



SCIENCE FORUM 2013

NUTRITION AND HEALTH OUTCOMES: TARGETS FOR AGRICULTURAL RESEARCH

SUMMARY

BONN, GERMANY 23-25 SEPTEMBER 2013



Independent Science
and Partnership
Council

BMZ



Federal Ministry
for Economic Cooperation
and Development

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INTRODUCTION

The Science Forum series is a flagship event initiated by the ISPC in 2009 under its remit of Mobilizing Science through international dialogue on critical and emerging issues for agricultural research and development. The Forum aims to foster partnerships that best complement expertise of the CGIAR's research initiatives and for explaining emerging issues. It serves to bring together scientists and scientific communities largely external to the CGIAR, but who have potentially important contributions to make to the CGIAR research portfolio, and members of the CGIAR community, including researchers, funders, the Consortium Board and key partners.

The CGIAR Science Fora are designed as interactive meetings, rather than conferences, with the Plenary Sessions raising the big questions and the main work carried out during Breakout Sessions, each focusing on a different aspect of the central theme. Science Forum 2013 focused on key linkages between the agriculture research community and delivery of nutrition and health outcomes. The objective was to explore recent evidence across a range of disciplines and to identify priority research needs and new scientific approaches, including facilitating new and stronger partnerships, through which the agricultural community can add most value to the delivery of nutrition and health outcomes. This Science Forum brought together a wide range of perspectives from scientists, practitioners, policymakers and funding agents, to stimulate discussion to achieve this goal.

For the main program and to facilitate broad participation, the number of Plenary Sessions was kept small and the topics focused on cross-cutting issues such as gender, evaluation and regional differences. Ten experts coordinated Breakout Groups which provided feedback to the Plenary under the following headings: Identify areas where progress has been made in recent years in relation to the topic of the breakout group; Highlight gaps in knowledge which were identified in your discussion as new priority research needs; Give examples of how cross-sectoral partnerships have or could help deliver nutrition and health outcomes with a view to research; Outline innovative approaches which the group believes would add most value to delivery of nutrition and health outcomes.

The contents of the Plenary and Breakout sessions are summarized here.





**BREAKOUT SESSION
SUMMARIES**

BREAKOUT SUMMARY

Monday 23 September 13:30-16:30 and Tuesday 24 September 10:30-12:00

BREAKOUT SESSION 1: UNDERNUTRITION

What evidence do we have, what do we need to have and how do we get it, in relation to under-nutrition (stunting and micronutrients) and what that means for agricultural research programmes?

Derek Headey, International Food Policy Research Institute (IFPRI), drew substantively on literature from India, particularly a systematic review of Indian context and paper on agriculture and nutrition linkages in India (TANDI) to discuss the economics of agriculture and nutrition: theory, evidence and policy implications. Progress was considered to have been made in emerging knowledge of links between farm production, diets and nutrition. However there were many knowledge gaps particularly on cost-effectiveness. It was noted that it is important to inculcate nutritional knowledge in non-nutrition policy makers and researchers; in poorest countries, the focus is on food security which is actually a barrier to promoting nutrition.

Alan Dangour, Leverhulme Centre for Integrative Research on Agriculture and Health (LCIRAH), UK, considered the largely indirect linkages between agriculture, nutrition and health and evidence to date, particularly Masset *et al.* (2011) and a DFID-commissioned mapping study of 151 current/planned relevant studies (in 2012). He suggested we needed improvements in (i) Methods: RCTs, study design, some (but not all) agricultural innovations are amenable to trials, evidence from other disciplines, learning across disciplines; (ii) Metrics: direct pathways (how likely are impacts on stunting? dietary intake/diversity, micronutrient status), indirect pathways (income/livelihoods, expenditure on schooling, WASH, health care, etc.), policy outcomes (evaluation methods, measurable outcomes); and (iii) Meta-analysis: Requires multiple studies with similar design, similar intervention, similar outcome variables. Raw data must be shared and an open data resource is needed.

Lynne Brown, World Bank, described the situation of women in agriculture (generally less access to land, credit, agricultural extension, inputs and markets) and women's responsibilities and choices. She suggested that neglect of gender makes agriculture nutrition insensitive.

Anna Herforth, Independent Consultant, reviewed the agriculture-nutrition evidence base as well as some of the on-going initiatives. This included the SUN framework which distinguished nutrition specific and nutrition sensitive approaches, the Global Panel on Agriculture and Food Systems, and the New Alliance for Food Security and Nutrition among others. She also presented ten key recommendations for improving nutrition through agriculture, including incorporating explicit nutrition objectives and indicators into program design, targeting the vulnerable and collaborating with other sectors. She further stated that food and agriculture policies can have a better impact on nutrition if they: increase incentives (and decrease disincentives); monitor

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dietary consumption and access to safe, diverse, and nutritious foods; include measures that protect and empower the poor and women; develop capacity; support multi-sectoral strategies to improve nutrition. It was important to understand how agriculture projects will measure impact on nutrition (c.f. the Nutrition Indicators in Agriculture Survey). In conclusion, new kinds of monitoring/ assessment may be required, need to be looking at whole investment portfolios, not only project by project, need to measure diet quality, women's empowerment, and water resources, partnerships to support M&E of large agricultural investments that are not research projects *per se*.

