the [Amsterdam Initiative against Malnutrition](#), the [Convergent Innovation Coalition](#) and [Pulse Innovation Platform](#) (both led by McGill University Business School); and the [GAIN Marketplace for Nutritious Foods](#). In more informal markets, we will expand partnerships with trader associations supported by business support enterprises.

Capacity development. In Phase II, A4NH will continue to co-invest in developing future research leaders with LCIRAH and the Innovative Methods and Metrics for Agriculture and Nutrition Actions (IMMANA) research initiative through the [Agriculture, Nutrition and Healthy Academy](#). We will support a number of

similar ongoing initiatives, such as the [African Nutrition Leadership Programme](#), the FANRPAN-coordinated Improving Nutrition Outcomes through Optimized Agricultural Investments ([ATONU](#)), the [EVIDENT network](#) that supports nutrition capacity in countries coordinated by the University of Antwerp, as well as relationships with African nutrition societies and regional agriculture-health research groups, such as [Afrique One](#) and the Southern Africa Centre for Infectious Disease Surveillance ([SACIDS](#)). Details on how A4NH plans to meet capacity development needs identified in the ToCs are described in our draft [Phase II Capacity Development Strategy](#).

LEADERSHIP, MANAGEMENT AND GOVERNANCE STRUCTURE AND PROPOSED ACTIVITIES

The lead Center for A4NH is the International Food Policy Research Institute (IFPRI). This choice reflects IFPRI's research excellence and global leadership in nutrition, and its demonstrated capacity to govern and manage A4NH in Phase I. A4NH's governance arrangements will follow [CGIAR principles](#) and practices recommended in the external evaluation of A4NH.

Independent Steering Committee (ISC). The composition of A4NH's current [Independent Advisory Committee \(IAC\)](#) fits the requirements of an Independent Steering Committee (ISC). In Phase II, it will take on a more active governance role by providing advice on strategic direction and priority-setting for the overall program, such as approval of the CRP's plan of work and budget, program evaluation plans, and strategies, as well as assessing the performance of the CRP Director. The CRP Director will become an ex-officio member, with an additional CGIAR and non-CGIAR institutional member. The ISC will report to the IFPRI Board annually. Potential conflicts between the governance role of the ISPC and the IFPRI Board will be managed and documented based on CGIAR guidance.

Planning and Management Committee. In Phase II, a larger PMC is proposed. We plan to enhance the role of core partners with four Tier 1 Centers and the two core partners represented at the Deputy Director General (DDG) or Program Director level. The six flagship leaders, as well as Hazel Malapit (gender research coordinator), Agnes Quisumbing (senior gender/equity research fellow), and Nancy Johnson, who currently leads A4NH's evaluation, will be members. The PMC will meet face-to-face twice annually and virtually each month. Individual flagships will have their own management groups. For the four flagships with continuing leadership, management will build on past systems. For the two flagships with external leaders (Wageningen UR) or co-leaders (LSHTM), the flagship leader will have a reporting relationship to the lead institution(s) and the CRP Director. Flagship leaders will convene flagship management groups that will include key researchers from different institutions.

Program Management Unit (PMU). The PMU has two main functions: to support flagship leaders, the ISC, and the PMC in all aspects of program implementation, and to coordinate CRP-level programming for evaluation, strategic partnerships, capacity development, knowledge management, and communications. Following evidence from the A4NH external evaluation, we will strengthen monitoring and evaluation in Phase II to support our results-based management approach and our internal CRP communications. John McDermott will continue as A4NH Director. Also continuing will be Nancy Johnson (evaluation leader), Hazel Malapit, and Agnes Quisumbing, and other key members of the PMU team. Four of the six flagship leaders who are currently leading ongoing work will continue as leaders: Marie Ruel, Howdy Bouis, Delia Grace, and Stuart Gillespie. All four are outstanding research leaders with demonstrated capacity for leading multi-institutional research for development partnerships. For the other two flagships, Food Systems for Healthier Diets and Improving Human Health, we have proposed new partnership arrangements across multiple institutions and will recruit new leadership (see draft ToRs in Annex 4 on Technical Competency). For flagships with significant cross-CRP coordination (Food Systems for Healthier Diets and Food Safety), we will hire research coordinators to support flagship leaders in effectively linking with the AFS-CRPs. At present, we plan to fund these collaborations through a combination of Window 1/Window 2 (W1/W2) resources and joint fundraising with partner CRPs.

BUDGET AND VALUE FOR MONEY

A4NH has evolved in response to the growing demand for leveraging agriculture for nutrition and health outcomes. However, the evolution varies by flagship. The flagships on Biofortification, Integrated Programs to Improve Nutrition, and Supporting Country Outcomes, have high-performing, globally recognized programs funded through large bilateral grants, strategically supported by approximately 20 – 25% of resources from the CGIAR Fund. The other current flagships are newer and will initially be relatively more reliant on the CGIAR Fund (as were our current large flagships were when they started).

For Phase II, A4NH proposes an expanded annual budget, from \$142 million in 2017 (**Table 1**) growing gradually to \$188 million in 2022, for a total of \$983 million for six years, anticipating an average growth of 7%, ranging from 4-8% depending on the flagship, with newer flagships obtaining increased bilateral funds over time. This is based on continued investor demand and A4NH's capacity to attract large bilateral and W3 grants. In Phase I, A4NH's overall revenue increased from \$37 million in 2012 to a projected revenue of over \$100 million in 2015. Although A4NH had the largest amount of W2 funding of any CRP, it has the lowest estimated proportion of W1/W2 to total funding across the CGIAR CRP portfolio (approximately 20% in 2015). As emphasized in the external evaluation of A4NH, this very low level of W1/W2 funding constrains the ability of A4NH to respond to new nutrition and health outcome demands in the SRF or to invest in key CRP-level program functions. What will this 40% expanded budget (approximately \$40M per annum) provide?

- New or expanded research based on SRF priorities, such as Food Systems for Healthy Diets (\$20M)
- Resources to support AFS-CRPs in value chain, food systems, and food safety research (\$7M)
- Greater role supporting country-led nutrition and health programs (\$10M); and
- Increased investment in CRP-level programming, as recommended by the external evaluation (\$3M).

The budget assumes 38% of revenue in 2017 from CGIAR (W1/W2) with large variations in proposed fund and grant revenue across flagships. The yearly allocation thereafter for each flagship will depend on the achievement of outcome streams presented in the performance matrix, the success of each flagship in fundraising, and partnership and capacity performance with other CRPs and partners. Monitoring and evaluation, and impact assessment leading to results-based management of each flagship will be an integral part of fund allocation and prioritization. In Phase I, A4NH laid a good foundation by: 1) establishing a database system to track project activities, timeline and deliverables, and major outputs and outcomes; 2) developing a system to collect financial information for those activities at the planning stage; 3) preparing performance summaries with participating centers; and 4) establishing regular CRP/partner Center management discussions. In Phase II, A4NH aims to invest more in enhancing evaluation and impact assessment, building on Phase I investments in ToC to make better use of human and financial resources.

As an I-CRP, A4NH relies on partnerships to achieve research and development outcomes. In 2014, partners received 33% of the yearly revenue which amounts to over \$30 million. We expect the partnership budget to grow in Phase II with expanded joint research with national partners in target countries in most flagships. There is already considerable co-investment with other CRPs in Biofortification. We plan to make considerable co-investment at a CRP-level with the AFS-CRPs in the flagships on Food Systems for Healthier Diets and Food Safety (**Table 1**). In general, effective partnerships require co-investment, which is usually in-kind with national partners, requiring joint planning and fundraising with other partners. For example, Wageningen UR and LSHTM/LCIRAH will have co-funding arrangements similar to CGIAR core partners, with a share of CGIAR funds and significant joint fundraising.

Table 1. Proposed budget for A4NH for the first year of Phase II (in millions USD)

2017 Budget Request (in Millions USD)					Growth %age from Phase I
Flagships		W1/W2	W3/ Bilateral	Total	
FS:1	Biofortification	10	40	50	6%
FS:2	Food Safety	9	11	20	38%
FS:3	Food Systems for Healthier Diets	10	12	22	45%
FS:4	Improving Human Health	5	6	11	64%
FS:5	Integrated Programs to Improve Nutrition	8	13	21	24%
FS:6	Supporting Country Outcomes through Research on Enabling Environments	4	6	10	50%
Program Level Activities		6.6	1.5	8.1	54%
Cross-cutting program on Gender, Equity and Empowerment		1.0	1.5	2.5	
Partnership/Capacity Building/Advocacy & Knowledge Management		2.0		2.0	
Evaluation and Impact Assessment		1.4		1.4	
CRP Management		2.2		2.2	
TOTAL		53	89	142	

A4NH will invest in strategic capacity development, actively raising bilateral funding to support country capacity across all flagships, but particularly in Supporting Country Outcomes and Food Systems for Healthier Diets. We estimate that 75% of the partnership budget is linked to capacity development (25% of total budget). We plan to co-fund and get bilateral grants with partners that represent approximately 10% of total budget. We expect gender research to increase from its 14% of total budget in 2014 to an estimated 20% in Phase II through a combination of CGIAR Fund and bilateral grants (some of which is already obtained). We are committed to keeping CRP-level management costs as low as possible, under 2% of the total budget, with some small additional anticipated costs for an expanded management team and more governance inputs from the ISC. We plan to make program investments at the CRP-level, in addition to the cross-cutting program on gender, equity and empowerment we will have an expanded evaluation and impact assessment, partnerships, capacity development and knowledge management.

A4NH has the ability in its large flagships on Biofortification and Integrated Programs to Improve Nutrition to coordinate large bilateral grants and to leverage scarce W1/W2 funds in an efficient and effective manner. A4NH is one of the largest CRPs and brings important economies of scale. For research quality, IFPRI and ILRI both have institutionalized ethical review systems in place. IFPRI's institutional review board for research involving human subjects and ILRI's animal welfare and biotech risk assessment are models for other CGIAR Centers. In terms of return on investment, A4NH works on big nutrition and health challenges that involve billions of people. A4NH is central to the CGIAR delivering on its SRF, particularly for SLO2, with strong implications on poverty reduction, gender and equity, and enabling country-led development processes. A4NH brings unique world-class researchers and other partners in nutrition and health, and links them to CGIAR's agricultural research capacity in addressing these large global challenges that the CGIAR SRF has taken on.

Flagship Narratives

Biofortification

IN BRIEF

This flagship builds on the strong track record of the HarvestPlus program. During Phase I of A4NH, HarvestPlus transitioned from development to delivery phase. During Phase II, the flagship will deliver outcomes at scale (20 million farm households by 2020) and conduct research to fill key evidence gaps and to learn lessons from delivery for future research and scaling. As part of building an enabling environment for biofortification in the future, the flagship will engage in policy analysis and advocacy at national and international levels and build capacity of key research and development partners to mainstream biofortification in their research and programming.

STRATEGIC RELEVANCE

THE CHALLENGE

Micronutrient deficiency affects approximately 2 billion people globally. A major cause of micronutrient deficiencies are monotonous poor-quality diets resulting in low intakes of micronutrients. Inadequate intakes of multiple micronutrients are common among women and children living in resource-poor settings (Kothari, Abderrahim, Coile, & Cheng, 2014; Torheim, Ferguson, Penrose, & Arimond, 2010). The long-run solution to this problem is to improve the quality and diversity of diets. In the meantime, increasing the micronutrient content of the staple commodities that the poor consume can make a meaningful contribution to reducing inadequate intakes and reducing micronutrient deficiency. Biofortification, the breeding of staple crops for higher levels of Vitamin A, zinc, and iron, is technically feasible with conventional breeding and there is a growing evidence base on the nutrition efficacy of biofortified crops. Ex-ante cost-effectiveness research suggests that biofortification is a cost-effective intervention per World Bank standards. It has particular potential for rural populations who are difficult to reach through other nutrition interventions such as supplementation or food fortification. The key challenges that remain are to demonstrate effectiveness and delivery at scale through markets, and to mainstream biofortification into crop improvement research and policy.

CONTRIBUTION TO THE STRATEGY AND RESULTS FRAMEWORK

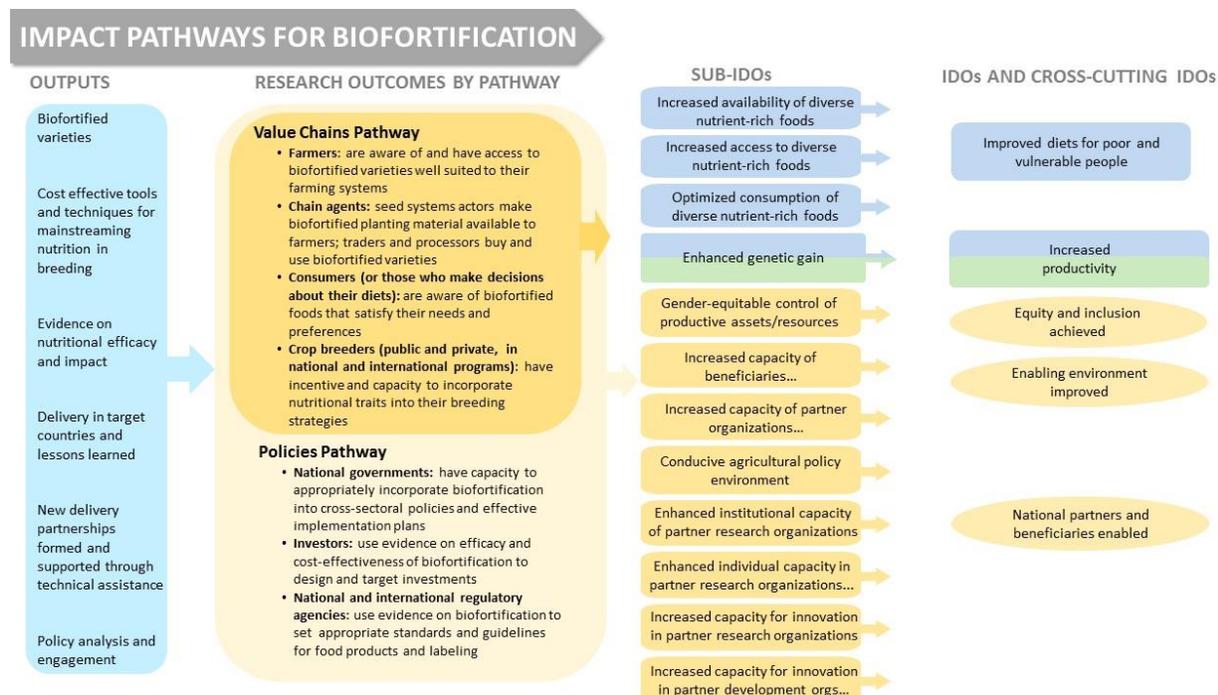
The flagship addresses the problem of micronutrient deficiency due to inadequate dietary intake of micronutrients, contributing to the second system level outcome (SLO2) on *improved food and nutrition security for health* through the IDOs of *improved diets for poor and vulnerable people* and *increased productivity (Figure 2)*. Improvements in productivity will also contribute to the SLO on *reduced poverty*.

GEOGRAPHIES AND TARGETS

In this flagship, HarvestPlus and its delivery partners will demonstrate the viability and cost-effectiveness of scaling up by reaching 20 million households by 2020 in the nine priority countries (Nigeria, Rwanda, DRC, Uganda, Zambia, Ethiopia, Pakistan, India, and Bangladesh) where HarvestPlus and national partners are taking the lead, in addition to those reached by partners working in other countries. HarvestPlus works closely with government-sponsored biofortification programs in India, China, and Brazil. Through the HarvestPlus Latin American and Caribbean (LAC) program, HarvestPlus provides technical assistance and support to government-driven biofortification programs in Bolivia, Panama, Colombia, Nicaragua, Guatemala, and Haiti and is exploring efforts in several additional countries. Building on biofortification efforts pioneered by the Brazilian Agricultural Research Corporation (Embrapa), the LAC countries use a food basket approach, integrating multiple biofortified crops that are accepted in local diets and also assessing the use of biofortified crops in processed food products. By 2030, HarvestPlus' aspirational goal is for one billion people

to be regular consumers of biofortified staple foods (see Annex 2 on Table of Target Beneficiaries and Countries). Key considerations for sustainability and scaling up are discussed in the next section.

Figure 2. Impact pathways for Biofortification



THEORY OF CHANGE: HOW WILL TARGETS BE REACHED

Available evidence and experience suggests that the goal of reaching one billion people by 2030 is audacious, but not impossible. To date, HarvestPlus and its partners have facilitated the release of biofortified varieties of six crops (vitamin A orange sweet potato, iron beans, vitamin A cassava, vitamin A maize, zinc rice, and zinc wheat). Biofortified varieties have now been released in 30 countries and are in multi-location testing in 42 countries. In 2015, biofortified planting materials are expected to reach more than 2 million farmers in HarvestPlus priority countries.

The pathway from research - through seed dissemination, adoption, and consumption - to improved diet and micronutrient status is long, complex, and context-specific. HarvestPlus has a good understanding of the pathway in general, and in specific contexts where delivery is taking place. In Phase I, the HarvestPlus impact pathway was translated into a series of country by crop combination theories of change (ToCs) that identify key outcomes, the underlying assumptions and risks for each outcome, and the availability of evidence to them (N. L. Johnson, Guedenet, & Saltzman, 2015) test them (N. L. Johnson, Guedenet, et al., 2015). The ToCs identify key areas for research, guide country-level delivery and monitoring, and provide a framework for country-level and cross-country learning.

Scaling and sustaining the impact achieved in target countries under the delivery phase will require (1) mainstreaming biofortification in agricultural research; (2) developing operational partnerships in additional countries; and (3) establishing a policy environment conducive to biofortified crops. HarvestPlus has made significant progress in each of these areas already and they will be given increasing priority in Phase II, guided by more detailed ToCs that specify goals and targets and facilitate learning.

HarvestPlus investments have filled breeding pipelines with varieties that are agronomically competitive, disease resistant, have preferred end-use qualities, and have full target levels of micronutrients. To sustain this investment, CGIAR Centers and national agricultural research system (NARS) partners must mainstream biofortification, using micronutrient dense materials throughout their breeding programs. This will ensure biofortification is sustainable, and that new, climate-adaptive varieties also contain the micronutrient traits. In 2014, Director Generals (DGs) of CGIAR Centers made a [commitment to mainstream biofortification](#).

Significant progress has already been made in mainstreaming biofortification into regional and national policies. At the recent Second International Conference on Nutrition (ICN2), high-level representatives from Bangladesh, Malawi, Nigeria, Pakistan, and Uganda highlighted the role of biofortification in their national strategies to end malnutrition by 2025. Panama and Columbia were among the first countries to include biofortification in their national food security plans. Since the 2nd Global Conference on Biofortification, biofortification has been included in national nutrition strategies in Rwanda, Zambia, and Nigeria. HarvestPlus and its partners are engaged with regional and global processes, like the African Union’s Comprehensive Africa Agriculture Development Programme (CAADP) and the Scaling up Nutrition movement (SUN), to ensure an enabling environment for biofortification. Efforts to include biofortification in global standards and guidelines for food products and labeling, such as the Codex Alimentarius, are well underway. This work will be a key focus in Phase II, especially on learning lessons about what approaches work and about how countries that commit to biofortification can convert that momentum into results on the ground, linked to work in the A4NH flagship on Supporting Country Outcomes through Research on Enabling Environments.

PLANS FOR PHASE II

The focus of HarvestPlus is expected to shift over the life of the second phase of the CRP. Earlier phases of HarvestPlus focused on breeding and nutritional evaluation, bringing together scientific research evidence with an impact orientation. Currently, and through 2020, HarvestPlus is focusing on delivery in a contextually rich world of markets, farmer behaviors, and dietary practices. Filling key evidence gaps and capturing lessons learned is of great strategic importance in this phase, intensifying the work of promoting production and consumption of the crops in target countries as a “proof of concept” of the approach, analyzing the effectiveness of different delivery mechanisms, and developing lessons for scaling up. In the 2020-2022 period, HarvestPlus will increasingly emphasize convening and facilitating delivery through partners.

EVIDENCE GAPS, RESEARCH ISSUES, AND RESEARCH QUESTIONS

Important research questions remain about which approaches work best to reach target beneficiaries (within the broader population of farm households), how gender influences consumption and production decisions related to biofortified crops within households, and how the market can best support both sustainable investment developing biofortified seeds and awareness, access and consumption of biofortified foods by target beneficiaries. The delivery phase offers an opportunity to learn in an action research context about what works, what doesn’t, and how delivery strategies can be refined to enhance impact in target countries and beyond. HarvestPlus’s monitoring, learning, and action (MLA) system and impact team work to monitor seed dissemination, farmer adoption, household consumption and sale, and other key variables. They assess gender inclusion in farmer outreach and distribution of biofortified planting materials, which then informs delivery efforts. Where full-target varieties are available, rigorous impact evaluations are planned to measure impacts on outcome variables, such as micronutrient intake and nutritional status of target beneficiaries. These efforts will be complemented by targeted research in key areas such as gender, markets or technology adoption that is specifically designed to answer important questions about the HarvestPlus ToC, and about potential for scaling up biofortification and other agricultural interventions. The biofortification research agenda builds on previous work with partners throughout CGIAR, including CGIAR Centers who carry out crop development work and other flagships in A4NH. In Phase II, in addition to collaboration with the flagship on Supporting Country Outcomes around policy and enabling environment at the national and international

scale, we also anticipate collaboration with the flagships on Food Systems for Healthier Diets and Food Safety to address research questions related to production issues (e.g., aflatoxins), opportunities and risks associated with value addition (e.g., processing, storage), and reaching target consumers in specific crops and countries.

In addition to addressing the research questions described above, in this period, HarvestPlus will also strengthen linkages for expansion between development implementers and delivery partners, playing a convening and facilitating role as others take leadership of the delivery work. As the established global leader for biofortification, HarvestPlus will focus on building national capacities in delivery, providing technical support and services to strategic partners, and initiating delivery partnerships to scale up the delivery of biofortified crops in new contexts and countries where HarvestPlus is not involved in implementation. HarvestPlus will look beyond Phase II primarily as a facilitator and convener, roles that will be better elaborated through planning processes in 2018-19.

Mainstreaming nutrition into breeding requires a two-pronged approach: (1) annually increasing the percentage of biofortified germplasm in CGIAR Centers' breeding programs, which are then distributed to NARS for further adaptation and eventual release, and (2) developing methods for reducing the costs of breeding for biofortified varieties (through marker-assisted selection and low-cost, high-throughput methods of measuring vitamin and mineral content). HarvestPlus also continues to lead training and capacity development with NARS for the development and eventual release of biofortified varieties. Mainstreaming the biofortified traits into breeding parental lines is a strategy to ensure, as new climate-adaptive varieties are developed in CGIAR Centers and NARS, these varieties will also contain higher levels of micronutrients. Mainstreaming represents an organizational challenge in terms of funding and governance within CGIAR, and during Phase II, the flagship on Biofortification will work with CGIAR to realize its 2014 commitment to develop and implement a plan for mainstreaming.

Operational partnerships are developed for countries where biofortified crops are released, and a wide variety of partners are sought, including private seed companies, international NGOs, multi-lateral institutions, food processing companies, and national governments. HarvestPlus LAC is demonstrating the importance of linking government-supported biofortification programs together across countries, and with CIAT and other CGIAR Centers working in LAC, producing lessons that can be applied elsewhere as biofortification scales up. Partnerships have been established in each of the aforementioned categories to demonstrate their viability, but these efforts must expand greatly in Phase II. HarvestPlus has developed a tool, the [Biofortification Prioritization Index \(BPI\)](#), to assist partners in identifying high potential country-crop combinations for expansion (Asare-Marfo et al., 2013).

Finally, HarvestPlus will undertake a broad agenda of developing regulatory standards, advocacy partnerships, and policy analysis and tools to support a policy environment conducive to scaling up biofortified crops. This engagement, and the translation of efficacy and effectiveness evidence to be understood as relevant by policymakers and regulators, must continue in order to sustain the momentum for biofortification. Many activities in this area will have significant synergies with the flagship on Supporting Country Outcomes.

COMPARATIVE ADVANTAGE

Building on fifteen years of research and operational experience, HarvestPlus coordinates the research and implementation of biofortification with partners in more than 50 countries. There is no other organization that has the capacity in terms of staff, partners, infrastructure, knowledge, and ground presence that can scale up biofortified crops in the near term. Increasingly, HarvestPlus will play a crucial role as a convener and facilitator of biofortification initiatives as they are taken up by public, private, and multi-lateral partners.

The success of the Discovery (2003–2008) and Development (2009–2013) phases of HarvestPlus have shown that the team has the technical and institutional capacity to bring people together across institutions, countries and disciplines, forge partnerships, and deliver high-quality technical outputs and immediate development outcomes. HarvestPlus has a strong track record in developing a robust evidence base to support the biofortification concept (Bouis, Low, McEwan, & Tanumihardjo, 2013; N. L. Johnson, Guedenet, et al., 2015; Saltzman et al., 2013). Effectiveness evidence is available for [orange sweet potato](#), and efficacy results have recently been published for [pearl millet](#) and [maize](#), with additional efficacy study results expected in 2016. Recently, HarvestPlus has increased its efforts to convene other actors around biofortification, including at the [2nd Global Conference on Biofortification](#) in 2014. The Global Panel on Agriculture and Food Systems for Nutrition released a policy brief in early 2015 [reviewing the evidence on biofortification](#) and recommending policymakers take steps to scale up biofortified crops. The success of the Discovery (2003–2008) and Development (2009–2013) phases of HarvestPlus have shown that the team has the technical and institutional capacity to bring people together across institutions, countries and disciplines, forge partnerships, and deliver high-quality technical outputs and immediate development outcomes. HarvestPlus has a strong track record in developing a robust evidence base to support the biofortification concept (Bouis et al., 2013; N. L. Johnson, Guedenet, et al., 2015; Saltzman et al., 2013). Effectiveness evidence is available for [orange sweet potato](#), and efficacy results have recently been published for [pearl millet](#) and [maize](#), with additional efficacy study results expected in 2016. Recently, HarvestPlus has increased its efforts to convene other actors around biofortification, including at the [2nd Global Conference on Biofortification](#) in 2014. The Global Panel on Agriculture and Food Systems for Nutrition released a policy brief in early 2015 [reviewing the evidence on biofortification](#) and recommending policymakers take steps to scale up biofortified crops. (Bouis et al., 2013; N. L. Johnson, Guedenet, et al., 2015; Saltzman et al., 2013).

Scientific research to date demonstrates that conventional breeding can increase nutrient levels to make a measurable and significant impact on human health, without reducing yield; that, when consumed, extra nutrients can be absorbed and utilized to improve micronutrient status; and that farmers are willing to grow biofortified crops and consumers to eat them. More than a million farmers received biofortified planting materials in 2014 and more than two million farmers will be reached in 2015. Country managers manage the delivery and partnership development process in target countries. From these delivery experiences, HarvestPlus will draw lessons learned about the effectiveness, costs and processes of scaling up interventions. In 2013, HarvestPlus commissioned a Strategic Gender Assessment (SGA) in collaboration with A4NH, and is now implementing recommendations to ensure gender-sensitive delivery of biofortified crops. HarvestPlus is investing in its monitoring, evaluation and gender capacity to support more effective implementation and learning, however additional capacity will be needed. Some of these skills can be found in A4NH (e.g., through the flagship on Supporting Country Outcomes and the team working on the A4NH cross-cutting program on Gender, Equity and Empowerment) and others will need to come from outside.

HarvestPlus currently employs 150 total staff, including eight senior scientists, three regional managers, and nine country managers. Additional scientists are engaged in HarvestPlus research through contracts with CGIAR Centers and NARS. [Research publications for 2014](#) provide insight into the depth and breadth of the HarvestPlus research program, which supports and informs delivery activities. CVs are included for the following senior staff (see Annex 4 on Technical Competency): Howarth Bouis, Director; Wolfgang Pfeiffer, Deputy Director of Operations; Ina Schonberg, Deputy Director of Programs; Thom Sprenger, Global Manager for Strategic Alliances; Ekin Birol, Head of Impact Research; Erick Boy, Head of Nutrition Research; Manfred Zeller, Head of Policy Research; and Parminder Virk, Manager for Crop Development

This research builds on a strong history of strategic CGIAR crop breeding for important traits combined with nutrition evaluation to develop biofortified food crops, and is a logical extension of engagement with national implementing and enabling partners to extend these crops at scale. HarvestPlus is experienced in adapting its strategy and implementation process to changing scientific and funding environments while still ensuring

that essential work is completed and the project moves forward. While scaling up will be a new challenge, requiring new capacities and new institutional arrangements, HarvestPlus is well positioned for taking on this challenge.

PARTNERSHIPS AND CAPACITY DEVELOPMENT

Partnerships have always been at the core of HarvestPlus's work, though previously these partnerships were predominantly with academic institutions, CGIAR Centers, and NARS. Now, as HarvestPlus moves beyond proof of concept and seeks to mainstream and scale up biofortification, new types of partners are essential to achieving SLOs 1 and 2. HarvestPlus seeks partnerships throughout the value chain, as well as those partners to promote an enabling policy environment. The following are the primary categories of partnerships being developed to ensure sustainable delivery models for biofortified crops:

- Private seed companies
 - In countries with robust private seed systems that reach smallholder farmers, private seed companies are a natural partner. This approach is particularly advantageous in the case of crops where hybrid seeds predominate, e.g. Seed Co. in Zambia (hybrid maize) and Nirmal Seeds in India (hybrid pearl millet) and where seed companies operate regionally. Because some countries, like India, allow private marketing of “truthfully labeled” seed that has not yet been formally released, private seed company partnerships can help shorten time to market for promising biofortified varieties.
- International NGOs
 - An MOU has been developed with World Vision to introduce biofortified crops into its agricultural programs which are then linked to its health/nutrition programs. Similar partnerships are being explored with other NGOs. In this type of partnership, HarvestPlus provides technical advice and sometimes assists with fundraising for biofortification activities, and also plays a convening role in bringing together implementing partners.
- Multi-lateral financial and assistance agencies
 - The World Food Programme's (WFP) Purchase for Progress program is very interested in local purchasing of biofortified crops, and partnerships are being developed in several countries. In Rwanda, local bean production is purchased and stored in WFP warehouses for later emergencies. Plans for using provitamin A maize in Zambia and other crops/countries are under discussion. Again, HarvestPlus largely plays a technical assistance and convening role.
- Food-processing companies
 - Small and medium size
 - Biofortified sweetpotato and cassava processed product value chains are being developed in Uganda and Nigeria by HarvestPlus; CIP is developing sweetpotato processed product value chains in Rwanda and other countries.
 - Embrapa's Food Technology Unit is testing biofortified crops for use in processed foods such as flour, noodles, cakes, bread, soups and mixtures for drinks, evaluating the mineral and vitamin contents after processing. Promising results are presented to private food companies interested in the development of products using biofortified crops.
 - Local millers in Zambia are beginning to sell orange maize flour in supermarkets in Lusaka
 - Multi-national companies
 - Interest in testing food processing characteristics, has been expressed by several companies
 - For both types of companies, HarvestPlus assists in linking private sector interests with supplies of biofortified crops.
- Advocacy partnerships

- To scale up biofortification, support is needed from institutions that influence national and regional policymakers, and vice versa. HarvestPlus is pursuing different ways of working together with a wide variety of partners, including the Food and Agriculture Organization of the United Nations (FAO), World Health Organization (WHO), World Bank, the International Fund for Agriculture Development (IFAD), WFP, Africa Union, CAADP, and the SUN movement.

HarvestPlus works through a broad range of partners, and scaling up will require building new and expanding existing partnerships, maintaining engagement and increasing partner capacity. Earlier phases of HarvestPlus focused heavily on building the evidence base for biofortified crops, working with research partners to initiate studies to assess agronomic characteristics, nutritional efficacy and consumer acceptance, and measure impact. Key partners included CGIAR centers, NARS in target countries, and universities in developed and target delivery countries. HarvestPlus invested in the abilities of these partners to assess biofortified crops, including upgrading equipment and training technical staff in 22 labs, primarily in target countries, to develop analytical capacity for vitamin and mineral content. As HarvestPlus shifted into delivery, partnerships began with private seed companies, local and international NGOs, government extension programs, and school feeding programs. In Phase I, HarvestPlus developed capacity in more 100 delivery partners, trained thousands of extension staff on agronomic practices and nutrition messages for biofortification, and developed technical packages for partners to use in delivery programming. Looking to the future, HarvestPlus seeks to add a more diverse array of partners, including private food companies and retailers, UN agencies, regional organizations, and innovative financing mechanisms and development banks. New investments in capacity building will focus on measuring the effectiveness of various delivery channels and strengthening linkages with policymakers. A focus in Phase II is building capacity for advocacy and policymaking at national and regional levels, including through the SUN platform and CAADP Nutrition initiatives.

In Phase II, there is also a strong emphasis on continuing to build capacity in NARS and national partners to breed for and measure vitamin and mineral content in crops. Phase II will expand lab support to the Latin American and Caribbean region and continue to invest in training and capacity building in existing labs. HarvestPlus will continue to build capacity at both the CGIAR and NARS levels to mainstream and measure nutritional breeding, including through fellowships for young breeders. In contrast to earlier phases of HarvestPlus, development of expertise is now shifting to staff in target countries and regional teams, who support capacity development in seed systems, marketing, nutrition, monitoring and evaluation, and policy/advocacy in country offices and with national delivery partners.

HarvestPlus supports increasing public and private sector capacity to deliver biofortified seeds into the future. In some countries, HarvestPlus provides technical assistance to NARS to increase seed production. In others, like Uganda, HarvestPlus supports strong public-private partnerships for maintaining production and supply of clean planting materials easily accessible for farmers. Additional capacity building comes through advocacy work, such as expanding seed certification to a new class of seed, “quality declared,” which allows for faster and less costly bulking of biofortified seed.

In Phase II, HarvestPlus will continue to focus on strengthening NARS research and analytical capacities, building the technical capacities of partners throughout the value chain to scale up their delivery efforts, developing training materials and providing training to delivery partners, and engaging with new and existing platforms for advocacy and policymaking to support biofortification. New and strengthened partnerships, both public and private, will be critical to achieving will and capacity at national and global levels to scale biofortification.

Food Safety

IN BRIEF

Food safety is moving rapidly up the development agenda as [major new studies](#) reveal its severely underestimated importance. Solutions that are effective in developed countries or in commercial food systems have not translated well to informal or formalizing markets, highlighting an urgent need for technical solutions to current food safety challenges, and broader policy and regulatory approaches to manage food safety risks in dynamic, developing market contexts. This flagship addresses these issues through targeted research on specific food safety issues as well as by generating evidence on what approaches are likely to work and how an enabling environment for innovative approaches to food safety can be achieved and sustained. The high priority food safety issues for Phase II, based on the extent of the health problem and CGIAR comparative advantage in solutions, are biological contamination of perishable products and aflatoxins in staple crops. The flagship will scale-up successfully piloted solutions alongside rigorous monitoring and impact evaluations to increase understanding of the incentives, capacity, and enabling policy environment required for successful delivery at scale. At the same time, it will continue to generate evidence on food safety risks, and their assessment, communication, and management. In close collaboration with the CRPs on Livestock, Fish, and Grain Legumes, this flagship will reach tens of millions of consumers, millions of farmers, and thousands of market agents working in priority countries in Africa and Asia.

STRATEGIC RELEVANCE

THE CHALLENGE

A growing new body of research confirms the increasing threat of food safety. More than 2 billion people get sick each year from the food they eat. Most foodborne diseases (FBD) come from microbes and parasites in perishable, fresh foods sold in informal markets of Africa and Asia (Grace, Baker, & Randolph, 2010), which impose a burden of around 60 million DALYs³ per year (Grace, in press). Pesticide residues, agricultural inputs, heavy metals, and other chemical hazards, all of which are common in fresh foods, and while the health burden is not known, some believe it is high (Grace, in press). Another culprit, aflatoxins in staple foods, causes an estimated 100,000 cases of liver cancer each year (1-2 million DALYs) and is also associated with childhood stunting (Grace, in press).

Beyond the health impacts, unsafe food also brings economic, trade, and equity impacts. Poor farmers can be excluded from high-value domestic markets, and poor countries from export markets (L. J. Unnevehr & Ronchi, 2014). Countries and farmers lose out on local food aid purchase programs for maize or groundnuts, when farmers fail to meet aflatoxin standards. Social identity, especially gender, has a powerful role in shaping value chain behavior, exposure to risks, and health outcomes; hence, involving women is needed to achieve food safety impacts (Quinlan, 2013). Women often predominate in traditional food processing and retail, yet as value chains evolve, poor design and targeting often excludes them (Roesel & Grace, 2015).

Consumers and policymakers are paying more attention to food safety in developing countries. ILRI studies in seven countries found food safety was often the most important food concern among consumers (“Demand for livestock products in developing countries with a focus on quality and safety attributes: Evidence from Asia and Africa,” n.d.). In fact, economic experiments by IFPRI have demonstrated that both consumers and traders are willing to pay significantly more for food that is certified as safe (Biro, Karandikar, Roy, & Torero, 2014; Hoffmann & Gatobu, 2014; Ordonez & Hoffmann, 2013). Yet, policymakers often have limited understanding of food safety risks and tradeoffs and react to food scares by proposing draconian regulations (Grace & McDermott, 2015), which can unintentionally threaten the livelihoods of poor value chain actors

³ The DALY, or Disability Adjusted Life Year, is a widely used metric for comparing health impacts; 1 DALY can be thought of as 1 lost year of healthy life.

and increase the cost of nutritious foods for consumers. Current approaches, for example in aflatoxin mitigation, may also lead to a concentration of unsafe food in poor populations (Moser & Hoffmann, 2015).

Despite the growing severity of the food safety problems and increasing attention from policymakers, there are still painfully few standards and approaches to address these challenges in informal markets, where most of the world's poor buy and sell food, and where the risks are pervasive, costs of compliance are high, and enforcement capacity is currently weak (L. J. Unnevehr & Grace, 2013). This flagship proposes bold changes that include: (a) risk based, pro-poor approaches that can shift governance away from doomed attempts to enforce regulation, towards enabling actors to meet important food safety demands; (b) market-based approaches that provide value chain actors with immediate incentives for behavior change; and (c) technologies that dramatically reduce the costs of delivering safe food. A4NH will continue to build capacity of regulators to apply risk-based methods that lead to better solutions. For example, in Kampala, urban dairying was discouraged because of perceived health risks. CGIAR supported research found risks were smaller and livelihood benefits higher than decision makers had assumed. This evidence led to a change in policy legitimizing urban agriculture. Taking these solutions to scale requires scaling up investments as well.

CONTRIBUTION TO THE STRATEGY AND RESULTS FRAMEWORK

This flagship is designed to primarily address the second system level outcome (SLO2 on *improved food and nutrition security for health* through focusing on the IDO of *improved food safety* (Figure 3). It contributes to SLO1 on *reduced poverty* directly through *reduced market barriers* and indirectly through *increased productivity* and *reduced pre- and post-harvest losses, including those caused by climate change*. It incorporates the cross-cutting issues of *gender and youth* (IDO on *equity and inclusion improved*), *policies and institutions* (IDO on *enabling environment improved*), and capacity development (IDO on *national partners and beneficiaries enabled*).

Figure 3. Impact pathways for Food Safety



GEOGRAPHIES AND TARGETS

In Phase II, this flagship will have two major areas of focus: perishable foods and staple crops. Hazards in perishable foods—especially those sold in informal markets—are prioritized because (a) they cause most of the known FBD, (b) we have a strong track-record in risk assessment, and (c) we have already developed promising and feasible solutions. As well as the poor, the target population includes the moderately poor earning between \$1.25 and \$10 per day, who increasingly consume risky fresh foods purchased in informal markets. We will generate food safety evidence and capacity that targets donors, international organizations, and national policymakers in countries where A4NH policy platforms exist (linked to the flagship on Supporting Country Outcomes through Research on Enabling Environments), such as Ethiopia, Kenya, Uganda, Tanzania, Zambia, India, Bangladesh, and Vietnam. Efforts to scale out work (especially increasing capacity of vendors) will target Tanzania, Kenya, Uganda, Ethiopia, and Vietnam, where A4NH works with the CRPs on Livestock and Fish to upgrade value chains. We will prioritize young, old, pregnant women, malnourished, and immunosuppressed consumers who are most at risk of infectious FBD.

In staple crops, the priority is aflatoxins because of a) the need for agricultural interventions, especially pre-harvest, b) the critical mass of CGIAR aflatoxin research, and c) the existence of *successfully piloted solutions*. Around 5 billion people in developing countries are exposed to uncontrolled levels of aflatoxins. Based on current evidence, analyses for this proposal show: (a) nearly 2 billion people are exposed to levels exceeding European and U.S. standards, (b) the highest levels of exposure are in eastern and southern Africa and just 28 countries bear 90% of the exposure burden, and (c) aflatoxin exposure and disease burden is declining in Asia, but increasing in Africa. A4NH has current projects with our target populations in nine countries which bear the brunt of the aflatoxin burden (Burundi, Kenya, Malawi, Mali, Nigeria, Rwanda, Senegal, Tanzania, and Zambia). More details on potential targets reached by this flagship are in Annex 2 on Table of Target Beneficiaries and Countries.

THEORY OF CHANGE: HOW WILL THE TARGET BE REACHED

This flagship aims to reduce the burden of FBD and support equitable economic growth without jeopardizing production and poverty reduction, while also continuing to address environmental, social, and health concerns linked to food production. Impact will occur through two main pathways: generating evidence that influences key decisionmakers and policy processes; and, taking food safety solutions from tested pilots to scale (aflatoxin mitigation and enabling vendors in wet markets); which will map into three clusters of activities: (1) evidence and enabling environments, (2) managing perishable product risks, and (3) managing aflatoxin risks.

The *evidence and enabling environments* cluster will focus on a) generating evidence to increase investments in food safety and shifting investments in a pro-poor direction, and b) supporting delivery at scale by researching under-evidenced assumptions in the theories of change (ToCs) for scaling out *successfully piloted solutions*. This flagship will also answer demands for better evidence around broad safety and agriculture issues and explore emerging issues where there is much concern, but little evidence (e.g. chemicals in food), thus influencing the behavior of donors and decisionmakers. At least half of its activities will be linked to the two *successfully piloted solutions* clusters (aflatoxins and wet markets), providing evidence, independent evaluations, and experimental learning about scaling assumptions and modalities.

In Phase II, the two *successfully piloted solutions* clusters will focus on bringing developed and tested technologies and approaches to scale, specifically a) training and incentivizing market agents in wet markets to improve safety of meat, milk, fish and vegetables and b) biocontrol and resistant varieties combined with good agricultural practices (GAP) for mitigating aflatoxins. In two complementary ToCs that were developed during Phase I (N. Johnson, Atherstone, & Grace, 2015; N. Johnson, Mayne, Grace, & Wyatt, 2015) we describe how these solutions are expected to contribute to reductions in exposure to FBD among consumers, and the strength of the evidence underlying the assumptions in the impact pathways.

The ToC for microbial hazards in informal markets for animal-source foods is largely based on behavioral change as opposed to fundamental changes in infrastructure, operation or relationships with customers or suppliers. It looks at how an institutional innovation in training, certification, and branding can improve the quality and safety of perishable foods (N. Johnson, Mayne, et al., 2015). Evidence from A4NH pilots supports the assumption that informal sector market agents do change their practices as a result of participating in the program and experience social and economic benefits, even if they do not receive a higher price from consumers. The relatively small number of wet market sellers (thousands as opposed to millions of consumers and farmers) means there are leverage points where low-cost interventions can have profound up-and downstream impacts.

In the aflatoxin ToC, analysis indicates strong potential to reduce exposure if crops are grown using GAP, resistant varieties, and/or biocontrol are consumed at scale (N. Johnson, Atherstone, et al., 2015). Economic incentives will ensure farmers adopt the technologies, but there are significant challenges to reaching target consumers and potential risks of increasing exposure through concentration of contaminated grain in the markets used by the poor. The ToC identifies several areas for additional research and highlights the need to look at how policy and program pathways can complement market pathways to achieve public health outcomes at scale.

PLANS FOR PHASE II

EVIDENCE GAPS, RESEARCH ISSUES, AND RESEARCH QUESTIONS

There is good evidence that CGIAR food safety research has influenced donors, decisionmakers, and national policies, but less evidence that they are sustainable and scalable. However, impact assessments and evaluations suggest the potential impact is high. A4NH is identifying research questions based on specific assumptions identified in the ToC. Broadly:

- Projects for biological control of aflatoxins are being taken to scale by the private sector with funding from donors. In Nigeria 260,000 tons of low-aflatoxin maize will be produced by 2017, equivalent to around 3% of current maize production. Another Aflasafe plant is under construction in Kenya where the government has made budget allocation to treat 500,000 hectares (ha). However, health impacts have not been assessed and whether large-scale introduction and adoption can be stimulated and replicated all across the continent requires ongoing research on the multiple benefits of biocontrol, funding mechanisms and incentives for uptake. How policies from different sectors can be harmonized and implemented to support this process is also an important areas of research. The work in Phase I on providing technical support to East African Community (EAC) policies on aflatoxin provides an opportunity to learn about the factors that support and constrain an enabling environment for pro-poor, risk-based approaches to food safety.
- GAP can improve yield, productivity, worker safety, and product quality and food safety. Although pilot and boutique projects often show impacts (Omore & Baker, 2011) and initiatives have enabled small farmers to comply with GAP for export, there is little evidence for success at scale in domestic markets (Schreinemachers et al., 2012; Viet Nam News, 2013; Waddington & White, 2014). We will research the constraints to adoption, incentives that improve uptake of tested effective GAP innovations for easier, cheaper, and more attractive GAP. Collaborating with the CRP on Policies, Institutions and Markets (PIM's) flagship on technology adoption will provide access to cutting edge methods and approaches for understanding constraints to adoption and ensure that lessons from this research are widely shared.
- In Kenya and the Indian state of Assam, initiatives to train milk traders and provide an enabling environment were effective, economically attractive, scalable and sustainable and highlighted in CGIAR impact assessments. Currently, an estimated 6.5 million consumers are benefiting from safer milk sold by trained and certified traders in the two countries (Kaitibie, Omore, Rich, & Kristjanson, 2010; Lapar, Deka, Lindahl, & Grace, 2014). However, the health impacts of these solutions were never assessed and in the absence of sustained follow up it appears some of the proven benefits of the Kenyan smallholder

dairy initiative may erode. We will increase research into the costs, benefits, sustainability and potential application of these initiatives.