Matin Qaim, University of Göttingen, Germany, Jemimah Njuki, CARE, and Prabhu Pingali, Cornell University, USA, contributed to a Panel discussion which noted *inter alia*: linkages between production diversity and dietary diversity (quality) are different at different levels. From a macro perspective, higher dietary diversity requires higher production diversity. However, this does not always hold true at the micro level. The correlation between on-farm production diversity and household nutritional quality can be positive or negative dependent upon market access and efficiency, plus various social factors. We need to develop the right indicators that are valid for different kinds of interventions and review effects across large agricultural investment programs. Research systems should be more responsive to gender and nutrition issues where more evidence is needed on the agriculture maternal pathways. Nutritional assessments need to understand the national development trends and capacity for economic growth (e.g. India) because there is a huge difference between progressive and lagging districts. Cash cropping is not an exception, rather the rule and this has nutrition implications. Connecting small farms to markets can have win-win effects for relative prices and income growth. For agricultural-nutrition pathways, data and metrics are still missing. It would be useful to add one page to agricultural surveys that would give rudimentary nutritional information. Similarly, nutrition surveys (nutritional scores) could be included as a one pager on agricultural data collection. Do we account for processed food as estimates of dietary diversity – how?

AREAS WHERE PROGRESS HAS BEEN MADE

There is recognition of the disconnect between agriculture, nutrition and health as well as emerging knowledge of the links between farm production, diets and some nutrition outcomes. There is also increasing recognition of the centrality of gender dimensions, while nascent discussions are beginning on learning from other disciplines to conduct integrative research.

KNOWLEDGE GAPS AND PRIORITY AREAS FOR RESEARCH

There is still a big evidence gap, i.e. not enough is known about the contribution of agricultural research, policies and programs in reducing the undernutrition burden. There is a need to strengthen that link in the most cost-effective way, keeping in mind the conditions under which these linkages would play out (for example pre-conditions such as development trajectories, other enabling environmental factors and sequencing of how programs and policies are placed, matter).



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We also face a big challenge with data and indicators, and therefore better methods and metrics are needed. A diagnostic approach to understand where the biggest gains or pain points are from macro to household and individual level would be key. Research designs should be qualitative in addition to quantitative. It is not clear what the best nutrition outcome indicators are (stunting or dietary diversity/diet quality).

PARTNERSHIPS

More strategic partnerships between development and research communities are required.

INNOVATIVE SCIENTIFIC APPROACHES TO ADD VALUE TO DELIVERY OF NUTRITION AND HEALTH OUTCOMES

Guidance notes on a decision making tree for research design should be developed (including choice of nutrition outcomes and pathway indicators), using already existing guidance from diverse disciplines. For example, there is angst about the use of RCTs, but they identify cost-effective measures based on robust evidence and are routinely used in other fields such as epidemiology. Survey instruments should be harmonized, i.e. a minimum set of nutrition questions should be part of agriculture surveys. Similarly, nutrition surveys should contain a minimum set of agriculture questions. Improvement and validation of some tools/scales (for example food frequency questionnaires, dietary diversity scores, etc.) would be valuable.

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BREAKOUT SESSION 2: NON-COMMUNICABLE DISEASES

What evidence do we have, what we need to have and how do we get it, in relation to non-communicable diseases and what that means for agricultural research?

WHAT WE KNOW:

We know an increasing amount about the global burden of non-communicable diseases (NCDs) such as heart disease and cancer. **Srinath Reddy, World Heart Federation**, presented stark figures showing an increase in proportion of all global deaths from NCDs increasing from 57% in 1990 to 65% in 2010, making NCDs the single biggest cause of death globally. The cluster of factors associated with diet and physical inactivity are responsible for increases in the incidence of NCDs. However, we know what healthy diets look like. **Walter Willett, Harvard University, USA**, outlined the evidence base from longitudinal cohort studies that supports our understanding of the importance of fruit and vegetable consumption, the negative impacts of trans-fats (also known as hydrogenated oil) on risk of NCDs, and how a shift from a largely meat-based diet to a plant-based diet is a win-win for human and environmental health. We know that there has been significant progress in raising the profile of the importance of NCDs in the international community – **Chizuru Nishida, World Health Organization (WHO)**, showed how WHO and other United Nations (UN) agencies worked together to convene a UN high-level meeting on NCDs in 2011. Yet we also know that dietary quality is deteriorating in many countries. **Jaap Siedell, University of Amsterdam, Netherlands**, reviewed the implications for agriculture of the sharp rise in obesity in the cities of poor countries. Is urban agriculture, including micro-scale/ container-based production a viable solution in some places? A lot of evidence is available regarding the effectiveness of an integrated approach to improving the food environments of the people living in cities in Europe and North America and their impacts. One of the main questions tackled by this group was whether agriculture is the problem, or whether other factors in the food system are more important in determining what people eat?