More specifically, some of the key research questions that will help fill gaps in the ToC and inform decisions include:

- **Health and other burdens.** What are the full health and other burdens of FBD? To what extent does aflatoxin contribute to stunting and immunosuppression in children and pesticides in food to ill health? What levels of subsidies do human health impacts justify?
- **Technology discovery and development.** What existing or emerging technologies have potential for reducing FBD? (This includes genetic resistance, biocontrol, vaccines, hygiene technologies, food processing; decontamination; toxin binders and others).
- **Diagnostics:** How can molecular epidemiology, bioinformatics and diagnostics improve understanding of FBD? How can cheap, reliable, kiosk-side diagnostics be developed and deployed?
- **Enabling environment.** Which policies are currently constraining (or facilitating) the provisions of safe food in target markets? How can policy be influenced to be more facilitative to the informal sector especially in contexts where the formal sector is monopolistic and poorly governed?
- **Other issues.** What are alternative uses for contaminated foods? What system should be in place to channel contaminated material to alternate use? What are emerging FBD issues?
- **Farmer/producer awareness.** How can farmers be made aware and convinced of benefits of risk-mitigating technologies and practices? To what extent can other benefits of hazard control (higher yields, profits, reduced waste) drive adoption? How can various mitigation strategies be integrated?
- **Role of markets and consumers.** What is the potential of differentiated markets to deliver safe foods? What is the size and value of these markets? How can the potential risks that such markets direct contaminated food to the poor be mitigated? Which populations can best be served through market based approaches and which through safety nets or programs? What are the ethical and economic risks of market-based approaches to food safety?
- **Regulations and standards.** How can regulations to improve the safety of food for all consumers be effectively designed and implemented in markets characterized by large numbers of small, informal firms and weak capacity to detect aflatoxins? What are the most appropriate standards for markets where currently a large proportion of foods sold do not meet standards? What factors determine whether and how policies are translated to effective programs and regulations and implemented effectively?

Phase II research aims to generate high quality evidence on food safety to influence the global agenda and also aims to achieve impact on the ground. RCTs and quantitative risk assessments will assess impact. Ancillary studies will evaluate incentives, capacity, and enabling environment factors required for successful delivery of promising technologies. Smaller controlled experiments will explore biological and behavioral constraints and solutions (Box 1). These will be supported by rapid diagnostics and molecular epidemiology: the biosciences platform will also support development or adaption of diagnostics and other technologies to improve food safety performance and governance. Given the importance of women in the informal sector, research into gender-based barriers to technologies, and unanticipated effects on women will be important.

Box 1: Food Safety Experimental Laboratory

A *Food Safety Experiment Laboratory* will conduct short, field-based, low-cost experiments on biological and behavioral aspects of food safety, (e.g. the effectiveness of insecticide treated nets for fly control or optimal design of contracts between market agents and market authorities). Through “lab-in-the-field” experiments, value chain actors will be faced with real choices that mirror the food safety decisions they make on a day-to-day basis, but where key parameters can be experimentally varied and consequences can be monitored.

COMPARATIVE ADVANTAGE

Globally, CGIAR has the largest research group working on unsafe food in wet markets and while punitive and prescriptive approaches to food safety have largely failed, more facilitative, behavioral CGIAR interventions have had some success. Almost uniquely to CGIAR, food safety approaches are not just designed to reduce health burdens, but also to have a strong emphasis on equity, gender, livelihoods, and nutrition. The recent [external evaluations of food safety](#) and of A4NH provide a strong endorsement of the approach, but stress the need to scale up activities in order to have meaningful impact.

In the relatively small world of food safety research in developing countries, A4NH scientists have a high profile (see Annex 4 on Technical Competency). We are members of high-level initiatives including the WHO FBD Epidemiology Reference Group (FERG) and the Partnership for Aflatoxin Control in Africa (PACA). A key evolution from Phase I is that the proposed research brings together researchers across five Centers in a coordinated, impact-oriented research agenda, informed by impact pathways and ToCs. Building on several decades of food safety research, and already considered the “go to” group for evidence on food safety in informal markets, the flagship is advanced in partnering with NARS and local universities, leveraging advanced research institutes, engaging with global standard setting and development agencies, and engaging the informal sector through traders’ associations and the formal sector through industry associations.

ILRI has a program on food safety and has pioneered risk-based approaches to food safety in informal markets. It has conducted risk assessments in around 40 value chains and with partners piloted a range of innovations including improved milk cans; insecticide treated nets for fly reduction; biogas in slaughter houses; rapid diagnostics for FBD; weather-based forecasts for aflatoxins; and, biological control of aflatoxins in food. Over 200 graduate fellows have been trained, several policy platforms are currently supported and university curricula upgraded. ILRI initiatives to train milk traders and provide an enabling environment were effective, economically attractive, scalable and sustainable in two countries (Kaitibie et al., 2010; Lapar et al., 2014). IITA started biocontrol research for aflatoxins in the late 1990s and has developed an effective product (Aflasafe) along with a systematic approach to large-scale production, ensuring conducive policies, and supporting dissemination (Grace, Mahuku, et al., 2015). ICRISAT has successfully bred for resistance in groundnuts to pre-harvest *Aspergillus* infection and aflatoxin contamination and its stability has been evaluated at multiple locations; such genotypes performed exceedingly well in India and West Africa (Nigam et al., 2009; Waliyar, Hassan, & Bosc, 1994). IFPRI’s work on food safety over the past 10 years includes studies on the impact of international standards on smallholder market participation (Narrod et al., 2009; Okello, Narrod, & Roy, 2011; L. J. Unnevehr & Ronchi, 2014; L. Unnevehr, 2015); the use of wastewater for agricultural irrigation (Lagerkvist, Johansson, Birol, Roy, & Narrod, 2009; Namara et al., 2010); firm response to food safety threats (Saak, 2012a, 2012b, 2013, 2014); and consumer willingness to pay for food safety (Birol, Karandikar, Roy, & Torero, 2015; Hoffmann & Gatobu, 2014; Ordonez & Hoffmann, 2013; Roy, Birol, Deffner, & Karandikar, 2010). Aflatoxin has been a major area of focus within IFPRI’s food safety research portfolio since 2009. IFPRI work on this topic includes collaboration with ILRI scientists on prevalence studies at various stages of the value chain (Hoffmann, Mutiga, Harvey, Nelson, & Milgroom, 2013; S. Mutiga, Hoffmann, Harvey, Milgroom, & Nelson, in press.; S. K. Mutiga et al., 2014); randomized evaluations of the impact of aflatoxin exposure on child growth (Hoffmann, Jones, & Leroy, 2014), farmers’ adoption of technologies to reduce contamination (Magnan, Gajatel-Garrido, Hoffman, Opoku, & Kanyan, in progress), and consumer response to third party aflatoxin labelling (Hoffmann, Moser, & Herrman, 2015); and policy analysis of aflatoxin control strategies (Florkowski & Kolavalli, 2013). IFPRI has developed a strong reputation for impact evaluation, beginning in 1999 with its influential assessment of Mexico’s conditional cash transfer program, PROGRESA (Skoufias, Parker, Behrman, & Pessino, 2001). Since that time, IFPRI has completed or is in the process of conducting dozens of impact evaluations of nutrition, agriculture, market intervention, and other programs all over the developing world.

Some of the significant outputs and outcomes from Phase I that will be built on in Phase II include:

Generating evidence

- *Food Safety and Informal Markets*, a book summarising 10 years of research on food safety in informal markets was published in 2014. The book offers policy makers and public health experts several examples of challenges and solutions in managing food safety in informal markets.
- In 2012, a special journal edition showcased research on informal urban value chains. Papers covered quantitative risk assessment, molecular epidemiology, gender and pilot testing social innovations.
- Technical packages on aflatoxins were developed for the East African Community (EAC) for incorporation into regional policy and a special edition of AJFAND is under preparation.

Enabling environments and policy engagement

- Food safety regulations in Vietnam are being updated with support from A4NH; a team supported by ILRI is helping draft guidelines and providing training; policy platforms are supported in Tanzania, Ethiopia, Uganda, and Assam, India.
- A series of 12 technical papers was prepared on behalf of the secretariat of the East African Community for guiding formulation of aflatoxin policies by the EAC. A team led by IITA and supported by ILRI finalized the papers and helped EAC in validating these in national workshops.
- The Aflatoxin Proficiency Testing for East and Central Africa (APTECA) was established in 2014 through a partnership between IFPRI, Texas A&M AgriLife Research, and the Kenya Cereal Millers Association. Three major maize millers in the region have adopted APTECA food safety protocols and regularly submit samples for third party verification testing at a BecA ILRI Hub laboratory.
- IITA made significant progress in making biocontrol available to farmers in Africa. The National Agency for Food and Drug Administration and Control of Nigeria and the Pest Control Products Board of Kenya granted full registration status to the respective country-specific Aflasafe biocontrol products, paving the way for commercialization. A large-scale Aflasafe manufacturing plant is operational in Nigeria and new modular manufacturing plant is under construction in Kenya.

Building food safety integration across CGIAR

- Seven meetings were held to improve coordination of aflatoxin research across CGIAR Centers. A series of briefs was co-edited by IFPRI and ILRI. Eight of the 19 briefs in the series were authored by CGIAR scientists (IFPRI 2020 Vision Initiative series). A session at the 2013 ISPC Science Forum focused on aflatoxin work across centres and resulted in a publication in 2015.
- Rapid integrated assessments of food safety and nutrition were conducted in five CRP L&F value chains developing recommendations to be taken up by L&F and, to date, four journal articles.

PARTNERSHIPS AND CAPACITY DEVELOPMENT

We will have a smaller number of key partners with whom we work closely in relations of high trust, and a broader range of partners where we work on areas of mutual interest, which is outlined in more detail [here](#). *Successfully piloted solutions* require scale out through funders and partners: these partnerships will build on existing relations, maintaining engagement through generation of evidence on impacts and costs. Exploratory research will be carried out in partnership with NARS, local universities, health services and NGOs. There will be a strong emphasis on science quality and building capacity of partners. Different partners have different contributions along our impact pathways.

- Research partners generate evidence on the importance of the problem and ways to mitigate it. They ensure this evidence is influential by choosing appropriate mediums and channels for dissemination. We partner with national universities in our target countries and elsewhere, national research institutes such as PHFI, ERC, CSRS, HSPH and KMRI, and, for aflatoxins especially, FTF ILs, USDA ARS, MRC, and IARC. Research outputs will be an indicator of this partnership.
- Global partners set the overarching agenda, recognize the importance of food safety, endorse CGIAR solutions for food safety, and make use of evidence provided by CGIAR to change approaches to food

safety in ways that make them more effective and equitable. Partners include WHO, OIE, FAO, and the World Bank, with all of whom we have ongoing partnerships around food safety. Continued and increased involvement in the global food safety agenda will be a partnership indicator.

- Donors fund pilots and jumpstart out-scaling of the most promising approaches, and reduce investments in approaches, which are not helpful. Key donor partners on aflatoxin research are BMGF, USAID, USDA-FAS, GIZ, Meridian Institute, Deloitte, CIDA, DFID, ACIAR and EU. Donor partners on perishables are BMZ/GIZ, DFID; BMGF; and ACIAR. Bilateral funding will be a partnership indicator.
- National, regional and continental public sector partners provide an enabling policy environment and invest in out-scaling. Some key public sector partners are PACA, COMESA, ECOWAS, SADAC, EAC, and Agricultural Ministry Extension Services, National Inter-Ministerial Food Safety Committees in various nations, and AU-IBAR, and municipal and regulatory authorities.
- Communication partners are involved in capacity development for outreach and communication as well as the development of innovative capacity building packages. Partners include CTA, ANH Academy, Ministry of Agriculture, national regulatory agencies (e.g., NAFDAC) and NGOs (e.g., ACDI-VOCA). Partnership indicators include reach and materials.
- Development partners are involved in implementing pilots and supporting out-scaling. Some key development partners in this flagship are WFP, FTH, PACA, FIPS, One Acre, PEPFAR, FAO, VSF-Ge, VSF-Canada. Initiatives based on or using A4NH will be a partnership indicator.
- Private sector (large and small-scale) partners respond to policies and incentives by changing structure and behavior and support development efforts through corporate social responsibility. For aflatoxins, some key private sector partners in this flagship are cereal millers, animal feed industry, poultry industry, farm advisories and agri-businesses (e.g., Doreo Partners in Nigeria and SODEFITEX in Senegal), farmer-producer organizations (e.g., NASFAM in Malawi), exporters MNC, and specialized food companies. For perishables, traders associations and business development services are key. GSMA and market agents associations are important in both areas of research. Engagement in A4NH activities, incorporation of A4NH technologies in and outscaling will be an indicator.

CGIAR has been a major promoter of risk-based approaches for domestic markets. In Phase I, we have developed capacity in more than 100 high-level regulators, graduated dozens of PhDs and MSc, built aflatoxin laboratory infrastructure for the national system in four countries, trained technical staff on biocontrol research from 10 countries, and helped upgrade university curricula in five countries. We are developing technical packages on aflatoxins for the East African Community across the health, agriculture, trade and communications sectors, supporting a national food safety policy task force in Vietnam, and putting food safety in commodity policy platforms in India, Uganda, Ethiopia, and Tanzania. In Phase II, this flagship will continue to focus on developing future research leaders, strengthening institutions, providing training for food safety regulators, developing material to build capacity of value chain actors and to provide policy advice for decisionmakers—all based on research spanning their costs, benefits, and feasibility.

Food Systems for Healthier Diets

IN BRIEF

This flagship aims to contribute to the goal of healthier diets for poor and vulnerable populations through identifying and enabling interventions and innovations by private, public, and civil society actors in national and sub-national food systems. Food systems will be analyzed from a diet and nutrition outcome perspective, filling healthy food gaps and reducing excesses in unhealthy diet components. The flagship builds on research on dietary assessment and methods for improving nutrition through value chains and places these in a broader agricultural, environmental, social, economic and political decisionmaking framework. The flagship includes a new partnership arrangement to implement this research and links to food system actors through a variety of platforms. In the long term, progress will be evaluated through improvements in diets, particularly for women, children, and vulnerable populations. Near-term progress will be measured through greater knowledge, awareness and systematic attention to diets and dietary transitions by researchers in other CRPs and partner research organizations, strategic partners from the private sector, civil society, policymakers, and consumers in target countries.

STRATEGIC RELEVANCE

THE CHALLENGE

The health implications of diets in developing countries are increasingly prioritized by governments, business, and civil society (International Food Policy Research Institute (IFPRI), 2014; WHO/FAO, 2003). While a substantial population share in low and middle-income countries in Africa and South Asia remains chronically undernourished, a rapidly growing share suffer from overweight and obesity and diet-related non-communicable diseases (NCDs) (Lim et al., 2012). These twin challenges are linked, as global, national, and sub-national food systems do not supply appropriate nutritious and safe foods for healthy lives.

What do we mean by food systems? Food systems refers to the full set of processes, activities, infrastructure, and environment that encompass the production, distribution and consumption of food. Food systems link biological, economic, political, and social systems, and include the [governance](#) and political economy of food production and consumption, their [sustainability](#), effects on health and well-being ([nutrition](#) and [food safety](#)), food losses and waste, and links between food production and the [natural environment](#). To understand food systems properly, it is important to pay attention to issues of policy, culture, history, tradition, geography, seasonality, and affordability. Food systems are multi-dimensional, including the socio-cultural, economic, environmental and political (e.g., farming, community, food sovereignty, food access). Food systems thinking is an approach that considers how all elements of the food system are interrelated and can be affected by (targeted) incentives that change final (nutrition) outcomes (Herforth, Lidder, & Gill, 2015).

Strategically, the global challenge of inadequate diets and the logic of taking a food systems approach are compelling and have implications for how we structure both our research and partnerships. CGIAR addresses many critical research elements required for considering food systems. Through a partnership with a world-class institution, Wageningen University and Research Centre (Wageningen UR), this flagship will both facilitate the multi-disciplinary research required and the outcome and impact partnerships for practical food system solutions for healthier diets. The A4NH perspective on food systems focuses on how they can contribute to healthier diets. Changing food systems is one key factor driving dietary transitions and an essential component of sustainable efforts to alleviate malnutrition, and nutrition-related NCDs worldwide (Corinna Hawkes & Popkin, 2015a).

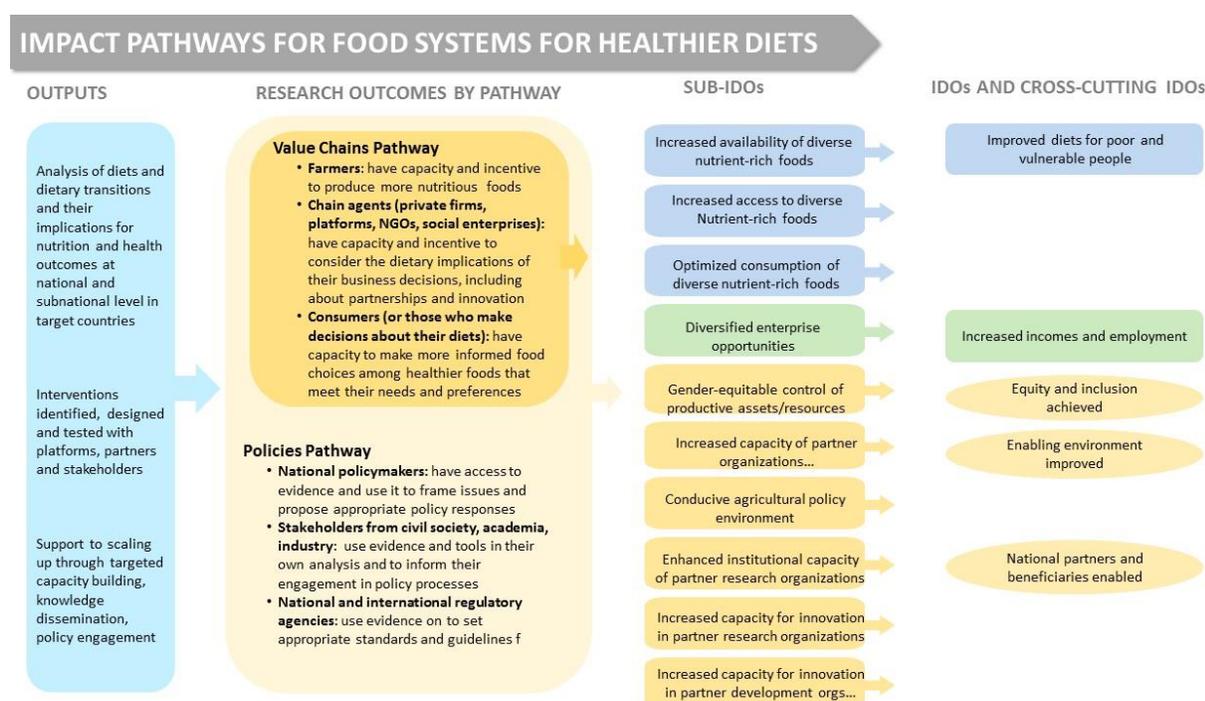
Diets are complex, as foods and nutrients are consumed in combinations that induce interactions and synergies between components. In this context, healthy diets refer to diet quality, defined according to the type and amount of foods and/or nutrients consumed. In general, intake of nutrients and foods of public health concern has grown globally in past decades, especially rapidly in low- and middle-income countries

(LMIC), (Corinna Hawkes & Popkin, 2015b). However, there have also been increases in consumption of healthier foods. A recent systematic assessment of trends in dietary quality indicates that consumption of both healthy foods and nutrients *and* less healthy foods and nutrients increased during the past two decades, with heterogeneity across regions and countries (Imamura et al., 2015). The challenge is to ensure that the healthier diets are available and accessible to all.

CONTRIBUTION TO THE STRATEGY AND RESULTS FRAMEWORK

The overarching goal of this flagship is to understand how diets can become healthier through changes in food systems, and to identify and test entry points for interventions to make those changes. This flagship has the potential to contribute to the aspirations of CGIAR, directly addressing the SLO2 of *improved food and nutrition security for health*, through the IDOs and sub-IDOs on *improved diets for poor and vulnerable people*. This flagship also has important implications for the SLO of *reduced poverty*, through the contributions to the sub-IDO on *diversified enterprise opportunities* (**Figure 4**). Given the wide-ranging implications of food system change, it also contributes to three of the cross-cutting issues.

Figure 4. Impact pathways for Food Systems for Healthier Diets



To transform food systems, this flagship will work with the agri-food system CRPs (AFS-CRPs) on their goals to improve diet quality and avoid unintended negative effects of food system transformation on diets. We will also partner with specific AFS-CRPs to design, test, and scale up promising value chain and food system interventions, like with the CRP on Policies, Institutions and Markets (PIM) for broader economic and food policy analysis (e.g. trade and subsidies), and with the CRPs on Climate Change (CAAFS) and Water, Land, and Ecosystems (WLE) for sustainability. In target countries, we will work closely with public health researchers to identify appropriate policy and regulatory responses, particularly with regard to overweight and obesity where most countries do not yet have national targets.

GEOGRAPHIES AND TARGETS

The focus regions for this flagship are Africa south of the Sahara, South Asia and to a lesser extent, Southeast Asia. Limited work will also be done in Latin America, with specific emphasis on rural-urban linkages and

regulations. In the focal regions, we will examine trends and variability in healthier diets across countries, linking them to changes in food systems. To provide a deeper understanding of diets and food system elements at national and sub-national level, more detailed analysis of determinants and drivers of diets and food systems will take place in four target countries: Bangladesh, Ethiopia, Nigeria and Vietnam. Interventions will also be piloted, and potentially scaled up, in a set of expansion countries (e.g. Benin, Burkina Faso, Ghana, India, Indonesia, Kenya, Malawi, Nepal, Pakistan, Senegal, Tanzania, and Zambia).

The main outcome targets include helping more women to have adequate dietary diversity, and fewer people with macro- and micro-nutrient deficiencies. At present, dietary diversity, our main target indicator, is not widely measured at national scale in the geographies of interest. We will work with countries and partners to use standardized dietary diversity indicators for women and children, and to understand how these indicators can be measured and tracked in feasible, robust, and informative ways.⁴ This builds on work from Phase I on developing and validating methods for using widely-available, household-level consumption and expenditure data to estimate individual-level micronutrient intakes and dietary diversity scores (Fiedler and Lividini in progress).

Many LMIC are increasingly concerned with a growing prevalence of overweight and obesity and associated NCDs. Globally, there has been very limited success in changing such patterns and at present most LMIC do not have targets for obesity and NCD indicators. In this flagship we propose to work with countries and food system actors on assessing overweight and obesity and assessing policy and regulatory options and incentives for reducing unhealthy components of diets.

THEORY OF CHANGE (HOW WILL TARGETS BE REACHED)

The activities and outputs of this flagship will contribute to development outcomes in three main ways, presented roughly in order of when we expect to start seeing (immediate) outcomes among the different actors targeted. The first is through supporting the AFS-CRPs to better incorporate food systems, diet, and gender into their productivity, value chain, and agri-food system research. Following the recommendation of the A4NH external evaluation, and building on the lessons of the gender-nutrition community of practice (CoP) in Phase I, this flagship will host a CoP focused on strengthening and leveraging agriculture, nutrition, and health research across CGIAR which will include capacity building as well as strategic research to address questions important for multiple CRPs. The CoP will set goals and track progress in terms of where and how it adds value to broader CGIAR efforts to contribute to IDOs. The theory of change (ToC) for this work will be developed together with the other CRPs as their ToCs and research plans are defined.