KNOWLEDGE GAPS AND PRIORITY AREAS FOR RESEARCH

Risk factors seem to be well understood, supported by good science. However, the global underlying mega-trends of urbanization and economic growth leading to increases in income for low-income households (and the increased consumption of red meat, sugar and oil that typically accompanies this) can sometimes be responsible for a “nutrition transition” in a relatively short period of time. Mitigating this transition through consumption, production or trade policy is contingent on political will and, crucially, the ability of governments to effectively intervene in global “food webs” of ever longer and more inter-connected value chains for food.

BREAKOUT SUMMARY

There were few opportunities identified for relatively simple but useful nutrition research interventions, although nutrition tables for the full range of foods that people eat in low-income countries would help – there are often highly nutritious local foods that are unique to a particular country but which don't appear in these tables. Plant breeders should be encouraged to ensure that taste and nutritional issues are more carefully evaluated when developing new varieties, particularly for fruits and vegetables, rather than a focus solely on increasing yields.

PARTNERSHIPS

Examples of intersectoral approaches to combating childhood obesity were discussed, mainly drawing on experience from Europe and North America. Intervening overtly in addressing a specific health problem is open to the accusation of “nannying” if the focus is too narrowly on dietary choices of adults. However, the ethical argument for focusing on the fate of children is strong – clinically obese children are victims of their food environment, as constructed by adults, so by aiming to mitigate this through a range of interventions (education, promotion of small-scale gardens, exposure visits to farms, local government initiatives to limit exposure to harmful foods in vending machines, etc.) is relatively uncontroversial. It was felt that this was best achieved through building broad coalitions, with Finland's experience highlighted as inspiration. The extent to which such approaches are likely to be effective in cities in low-income countries was a matter of considerable debate. The multiple disadvantages in the spheres of security, literacy, sanitation, and importantly, access to safe drinking water, potentially severely limit the scope for progress to be made using such a food-focused approach.

INNOVATIVE SCIENTIFIC APPROACHES TO ADD VALUE TO DELIVERY OF NUTRITION AND HEALTH OUTCOMES:

The main thrust was on the relationship between nutrition and agriculture research communities and the private sector and to build on the value chains work (as presented by **Corinna Hawkes, World Cancer Research Fund International**) to map the commercial interests at different stages in the value chains. The goal would be to understand the ways in which large companies intervene in the governance of food systems, from lobbying around specific policy proposals, through to taking governments to the World Trade Organization when they attempt to introduce mandatory labelling schemes. While there are a number of non-governmental organizations and investigative journalists that do these kinds of analyses, it was felt that rigorous political science could be a useful complement to these efforts, though not necessarily an area of CGIAR comparative advantage. The idea of working with large food processors to try and develop more nutritious non-perishable processed foods was widely accepted as a good idea, and provides an incentive for enlightened companies that see poor nutrition content of their products as a long-term reputational risk. Focusing on edible oils was suggested as a good place to start because there is a good degree of substitutability among different oils and yet a very wide divergence in their NCD risk. One important area where much more research is needed is coherence of policies (agriculture, food security, nutrition and health, poverty, environment, macro fiscal, monetary, trade, etc.).

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BREAKOUT SESSION 3: DIET DIVERSIFICATION

Agricultural approaches to making diets more diverse: what do they contribute to the consumption of a balanced diet by women and children?

The session examined dietary diversification from two perspectives: a) diversity of foods on the plate (fruits, vegetables, animal-source protein, etc.); and b) diversity of nutrients on the plate. This was done by assessing the role of indigenous foods, forests and fisheries, and then the promise of biofortified foods in promoting dietary diversification. Howarth Bouis prefaced the session by pointing out differences in the inclusion of nutrient dense foods in the diets of rich and poor people. The poor ensure that they get sufficient calories first then, as income increases, they buy more non-staple foods at the margin. If cereal prices become unstable, as they did in 2007/8 it is very hard for the poor to purchase the complementary nutrient-dense foods that are required for a healthy diet.

Three speakers focused on the actual and potential role of diverse food species in diets of indigenous populations. **Edmond Dounias, Institut de recherche pour le développement (IRD), France**, spoke of the lack of data/research on non-traditional and indigenous food resources, access to/availability of these resources and consumption behaviour. **Amy Ickowitz, Center for International Forestry Research (CIFOR)**, presented CIFOR's hypotheses that trees and forests are important for dietary quality (diversity) and for food security/nutrition (beyond their role in the sustainability of ecosystems). Ickowitz presented findings from two CIFOR studies that are attempting to test this hypothesis. **Céline Termote, Bioversity International**, emphasized how only a small part of biodiversity is available or used and, like Dounias, noted that use is influenced by many factors, e.g. costs, knowledge, cultural beliefs, individual choices, etc. She reported 2 African case studies seeking to document the availability and knowledge of local food biodiversity and to study their actual and potential consumption to optimize diet quality (mostly through local plant species) and reduce the cost of diets. The hypothesis is that consumer demand for nutritious and healthy food might stimulate biodiversity conservation. Observers noted that there are powerful underlying trends (urbanization, intensification of agriculture) that shift people's diets away from local foods. Research and modelling that accounts for such dynamic societies is essential – we need to consider what will occur in 20, 30 or 40 years to organise a valid research agenda now. It is important to contextualize nutrient-deprived populations because we lack understanding of their geographies. The CGIAR's system-based programs offered an excellent opportunity for making these evaluations at the chosen work sites.