The second way this flagship will contribute to development outcomes is through the policy pathway, initially in the target countries and later in spillover countries. National governments and other stakeholders can consider policy and regulatory options to promote healthier processed foods and reduce unhealthy components. The flagship will provide evidence of diet and food system changes to inform policy discussions and government regulation. Key policymakers and other policy process stakeholders (e.g. from private sector or consumer organizations) will be identified and engaged early on in the target countries. Initially, results of diagnostic work can help frame policy debates, and later, evidence for specific policy interventions can help change the policies themselves or how they are implemented (e.g. through public-private investments).

Finally, this flagship will contribute to better dietary diversity by improving the performance of specific value chains. For target populations with low dietary diversity, we will improve informal and formal value chains for nutritious foods, such as vegetables, grain legumes, biofortified staples, and animal source foods. Wageningen UR will use its experience to coordinate new value chain research on fruits and vegetables

⁴ In 2014, Minimum Dietary Diversity – Women (MDD-W) was selected as the new indicator for global use in assessing the micronutrient adequacy of women’s diets. More information about the indicator is available [here](#).

within this flagship. Early in Phase II, we will identify promising options in other AFS-CRPs’ flagships for collaboration and co-investment. Once we identify promising options for developing, testing, and scaling up interventions, detailed ToCs (similar to those developed in Phase I for other value chain interventions in [biofortification](#) and [food safety](#)) will be developed. Linkages are described more fully in Annex 3 on A4NH Strategic Links to other CRPs, Coordination and Country Collaboration.

PLANS FOR PHASE II

The flagship is motivated by the fact that food system transformation improves food availability, but may have negative health consequences on diets. Research is essential to understand how food systems can be shaped for healthier diets. We propose three distinct but overlapping stages to the research program, along which we organize the work (**Table 2**).

Table 2. Stages of research in Food Systems for Healthier Diets with key outputs and outcomes

STAGE	OUTPUTS	OUTCOMES
Diagnostic	<p>Characterization of diets and changes to diets over time in focus countries</p> <p>Characterization of the food system from perspective of healthy diets in focus countries</p> <p>Analysis of global, national, and subnational food policies on diet</p> <p>Identify constraints and opportunities within food systems for improving diets</p>	<p>Stakeholders and policy makers use generated evidence towards response</p> <p>Enables an evidence based discussion of possible strategies to intervene in the food system</p> <p>Improvement in partnerships and/or networks related to food systems for healthier diets</p> <p>Incorporate key ideas from other CRPs</p> <p>Disseminate diet and food systems information into other CRPs and CRPs use that information</p>
Co-Development and Proof of Concept	<p>Food system interventions for healthier diets identified and designed with platforms, partners and stakeholders</p> <p>Interventions tested /evaluated for improvement in diets</p>	<p>Conceptual framework and process for designing interventions from different perspectives</p> <p>Intervention designs funded for proof of concept</p> <p>Partners identified for proof of concept phase</p> <p>Evidence used in informing future interventions/investments and policies to support food systems for healthier diets</p>
Scale Up	<p>Plans for successful interventions that are tested for impacts on diets, are well-defined, and for which capacity for upscaling exists</p>	<p>Awareness and capacity built around key messages; interventions targeting particular actors</p> <p>Effective food systems or value chain interventions for improving diets in the long term</p>

In the diagnostic stage, dietary transitions, their drivers, and implications in terms of dietary gaps among target populations in the four focus countries is a priority. In this stage, we specifically plan to link changes in food systems to changes in dietary patterns and to understand how dietary patterns change in response to changes in food systems. In the co-development (with other partners including specific AFS-CRPs) and proof of concept stage, results from the first stage are used to help design and pilot test context-specific interventions to modify food systems to improve diets. These interventions can be thought of as value chain interventions, behavior change communication (BCC) interventions, or as working through regulation, pricing or policy levers. In the scale up stage, we will bring solutions for which proof of concept has been obtained in the second phase to scale by partnering with public, private and civil society agents for broad-based interventions in food systems.

EVIDENCE GAPS, RESEARCH ISSUES, AND RESEARCH QUESTIONS

Diagnostic stage. Research questions that we plan to answer in the diagnostic stage are:

- What are the crucial gaps in diet quality in focus countries (and sub-regions), and how are gaps linked to the stage of food system transformation and the policies and actors which influence it? Elements of food

systems cut across value chains, including production, post-harvest handling, distribution and trade, food processing, marketing systems, retailing, and influencing policies.

- How will supply-side and demand-side factors—such as urbanization and increased incomes—influence diet trends, especially for fruits, vegetables, and animal source foods?
- What constraints and disincentives exist in national and subnational food systems that hinder key actors, including both the public and private sector, from improving diets?
- What opportunities exist to support food systems in focus countries in ways that lead to improved diets?

Crucial to all these questions of food system and diet change is understanding the dynamics of consumption and the differential roles in food systems for people by socio-economic status, age and gender, particularly among adolescent girls and women of reproductive age.

The first building block of this research assesses national and sub-national data on consumption for different sub-populations over time. A4NH is currently assessing different sources of individual and household diet data from the Demographic and Health Surveys (DHS), Living Standards Measurement Study (LSMS), and Household Consumption and Expenditure Surveys (HCES) in Bangladesh, Ethiopia and Nigeria as part of the broader International Dietary Data Expansion (INDDEX) Project led by Tufts University. An important objective is to work with national partners in focus countries to combine and triangulate various data sources from a healthy diet perspective, including dietary intake studies, HCES, agricultural censuses, and price surveys. The focus country work will be more broadly informed by ongoing cross-country analyses of food system and diet transformation across a larger set of countries.

The second building block is to characterize dominant food systems and important sub-national food systems in the focus countries, building on existing work, for example, on urban food systems in Vietnamese cities (through CIAT and CIRAD), in local food systems in rural Vietnam (through Bioversity), or on potatoes and aquaculture in Kenya (implemented by Wageningen UR). To do so, key metrics/indicators of food systems relevant to diets will be identified and used to identify the similarities and differences between countries. For different public and private actors in the food systems, the constraints and opportunities for actors to produce, trade, and consume foods contributing to healthier diets will be assessed. The research will take into account differences in the ways food is accessed across the rural-urban gradient, by men, women and children, and by socio-economic group. Gender is particularly important as women play important roles in food systems as both producers and consumers, and often in less formal value chains.

National or sub-national policies are another key element in shaping the actions and choices of food system actors and consumers. For example, cereal-first policies may lead to an overemphasis of grains in the diet relative to legumes. National and international trade policy, taxes, and other regulations can play a role in determining what foods are available and accessible. Further drivers are voluntary sustainability standards adopted by the food industry that seek to reduce the sugar, salt and fat content of their products, as well as their environmental footprint. This work will be done in close collaboration with the AFS-CRPs, PIM, and A4NH flagship on Supporting Country Outcomes through Research on Enabling Environments, which can help shed light on the cross-sector policy interactions and the types of interventions that motivate policymakers to become more nutrition sensitive.

Co-development and proof of concept stage. Concrete opportunities to improve diet quality can be identified and tested by researchers, value chain actors, program implementers, and policymakers or investors within the broader food system and diet transformation framework described above. Some food systems interventions involve improvements to nutrition-sensitive value chains while others may be context-specific. We break value chain research into two different streams of work: one led by Wageningen UR on fruits and vegetables, and the other with AFS-CRPs on improving availability and consumption of other nutritious foods, including legumes, animal source foods, biofortified staples, and complementary foods. We

also see opportunities with the AFS-CRPs to improve specific food groups as well as the Inclusive and Efficient Value Chains flagship in PIM. Another entry point is through partner organizations planning nutrition-sensitive value chain interventions such as the World Food Program (WFP), the International Fund for Agricultural Development (IFAD) or several civic society organizations (e.g. SNV, ICCO). A third type of intervention that could take place would be within other parts of the food system; we discuss those interventions separately. Research questions in this stage differ by type of value chain.

Fruit and Vegetable Value Chains. In each specific context, it is important to understand both the constraints and opportunities for specific fruits and vegetables, as well as for reaching the targeted consumers. It is also important to understand tradeoffs for expanding fruit and vegetable production, likely related to the environment or health. A principal dilemma is the tension between affordability of diverse, nutrient rich food to improve access for low-income consumers, and price incentives for smallholders for producing quality raw materials or produce. This dilemma will be addressed by looking into infrastructural and logistical aspects of agri-food value chains, as well as options for increased efficiencies. For work on fruit and vegetable value chains, the flagship expects to work on actually designing interventions, taking advantage of linkages between Wageningen UR and private seed and agrologistics companies, as well as public sector research and development of fruit and vegetable value chains with AVRDC (The World Vegetable Center) and CGIAR Centers such as ICRAF and IITA, building on work from Phase I. Some research questions we plan to answer:

- What types of interventions in value chains will lead to more affordable, available, or more preferred (in terms of quality characteristics) fruits and vegetables for target populations?

Other Nutrition-Sensitive Value Chains. The flagship plans to collaborate with AFS-CRPs and other partners (e.g. WFP, IFAD) with a strong interest in improving nutrition sensitivity of value chains. While A4NH will not implement value chain interventions, the flagship will add value to interventions with tools and approaches to help value chain actors integrate nutrition sensitivity, with diagnostics from a healthy diet perspective, or with impact evaluations on nutrition outcomes of value chain interventions. The tools being developed include healthy diet outcome measures for consumers. For diagnostics and approaches for integrating nutrition sensitivity into value chains, the flagship will collaborate with the Inclusive and Efficient Value Chains flagship of PIM, which provides a suite of tools for examining value chains. In Phase II, we propose a nutrition-sensitive research team would be resourced by A4NH to collaborate with AFS-CRPs and other partners. Some research questions that we plan to answer are:

- How should value chain interventions be influenced to make them more nutrition-sensitive, accounting for potential positive or negative unintended consequences?
- Where are the opportunities for value chains to retain nutrients through adequate post-harvest handling, storage, transport, and processing, and to augment nutrients through fortification or enrichment? These opportunities likely differ by the type of food (e.g. legumes, animal source foods, biofortified staples).
- What are the net nutritional impacts of value chain interventions taking a whole diet approach? Do foods added to the diet substitute for other healthy foods, or do they replace less healthy foods?

Food Systems Innovations. Beyond using existing good-practice interventions in value chains, new technical, institutional and enabling innovations will be necessary in food systems to better align economic value with nutritional value and diversity of foods, considering that private actors implement many food system actions. Gaps between economic value and nutritional value could result from contextual factors that shape decisionmaking of food systems actors, related to policy, regulation, governance, or even perceptions of policymaker incentives. In this group of activities, the organizing research questions are:

- What types of effective innovations can be done with food suppliers, and what innovations can be suggested to regulators or policymakers to improve diets through the food system?
- Which demand-side innovations stimulate consumers to make healthier food choices?
- How can public regulations and private sustainability standards be co-developed for more synergetic outcomes in national food systems?

Decisions about innovations must be made by all stakeholders, so that the process ownership is shared by participants and researchers and ultimately are adopted by consumers. A particular gap is research into processing, storage, food preparation and other food interventions post-farm. A key innovation is to find ways to mitigate and manage the expansion of relatively cheap packaged and processed foods and beverages, which create diets rich in calories but low in vital nutrients. Another key research area is to increase the seasonal availability and affordability of a basket of nutrient-rich foods. Innovation should involve changes on both the demand side (e.g. through BCC programs) and the supply side (through policy or self-enforcing regulation). Within this context, the flagship would focus on working through public-private platforms (PPPs) in the focus countries and identifying incentives that encourage positive shifts by the business sector.

For PPPs, such efforts are taking place in a larger international context including the World Economic Forum (WEF) and the Scaling up Nutrition (SUN) [Business Network](#). We will focus on engaging with PPPs in the focus countries (and India with many SMEs in on-going proofs of concept) in support of SMEs to develop healthier product portfolios with greater safety and nutritional quality available and accessible to targeted consumers. The flagship will work within existing governmental and consumer initiatives, such as food-based national guidelines and standards, nutrition and cooking clubs, and public-private innovation platforms (for example the [Pulse Innovation Platform](#)) to develop appropriate consumer messaging and interventions to encourage healthier eating habits as well as incentivize companies to provide and promote healthier food options.

Scale-up stage. The goal of the co-development and proof of concept phases will be to identify interventions that work, and modify food systems to provide a diversity of healthier foods. Since the primary countries involved in the flagship are characterized by different initial levels of food system transformation and different diet patterns, by compiling the results obtained in all these countries and conducting a compare-and-contrast exercise, the program will be in a position to generate lessons learned that go beyond the main findings for individual countries. This analysis can also be useful in conducting foresight analyses, under scenarios related to further changes in food systems. In this phase, the partnerships within the co-development phase as well as other scaling partnerships will be critical.

COMPARATIVE ADVANTAGE

Diet transformation and food system research have been identified as key priorities by numerous forums including the [2nd International Conference on Nutrition \(ICN2\)](#), the [International Panel of Experts on Sustainable Food Systems \(IPES Food\)](#), the [Global Panel on Agriculture and Food Systems for Nutrition](#), and others. What is the comparative advantage of CGIAR, A4NH, and the partnership proposed?

CGIAR has considerable capacity in many elements of food systems research including primary agricultural production, value chain, natural resources and environmental sustainability, and policies and institutions. This research has been focused on agricultural productivity and food security goals, but can be realigned to contribute to healthier food systems. In 2012, CGIAR added improved nutrition and health as a high-level goal. A4NH has developed a strong basis for this proposed research, including a validation of dietary diversity indicators (Bermudez, Lividini, Smitz, & Fiedler, 2012), a [framework](#) for nutrition sensitive value chain interventions, [agriculture-nutrition pathways](#), gender-nutrition tools and methods, and assessment of diet transition (Headey, Hoddinott, Ali, Tesfaye, & Dereje, 2015).

Since CGIAR Centers have limited experience in broader food systems transformation, a crucial consideration in this flagship proposal is the partnership arrangement that can address the challenges of convening and integrating diverse partners in a food systems and diet transition research program. Consequently, Wageningen UR has been chosen as the lead partner. Wageningen UR has the breadth of experience across all elements of food system analysis and expertise linking agriculture and nutrition in the Department of

Human Nutrition. With the Centre for Development Innovation (CDI), Wageningen UR also partners with a majority of CGIAR Centers and AFS-CRPs, important for integrating the multiple AFS-CRP value chain efforts within a broader diet quality and food systems framework. Wageningen UR is the project coordinator managing the EU funded project [Smart AgriFood 2; Sustainable Food and Nutrition Security \(SUSFANS\)](#), (EU grant almost €5 million), and [FOODSECURE](#) (EU grant almost €8 million). Within WUR, [LEI WUR](#) will coordinate flagship management, which currently coordinates ten large-scale projects funded by the EU's Seventh Framework Programme (FP7) and H2020. Wageningen UR also has considerable experience with vegetable value chains and public-private partnerships, both in the Netherlands and internationally. Together, we will recruit a new flagship leader and have included the TOR for the position in Annex 4 on Technical Competency, along with details on the qualifications of a selection of researchers expected to work on this flagship.

PARTNERSHIPS AND CAPACITY DEVELOPMENT

Food systems are a broad area of research, so it is important to identify the niche of this research within broader food systems research. This flagship examines food systems from a diet quality lens. For economic growth and sustainability perspectives we will link with other CRPs and partners, including the Inclusive and Efficient Value Chains flagship in PIM, the A4NH flagship on Supporting Country Outcomes, and natural resource and climate change research on the sustainability and resilience of food systems under WLE and CCAFS. Joint work on foresight of food system transformation will be important, as well as working together in national policy forums. We will align with and not duplicate research by public health research colleagues working on dietary assessments (for example Tufts University INDEXX project with IFPRI and FAO) as well as on public health research on the health consequences of dietary change (several groups including Tufts).

Food systems in developing countries involve multiple actors, from smallholder farmers to small-scale enterprises, to policymakers and large or multinational corporations. As private companies play a large role in food systems and their dynamics, operational research on the types of PPPs that can best lead to healthier diets is important. The research will occur through existing platforms constructing public-private partnerships, such as the Amsterdam Initiative for Malnutrition (AIM) the GAIN [Marketplace for Nutritious Foods](#), [COLEACP](#), The Sustainability Consortium (TSC) led by Wageningen UR and Arizona universities, and the Pulse Innovation Partnership led by McGill University, as well as through other existing partners of Wageningen UR, such as Nutreco, Unilever, DSM and FrieslandCampina. A major partnership focus will be to support SMEs in developing countries in developing healthier food products and portfolios. Support can include research evidence on technical innovation to help understand the marketplace and how rules and regulations are applied. For large firms, the partnership interest is to understand how public regulation and private incentives affect decision making, balancing consideration of health, sustainability, and returns to economic activities.

An important part of the research is co-development and testing of food system interventions and innovations with national partners. A goal of partnerships is to develop individual and institutional food system champions in focus countries and to build the capacity of partners in analysis of diet change data and in the use of nutrition-sensitive agriculture and healthy diet tools, interventions, and approaches. Thus, capacity building is a key objective of this flagship. In addition to national partners, CGIAR Centers/CRPs and partners are a key target audience. The aim is to strengthen food systems research capacity across the system (including in A4NH) and capacity to integrate nutrition and health in agricultural research across the AFS-CRPs and I-CRPs focused on policy and sustainability. Capacity will also be built among policymakers and actors in the policy process to support the willingness and ability to use evidence in policymaking and policy implementation, including commitment to collecting and analyzing diet-related on an ongoing basis to inform policy decisions monitor progress towards outcomes.

Improving Human Health

IN BRIEF

This flagship assesses and manages health risks created by agriculture in order to improve human health and agricultural productivity. We propose a new joint partnership arrangement co-convened by the London School of Hygiene and Tropical Medicine (LSHTM) and the International Livestock Research Institute (ILRI), thus bridging agriculture and public health research to identify key opportunities for integrated actions that improve human health. Priorities for cross-sectoral research include health effects of ecosystem changes (such as large scale agricultural water use), shared disease risks and their control between people and animals, and opportunities to increase health benefits by co-locating and aligning health and agriculture interventions. We also note some key emerging challenges, such as antimicrobial resistance and chemical resistance, in which coordinated health and agriculture actions are critical.

STRATEGIC RELEVANCE

THE CHALLENGE

Research linking agriculture and health is not a new idea in development, nor is it new to CGIAR.⁵ Over the past decades, important CGIAR research has spanned irrigation and malaria, use of wastewater, integrated pest management, and emerging and neglected zoonotic diseases, such as influenza and brucellosis. Research that bridges the structural divisions between the agriculture and health sectors provides a largely untapped opportunity to improve the health and livelihoods of poor people, since agriculture, health, and poverty are intimately connected. Ill health is often the [most important pathway](#) for staying or becoming poor. Agriculture is a critical source of income, yet increasing income from agriculture requires healthy and productive farmers.

For infectious diseases, it is clearer to see how agriculture and health communities can work together on prevention and control in humans and animals. There has already been success using multisector approaches, such as One Health.⁶ For health issues related to agro-ecosystem changes and for emerging global challenges, such as antimicrobial resistance in human and animal pathogens and vector resistance to chemicals, joint research is critical but it has been harder to bring together the two communities. Our hypothesis is that important health consequences of future agriculture change can be managed proactively if informed through targeted, collaborative research done in partnership between agriculture and public health. This will require innovative research methods and approaches as well as joint agriculture-health leadership and research teams, in order to ensure that health, agriculture, and equity benefits and risks are better identified and assessed, and that these benefits are promoted or risks prevented or mitigated.

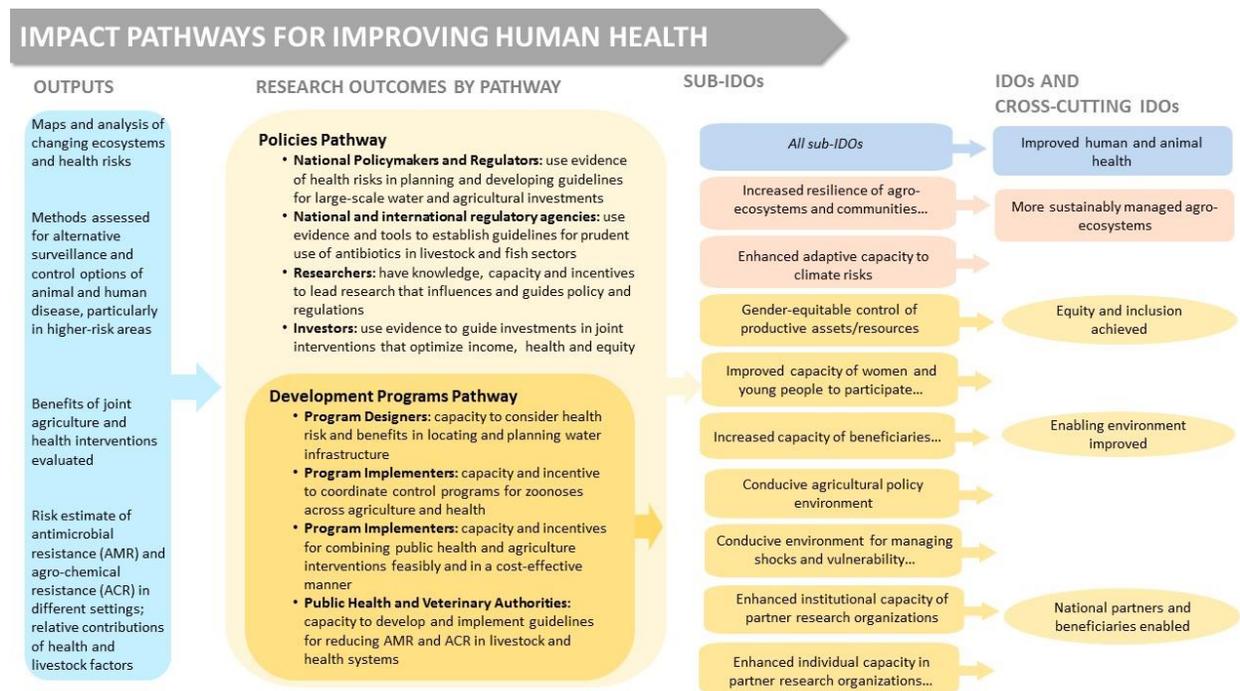
CONTRIBUTION TO THE STRATEGY AND RESULTS FRAMEWORK

This flagship is closely aligned with CGIAR's clear emphasis on linking agriculture and human health in the new Strategy and Results Framework (SRF). It contributes directly to the system level outcome (SLO) on *improved food and nutrition security for health*, the intermediate development outcome (IDO) on *improved human and animal health through better agriculture practices* (and its sub-IDOs), and also to SLO3 on *improved natural resource systems and ecosystem services* as well as cross-cutting issues on *climate change, gender and youth, policies and institutions, and capacity development (Figure 5)*.

⁵ See for example the CGIAR Agriculture and Health Research Platform, led by IFPRI (<http://programs.ifpri.org/ahrp/ahrp.asp>).

⁶ One Health is based on the concept that the health of animals and the health of people are inextricably linked. The health of the environment is also considered to varying degrees in this multi-sectoral approach.

Figure 5. Impact pathways for Improving Human Health



To meet the challenge of effectively linking agriculture and health research, as presented in the SRF, this flagship will be a joint research partnership between leading public health research institutes, convened by the London School of Hygiene and Tropical Medicine (LSHTM) and CGIAR. We offer the best methods and approaches from context-specific agriculture and health research including epidemiology, economics, risk assessment and operational research. Public health research partners will be encouraged to contribute to other public health-oriented issues in the flagships on Food Safety, Integrated Programs to Improve Nutrition, and Food Systems for Healthier Diets. This collaboration will engage with a wider public health research community, including the other CRPs, such as WLE and CCAFS as well as provide CGIAR with a platform for cross-sector agenda-setting in support of its health-related IDOs.