Inge D. Brouwer, Wageningen University, Netherlands, spoke on gaps in knowledge at the dietary diversity, agriculture and nutrition nexus. She noted that while the dietary diversity score

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is a good indicator and correlates well with nutrient intake, it requires further refinement, e.g. to distinguish between scores at the household and individual level. Her research also suggests that local diets may not always fulfil all nutrient requirements because of bioavailability issues. Iron, zinc, and calcium are consistently “problem” nutrients across many studies. In general, the probability of an adequate diet increases with the number of food groups considered, however more information on alternatives is needed before promoting indigenous species. Building scientific capacity in target countries is necessary to derive food composition tables for rare foods (e.g. non-timber forest products).

Shakuntala Thilsted, WorldFish, presented a project in Bangladesh designed to increase consumption of small, nutrient-rich fish by poor households. From a nutritional perspective small dry fish are most important, and the project has identified indigenous wild freshwater species with very high concentrations of vitamin A and other micronutrients. Households were encouraged to cultivate vegetables around the perimeter of the water bodies in which fish were farmed. In addition, they developed a complementary feed mix for children (first 1000 days) that included small fish. Observers noted that this was a valuable approach but that the session presentations had not considered other livestock food sources which were important contributors of a number of micronutrients, protein and fats in balanced diets. A challenge was to properly evaluate them as components of agricultural and dietary systems.

The focus in part II of the session was on biofortification introduced by **Howarth Bouis, HarvestPlus**. The Program is testing three hypotheses: 1) can breeding increase nutrient content in crops to levels that improve nutrition; 2) are extra nutrients bioavailable at sufficient levels to improve micronutrient status; and, (3) will farmers adopt such crops and consumers eat them? Emphasis is on biofortification for vitamin A, Fe and Zn in four cereals (pearl millet, rice, maize and wheat) and two legumes (beans and cassava). Results of earlier studies on vitamin A in orange fleshed sweet potato showing positive effects on serum retinol have already been published, and **Alida Melse-Boonstra, of Wageningen University** reported on a trial of yellow (provitamin A biofortified) cassava on the vitamin A status of school children in Kenya. The protocol resulted in substantial increases in intake of β -carotene, enhanced serum levels and improved vitamin A status. Diet competition effects noted because of the large quantities of cassava that needed to be ingested could be overcome by new experimental varieties of cassava improved to higher levels of β -carotene.

AREAS WHERE PROGRESS HAS BEEN MADE

There is increasing evidence on biofortification’s impact on efficacy and bioavailability. There is also evidence on the power of even small amounts of animal source foods to meet nutrient needs. Studies have also started to take an integrated approach to agriculture and nutrition considering both production and adoption (farmers, consumers) dimensions.

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KNOWLEDGE GAPS AND PRIORITY AREAS FOR RESEARCH

Emphasis focussed on an analytical framework which could determine availability, bioavailability and seasonality. Progress was being made with improving options for vitamin A, but Fe, Zn and Ca, fatty acids and folate remained problem areas. Establishing the drivers of adoption for diverse diets was clearly important amongst which cost was expected to be key (for the poor).

PARTNERSHIPS

Discussants acknowledged the gap in focus on peri-urban and urban poor, and wondered if the CGIAR system could develop partnerships to transfer technologies into this area along the lines of what Harvest Plus had done (staged partnerships).

INNOVATIVE SCIENTIFIC APPROACHES TO ADD VALUE TO DELIVERY OF NUTRITION AND HEALTH OUTCOMES:

In addition to the several areas of research advanced above, for biofortification to make sustainable contributions in the longer term, micronutrient biofortification of staples needs to become a core breeding objective (alongside yield, disease resistance, etc.).

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BREAKOUT SESSION 4: FOOD SAFETY

Research to support agricultural approaches to enhancing food safety along value chains.

The session focussed on aflatoxins as an example of how research targets can affect nutrition and health outcomes.

Delia Grace, International Livestock Research Institute (ILRI), noted the role of agriculture in providing more food for poor people but that food security alone is not enough. The food that feeds us can also sicken and kill us. **Fen Beed, International Institute of Tropical Agriculture (IITA)**, introduced aflatoxins – poisons produced by *Aspergillus* species and infecting crops like maize, groundnut, nuts, spices and many others. Depending on the degree of contamination in food and feed, they cause death, cancer, immuno-suppression and stunting of children. They are passed from mothers to babies; and from feed to cows' milk. Due to the risks to human and animal health, international trade strictly regulates contamination levels of products that may be affected by aflatoxins. Mitigation of aflatoxins is therefore both a food safety and a market access issue.

Five current approaches to mitigation were presented: Breeding aflatoxin-resistant maize: **George Mahuku, International Maize and Wheat Improvement Center (CIMMYT)**; Biological control of aflatoxins: **Peter Cotty, University of Arizona, USA**; Integrated management of aflatoxins in maize and groundnuts: **Ranajit Bandyopadhyay, IITA**; Genetic enhancement of groundnuts to resist aflatoxins: **Hari Upadhyaya, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)**; Integrated groundnut aflatoxin management: **Moses Osiru, ICRISAT**.

A Panel (**Laurian Unnevehr, IFPRI**; **Tom Randolph, Livestock and Fish Research Program**; and **Wycliffe Kumwenda, National Smallholder Farmers' Association of Malawi**) challenged the presenters on the science and potential large scale impact of their approaches. The Panel favoured most the two integrated control programs, one rolling out a generic control program across crops and across Africa, and the other supporting improved control for groundnuts in southern Africa. These demonstrated thoughtful attention to a mix of control strategies and the incentives that will be needed to ensure uptake and sustained provision and use by focusing on enabling policies and partnership with the private sector. However, the further development of the control technologies themselves would be necessary: e.g. by biocontrol and breeding for aflatoxin resistance in maize and groundnuts. It was recognized that investments in these efforts serve to complement those that should be demonstrating the commitment of the private sector for taking up biocontrol and the research investments in the other breeding drivers for drought resistance and yield. The session helped to underline the need to better demonstrate the potential for short term benefits while ensuring an appropriate balance of longer term discovery research.

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Among the important messages were:

- Food safety in informal markets is often neglected: strong evidence on cost and benefits is needed to convince policy makers;
- Building strong links with public health, including Food Safety authorities, is important;
- Innovations have great potential for improving food safety;
- In informal markets and subsistence systems, we need models for effective governance;
- CGIAR food safety research can have impact by linking with commodity and system CRPs."

AREAS WHERE PROGRESS HAS BEEN MADE

Effective technologies ready to role out; improved diagnostics; better understanding of incentives for behavior change around food safety.

KNOWLEDGE GAPS AND PRIORITY AREAS FOR RESEARCH

Understanding and improving governance in subsistence and informal food value chains; Health outcomes of sustainable intensification; Cheap diagnostics which can be used by consumers and value chain actors.

PARTNERSHIPS

The One Health movement successfully linked veterinary public health and human health; the example of ICRISAT supporting an NGO which worked successfully with small groundnut farmers enabling them to reach European markets.

INNOVATIVE SCIENTIFIC APPROACHES TO ADD VALUE TO DELIVERY OF NUTRITION AND HEALTH OUTCOMES

Applying bio-informatics and genomics to food safety; Understanding behavior and incentives for food safety.

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BREAKOUT SESSION 5: POLICY AND INSTITUTIONAL APPROACHES

Policy and institutional approaches in nutrition-sensitive agriculture.

Linda Fulponi, Organisation for Economic Co-operation and Development (OECD), provided the background and rationale for this the topic. Agricultural and food policies are seldom designed taking nutritional and health considerations into account. However, the deployment of agricultural and food policy instruments such as production or consumption subsidies, and choices made by governments about commodities or regions or aspects of the food system in which to invest are potentially very relevant to nutritional outcomes of the population. Mirroring this policy design misalignment is an institutional disconnection: institutions operating in the agriculture and health sectors have little interaction, and there is little knowledge available on how inter-sectoral solutions are facilitated and sustained. However, a number of research projects are currently engaged in improving our knowledge base in this area.

Bhavani Shankar, Leverhulme Centre for Integrative Research on Agriculture and Health (LCIRAH), UK, provided a review of the available evidence on how traditional agricultural policy instruments have impacted on nutrition and health outcomes. Some of the challenges involved in inferring the causal impact of agricultural policies on nutrition outcomes were highlighted. Shankar briefly described some recent examples of policy impact evaluation in the agriculture-nutrition space. This was followed by a presentation from **Stuart Gillespie from IFPRI**, who spoke to the various “disconnects” of agriculture-nutrition policy in South Asia. Drawing on recent country-level reviews of the evidence of linkages between agriculture and nutrition in South Asia, Gillespie reflected upon the political, institutional and policy-related challenges to enhancing the nutrition-sensitivity of agricultural systems in the region. **S. Chandrasekhar, Indira Gandhi Institute for Development Research (IGIDR), India**, presented results of some recent empirical work on agriculture-nutrition linkages and policies in India. Chandrasekhar’s presentation examined some of the disconnects between agricultural and nutrition policy in India, with special reference to the public distribution system.