The development of this flagship pre-proposal was informed by a series of [three regional consultations and one global consultation](#) convened by A4NH in 2015 to obtain advice from agriculture and public health research communities on research content (problem definition and expected outputs and outcomes) and process (linkages with national and regional priorities and partnerships). It is evident there are some strong regional networks working on agriculture-health challenges that this flagship can support and build upon and the proposed research issues are considered to be high-priority problems in all the regions.

GEOGRAPHIES AND TARGETS

This flagship will focus primarily on Africa (West/Central and Eastern/Southern regions), South Asia and Southeast Asia, which have significant health burdens associated with agriculture (Grace, Mutua, et al., 2012). We will build on current projects in Benin, Kenya, India, and Vietnam, targeting vulnerable populations in which health burdens remain high to assure equitable health benefits for women, children, youth, and the very poor. [Past research](#) has helped us identify priority zoonotic and emerging diseases and countries (Gilbert et al., 2015) and in Phase II, we will systematically bring together agriculture and health data and analyses to identify target populations. See Annex 2 on Table of Target Beneficiaries and Countries for more details.

The scale of many agriculture-health challenges is known. Our research has confirmed that zoonoses associated with livestock production cause more than 2 million human deaths a year and infect at least one

in 12 animals (2.5 billion) each year in developing countries, reducing their productivity by 10% (Grace, Mutua, et al., 2012). On average, a new disease appears every four months (Doble & Fèvre, 2010; Jones et al., 2013). Most emerging human infectious diseases to spread widely in recent years, originated in animals (Cleaveland, Laurenson, & Taylor, 2001). Since 1997, eight major emerging diseases have cost at least \$100 billion and if these outbreaks had become human pandemics, the losses would have been several trillion dollars (World Bank, 2012). For seven of these eight emerging diseases, livestock was a bridge carrying the disease to humans. Thus, the health impact potential is enormous (Grace, 2014) and research will be critical to bring prevention strategies into the global portfolio, to complement rapid outbreak response.

However, for other research proposed in this flagship, detailed theories of change (ToCs) to assess the potential for impacts at scale need more evidence on key assumptions. For this earlier stage research, some illustrative example of early ToCs were developed during the [regional consultations](#). For early stage research, we will explore systematic prioritization work to understand scale and targets. Agriculture can create environments that are either more or less suitable for agricultural pests, diseases, human pathogens and disease vectors for major high-burden diseases We will build on recent systematic reviews on the role of irrigation and dams for malaria (Keiser, De Castro, et al., 2005), schistosomiasis (Steinmann, Keiser, Bos, Tanner, & Utzinger, 2006), and Japanese encephalitis (Keiser, Maltese, et al., 2005) as well as research on selection of insecticide resistance in malaria vectors (R. F. Djouaka et al., 2008; R. Djouaka, Irving, Tukur, & Wondji, 2011). The scale of problem is big as irrigated rice production systems expanded by 22% in Asia in the last 40 years and will expand in Africa in the next decades (Xie, You, Wielgosz, & Ringler, 2014). This will certainly increase the incidence of vector borne disease (Bett & Grace, 2014). Beyond major diseases of public health, other diseases will emerge in agricultural settings, such as Buruli ulcer in West Africa (Brou, Brouhin, Elguero, Asse, & Guegan, 2008). Ecosystem pressures, such as intensifying livestock, are likely to be exacerbated by climate change; among 25 zoonoses of high importance to the poor, 14 are highly and nine are moderately climate sensitive (Grace, Bett, Lindahl, & Robinson, 2015).

Lastly, describing the scale of and establishing impact targets for emerging challenges, such as occupational hazards of chemical use and antimicrobial resistance (AMR) in humans and animals, will be an area of Phase II research. As much as two thirds of global antibiotics are used in livestock and fish production (Van Boeckel et al., 2015). Annual economic losses from pesticide poisonings in Africa alone are estimated to reach \$97 billion by 2020 (United Nations Environment Programme, 2013) and AMR infections may cause 10 million extra deaths a year and cost the global economy up to \$100 trillion by 2050 (Review on Antimicrobial Resistance, 2014).

THEORY OF CHANGE: HOW WILL THE TARGET BE REACHED

Evidence generated by this flagship is expected to influence agriculture and health program implementers in designing and implementing more cost-effective programs, while also helping enablers, like policymakers, decisionmakers, and donors, make sound policy and investment decisions to improve human health. Building on theories of change (ToCs) already developed on [how research influences program implementers](#) and [how to create an enabling cross-sectoral policy environment](#), we will develop detailed ToCs for research clusters using these two pathways. One key assumption underlying this flagship's ToC is that agriculture and health researchers need to and can work productively together on the challenges described. Given past experiences, we believe that this assumption needs to be explored and validated.

In developing this program, we sought advice from our external evaluators on the [past history of agriculture-health research and opportunities for the future](#) and we conducted a [series of consultations](#) with agriculture and health researchers. From this it emerged that cross-sectoral collaboration requires a strong appreciation of the benefits and a respect for the valuable knowledge held by each sector. This has been achieved in the specific area of One Health, and public health researchers consulted welcomed agricultural research collaboration on health issues associated with ecosystem change and global challenges such as AMR and

resistance/residues to chemicals to help health move beyond response to mitigation and prevention. For outcomes and impacts, this cross-sectoral convergence approach will need to be agreed upon and supported by other key implementers such as government agencies as well as donors and policy makers.

We have already explored the potential for cross-sectoral ToC development in a [series of regional consultations](#) with agriculture and health researchers held earlier this year, where A4NH's overall approach to impact pathways and ToCs was enthusiastically endorsed. A number of initial ToCs were developed for further integration into the research process, summarized in the [consultation report](#). Beyond direct health benefits, outcomes should integrate equity, gender, youth and vulnerability issues across all proposed research (**Figure 5**). For example, emerging zoonoses often cause panic and lead to market disruption, reduced access to inputs, and diversion of funding to emergency responses, that can be much more harmful to poor producers and consumers than direct losses from the disease (McDermott & Grace, 2011). Key assumptions in the ToCs include the acceptability and accessibility of solutions for intended beneficiaries and the degree to which program implementers and policy enablers (government, civil society, and communities) can come together to design and adapt interventions that are feasible, scalable and sustainable. To tackle this complexity, some important research principles will include joint research with beneficiaries, building research teams in countries and with regional networks, and then linking these teams to global networks.

Evidence will be crucial in updating ToCs and using them for evaluation and learning. In newer areas of research, this flagship will generate research outputs through evidence gap mapping and systematic reviews supported by epidemiological studies to assess and quantify risks, and through economic assessments on costs of disease and cost-benefits of different control options. New research approaches and methods will be developed, including innovative ways of combining existing agriculture and health data and synthesizing evidence for a variety of decisionmakers across sectors and contexts.

PLANS FOR PHASE II

EVIDENCE GAPS, RESEARCH ISSUES, AND QUESTIONS

The major gap this flagship fills is the need for integrated agriculture and health research expertise on the challenges previously described. By linking CGIAR experts in agricultural systems in low and middle-income countries with health experts in the same regions, we will create and apply interdisciplinary methods to identify agriculture-health research priorities and design coordinated interventions. This will involve integrating data sets and developing new tools and metrics. Specifically it will involve:

- Economists collaborating with epidemiologists to create innovative ways to measure combined agriculture and health benefits and costs of interventions in target populations;
- Agro-ecosystem experts working with epidemiologists to understand and manage agricultural processes for positive health impacts;
- Animal health and human health epidemiologists and evaluation specialists working together to model and measure cross-sectoral risks (e.g. for zoonotic disease or AMR and ACR); and
- Molecular biologists developing and applying genomic methods to measure the movement of pathogens and pathogen resistance between livestock and humans.

Research in this flagship will contribute to innovation in three main areas: diseases in agricultural landscapes, emerging and neglected zoonotic diseases, and global challenges on agriculture and health.

Diseases in agricultural landscapes. This area is about predicting and managing health implications of ecosystem/ land use change, particularly changes in land, water and agrochemical use, intensification of livestock systems and impact of climate change on agriculture and health. We will focus on the relationship between changing land and agriculture water use and vector borne disease, wastewater management and use in intensive livestock and urban agricultural systems, occupational health in intensified agriculture and the implications of climate change for health in agricultural landscapes. We will build on current research and

established partnerships; however there will be much new research in this area. This research will use existing or conduct new systematic reviews and gap analysis. With this evidence in hand, the next step will be for multi-disciplinary research teams to agree upon research priorities, form teams, and co-develop interventions to test in 3-4 sites across the three regions. Initial projects will be focused primarily on health links to irrigation and the issue of waste related to livestock intensification. Results from the studies will be shared with stakeholders to adapt into guidelines for investment and implementation of large scale interventions and agricultural intensification plans. Key research questions on diseases in agricultural landscapes that we will explore are:

- Prioritization. Which interactions between agroecosystems and public health issues are important? How do we measure “importance” across health and agricultural outcomes? What methods can assist decision makers in prioritization?
- Testing solutions. How do we evaluate agricultural interventions for improved health benefits or reduced risks in the context of intensifying agricultural systems? What ecosystem services help regulate disease? How can these be measured, monitored and valued across sectors? How can women and youth benefit from the opportunities opened by agriculture intensification and protected from the associated risks?
- Capacity development and enabling environment for scaling up. How can integrated agriculture and health projects be developed for different contexts and populations? What are the constraints and bottlenecks to replication, adaptation and scaling-up for such cross-sectoral initiatives? What sectoral and inter-sectoral capacities and skills need to be developed at community level and in government (district, provincial, and central level), with what approaches? How can evidence from this research be used to support inter-sectoral programs and policy?

Emerging and neglected zoonotic diseases. Research in this area aims to reduce the human health burden of zoonotic disease and the health and economic burden of global pandemic threats, using the One Health approach. This will build on substantial work on brucellosis, cysticercosis and avian influenza and more recent, exploratory, research on Q fever, leptospirosis, MERS, Lassa fever (LF), and Ebola. Control of neglected zoonoses is primarily a problem of resources and co-ordination. We will focus on design and evaluation of interventions for two priority diseases, brucellosis in all three regions and cysticercosis in eastern and southern Africa (building on A4NH research from Phase I that contributed to [WHO priorities](#) for cysticercosis control. Research will combine both public health and veterinary interventions, co-development with stakeholders. Results from these interventions can be adapted and used by national and international veterinary stakeholders in improved disease control models in target countries. The second stream of work is around emerging diseases. We will establish new diagnostic platforms in all three regions to look at pathogen trends in livestock and humans. Research generated by these platforms has high potential to be incorporated into country surveillance programs to improve targeting and prioritization of risks. Another part of this research will look at historical data from emerging disease outbreaks, like avian influenza, to see how outbreak response plans and their implementation affected gender and equity impacts. This research can be helpful in improving national and regional emerging disease response plans that do not inadvertently harm the vulnerable during outbreaks. Key research questions on emerging and neglected zoonotic diseases are:

- Characterization and prioritization. How can combinations of existing and new data contribute to better prioritization and targeting of human and animal health burdens and benefits of interventions? What are the priorities for field and research diagnostics to improve exposure and risk information?
- Testing solutions. Developing and piloting approaches to managing priority zoonotic disease such as brucellosis in the Indian dairy chain and cysticercosis in smallholder pigs in both East Africa and Asia. What are options for deployment of existing or adapted technologies such as vaccines in different contexts?
- Capacity development and enabling environment for scaling up. How best to enhance the capacity of the local animal and public health workers on surveillance and diagnosis of zoonotic diseases, particularly in vulnerable populations? Can we adapt the successes of participatory approaches so effective in global rinderpest eradication? What alternative program approaches could be used at scale such as community

animal/human health workers; health delivery franchises; and others? What can be learned from public health systems research for application in agriculture?

Global challenges on agriculture and health. This research will take a new, integrated approach to investigating problems which are common to both agriculture and health sectors and may be linked, but for which the scale of the problem and the role of agriculture are not fully understood. These include AMR, insecticide resistance in pests and vectors, and the food, and zoonotic disease factors, which interacting with care, determine maternal and child nutrition. These areas are characterized by a lack of information on their relative importance and links, and a lack of existing collaboration. Research will start with evidence summaries (Grace, 2015) and joint systematic reviews and gap analyses, involving CGIAR experts in animal health, pest management, and nutrition, and health experts in early childhood disease, sanitation, antimicrobial use, medical entomology, toxicology, etc. The next step will be for stakeholders to agree on how to gather field evidence to identify the major risks associated with antibiotic use in livestock and AMR and to promote information sharing across disciplines, sectors, and national boundaries in order to characterize the use of chemicals in different agricultural systems and the links to human health outcomes (including occupational hazards, resistance, and residues). For both of these issues – antibiotic and chemical use in agriculture – research generated by this cluster will be used to influence country policies, guidelines, and codes of conduct. Key questions on global challenges on agriculture and health are:

- *Characterization and prioritization* What is the current evidence on the role of agriculture in the problem and in the solution (e.g. AMR in livestock, insecticide resistance in pests, food and its contribution to nutrition) in low and middle income countries: prevalence, trends, drivers and variation by farming system, species and country? What is the current evidence on the human health problem (e.g. AMR in humans, vector resistance to bednet insecticides, infectious disease and nutrition). What are the pathways by which these problems may be linked across agriculture and health? How can experiments/studies be developed to examine these links?
- *Testing solutions.* How can social, economic and biological research (including molecular epidemiology, enteropathy studies) research be used to quantify links between agriculture and health problems and identify key points for intervention? What approaches to regulation and education may prove most effective in improving both health and agricultural outcomes, and how might these interventions be linked?
- *Capacity development and enabling environments for scaling up.* How can comprehensive, systematic, repeated, integrated surveillance systems be established to ensure that agriculture and health benefits from sectoral interventions like antibiotic use, insecticide use and maternal and child nutrition are realized and negative interactions avoided?

Beyond research in this flagship, we will use this agriculture-public health research partnership to jointly plan and assess co-located health and agriculture interventions. Some of these co-located interventions will be in this flagship (for example veterinary interventions for cysticercosis with WASH interventions from public health). Other will be in other flagships, such as joint WASH and nutrition-sensitive agriculture interventions in the A4NH flagship on Integrated Programs to Improve Nutrition and joint food safety interventions for vegetables linked with wastewater treatment interventions in the A4NH flagship on Food Safety and WLE.

COMPARATIVE ADVANTAGE

Key to A4NH's comparative advantage is the unique inter-sectoral management structure established for this flagship. It will be a joint venture between agriculture and health research institutes, jointly led by a public health research network and CGIAR. LSHTM will represent and convene public health partners and ILRI will represent and convene CGIAR partners, a selection of animal-health focused research institutions, and a range of national partners. The co-leads will jointly recruit a flagship leader and will support that leader in convening a flagship management team of senior researchers from different institutes who will develop the research agenda, identify priorities and partners, and contribute designing cross-sectoral projects (ToRs to be

made available). This team will also serve as a resource for other CRPs and Centers on agriculture-health collaboration.

The public health research network will be convened by LSHTM, who will draw upon its research expertise and strong international collaborations on water and sanitation, management of malaria and other vector borne diseases, climate change and health, urban health, and zoonotic diseases. LSHTM has unique experience in successful research collaborations with the agricultural sector through its membership in the Leverhulme Centre for Integrative Research on Agriculture and Health (LCIRAH). LCIRAH brings together natural and social scientists from LSHTM, the Royal Veterinary College and the School of Oriental and African Studies. LCIRAH has developed with A4NH a new global Agriculture, Nutrition and Health Academy which will focus on building research capacity for methods linking agriculture and public health. LCIRAH's research includes work with LSHTM's highly regarded [Malaria Centre](#) on the impact of agricultural development on malaria prevalence, studies on optimizing health and environmental outcomes from agriculture and food systems in Asia and interdisciplinary studies on AMR and zoonotic disease in Africa. Established in 2010, LCIRAH is a unique inter-institutional, interdisciplinary, and inter-sectoral collaboration for research and capacity building in agri-health, and a partner with A4NH in the newly launched Agriculture Nutrition and Health Academy. Other founding global public health research consortium members include the University of Liverpool / Liverpool School of Tropical Medicine and the Swiss Tropical and Public Health Institute.

From CGIAR, researchers in A4NH (mainly from ILRI and IITA) have produced key priority-setting and systematic evidence reviews to inform proposed Phase II research. In addition, we have an existing portfolio of agriculture-health research projects and platforms that can be built upon in this flagship:

- [West and Central Africa AgroEcoHealth platform](#) housed at IITA in Benin with a number of agriculture-health research projects and national and regional Ecohealth partnerships.
- [Centre Suisse research centre in Cote d'Ivoire](#) including long-term health demographic sites and agriculture-health research projects.
- [Roadmap to Combat Zoonoses Initiative \(RCZI\)](#) in India was launched by the Public Health Foundation of India in 2008 as a national initiative on research, capacity building and health promotion for prevention and control of zoonotic infections.
- [Zoonotic and Emerging Diseases research group](#) bringing together the Institute of Infection and Global Health, University of Liverpool and ILRI, with the Kenya Medical Research Institute (KEMRI) have two major field research sites in Kenya.
- The [Leverhulme Centre for Integrative Research on Agriculture and Health](#) (LCIRAH) has since 2010 led an interdisciplinary, intercollegiate research programme linking public health, environment, and agriculture and livestock science research. LCIRAH's research includes work with LSHTM's highly regarded [Malaria Centre](#) on the impact of agricultural development on malaria prevalence, studies on optimizing health and environmental outcomes from agriculture and food systems in Asia and interdisciplinary studies on AMR and zoonotic disease in Africa.
- [Biosciences eastern and central Africa-International Livestock Research Institute](#) (BecA-ILRI) Hub is a shared research and biosciences platform located at and managed by ILRI in Nairobi, Kenya. It provides a bio-bank facility as well as state-of-the-art molecular biology laboratories for African and international scientists.
- South-east Asia research and capacity building initiatives include: the [Southeast Asia One Health University Network](#), the [Ecohealth Field Building Leadership Initiative](#), the [One Health / Ecohealth Resource Center at Chiang Mai University](#), among others.

PARTNERSHIPS AND CAPACITY DEVELOPMENT

This flagship will require collaboration across health, agricultural, and environmental research sectors, and will rely on experience working with A4NH's broad categories of partners: researchers, implementers, and enablers (such as policymakers, decisionmakers, and donors).

Researchers. In addition to the co-leading institutes and CGIAR Centers and CRPs, we will build on partnerships with PHFI, University of Liverpool, Swiss TPH, Liverpool School of Tropical Medicine, The West and Central Africa organizations for the control of endemic diseases (OCEAC and OAS/WAHO), Kenya Medical Research Institute, and the medical and veterinary departments of national universities. In each of our focal regions, we have identified a group of agriculture-health research champions, many supported by the Wellcome Trust and the International Development Research Centre (IDRC), for example.

Program implementers. Another important group of partners are program implementers, including both national agricultural agencies and public health program implementers, Zoonotic Disease Units of government ministries, and UN agencies like WHO and FAO. Many of our national partners have developed relationships with important civil society and community groups. The relevance of our research is enhanced and the likelihood research outputs can contribute to the achievement of outcomes is increased by these partnerships. There is a unique role for engaging the *private sector* in this flagship. The pharmaceutical industry and pesticide companies have an important role in improving AB and pesticide use.

Enablers. This flagship will build on its experience working with governments and donors. The team has built the strongest relationships in India and Kenya. Influential global entities, such as DFID, OECD, OIE, FAO and WHO commissioned researchers in this team to develop reports on zoonoses and poverty, emerging disease, foodborne disease, MERS, gender and livestock (including health) and the impact of livestock disease (including zoonoses), and AMR during Phase I of A4NH.

Capacity development is a significant part of how this flagship plans to contribute to development outcomes. It has a particular challenge of building capacity for research collaboration across historically isolated public health and agricultural research communities. This flagship primarily focuses on two of the nine elements of capacity development. In interactions with academic partners, we provide capacity strengthening of post-graduate students through teaching and mentoring, which develops future research leaders. The Agriculture, Nutrition and Health Academy will be one such avenue where this flagship will directly contribute to cultivating future agri-health research leaders.

At the regional level, we are partnered with strong capacity development institutions and networks. In India, PHFI integrates both research and public health capacity development. In Southeast Asia, effective regional networks and platforms, established as part of regional Ecohealth or veterinary public health initiatives at CMU in Thailand with its One Health/Ecohealth Resource Center and Veterinary Public Health Center for Asia Pacific (VPHCAP) and the Hanoi School of Public Health will be active partners. Past investments by Wellcome Trust have established to agriculture-health networks, SACIDS and Afrique One in Eastern and Southern Africa and West and Central Africa respectively. We will link these with coordinated research in the program through the IITA-convened agro-ecohealth platform and ILRI-coordinated zoonoses research efforts in East Africa.

Integrated Programs to Improve Nutrition

IN BRIEF

This flagship responds to strong demand from governments, donors and program implementers for evidence on the impact of development programs that integrate nutrition and health components with elements from other sectors such as agriculture, social protection, gender, or water and sanitation on nutritionally-vulnerable populations such as mothers and young children. Integrated, multisectoral programs are essential to meeting global nutrition targets, yet to date there is little evidence on what types of programs work, in what contexts, and at what cost. Flagship researchers work in close collaboration with program implementers to ensure the quality of the evaluations, as well as to learn about how programs work, what the implementation challenges are, and how program designs can be improved and scaled up. In addition to providing evidence and building capacity among investors and implementers, this flagship also produces data, methods, and tools that other researchers and evaluators can use to continue to build the evidence base on program effectiveness. Examples of areas of expansion for Phase II include a greater focus on children beyond the first 1000 days and on adolescent girls, a broadening of the scope of outcomes and impact indicators (e.g. early child development outcomes, indicators of overweight, obesity and non-communicable diseases), and a focus on programming through a broader range of implementers and in urban and rural areas where relevant.

STRATEGIC RELEVANCE

THE CHALLENGE

The need for a multisectoral approach to address undernutrition is widely recognized. Even if the core package of effective nutrition-specific interventions were scaled up to 90% population coverage in the 34 countries with the highest burden of undernutrition, child stunting would only be reduced by 20% (Bhutta et al., 2013). However there is still a challenge to identify which nutrition-sensitive interventions are the most cost-effective (Ruel & Alderman, 2013). This challenge is especially pressing for the most nutritionally vulnerable individuals, pregnant and lactating women and young children who have high nutrient requirements. Young children especially are difficult to reach through market-oriented agricultural interventions, and the window of opportunity for preventing the lifelong consequences of undernutrition is very short—the 1000 days from conception to a child’s second birthday (Black et al., 2013). Currently, there is a high level of commitment to addressing maternal and child health through multisectoral approaches, however this commitment is accompanied by a demand for rigorous and credible evaluation evidence to inform intervention and investment choices.

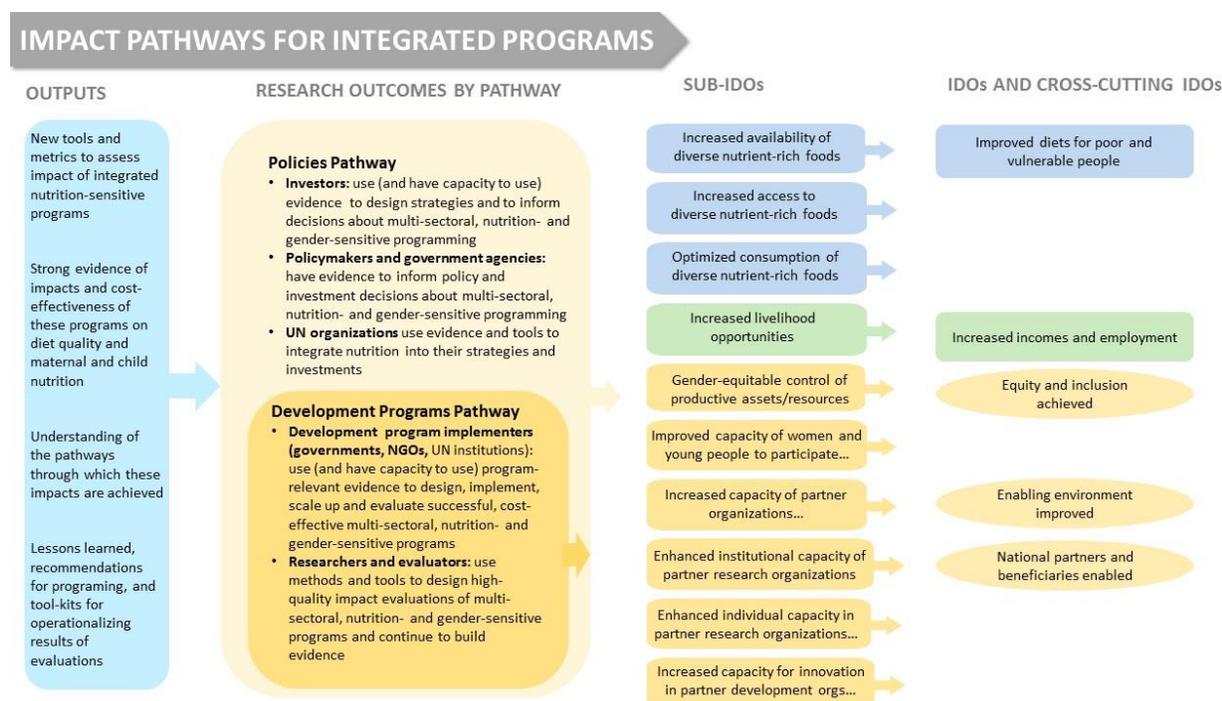
The direct determinants of undernutrition – poor diets, high rates of infections, and sub-optimal child feeding and care practices (Black et al., 2013) – are well known, as are the underlying household and community factors that characterize poor environments, including limited access to stable income, education, nutrition information, nutritious foods, health, water, sanitation and hygiene (WASH) services, and gender inequities (Ruel & Alderman, 2013). What is needed is to identify ways to translate this knowledge into cost-effective programs, targeted to specific beneficiaries and contexts. Agriculture has the potential to be an important component of integrated interventions due to its close linkages with both the direct causes (diet, feeding practices) and underlying factors (income, food, water, gender) of undernutrition. However to date there is little evidence that agricultural interventions improve nutrition outcomes (Ruel & Alderman, 2013). Many of the studies of agricultural programs that failed to document impact in the past were not well designed and may not have captured impact had it occurred (Ruel & Alderman, 2013). Therefore, there is an urgent need to conduct rigorous, well-designed evaluation studies to document whether and how agriculture can be incorporated, along with other sectors like health, education, social protection, and WASH into successful programs that improve the lives of vulnerable populations.

Working closely with investors and development implementers, this flagship has already completed several evaluations that have provided important and influential evidence on effectiveness of integrated agriculture, nutrition and health interventions on beneficiaries’ knowledge and practices, on diets and nutrition, and on women’s empowerment and status (D. Olney, Pedehombga, Ruel, & Dillon, 2015; D. Olney, Bliznashka, et al., 2015; van den Bold, Quisumbing, & Gillespie, 2013a). When the current portfolio of 13 evaluations is completed and results are synthesized in the first three years of Phase II, they will add considerably to the evidence base on what works, where and how and further inform the areas of research expansion planned.

CONTRIBUTION TO THE STRATEGY STRATEGY AND RESULTS FRAMEWORK

This flagship is designed to address the second system level outcome (SLO2) of *improved food and nutrition security for health* through focusing on the IDO of *improved diets for poor and vulnerable people* (and all sub-IDOs) while incorporating the cross-cutting issues of *gender and youth, policies and institutions* and *capacity development* (Figure 6). This flagship has the potential to contribute to the SLO of *reduced poverty* in the short term (through the IDO on *increased incomes and employment*) and in the long-term through building human capital.⁷ If well designed, targeted and implemented, the multisectoral, gender-focused, nutrition-sensitive-development programs that this flagship aims to strengthen can improve the lives of the poor and contribute to economic development.

Figure 6. Impact pathways for Integrated Programs to Improve Nutrition



GEOGRAPHIES AND TARGETS

South Asia and Africa south of the Sahara have the highest burden of child and maternal undernutrition and progress in reducing undernutrition, especially in Africa south of the Sahara has been slow. This flagship focuses primarily on rural areas in these regions (e.g. Bangladesh, India, and Nepal in South Asia and Burkina Faso, Senegal, Mali, Ethiopia, Tanzania, and Zambia in Africa). Given rapid urbanization, however, this

⁷ Improving nutrition in utero and the first few years of life can improve cognitive development, educational achievements, employment and wages, and health and nutrition at adulthood and in future generations (Addo et al.; Hoddinott, Alderman, Behrman, Haddad, & Horton, 2013; Prendergast & Humphrey, 2014).

flagship will expand in Phase II to looking at programs in urban areas with potential impacts on overweight, obesity and double burden (under and over nutrition) where relevant. More details can be found in the Annex 2 on Table of Target Beneficiaries and Countries.

THEORY OF CHANGE: HOW WILL TARGETS BE REACHED

As suggested in **Figure 6**, this flagship expects to have impact by improving the way that development implementers design and implement development programs that integrate components from multiple sectors, including agriculture, to improve nutrition, health and other outcomes. Evidence on what programs work, where and why is essential, however this information needs to reach decisionmakers in implementing organizations and they need to have funding to implement the programs. The latter is often influenced by investors, so this flagship works closely with them to ensure that evidence supports and informs strategies and investment choices. Examples include the U.S. Government's [Feed the Future initiative](#), which promotes the improvement of nutrition through multisectoral approaches linking agriculture, health and nutrition in 19 target countries; and the Bill and Melinda Gates Foundation's newly launched [nutrition strategy](#), which includes a strong focus on leveraging agriculture and food systems to improve nutrition.

Uptake also requires that program implementers are able to operationalize the findings, which often means adapting them to their own contexts. To facilitate uptake of our research outputs by programs, we will continue to have ongoing engagement with program implementers to formulate research questions, define program impact pathways, and discuss findings from process and impact evaluations. We will work with knowledge translators to identify the general principles and operational implications of research, including resource and capacity requirements. This information will help implementers (and investors) make informed decisions. Researchers in this flagship already work closely on dissemination and capacity strengthening approaches in partnerships with knowledge translators (e.g. the FANTA and SPRING projects, select NGO or UN institutions). In Phase II, we will design a plan to work more closely with in-house and external knowledge translators to enhance our capacity in knowledge dissemination and evidence translation into lessons learned, recommendations for programming, and toolkits for operationalizing the learning from our body of evidence.

For the impact of research to be scaled and sustained, it will also be important that an enabling environment for nutrition-sensitive development be supported. At the global level, our work will provide concrete evidence and country examples for the Scaling up Nutrition (SUN) movement's promotion of multisectoral approaches for improving nutrition, and for partner institutions like the International Fund for Agricultural Development (IFAD) who are in the process of mainstreaming nutrition in their country strategies and agricultural projects. At the regional and country level, we will continue to engage in Africa with the African Union's Comprehensive Africa Agriculture Development Programme (CAADP) process and partners. Through the A4NH flagship on Supporting Country Outcomes through Research on Enabling Environments, we will share lessons learned from our work to support CAADP's efforts to mainstream nutrition in national agricultural development programs and policies (see [A4NH blog post](#)).

Finally, in the diverse and dynamic environments in which we work, there will be a need for ongoing evaluations to validate proven programs and test new ones. We will collaborate with researchers and mentor students from academic institutions to further the reach and use of our outputs and to benefit from the methods, tools and evidence generated by other researchers on what works to improve nutrition.

PLANS FOR PHASE II

EVIDENCE GAPS, RESEARCH ISSUES, AND RESEARCH QUESTIONS

In Phase II, this flagship will expand its evaluation, capacity building and engagement activities and undertake synthesis work to generate a rich body of evidence and knowledge regarding the contribution of these

programs to improving diet quality and the welfare of the poor, especially nutritionally-vulnerable mothers and young children.

In addition to the general lack of evidence on what interventions work, there are several key evidence gaps we sought to fill in Phase I. The first is related to *how* to optimize delivery and utilization of these complex, integrated, multisectoral programs. Some key bottlenecks such as low coverage, inefficient targeting and poor quality of service delivery have been identified. For example, research conducted under this flagship during Phase I studied different platforms that were used to deliver nutrition and health behavior change communication (BCC), and found that several of them had limited impacts on improving knowledge and adoption of some recommended health and nutrition practices (Jef L. Leroy, Heckert, Cunningham, & Olney, 2014), although they were successful at improving others (e.g. [Alive & Thrive](#) project in Bangladesh, Ethiopia and Vietnam; results forthcoming). Some of the constraints identified through process evaluations included staff capacity and motivation and sub-optimal intensity and quality of BCC activities (D. Olney, Behrman, Iruhiriye, van den Bold, & Pedehombga, 2013; D. Olney, Parker, Iruhiriye, Leroy, & Ruel, 2013; D. Olney, Richter, et al., 2013). The capacity (economic, cultural, time-related) of beneficiaries to learn, retain and adopt recommended practices may also be a limiting factor.

Research carried out in Phase I also highlighted the key role of women in fostering the impacts of agriculture on nutrition (Herforth & Harris, 2014). (Herforth & Harris, 2014). More specifically, our work identified women's health, nutrition, empowerment and time use as key mediating factors in ensuring that agriculture leads to improved diets and optimal use of income to protect the health and nutrition of vulnerable household members. Recognizing the importance of women's engagement in agriculture for maximum impacts, several of the programs evaluated in Phase I specifically targeted women and incorporated sets of activities to educate and empower them. For example, results from a study in Burkina Faso with Helen Keller International (HKI) showed that nutrition-and gender-sensitive agriculture programs improved women's empowerment, including control and ownership of assets (Quisumbing et al., 2015) and reduced the male-female asset gap (van den Bold, Pedehombga, Ouédraogo, Quisumbing, & Olney, 2013). Planned work in Phase II will build on past work and identify new ways to empower women and also to sensitize men and communities about the importance of supporting women in their multiple roles. Research will continue to assess and prevent the potential unintended consequences of targeting women in agricultural programs such as increased workload, domestic violence or loss of control over income (Hidrobo & Fernald, 2013; Quisumbing, Meinzen-Dick, Njuki, & Johnson, 2013; von Braun & Webb, 1989). Similarly, we will continue to monitor the potentially negative consequences of select agricultural programs including irrigation for malaria (Ijumba & Lindsay, 2001; Keiser, De Castro, et al., 2005), or the promotion of small animal rearing for zoonotic and other infectious diseases, especially in young children living in close proximity with animals (Humphrey, 2009; Prendergast & Humphrey, 2014). We will ensure that income gains from agriculture and complementary social protection programs do not increase the risk of overweight and obesity in populations where these problems are emerging or rapidly becoming endemic (Jef L Leroy, Gadsden, González de Cossío, & Gertler, 2013). Finally, the dearth of information on cost-effectiveness of different programs and interventions packages constrains the use of evidence for decisionmaking regarding program choices and scale-up.

To address these evidence gaps, this flagship will continue to build and synthesize evidence on what works, how and at what cost for nutrition-sensitive programs. Our synthesis work, which will start early in Phase II will use findings from Phase I to identify commonalities and differences across programs and contexts in aspects such as impacts on maternal and child health and nutrition outcomes, implementation challenges, bottlenecks and successes, and cost-effectiveness of different approaches. It will show to what extent the effectiveness of specific program approaches and implementation platforms depends on contextual factors, such as poverty level, education, or availability of services. This synthesis work will thus provide invaluable insights into key areas that need to be addressed in order to optimize impacts of nutrition-sensitive

development programs such as issues related to program design, targeting, implementation, utilization and evaluation. Furthermore, in Phase II we will:

- Expand our evaluation work to new program packages and models, especially in WASH and malaria prevention and treatment, which may improve program impacts on nutrition outcomes through reductions in disease burdens (this work will be carried out in partnership with the flagship on Improving Human Health). We will also expand our work to programs that incorporate education and early child development (ECD) interventions, which may have both short (motor and cognitive development), medium (school achievement) and long-term (income) benefits (Engle et al., 2011).
- Test different delivery platforms and innovations for nutrition interventions (e.g. market-based platforms or self-help groups) with implementers.
- Broaden the scope of outcomes and impact indicators we evaluate to have a more comprehensive understanding of the multiple benefits of the programs, including ECD outcomes, women's nutrition, health, empowerment, time use, and overweight, obesity and NCDs where relevant.
- Increase the timeline over which we measure program impacts to look at longer-term, spillover, and/or potential intergenerational effects.
- Expand our target populations to include: a) adolescent girls with a focus on interventions aimed at keeping girls in school and delaying pregnancy in order to improve their health and nutrition knowledge, practices and status prior to marriage and conception; this work will also include sensitization of adolescent boys, men and communities to prevent early marriage and pregnancy; b) preschoolers 3-5 years of age to determine if – or to what extent – children can benefit from nutrition-sensitive programs after the first 1000 days (Jef L. Leroy, Ruel, & Habicht, 2015); and c) urban populations (with the flagship on *Food Systems for Healthier Diets*) as relevant in our target countries.

The primary research questions that will be addressed in Phase II include the following:

- What is needed to optimize the impact of nutrition-sensitive programs to improve diet quality and to improve other health and nutrition outcomes in children, adolescent girls and women of reproductive age (e.g. WASH, micronutrient supplements, malaria control strategies, reduction in aflatoxin exposure, interventions to empower women and reduce gender gaps, etc.)? What is the additional impact of integrating interventions to sensitize men and communities regarding the special nutritional vulnerability and needs of children, adolescent girls and women of reproductive age?
- Can delivery platforms other than agriculture be utilized to improve diets and food and nutrition security (e.g. markets, health systems, ECD, schools, social protection programs, self-help groups focused on agriculture, livelihoods, financial services and on reducing gender gaps)?
- How can program reach, delivery and utilization be improved to optimize program impacts on maternal and child health and nutrition outcomes?
- Do programs need to be integrated to attain the greatest impacts on maternal and child health and nutrition outcomes? Or, can similar or even greater impacts be achieved through programs that co-locate services from different sectors (e.g. agriculture and nutrition programs delivered by different actors/NGOs/sectors to the same target households and individuals) or services from different sectors that are implemented sequentially (e.g. health and nutrition program for women and children during the first 1,000 days followed by an ECD program for children and their parents when children are between 2 and 5 years of age, followed by interventions in education to reach adolescent girls)? What are the synergies/antagonisms between different programs implemented simultaneously or sequentially?

The secondary research questions that will be addressed during phase II include the following:

- What are the factors that mediate the impacts of nutrition-sensitive programs on maternal and child health and nutrition outcomes (e.g. changes in agricultural production, access to nutrient-rich foods, food security, hygiene, health and nutrition related-knowledge and/or practices, income, women's/men's empowerment, culture etc.)?

- What are the longer-term, spillover and inter-generational impacts of nutrition-sensitive programs?
- Can children benefit from interventions beyond the first 1000 days, in growth (height), micronutrient status or prevention of overweight and obesity? What types of intervention packages and platforms would be most appropriate to target this age groups and maximize impacts?
- What types of intervention packages and platforms are needed to address the double burden of malnutrition in contexts where it is prevalent and to reach urban populations?

COMPARATIVE ADVANTAGE

This flagship builds on more than one decade of CGIAR work focused on understanding, evaluating and strengthening development programs, especially in the areas of social protection and agriculture (see Annex on 4 Technical Competency). IFPRI, which hosts most of this flagship’s key researchers, first developed its strong reputation for impact evaluation through its work assessing the impact of Mexico’s path-breaking Conditional Cash Transfer (CCT) program, PROGRESA (Programa de Educación, Salud y Alimentación), later named *Oportunidades* (Skoufias, 2005). Since this high-profile impact evaluation, the team now involved in A4NH has evaluated, or is currently evaluating, a variety of complex nutrition-sensitive programs in the area of social protection, agriculture, education and health in a large number of countries in key regions of the developing world (de Brauw, Gilligan, Hoddinott, & Roy, 2014; Hidrobo, Hoddinott, Peterman, Margolies, & Moreira, 2014; Jef L. Leroy et al., 2008; Menon, Rawat, & Ruel, 2013; D. K. Olney et al., 2013; D. Olney, Parker, et al., 2013; D. Olney, Pedehombga, et al., 2015; D. Olney, Richter, et al., 2013; Quisumbing, Rubin, et al., 2014; Rawat et al., 2013).

The unique multi-disciplinary teams engaged in this flagship include staff with expertise in nutrition, epidemiology, agriculture, economics, demography, public health and gender, who have successfully worked together for several years. Such closely meshed and effective teams are rarely found in academic institutions. The team has strong program-relevant research skills and counts on years of experience working with a large number of partners including policy makers, donors and program implementers, and communities in several countries to generate evidence for action (or “usable evidence”). The teams are well positioned in research and academic circles and several of their members have strong international reputations. Currently, there are 15 to 20 senior staff working in this flagship (see Annex 4 on Technical Competency). The flagship is led by Marie Ruel, with Deanna Olney and Jef Leroy (support to entire portfolio, based at IFPRI headquarters), Purnima Menon (leading the South Asia portfolio) and Rahul Rawat (leading the Africa portfolio). Agnes Quisumbing, in collaboration with Shalini Roy and Neha Kumar, will increase their engagement in the flagship program in Phase II given the greater focus on studying and understanding gender dynamics around agriculture, livelihoods and nutrition.

Examples of key outputs from phase I include:

- **Generating evidence on the impact of an integrated agriculture, nutrition and health programs:** Results from the first cluster-randomized controlled trial of a homestead food production program in Burkina Faso showed improvements in both child nutrition (anemia, wasting and diarrhea) and women’s nutrition and empowerment (D. Olney, Pedehombga, et al., 2015; D. Olney, Bliznashka, et al., 2015).
- **Evidence on the dynamics of growth retardation in children:** Using a newly developed metric for linear growth, Leroy et al. found that growth faltering continues after 24 months of age and that there is no catch-up growth in height in the absence of interventions aimed at improving growth (J L Leroy, Ruel, Habicht, & Frongillo, 2014; Jef L. Leroy, Ruel, & Habicht, 2015). These findings are critically important for the targeting and design of nutrition interventions as well as for interpreting trends in stunting (and/or catch-up growth) as children age.
- **Development, validation and dissemination of indicators and methods for program evaluation:** Examples include impact and process evaluation methods using program impact pathway analysis for nutrition-sensitive programs (Menon et al., 2013; D. Olney, Leroy, & Ruel, 2015; Rawat et al., 2013), and

indicators for women's dietary diversity (FAO, 2014), food security (Jef L. Leroy, Ruel, Frongillo, Harris, & Ballard, 2015) and women's empowerment (Alkire et al., 2012).

- **Dissemination of findings, methods and tools and capacity development:** Examples include the wide dissemination of methods, tools and findings of a new body of evidence from our evaluations of complex, integrated (nutrition-sensitive) programs at workshops and conferences (international, regional, national), targeting a variety of audiences including donors, program implementers (both our partners and larger in-country networks), academics and other stakeholders. The team also engages with communities and program implementers in workshops to share research findings and discuss their implications. Another example is the widespread dissemination of tools such as the WEAI (Quisumbing, Meinzen-Dick, Johnson, et al., 2014) and the pathways linking agriculture and nutrition (Herforth & Harris, 2014) to foster their use and the engagement of A4NH staff in workshops and trainings on the use of the tools.

PARTNERSHIPS AND CAPACITY DEVELOPMENT

This flagship has extensive experience working with three of A4NH's four broad categories of partners: development implementers, enablers (policymakers/decisionmakers/donors) and researchers. In Phase II, we expect to continue to build on and strengthen these partnerships while also exploring new alliances that will allow broader scope for building evidence and for effective translation of research findings into stronger and most cost-effective nutrition-sensitive programs. This will also provide an opportunity to interact with communities for action.

We rely heavily on strong partnerships with high-quality development implementers such as INGOs and NGOs, governments and UN institutions. Some of these partnerships are long-standing (e.g. with HKI) and joint fundraising and work has been carried out in several countries, such as Cambodia, Burkina Faso, Senegal, Mali, Tanzania, and Côte d'Ivoire for more than a decade. Similarly, our partnership with BRAC, a large NGO in Bangladesh, spans several decades. In most countries, we interact with the national and community health systems, facilities and staff through the implementing NGOs we partner with. In a few cases, such as in Bangladesh and Mali, our work is carried out directly with government partners who have specifically invited us to partner with them to generate evidence for decisionmaking regarding their programs. We will expand our partnerships with NGOs, such as PRADAN, that support and work through self-help groups to support nutrition outcomes. These partnerships are critically important both for generating rigorous evidence and for achieving development outcomes and impacts. As an example, the quality and usefulness of our research findings depends on the quality of implementation of the programs we are evaluating. Poor implementation will generate negative findings (no impact) and will fail to test the real potential of a given program model. Thus, quality of implementation is critically important for learning and evidence generation.

This flagship has developed strong partnerships with enablers such as governments and with several donors whose decisions determine which programs get implemented and/or scaled up. Enablers also share evidence with international agencies, governments and donors. The team has a strong track record of influencing the international agenda. For example, evidence on the effectiveness of the Preventing Malnutrition in Children under 2 Years of Age (PM2A) model for targeting nutrition interventions during the first 1000 days was [adopted by USAID](#). The team has been effective in [building an evaluation culture](#) and increasing demand for rigorous evidence within networks of program implementers and donors.

In Phase II, this flagship will build on and expand partnerships with other flagships in the A4NH portfolio. We will build on collaborations with Biofortification, especially in documenting the adoption of biofortified crops by small farmers and their effectiveness at improving household, maternal and child diets and nutritional status (Hotz, Loechl, de Brauw, et al., 2012; Hotz, Loechl, Lubowa, et al., 2012), and in testing and documenting different crop dissemination approaches. For work on value chains, now part of Food Systems

for Healthier Diets, we will continue work on the context of homegrown school feeding programs and their evaluation, and expand work to other value chains (possibly vegetables, dairy or fish). In Phase II, we will explore new partnerships with the flagships on Food Systems for Healthier Diets and Improving Human Health, bringing in expertise in nutrition, maternal and child health, and evaluation research. We will continue to work closely with SCORE and its numerous partners, and will feed key outputs and knowledge products into their networks of stakeholders and policy makers through their knowledge platforms (e.g. [POSHAN](#)) and active policy engagement. We will also continue work, with the A4NH Gender, Equity and Empowerment (GEE) unit,⁸ especially on the use of the Women's Empowerment in Agriculture Index (WEAI) in the context of impact evaluations, and in the design of programs aimed at empowering women and reducing gender gaps in agriculture.