Jody Harris, IFPRI and LCIRAH, spoke about intersectoral coordination for realizing nutrition-sensitive agriculture, emphasizing the need to better understand how the agriculture sector might coordinate with others involved in the delivery of nutrition-related services for greater impact. Harris summarized some important on-going work in Zambia under the “Realigning Agriculture for Improved Nutrition” (RAIN) project. The final speaker, **Patrick Webb, Tufts University, USA**, spoke about the need for understanding the roles of individuals and institutions in achieving nutrition goals. With special reference to understanding knowledge gaps in the policy implementation process, Webb provided an overview of some on-going “process research”

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in Nepal and Uganda (“Nutrition Innovation Lab”) and presented some preliminary results and insights from the first round of data collection in Nepal.

KNOWLEDGE GAPS AND PRIORITY AREAS FOR RESEARCH

Consistent with sentiments expressed during the plenary sessions, there was strong recognition of the need for undertaking nutrition and health impact assessments of food policies giving careful consideration of causal relationships. Research on the political economy of agricultural policy making and implications for nutrition or health sensitive policy (e.g., incentives faced by policymakers and best practice in strategies to influence policy) was deemed a high priority area. A range of other related topics were also identified as requiring serious research attention:

- Labor dynamics and the changing occupational structures in agriculture and the role that has in shaping how agricultural policy affects nutrition/health;
- Analyzing and documenting best practice in nutrition-sensitive agricultural policy;
- Policy coherence; dealing with multiple concurrently running policies;
- Consistency in priorities, knowledge and incentives across stakeholders;
- Ways to develop bottom-up, demand driven policymaking;
- Monitoring policy implementation and assessing capacity–learning from other sectors?
- Policy tradeoffs and synergies – productivity, income, environment, health; aspects such as health co-benefits of climate change mitigation strategies (via agriculture/diets).

PARTNERSHIPS

We are beginning to see more research and academic collaborations between agricultural, social science and health scientists across a number of organizations. Partnerships are also forming between CGIAR scientists and health scientists from outside the CGIAR system in studying agriculture for health issues. Two specific examples are the RAIN project in Zambia where policy implementation coordination between the Ministries of Agriculture and Health is being promoted and studied and the *Partnerships and Opportunities to Strengthen and Harmonize Actions for Nutrition in India* (POSHAN) study in 21 districts of Nepal where strategies are being developed for effective multi-sectoral coordination and coherence to achieve improvements in nutrition through agriculture and nutrition program rollouts.

INNOVATIVE SCIENTIFIC APPROACHES TO ADD VALUE TO DELIVERY OF NUTRITION AND HEALTH OUTCOMES

- Marrying economic and epidemiological models in policy impact assessment;
- Mainstreaming frameworks and ideas from political and policy sciences in studying nutrition-sensitive policy formation;
- Using social network mapping and realist synthesis methods to study inter-sectoral and cross-institutional coordination;
- Collecting and analyzing panel data on policymakers covering a range of relevant sectors and layers of government.

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Tuesday 24 September 14:15-17:00

BREAKOUT SESSION 6: SCIENCE, TECHNOLOGY AND PARTNERSHIPS

A dialogue on partnership models, examples and practices for sustainably improved agriculture and nutrition.

Andreas Blüthner, BASF/University of Mannheim, Germany, prefaced the session with a discussion of the value chain for nutritional products which passed from consideration of inputs through farming, milling (or processing), distribution to consumers and the plate. He noted that the CGIAR tended to focus at the farming and input end of the chain, where there was an opportunity to cluster small holders to generate production at scales at which the private sector would then be interested to participate. However, the private sector starts from the plate end, as it considers the delivery of individual products (e.g. enriched oils or flours). In principle, the private sector could contribute to the three major avenues for the enhancement of nutrient quality of foods although the time scales were different, i.e. supplementation might achieve effects in three to six years, with fortification programs continuing over five to fifteen years.

Dietary improvement was not an immediate process and would take behavioral change and a long-term perspective. There was the opportunity however to retarget these three approaches to provide holistic nutrition policy for individual countries. Partnerships are essential because it is the private sector that produces the food, not governments; but governments have to produce the framework for national food security and nutrition. The private sector enters into public-private partnerships (PPP) for a variety of reasons but corporate social responsibility is still "social business" and there should be shared business models right from the roots of the tree to the fruits that will result. Companies should be allowed to scale things that work. The private sector is interested in markets and tends to work with processed foods, which pre-selects urban rather than rural markets. PPP for the poorest may need to be discussed in different terms, perhaps starting with a clear map of which interventions (supplementation, fortification, etc.) work well.

Hans Biesalski, University of Hohenheim, Germany, discussed micronutrient deficiency. In order to elucidate gaps in biochemical inadequacy before clinical symptoms occur, his laboratory has developed a Calculator for Identification of Micronutrient Inadequacy (CIMI). He felt that it was better to assess micronutrients in diet comprehensively as single micronutrient levels might be misleading. Observers noted that CIMI had been tested for Indonesian populations and there was room to evaluate this further in partnership with the government. **Florian Schweigert, BioAnalyst/University of Postdam, Germany**, reported on a simple-to-use test kit for vitamin A analysis that was now being marketed. Blood injection directly into a solvent now allowed estimation of iron and zinc levels, although folic acid remained a challenge.