Capacity development

This flagship works on capacity strengthening mainly through its partnerships with development implementers and academic institutions. Capacity strengthening with development implementers relies mostly on extensive discussions and workshops with program implementers on topics such as design of programs, implementation plans, program impact pathway analysis, presentation and interpretation of results and discussions of the implications of research findings for programming. Our close interactions with program implementers at each step of the program cycle constitutes a unique opportunity for learning for both researchers and implementers. We also engage with program implementers on data analysis and publication of findings, thereby building their analytical and research capacity. At the country level, our teams engage with existing networks of program implementers, beyond the partners involved in a specific project, through workshops and meetings aimed at discussing methods and findings of our evaluation work and their broad implications for strengthening integrated programs. This flagship has several ongoing partnerships with academic institutions, both in developed and developing countries, in research, training and capacity strengthening activities. Capacity strengthening activities mostly take the form of teaching and mentoring of students. Our existing partnerships with academic institutions include Cornell University (with the Tata Foundation), Johns Hopkins University (with doctoral students), the Leverhulme Center for Integrative Research on Agriculture and Health (LCIRAH) and Agriculture, Nutrition and Health Academy (in research and student mentorship), Emory University (in research), the French Institute of Research for Development (IRD) (in research), and the Public Health Foundation of India (in research and capacity strengthening). The program also partners with FAO on the development of tools and methods, and for capacity strengthening on the ground.

⁸ In Phase 1, GEE was referred to as the Strategic Gender Unit. The name change reflects a recommendation of the A4NH External Evaluation to pay more attention to equity issues.

Supporting Country Outcomes through Research on Enabling Environments

IN BRIEF

The aim of this flagship is to identify, exploit and enhance synergies between agriculture, nutrition, and health policy processes and to promote enabling cross-sectoral policy and investment environments. This will be achieved through a combination of strategic, action-oriented research – guided by a conceptual framework (Gillespie et al., 2013) and carried out in target countries, with global and regional organizations – and through coordinated support to other flagships and CRPs in areas where a multisectoral lens could add value to their sectoral policy work. By contributing to improved national enabling environments, the work of this flagship enhances the impacts and sustainability of many investments of A4NH and other research and development (R&D) organizations in the target countries, resulting in a measurable shift in current trends for key nutrition, health and equity indicators.

STRATEGIC RELEVANCE

THE CHALLENGE

A4NH is predicated on the belief that agricultural policies, interventions and practices can be redesigned to enhance nutrition and health benefits. Nutrition and health are complex challenges, driven by factors and processes that lie within the mandates of many sectors. To make sustainable inroads, a multisectoral, multi-level response is therefore required, including both direct (nutrition- and health-specific) and indirect (nutrition- and health-sensitive) interventions, underpinned by enabling environments (Black et al., 2013).

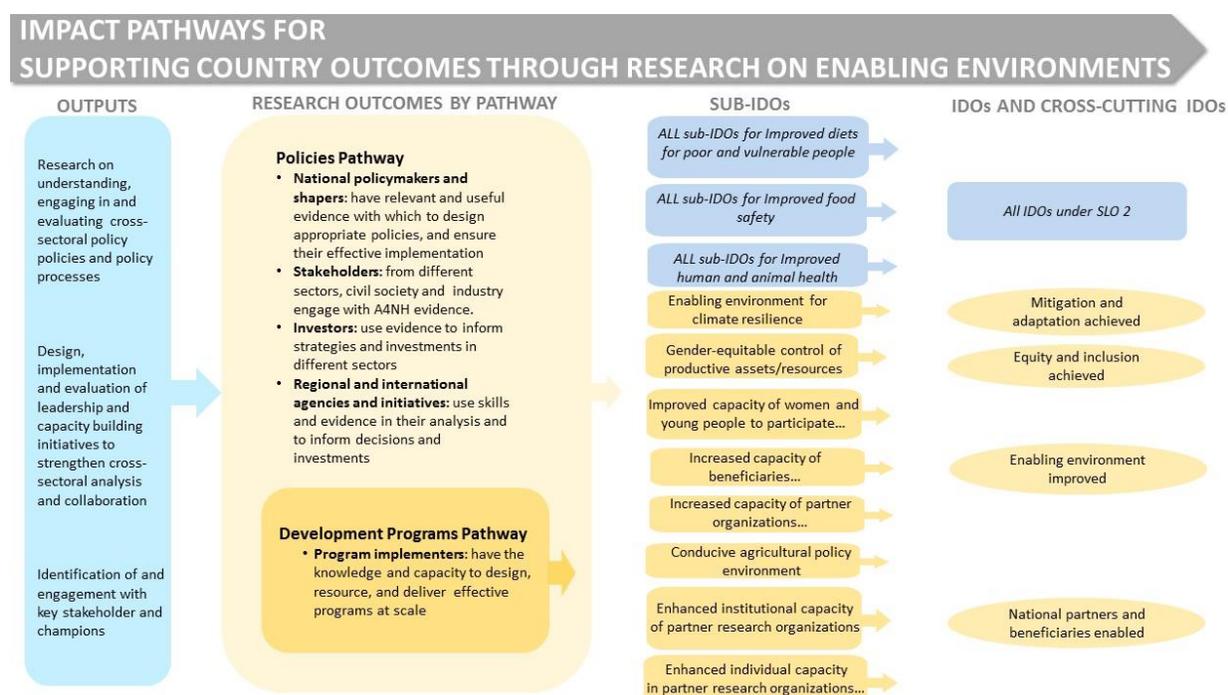
This flagship on Supporting Country Outcomes through Research on Enabling Environments is fundamentally about policy change, and different policy change models will be assessed in structuring our work. For example, Sumner et al. disaggregate policy change into changes in framing, agenda-setting, content, resource allocation and, crucially, implementation, while Resnick et al. have developed the “kaleidoscope model” of policy change in agriculture, nutrition and health (Resnick, Babu, Haggblade, Hendricks, & Mather, 2015; Sumner, Crichton, Theobald, Zulu, & Parkhurst, 2011). This flagship aligns with the perspective that “*policy is what it does*” (Clay & Schaffer, 1984) which requires a strong focus on the links between policy and implementation of relevant programs at scale, recognizing that a change in policy will not lead to outcomes if the policy is not implemented in practice. While better evidence, for example, from program evaluations, is necessary, it is far from sufficient for achieving policy change. Policymakers to date have rarely managed to attain a synergy between politically brokered economy-wide drivers of agriculture policy, food security and livelihoods, and nutritional and health status of poor and vulnerable people. At the very least, evidence on existing policy, other available options and the likely impacts on key target groups needs to be framed and communicated effectively so that it is accessible and useful to decisionmakers. The availability of new and relevant evidence must be accompanied by an understanding of the political economy of agriculture and agrifood systems; and of the politics of policy processes, including the prevailing incentives, disincentives, opportunities, constraints, trade-offs and potential synergies. A critical part of this understanding relates to the dynamic environment of capacity and financing, at both country and global level, including strengths, weaknesses and gaps.

All these challenges are currently being faced by major global and regional initiatives on nutrition security including the [Scaling up Nutrition \(SUN\)](#) movement and the African Union’s [Comprehensive Africa Agriculture Development Programme](#) (CAADP) investment planning process. Regionally, for example, the Malabo Declaration of the African Heads of State (2014) along with the Africa Region Nutrition Strategy have set nutrition targets for the African continent to reduce stunting to 10% and underweight to 5% by 2025 using agriculture as a primary strategy. This flagship will build on current involvement of staff and partners with these initiatives to support countries in effectively tackling these goals.

CONTRIBUTION TO THE STRATEGY AND RESULTS FRAMEWORK

This flagship is ultimately intended to impact the second system level outcome (SLO2) on *improved food and nutrition security for health*. It will contribute indirectly to all three IDOs under this SLO (**Figure 7**). We focus primarily on undernutrition, while the “double burden” (including the growing challenge of overweight and obesity) will be progressively taken on board. This will be achieved through the cross-cutting IDO on *enabling environments improved* defined as: “the wider political and policy processes which build and sustain momentum for the effective implementation of actions that reduce undernutrition” (see recent [blog post from Gillespie](#) and Gillespie et al., 2013). Since sustainability is a key element of an enabling environment for nutrition and health, this flagship will also contribute to the sub-IDO on *enabled environment for climate resilience*, and to the cross-cutting IDO on *national partners and beneficiaries enabled* and on *equity and inclusion achieved*. The flagship’s approach to gender, consistent with the [A4NH Gender Strategy](#), addresses relationships between men and women and is more sociologically coherent than focusing only on women as disadvantaged economic agents. Such an approach acknowledges the diversity and complexity of social and gender relations, and the structural drivers of women's inequity (e.g., legal and land rights). Such a focus moreover is embedded within current agri-nutrition conceptual frameworks (Gillespie, Harris, & Kadiyala, 2012b) that highlight the balance between women's wider livelihoods, unpaid care, optimal infant feeding practices, and women’s nutritional and health status.

Figure 7. Impact pathways for Supporting Country Outcomes through Research on Enabling Environments



GEOGRAPHIES AND TARGETS

The challenge of developing environments that enable and incentivize the pursuit of nutrition and health objectives across sectors is of particular importance where high burdens of malnutrition and ill-health co-exist within poor, rural populations that are primarily dependent on agriculture for their livelihood. The primary geographic focus of this flagship is therefore on Africa south of the Sahara, and South Asia.

Our central focus is on enabling and sustaining *country-level* impact, thus aligning with the [Busan declaration for aid effectiveness](#) that fosters ownership and accountability among countries in the south. But countries are not isolated islands. We need to apply a wide-angle lens to locate countries within relevant regional and

global contexts and initiatives. We will also need to “zoom in” to understand the policy-implementation nexus (often referred to as the “know-do gap” or the “missing middle”) at a *subnational* level. In selecting target areas for sub-national analysis and engagement, special emphasis will be on the role of gender relations in influencing agriculture and nutrition outcomes. We focus on rural environments, but not exclusively. We will also examine policy issues as they apply to urban/rural linkages and urban/peri-urban/urbanizing environments. In addition to poor and nutritionally vulnerable populations, we will focus on populations affected or displaced by ongoing processes of agrarian change and agricultural intensification.

Our focus will be on 12 countries which are home to 1 billion individuals from landholding households (and more from agriculture-dependent but landless households), and over 101 million stunted children (comprising 63% of the global total). We will develop three hubs – an Eastern and Southern African hub (including Ethiopia, Kenya, Tanzania, Zambia and Malawi), a West African hub (Ghana, Senegal and Nigeria) and a South Asian hub (including India, Bangladesh, Pakistan and Nepal). These are all countries in which this flagship – as well as others in A4NH and other CRPs – have active ongoing partnerships and activities. Descriptions of our targets are described in more detail in the Annex 2 on Table of Target Beneficiaries and Countries.

THEORY OF CHANGE (HOW WILL THE TARGET BE REACHED)

Scale and sustainability are inherent characteristics of enabling environments and policy processes, and thus embedded in this flagship. We will build on IFPRI’s recent work on scaling up impact on nutrition (Gillespie, Menon, et al., 2015) and the fourth paper of the Lancet Maternal and Child Nutrition Series (Gillespie et al., 2013), to apply lessons learnt from past attempts to create and sustain large-scale enabling environments. We will ensure scale and sustainability through deepening our ongoing engagement with regional and global platforms such as CAADP and SUN, as well as directly engaging with partners (including governments) in our focal countries. The flagship is also linked with the new Results for Development (R4D)/MSI-led Scaling Up Development Community of Practice.

The [theory of change \(ToC\) for this flagship](#) is based on a conceptual framework for creating enabling environments for nutrition and health-sensitive agricultural policy which divides the process into two stages (Gillespie et al., 2013). The conceptual framework was applied successfully in the Leveraging Agriculture for Nutrition in South Asia (LANSA) and Leveraging Agriculture for Nutrition in East Africa (LANEA) initiatives (Gillespie, van den Bold, et al., 2015). This [six-cell framework](#) highlights two stages – (1) building momentum for nutrition, and (2) translating it into implementation and ultimately impact – and three cross-cutting domains: (1) knowledge and evidence, (2) politics and governance, and (3) capacity and resources. At each stage, the three domains are important, though the issues and challenges and even the actors themselves differ by stage. The key outcome in the ToC is that policy and practice communities incorporate new knowledge into discourse, attitudes, procedures, behaviors, and ultimately practices. This will be achieved by working through champions, by engaging with and strengthening capacity of key individual and institutions, and by making evidence available in appropriate formats to key stakeholders. Specific outcomes and targets including assumptions and risks, and engagement strategies will be defined for the target countries, and will form the basis not only for implementing flagship activities but also for tracking influence and conducting comparative analysis and synthesis within and across countries.

A key element of this flagship’s ToC will be based on its convening role within CGIAR with respect to engagement in nutrition and health policy processes. This flagship will represent CGIAR in these processes, bringing information about what CGIAR has to offer to national and global processes and feeding back information and guidance to CRPs about where and how their work can contribute. Through this role, this flagship will enhance the impact of CRP investments on nutrition and health outcomes.

PLANS FOR PHASE II

EVIDENCE GAPS, RESEARCH ISSUES, AND QUESTIONS

The overarching *research questions*⁹ that this flagship seeks to address are as follows:

- **Policy coherence:** Why are agricultural policies and programs not aligned with nutrition and health goals?
- **Policy processes:** What are the barriers and constraints to the creation of cross-sectoral policy and institutional environments that better support nutrition and health goals for the poor and vulnerable?
- **Policy learning:** What are the wider lessons from examples where political momentum for nutrition has been successfully linked to effective, large-scale implementation of relevant programs?

The six-year program of work in this flagship is divided into three overlapping stages: (1) *understanding* enabling environments, (2) *engaging* with stakeholders to strengthen these environments, and (3) *evaluating* and synthesizing knowledge gained in this process (**Table 3. Mapping outputs to outcomes in Supporting Country Outcomes through Research on Enabling Environments** *Table 3*). As different focal countries are at different stages within this spectrum of activity, the flagship will orient and sequence its work accordingly, by country.

We will not engage in all countries in the three hubs with the same intensity from the outset. Rather, there will be a sequencing in terms of the type and the intensity of engagement that relates to “where we are at” with this work in these countries. In addition to considering the conditions in an individual country, the engagement strategy and sequence will also consider how the overall “portfolio” of analysis and engagement can be used to test and validate the conceptual framework for an enabling environment and the ToC for how research can contribute to an improvement in that environment. The ability to contribute to broader comparative analysis and synthesis will also be a criterion used to decide on strategic collaboration with other flagships and CRPs.

Foundational work has been undertaken in most countries in the South Asian and Eastern and Southern Africa hubs already, via LANSAs and LANEAs and the *Stories of Change* initiative. This is not the case for West Africa, yet. Such foundational work will be undertaken in the early years, in this hub, linking with CAADP and Economic Community of West African States (ECOWAS).

We do not anticipate any major risks in work under this flagship. Working on policy change requires a focus on decisionmaking, strategy and priority-setting, backed by (re)allocation of resources. In making such decisions and addressing inherent trade-offs, we look for win-win scenarios (e.g. where nutrition is promoted *while* agriculture continues to achieve its other objectives). There may however be unintended consequences on other fields of activity, though we will seek to prevent or mitigate these through active engagement in other initiatives in core countries. Other challenges include balancing the need to understand local contexts (as they apply within different countries) with the need to scale up lessons to maximize impact and navigating the etiological, institutional and political complexity implicit in such transdisciplinary work (though this will be addressed in large part by the breadth of expertise across partners within the proposed team).

⁹ An illustration of the types of research questions to be considered in the work of this flagship is available [here](#).

Table 3. Mapping outputs to outcomes in Supporting Country Outcomes through Research on Enabling Environments

	RESEARCH	CAPACITY
Stage 1: Understanding (assessment and analysis)		
Activities and Outputs	Knowledge and information system inventorizing, policy landscaping, political economy analyses, investigation of policy-relevant challenges, constraints, incentives, trade-offs, opportunities/windows (through “stories of change” and other approaches).	Capacity and leadership assessments/audits; development of capacity and leadership strengthening plans, network/alliance-building, annual cross-CRP engagement, leadership training
Uptake	Stakeholder mapping, consultations, strategic policy reviews, development of engagement platforms, compiling and communicating “stories of change”.	
Intermediate Outcomes	Cross-sectoral discourse in SUN and CAADP, and key partners in identified pathways at national, regional, international and subnational levels and cross-CRP. Change in discourse and knowledge on agriculture, nutrition, and health (ANH). Identification of synergies between ANH policy processes.	SUN and CAADP, and key partners in identified pathways at national, regional, international and subnational levels and cross-CRP engaged with this flagship. Strengthened cross-sectoral capacity and leadership in expanded cadre of active nutrition leaders and in CRP partners/ other CRPs. Improved capacity to use information systems and apply tools to understand and apply information and evidence in policy.
Stage 2: Engaging (formulation, implementation, monitoring)		
Activities and Outputs	Using knowledge, methods and tools to document real-time policy influence and engagement processes; priority-setting and diagnostic tools assessed within the CAADP and SUN processes in case country studies; policy research to resolve specific emerging challenges and trade-offs.	Implementation and monitoring of capacity and leadership strengthening plans, including strong focus on gender relations approach, annual cross-CRP engagement.
Uptake	Stakeholder mapping, consultations, and strategic policy reviews, improvement of engagement platforms	
Intermediate Outcomes	New knowledge influences discourse, attitudes, procedures, behaviors and practices on ANH Discourse, attitudes, behaviors, practices on ANH incorporate new knowledge on climate change and gender relations.	Better use of evidence in national, regional and global processes to inform policy and implementation processes Change in policy procedures, behaviors, decisions and actions to support nutrition-sensitive agriculture and development.
Stage 3: Evaluation (re-assessment, re-formulation) and synthesis		
Activities and Outputs	Documentation and evaluation of real-time policy influence and engagement processes; policy research to resolve specific emerging challenges and trade-offs (identified in Phases 1 and 2). Synthesis of outputs.	Evaluation of capacity and leadership strengthening, annual cross-CRP engagement.
Uptake	Intensified outreach; evaluation of flagship through stakeholder consultations, strategic policy evaluations.	
Intermediate Outcomes	Cross-sectoral policy and investment decisions. Mainstreaming evidence-informed learning culture within policy communities.	Strengthened capacity to undertake cross-sectoral policy-relevant decision making in different contexts. Change and responsiveness in policy decision, procedure, behaviors and actions.
Flagship Outcomes	Improved policy processes, decisions, investments and outcomes related to nutrition- and health-sensitive development (identifying, exploring and enhancing synergies between ANH policy processes).	Improved capacity at national levels to generate and use evidence on cross-sectoral policy issues and research related to nutrition- and health-sensitive development (enabling cross-sectoral policy and investment environments).

COMPARATIVE ADVANTAGE

IFPRI has developed expertise in analyzing the political economy of leveraging agriculture for nutrition and health, in policy process research, and in cultivating and sustaining enabling environments for nutrition in South Asia and Africa. Its leadership role in nutrition-relevant policy analysis is evidenced by the Copenhagen Consensus, [The Lancet Maternal and Child Nutrition Series](#), the [Global Nutrition Report \(GNR\)](#), the Regional Strategic Analysis and Knowledge Support System ([ReSAKSS](#)), and multi-partner consortia such as [Transform Nutrition](#), [Leveraging Agriculture for Nutrition in South Asia \(LANSA\)](#) and [Partnerships and Opportunities for Strengthening and Harmonizing Actions on Nutrition in India \(POSHAN\)](#). The GNR of 2014 and 2015, convened by IFPRI, focuses on monitoring progress in nutrition outcomes and actions, identifying policy and program actions to accelerate progress in outcomes and, crucially, to strengthen accountability in the policy process. Lessons from this work include: substantial progress in nutrition outcomes is possible within a generation; for progress to occur, multiple – but not all – sectors have to be moving in a positive direction; and processes and data for accountability need strengthening to convert policy commitments into action. IFPRI also has a strong ongoing engagement with the SUN movement globally and the CAADP process regionally, both of which will continue to provide opportunities and platforms for research, influence and the scaling up of sustainable impacts from this flagship.

Other CGIAR Centers involved in this flagship and other A4NH flagships also bring substantial experience in policy analysis and in engaging in policy and decisionmaking processes. By providing a space to bring together IFPRI's policy process analysis experience, especially in relation to nutrition policy, with other policy engagement work in CGIAR, the flagship has the potential to realize an important system-level synergy. In addition, the multi-partner consortia established under Phase I provide an important network through which we can disseminate outputs and knowledge products from other flagships, thus accelerating the process by which actionable evidence gets into the hands of those who need it.

A core partnership will be developed with the [Institute of Development Studies \(IDS\)](#), a leading global institution for development research, teaching and learning, and impact and communications, based at the University of Sussex in the UK. Founded in 1966, IDS enjoys an international reputation for applying academic skills to real-world challenges. Home to approximately 100 researchers, 70 knowledge services staff, 65 professional staff and about 200 students, IDS was ranked No. 1 for development studies in the QS World University Rankings in 2015. Through its leadership in initiatives like the [Future Agricultures Consortium](#) and the [STEPS Centre](#), and participation in *Transform Nutrition* and LANSA and the GNR, IDS brings expertise and experience in the analysis of policy processes and the political economy of agricultural policy, as well as in nutrition and health policy.

We will also collaborate with the Evidence-informed Decisionmaking in Health and Nutrition ([EVIDENT](#)) partnership, a global hub of North-South partners aiming to enhance evidence-informed decisionmaking and policy driven research in health and nutrition – along with the Food, Agriculture and Natural Resources Policy Analysis Network ([FANRPAN](#)), the [Africa Nutrition Leadership Programme](#) (linked to the Global Nutrition Leadership Programme), the [Agriculture, Nutrition, and Health Academy](#), and with the EU-UNICEF [African Nutrition Security Partnership](#), coordinated by Cornell University.

The following individuals comprise the PI team of the flagship: Stuart Gillespie, Lawrence Haddad, Namukolo Covic, Purnima Menon, Rahul Rawat (IFPRI), Nicholas Nisbett, John Thompson, James Sumberg (IDS), Patrick Kolsteren, Carl Lachat, Roos Verstraeten (EVIDENT), David Pelletier (Cornell University), Lindiwe Sibanda (FANRPAN), Suneetha Kadiyala (LCIRAH). More details on their expertise can be found in Annex 4 on Technical Competency.

Examples of our key outputs include the *Lancet Maternal and Nutrition Series* (2013) Paper 4 (with over 100 citations in 2 years, this is rated in the top 5% of all *Lancet* articles of its age, and the 2nd most influential

paper by IFPRI (Almetric 2013-14). This has been followed by papers in *World Development* and *Food Policy* on innovative new research focusing on: a) the role of governance amongst other cross-country predictors of nutrition outcomes; and the role of b) leadership and c) capacity in country constraints and success. The annual GNR within this flagship is widely regarded as the most comprehensive, up-to-date compendium of data, evidence and insight on international nutrition. Other key outputs include a 6-country study of the enabling environment for nutrition-sensitive agriculture (Gillespie, van den Bold, et al., 2015), a joint A4NH/PIM toolkit and bibliography on understanding, engaging and evaluating policy processes in agriculture, nutrition and health, and the evolving curriculum and alumni network (now standing at 160 members) for the [Transforming Nutrition short courses](#), held in the UK and India (with plans for including new regions in Phase II). *Transform Nutrition* has achieved a number of specific impacts, including revisions to the Productive Safety Net Programme in Ethiopia on the basis of previous *Transform Nutrition* research on its limited nutritional impact; members have been invited to join nutrition policy development working groups in India (at national level and Maharashtra state), Bangladesh and Ethiopia; and the Government of India has used *Transform Nutrition's* situation analysis documents on nutrition-sensitive policies. The Hunger and Nutrition Commitment Index ([HANCI](#)) to which *Transform Nutrition* contributed has attracted a great deal of media and governmental attention.