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Bonnie McClafferty, Global Alliance for Improved Nutrition (GAIN), described GAIN's approach by reference to a project on infant food sourcing, feeding and adequacy in rural Kenya. GAIN is dealing in business models across the entire value chain and partners with private sector, the public sector and NGOs. The bar for successful projects in nutrition is set high. For GAIN, it starts with a demonstration of impact and considerations of scale, sustainability, expansion and replication. They consider where the undernourished are sourcing their food because over 50% of African farmers are net purchasers of food, as substantiated even in poor regions of Kenya. She suggested that agroindustry and the food industry bring food to larger markets whereas the CGIAR can influence local markets. For the small private sector to make use of this opportunity they need to have their risk reduced to enter. For this reason, GAIN supports local actors in Tanzania, Kenya and Mozambique; it talks to governments and provides awards for marketable business plans, helping with links to investors. Within this framework, GAIN relies on the CGIAR for technology. The idea of joint work on seasonality and food composition in Africa, including diversity of feeds for animals, were raised. An additional area could be cooperation (PPP) in the development of nutrition and health services.

Albert Tschamdja, Food Industry and Fortification Expert, Togo, related the history and successes of the "Enrichi" label in Togo and now francophone Africa developing a number of fortified products appropriate to the local market. As well as oil- and flour-based products, it was noted that fermentation and malting aids the bioavailability of zinc, etc. The company was supported in its quality control by linkage to a major private sector partner.

The discussion developed the concept of the three cornered approach of fortification, supplementation (including emergency rations) and agricultural diet diversifications. For this framework to be developed, the major gaps were the lack of data on micronutrients in target populations and their diets, the unified use of tools and the extent to which data and knowledge were being shared. The private sector used a value chain approach with a proper analysis of what people are eating and what the opportunities are to fill the nutrient gaps. Financing Small and medium enterprises (SME) operations in nutrition is often difficult and the private sector preferred going with things that worked and that are replicable and scalable.

BREAKOUT SUMMARY

Tuesday 24 September 14:15-17:00

BREAKOUT SESSION 7: FACILITATING RESEARCH UPTAKE

Moving the message beyond research and highlighting the importance of considering the empowerment of decision-making within households.

The objective of this session, introduced by **Myriam Ait Aissa (Action Contre la Faim)**, was to explore policy links being made between what are widely regarded as female domains of subsistence farming, household food security, nutrition and health outcomes, and to suggest strategies for moving information beyond research into programs that will result in improvements in nutrition and health needs. These strategies could extend from programs that directly deliver nutrition and health messages to populations in need, to programs that fill information gaps.

Stuart Gillespie, IFPRI, talked on Women's empowerment and nutrition highlighting evidence from the recent *Transform Nutrition* review which differentiates structural interventions that aim to influence underlying societal gender norms from direct interventions such as cash transfer programs, agricultural interventions, and microfinance programs. Qualitative evidence generally points to positive impacts on women's empowerment from *conditional* cash transfer (CCT) programs, although quantitative research findings are more heterogeneous. CCT programs produce mixed results on long-term nutritional status, and very limited evidence exists of their impacts on micronutrient status. The little evidence available on *unconditional* cash transfers (UCT) indicates mixed impacts on women's empowerment and positive impacts on nutrition; however, recent reviews comparing conditional and UCT programs have found little difference in terms of their effects on stunting and that conditionality is less important than other factors, such as access to healthcare and child age and sex. Agricultural interventions show mixed impacts on women's empowerment and they demonstrate little impact on nutrition (though in many cases this may be due to their not being sufficiently powered to do so). Implementation modalities are shown to determine differential impacts in terms of empowerment and nutrition outcomes. The evidence is also mixed for the impact of microfinance on women's empowerment, although more recent reviews do not find any impact. The impact of microfinance on nutritional status is mixed, with no evidence of impact on micronutrient status. Across all three types of programs (cash transfer programs, agricultural interventions, and microfinance programs), very little evidence exists on pathways of impact, and evidence is often biased toward a particular region.

Jennifer Nielsen, Helen Keller International (HKI), discussed HKI's nutrition-sensitive Enhanced Homestead Food Production (EHFP) model that targets agricultural inputs, training and technical support to women in recognition of their important role as a gatekeeper for household nutrition and their limited access to assets for agricultural enterprises. This presentation shared findings from HKI's own research in Asia (Bangladesh, Cambodia and Nepal), and in Africa from research

BREAKOUT SUMMARY

conducted in partnership with IFPRI (Burkina Faso) and ICRISAT (Mali). The main conclusions are that EHFP can make inroads on gender inequities, including increasing income generated by women, access to and control of smaller agricultural assets, and recognition of their contributions to household economics, food security, nutrition and health. There is also some evidence that social norms regarding women's right to control land use have shifted in Burkina Faso. HKI's sustained experience in each setting informs culturally adapted strategies that work incrementally. Partnerships and participatory models are fundamental.