PARTNERSHIPS AND CAPACITY DEVELOPMENT

This flagship will be self-standing but closely linked to other flagships and CRPs. It will thus develop a coherent body of work that addresses the three overarching research questions, and at the same time have a more demand-driven *integrative* dimension. A4NH flagships and indeed all CRPs will address policy to some extent. Links with other A4NH flagships (especially Integrated Programs to Improve Nutrition) will be determined by the *cross-sectorality* of the policy issue to be addressed. We will collaborate with the flagship on Biofortification on understanding how countries translate national commitment to biofortification into results on the ground. The flagship on Food Safety has already applied our conceptual framework to its [analysis of national food safety regulations](#) in Phase I and intends to build on this work in Phase II around both aflatoxins and food safety in informal markets for meat, milk and fish. With regard to other CRPs, we will build on past collaborations with Policies, Institutions and Markets (PIM) and will further collaborate on Cluster 2.3 (Political Economy of the Policy Process) within its second flagship (Inclusive Growth and Rural Transformation). We will also engage with Climate Change, Agriculture and Food Security (CCAFS), especially Cluster 4.3 (Governance and Institutions for Climate-Smart Food Systems) within its fourth flagship (Food System Governance under Climate Change). In all these collaborations, we will share experiences, perspectives, methods, tools and evidence to address common policy-relevant challenges. Recognizing there are different types and degrees of engagement – ranging from simple communications to joint planning and integrated projects – we will play a convening role at the CGIAR system level while at the same time retaining the flexibility to engage with other CRPs, based on expressed demand and comparative advantage. Policy is a key element of an enabling environment, but there are other ingredients and drivers such as capacity and financial resources, as the framework shows. Our work will thus link strongly with the overarching capacity strengthening and partnership development activities of A4NH (see below).

Accountability is a key ingredient of an enabling environment. Each year the GNR aims to contribute to accountability and to policy processes in 20 countries by (a) highlighting a country's progress on the World Health Assembly (WHA) indicators and other actions and its situation within its region and continent, (b) providing evidence of how other countries from the region have made progress, identifying policy and data gaps, and (c) sparking dialogue on nutrition, agriculture and development at the highest levels in the country. Typically this is done by facilitating greater interaction between civil society and senior government officials in an evidence-enhanced context.

This flagship will build upon past or ongoing collaborations (e.g. between IDS and IFPRI in *Transform Nutrition* and LANSA). In Phase I, we strengthened our engagement with platforms such as the [SUN Communities of](#)

[Practice](#) on functional capacity for nutrition, and on social mobilization and communication, the SUN Civil Society Network, and with CAADP via ReSAKKS. Both *Transform Nutrition* and LANSAs have developed a strong policy engagement in their focal countries (India, Bangladesh, Pakistan, and Ethiopia). India and Ethiopia have recently hosted major conferences (“[Together for Nutrition](#)”), each with 200-300 participants from a range of sectors, civil society organizations, and research organizations.

Leadership is a form of capacity which is transformational. Through its nutrition leadership short courses, *Transform Nutrition* is developing an alumni network across several of our focal countries (projected to be around 300 alumni by 2017), in which an increasing number of south-south connections are developing. The CGIAR Capacity Development Community of Practice has identified several core elements including: capacity needs assessment and intervention strategy, design and delivery of innovative learning materials, identifying and brokering appropriate partnership models, gender-sensitive leadership and capacity development, institutional strengthening, strengthening capacity of decisionmakers to use evidence, M&E capacity, organizational capacity development as well as research on approaches to strengthening capacity. Following the conceptual framework, capacity and leadership are recognized as crucial ingredients of enabling environments. The entire spectrum of core flagship activities has a capacity dimension. In this sense, through a series of specific capacity strengthening activities, and through the process of undertaking policy research with different partners, we will focus on all these elements, in different ways, and at different times. Our collaborations with the Agriculture, Nutrition and Health Academy and with the EVIDENT Hub will have a special focus on capacity strengthening.

This flagship will seek to expand and deepen existing partnerships, and build new partnerships and alliances in this evolving multi-stakeholder arena. At the moment, there is strong international and national consensus on the importance of a multisectoral approach, and (within this) on leveraging agriculture for improving nutrition and health – as evidenced by major initiatives such as SUN, REACH and CAADP. But these efforts can only be sustained effectively if aligned with policy making processes. The role of this flagship will be to apply cross-sectoral agriculture, nutrition and health knowledge, methods and tools within broader policy processes, in close partnership with PIM. There is increasing scope for doing this in Africa through the CAADP investment planning process that links continental and regional policy processes to specific policies and implementation plans at national level.

As discussed above, capacity and skillsets within CGIAR will need to be supplemented for this work to be done effectively and to maximize its uptake and impact. In sum, partnerships will be forged with:

- Governments, civil society, private sector, local universities and relevant national networks in the 12 focal countries in the 3 regional hubs
- International and regional organizations and networks e.g. SUN, REACH, NEPAD/CAADP
- Research organizations, program consortia, networks and initiatives: *Transform Nutrition*, LANSAs, GNR, POSHAN, EVIDENT, FANRPAN/ATONU, Africa Nutrition Leadership Programme, Global Nutrition Leadership Programme, the Leverhulme Centre for Integrative Research on Agriculture and Health (LCIRAH), Agriculture, Nutrition, and Health Academy, the Federation of African Nutrition Societies, and the African Nutrition Security Partnership, coordinated by Cornell University.

Gender Summary

Evidence informing A4NH gender research priorities

A4NH gender research aims to fill evidence gaps in the widely accepted framework that traces the links from agriculture to nutrition and healthⁱ (Corinna Hawkes & Ruel, 2006; Herforth & Harris, 2014; Kadiyala, Harris, Headey, Yosef, & Gillespie, 2014), (Box 1). Gender matters for all of the pathways because: (1) existing gender differences in roles, preferences, and power mediate nutrition and health outcomes; (2) the agriculture, nutrition, and health pathways can bring differential benefits and risks to different genders and social groups, given that men and women have specific health needs and sources of resilience that vary across contexts and the life cycle, and (3) the pathways also present opportunities to shift gender relations, enhancing women’s empowerment and their own well-being. A4NH seeks to understand how gender influences agriculture’s impacts on nutrition and health through these pathways, as well as how the pathways can structure efforts to enhance gender equity.

Box 1: Pathways from agriculture to nutrition and healthⁱⁱ

1. **Agriculture as a source of food:** Farmers produce for own consumption.
2. **Agriculture as a source of income for food and non-food expenditures:** As a major source of rural income, agriculture influences diets and other nutrition- and health-relevant expenditures.
3. **Agricultural policy and food prices:** Agricultural conditions can change the relative prices and affordability of specific foods and foods in general.
4. **Women’s roles in agriculture and intrahousehold decision making** and resource allocation may be influenced by agricultural activities and gendered control of assets, which in turn influences intrahousehold allocations of food, health, and care.ⁱⁱⁱ
5. **Maternal employment in agriculture and child care and feeding:** A mother’s ability to care for her child may be influenced by her engagement in agriculture.^{iv}
6. **Women in agriculture and maternal nutrition and health status:** Maternal health and nutritional status may be compromised by the often arduous and hazardous conditions of agricultural labor, which may in turn influence child nutrition outcomes.^v

Although consensus exists on the pathways as a guiding framework for research and practice on leveraging agriculture for nutrition and health, a number of systematic reviews have pointed to the lack of documentation of the effects of these pathways in practice (C. Hawkes, Turner, & Waage, 2012; Herforth, Jones, & Pinstrip-Andersen, 2012; Masset, Haddad, Cornelius, & Isaza-Castro, 2012; Ruel & Alderman, 2013). The pathways can thus be grouped into three strands of research that A4NH has addressed and will continue to investigate, using diagnostic gender analysis, gender impact studies, and explicit gender-based targeting:^{vi}

- **Impact of gender-based differences on nutrition- and health-related outcomes (pathways 1, 2 and 3):** This research aims to identify which gender-based differences matter for nutrition and health outcomes, and the mechanism through which they influence nutrition and health (for example, men and women’s preferences on production and consumption decisions, allocation of productive and reproductive work, and access to assets, credit, information, social capital, and so on) (de Brauw, 2014; Gilligan, Kumar, McNiven, Meenakshi, & Quisumbing, 2014). These questions are particularly critical for research related to agricultural development interventions or delivery, since investigating and addressing gender-based differences is important in the design and ultimately for the success of such projects (N. Johnson et al., 2013).
- **Improving nutrition through women’s empowerment (pathway 4):** In this category, A4NH research focuses on understanding the impact of different aspects of women’s empowerment on various nutritional and health indicators. Aspects of empowerment that A4NH researchers have investigated for their impact on nutrition and health include measures of decisionmaking power (Peterman et al., 2015), access to and control of assets (N. L. Johnson, Kovarik, Meinzen-Dick, Njuki, & Quisumbing, 2015;

Quisumbing et al., 2015), autonomy in production and hours worked (Malapit, Kadiyala, Quisumbing, Cunningham, & Tyagi, 2013), and women’s time use (Hull, Johnston, & Stevano, 2015). This research has begun to indicate that different aspects of women’s empowerment influence different health and nutritional indicators (e.g. diets, child feeding practices, maternal and child anthropometric measures), and more research is needed to understand the patterns of impact in different contexts, as well as the mechanisms driving impact (van den Bold, Quisumbing, & Gillespie, 2013b). It will pay particular attention to gender dynamics—relationships between women and men—as factors affecting empowerment.

- **Avoiding unintended consequences to women’s well-being and empowerment (pathways 4, 5 and 6):** The third category of gender research aims to improve understanding of unintended consequences and tradeoffs between outcomes of agricultural interventions. This research pays attention to how gender-based differences can increase women’s exposure to risk (Grace, Olowoye, Dipeolu, Odebode, & Randolph, 2012) and potentially harm, to women and children’s health and nutrition through impact on women’s energy expenditure, time burden, and access to and control over assets.

These three research areas translate into specific research priorities in each flagship (**Table 4**).

Table 4. Gender research priorities in each of the proposed flagships

A4NH flagship	Fundamental gender research questions
Biofortification	How to ensure delivery of biofortified crops meet men, women, and girls’ preferences and nutritional needs (Gender-based differences), support gender-equitable decisionmaking in production and consumption decisions (Women’s empowerment), and avoid harm to women’s time, work burden, and health status (Unintended consequences)? How to promote adoption of biofortified crops by targeting appropriate household decision-makers, including men?
Food Safety	How does exposure to agricultural diseases, strategies to manage risk, and the impacts of disease vary by gender? (Unintended consequences; Gender-based differences)? How can measures to improve food safety proactively include women (Gender-based differences)?
Food Systems for Healthier Diets	How can healthy food systems benefit both women and men, especially as consumers and value chain agents (Gender-based differences; Women’s empowerment), while avoiding harm to women’s time, work burden, and health status (Unintended consequences)?
Integrated Programs to Improve Nutrition	How are gender dynamics (relations between women and men) and women’s decisionmaking power associated with improved child and women’s nutrition outcomes (Women’s empowerment)? How can agricultural development interventions enhance women’s status while avoiding harm to women’s time and health (Unintended consequences)?
Improving Human Health	How do the health risks and benefits of agriculture vary by gender (Unintended consequences; Gender-based differences)? How can measures to improve human health proactively include women (Gender-based differences)?
Supporting Country Outcomes through Research on Enabling Environments	How can policymakers develop cross-sectoral, gender-responsive policies? (Gender-based differences; Women’s empowerment; Unintended consequences)

Strategic cross-cutting gender research

In addition to supporting the gender research areas in the flagships, A4NH also leads cross-cutting research on strategic issues relevant to the overall research program. In particular, the PMU and the Cross-cutting Gender, Equity and Empowerment (GEE) unit^{vi} identified four priority themes to fill important gaps in the knowledge base on gender, nutrition, health and agriculture:

- 1) **How women’s empowerment affects nutrition and health:** Recent studies find that different aspects of empowerment have impacts on various health and nutritional outcomes, and these vary widely in different settings (Malapit, Kadiyala, Quisumbing, Cunningham, & Tyagi, 2015; Malapit & Quisumbing, 2015; Sraboni, Malapit, Quisumbing, & Ahmed, 2014). In particular, the gendered control over assets,

including water, technology, and land, has bearings on nutrition and health. Evidence-based and culture- and context-sensitive policies will therefore require a deeper understanding of which specific domains of women's empowerment matter for particular outcomes (Malapit & Quisumbing, 2015).

- 2) **How to engage men in nutrition and health:** Gender research in nutrition and health frequently focuses on women: safeguarding women's health, enhancing women's decisionmaking power, and improving women's nutrition knowledge. However, although women are primary caregivers, men have an important role to play. Some organizations^{viii} have started experimenting with projects that work with men and with couples to support family health and nutrition behaviors, but the state of knowledge about what works to engage men in women and children's nutrition and health and women's empowerment is incipient. A deeper focus on gender relations and norms that help or hinder better nutrition and health outcomes is merited.
- 3) **How to target the youth:** Given that average age of the onset of childbearing is below 18 in much of the world, research is starting to highlight adolescence as a key window to reach girls and invest in their health and nutrition, including education on infant and young child feeding practices (IYCF) (Hackett, Mukta, Jalal, & Sellen, 2015). Key knowledge gaps include how to create lasting behavior change to postpone childbearing and improve IYCF, and the intersections between nutrition, health and family planning.
- 4) **Linkages between gender, agriculture, health, and nutrition:** Though health status is recognized in the UNICEF framework as an underlying determinant of nutrition, and health during pregnancy can directly affect children's health and nutrition, there is little known about how exposure to health risks in the context of rural livelihoods vary by gender, deriving from men and women's division of labor, differing power to access health services, and distinct ways of coping with risk. These agriculture-associated health risks include unsafe WASH practices, environmental enteropathy, malaria, and more.

In addition, A4NH will continue to invest in research that builds evidence on key conceptual and methodological questions, and develop and validate indicators, tools and metrics that can be used to measure impact along the pathways. A significant stream of strategic gender-nutrition research in A4NH will be conducted in 2015-2020 as part of the second phase of the Gender, Agriculture, and Assets Project (GAAP2), which will generate the first systematic body of evidence on how different types of agricultural projects can be oriented to empower women and improve nutrition outcomes^{ix}.

Monitoring and evaluation of gender integration in A4NH research

All A4NH flagships are expected to contribute to the cross-cutting issue on *gender and youth* in the new CGIAR Strategy and Results Framework (SRF) and to have articulated the significance of gender for successful delivery. The pre-proposal outlines how gender issues are addressed in each flagship's theory of change (ToC), impact pathways, research questions, outputs and outcomes. Gender research priorities and fundamental gender research questions aim to close evidence gaps (**Table 4**), informed by each flagship's ToC. While gender is well-integrated at the planning stage for Phase II, we will continue to monitor projects throughout the research process to ensure that gender dimensions do not get lost in implementation and are appropriately reflected in research outputs, and to get periodic feedback from projects to identify what types of support may be required from the GEE unit.

In 2014, A4NH started systematically collecting information on the gender research focus of projects mapped to A4NH (from all funding sources). All projects are asked to report whether or not there is a gender research dimension to the project (and why not if there is no gender dimension), the gender research questions to be addressed, the types of sex-disaggregated data collected,^x the level of gender focus of each project deliverable (none, some, significant), and the name of the person responsible for gender research. Responses to these questions enabled us to assess how well the gender research questions identified are reflected in project deliverables, and track progress over time^{xi}. The information gathered at the work planning stage will be reviewed by the GEE unit (as was done for the 2015 Plan of Work and Budget), to help advise research teams on improving gender research before research plans are implemented. As deliverables are completed,

the GEE unit will review completed deliverables to assess the quality of gender analysis in our research products.^{xii} A4NH is also working with the CRP on Policies, Institutions and Markets (PIM) to harmonize its M&E systems for tracking progress on the integration of gender in research. Further guidelines and updates to the gender section of the work plan template are expected to be used as part of future work planning processes.

Beyond monitoring the gender focus of research outputs, projects that focus solely on women or that collect but do not analyze sex-disaggregated data are particularly important to identify because they have the potential for doing more gender analysis, such as expanding analysis to include men and/or use sex-disaggregated data to conduct gender analyses in greater depth. Such projects can be targeted for additional technical assistance, linking up researchers with gender experts and providing small grants to add a gender component or to collect gender-relevant data (more on this below).

Strengthening research capacity on gender, nutrition and health

A4NH will build on the internationally-recognized research capability of IFPRI and its partners in studying the implications of gender in relation to agricultural research and food and nutrition security.^{xiii} The gender specialists in A4NH work closely with those in PIM, making sure that there is cross-CRP exchange of methods and learning; a number of projects do cut across both CRPs.

In line with recommendations from a recent [portfolio review](#), which emphasized the need to continue building gender research and M&E capacity across CGIAR and its external partners, A4NH plans to continue providing gender methods training and support through the following activities:

- *Annual Gender-Nutrition Method Workshops:* A4NH has conducted two workshops to date, attended by about 40 A4NH researchers, researchers from other CRPs with nutrition IDOs, and other partner organizations. The first [workshop](#) focused on establishing common frameworks, while the second [workshop](#) focused on women's empowerment and decisionmaking. These workshops have been very well-attended and participants expressed continued demand for future workshops.^{xiv}
- *Gender Nutrition Idea Exchange:* A monthly [blog](#) hosted on the A4NH web site, featuring contributions from researchers on how to conduct high-quality agriculture research that considers gender and nutrition issues. Since its launch in May 2014 to June 2015, the blog has accumulated over 11,000 unique page views, and 6,900 users.
- *Learning events and other outreach activities for gender researchers:* A4NH will reach out to the gender researchers identified in the projects database to help identify and support specific needs for capacity building. These could include, for example, workshops on specific topics or methods, organizing panels in major conferences to showcase gender research in A4NH, establishing a rotating webinar seminar series, and other types of outreach.
- *Small grants for gender research:* A number of small grants will be provided to A4NH-mapped research projects participating in the CoP that will build the evidence base around strategic gender research priorities. These grants will be combined with technical advising from the GEE unit. A more detailed process for providing targeted support will be developed for Phase II in consultation with the PMC.

These activities will be part of a larger community of practice in agriculture, nutrition and health that will build on smaller Phase I initiatives, e.g., the gender-nutrition work, the nutrition support to systems CRPs, to provide to provide support and add value to research across CGIAR, especially in the agri-food systems CRPs. This CoP will be managed by the flagship on Food Systems for Healthier Diets but will draw from across A4NH to meet needs identified in other CRPs. Building capacity at scale in CGIAR will require more cost-effective approaches. A4NH will seek partnerships with organizations who can lead the coordination of the CoP, and organize the delivery of trainings and technical assistance through the blog and a "helpdesk" function.

ⁱ We have adapted the original framework on agriculture-nutrition pathways to extend to health outcomes and it is available here: https://www.dropbox.com/sh/cfszsnq1aujon6/AADLtLPmCgIQW_P4jDI7OCVca?dl=0

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- ⁱⁱ Source: (Kadiyala et al., 2014) earlier versions in (World Bank, 2007; Arimond et al., 2011; Gillespie, Harris, & Kadiyala, 2012)
- ⁱⁱⁱ Women tend to spend their additional income on food, healthcare, and children’s education, while men spend more of their income on personal items. In Bangladesh, a higher share of women’s assets is associated with better health outcomes for girls (Hallman, 2000). Research from IFPRI finds that equalizing women’s status would lower child malnutrition in South Asia by 13 percent (13.4 million children) and in Africa south of the Sahara by 3 percent (1.7 million children), (Smith, Ramakrishnan, Ndiaye, Haddad, & Martorell, 2003).
- ^{iv} Women fulfill multiple household responsibilities, as the children’s primary caregivers and as wage-earners. The literature suggests that factors such as poverty, an inflexible or time-intensive job, the type of alternative caregiver, and control over income earned can have a negative effect on child growth (Engle, Menon, & Haddad, 1999).
- ^v The reproductive role of women has significant implications not only for agricultural production during her lifetime, but also for the inter-generational impact of her nutrition and health status on future agricultural productivity through her children (Harris, 2014)
- ^{vi} The research areas correspond principally, but not exclusively to the pathways named; each research area can be considered in each pathway.
- ^{vii} In Phase I, GEE was referred to as the Strategic Gender Unit (SGU). The name change reflects a recommendation of the A4NH External Evaluation to pay more attention to equity issues.
- ^{viii} Notably, Promundo and CARE USA (Pawlak, Slegh, & Barker, 2012), and IFAD’s Household Methodologies project
- ^{ix} GAAP2 will adapt and validate a project-level Women’s Empowerment in Agriculture Index that agricultural development projects can use to diagnose key areas of women’s (and men’s) disempowerment, design appropriate strategies to address deficiencies, and monitor project outcomes related to women’s empowerment. GAAP2 is supported by BMGF and USAID, and will be undertaken in partnership with PIM (where WEAI is housed) and implementing organizations.
- ^x In 2014, responses to this question gave us the information on the topics for which sex-disaggregated data were collected like anthropometry, consumption, production. This was later revised to ask what primary data is collected (panel, cross-sectional, FGD, etc.) and which of those are sex-disaggregated.
- ^{xi} For example, the A4NH projects database indicate that 53% of active projects in 2014 report collecting primary sex-disaggregated data including, but not limited to, anthropometry, dietary intakes, food consumption, production, and decision-making. Furthermore, 76% of projects that collect sex-disaggregated data also address gender-related constraints. Based on the 2014 project-level information available, we estimate that 40% of projects use data to address gender-related constraints in our target population. In terms of completed project deliverables, 49% were reported as having ‘some’ or ‘significant’ gender focus in 2014. However, our analysis revealed substantial variation in the types of gender analysis reflected in the ‘some’ and ‘significant’ categories. To address this issue, we have developed standardized definitions for each category and plan to expand the “levels of gender analysis” in deliverables to reflect increasing depth in gender analysis: 0) None, 1) Woman-focused, 2) Sex-disaggregated data reported but no gender research questions, 3) Some gender analysis but not main focus of research, and 4) Significant gender analysis is main focus of research.
- ^{xii} This will be based on a random sample of completed deliverables per flagship; actual sample size will depend on available resources.
- ^{xiii} Notable examples include a multi-country program on gender and intrahousehold research that “shifted the burden of proof” by demonstrating that households do not behave as monolithic units with common interests and preferences (Alderman, Chiappori, Haddad, Hodinott, & Kanbur, 1995; Quisumbing, 2003); the background research drawn upon for the FAO SOFA 2011 (Quisumbing, Meinzen-Dick, Raney, et al., 2014); the background paper on gender for GCARD1 (Meinzen-Dick et al., 2011); and the development of the [WEAI](#), and numerous guides for [collecting sex-disaggregated data](#) and conducting [gender analysis](#).
- ^{xiv} In the future, we will explore alternative ways of extending the reach of these trainings, including providing access to workshop videos, webinars, and other virtual platforms.

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