Cristina Tirado-von der Pahlen, School of Public Health, UCLA, discussed strategies for gender responsive adaptation for food security and nutrition under a changing climate. She noted that women are instrumental in addressing climate change, nutrition and health in an integrated way. Promoting women's leadership on these issues requires an integrated approach focusing on both immediate and long-term actions.

Christine Okali, Institute of Development Studies, UK spoke on examining chains of change used in policy to link women's status and position in households and nutrition and health outcomes. The concept of "gender" tends to treat women as individuals with less interest in the workings of institutions such as households, and others with which they are closely linked. We need to understand more about gender relations at this level, and the related complexity of decision-making if we are banking on women for achieving improvements in nutrition. She also raised "women's empowerment" as still being a "fuzzy" concept, used by organizations in different ways. However, will these empowered women deliver the nutritional benefits we expect? What is the basis of this understanding? Where is the evidence?

Some of the questions arising from the session relate directly to the assumptions that underpin the strategies already being implemented. Others relate to desirable strategies that are both transformative for women, and support the nutritional needs of women and young children.

AREAS WHERE PROGRESS HAS BEEN MADE

The role of women in tackling nutrition security at the household level has been recognized for many years now. The fact that there is growing interest, international recognition and efforts from different institutions including donors, of the role of women in nutrition, and the importance of care practices, was appreciated. There are current field-level assessments of the positioning of women in household nutrition security; knowledge drawn from the experiences of HKI, CARE and ACF, UN organizations institutions like PAHO, research organizations like IDS, IFPRI and donors, will be informative on the issues of women empowerment and decision-making at the household level.

There are several different definitions of "empowerment" though any definition should emphasize two aspects: women's agency (autonomy, control of decisions and resources, and choice) and

BREAKOUT SUMMARY

empowerment as a process. It is considered important to consider both gender relations and domestic relations and review definitions or “mind sets” being used. “Agency” and empowerment as a process are the two aspects of empowerment that have been highlighted in the literature as providing the most significant overlap between many different definitions that are used. Empowerment is ultimately heavily contextual so any study needs to have an understanding of local gender relations and empowerment conceptualizations.

KNOWLEDGE GAPS AND PRIORITY AREAS FOR RESEARCH

In a general way, the need to know more about what goes on within households, and how this can have an impact on under-nutrition, using qualitative methods where appropriate. Despite the focus on women, there is a dearth of information on pathways of impact.

PARTNERSHIPS

A good coordination between different agencies, not only in the agricultural and nutrition sectors, but including agencies delivering sanitation, wider health care practices and social protection or involved in the definition of the agenda of climate change and disaster risk reduction is crucial for achieving improved household nutrition.

INNOVATIVE SCIENTIFIC APPROACHES TO ADD VALUE TO DELIVERY OF NUTRITION AND HEALTH OUTCOMES

We need to acknowledge the value of different research methods for analysis and learning about social change. The solution to learning more is not about choosing between methods (quantitative and qualitative), but rather about using a mix of methods suitable for answering different research questions. Qualitative research can be particularly useful to capture local conceptualizations of empowerment and carry out gender analyses, to examine program impact pathways, quality of service delivery or barriers to program uptake. Quantitative evidence is useful for measuring final health and nutrition outcomes and the impact of different implementation modalities on these outcomes. The collection of sex-disaggregated data, and data on gender-differentiated health/nutrition burdens is crucial in this regard.

BREAKOUT SUMMARY

Tuesday 24 September 14:15-17:00

BREAKOUT SESSION 8: VALUE CHAINS

Leveraging value chains for better nutrition and food safety: lessons for CGIAR research. To enhance our insights in the applicability of value chain concepts, methodologies and tools in nutrition and health related CGIAR research projects.

The session started with a keynote presentation by **Laurian Unnevehr, IFPRI**, linking nutrition and health issues to value chains, and the application of the value chain concept in nutrition and health related CGIAR research. Three case studies were then presented by: **Delia Grace, International Livestock Research Institute (ILRI)**, on food safety and informal markets in meat value chains, **Alan de Brauw, IFPRI**, on the introduction and promotion of products with high nutritional value (Orange Sweet Potatoes), and **Jason Donovan, World Agroforestry Centre (ICRAF)**, on typical challenges of fruit value chains supplying products into Lima.

AREAS WHERE PROGRESS HAS BEEN MADE

Value chain analysis can help investigate how demand (e.g. for certain diets) can be met by supply, and how necessary production attributes can be met by the delivering value chains. There has been some progress in developing value chain approaches to management and control of food safety, including application of risk assessment and preventive approaches. There is better understanding of consumption behaviours and analysis of ways for influencing behaviour (social networks, policies, etc.). There has been some progress in the development of a conceptual framework for nutrition (e.g. see paper by C. Hawkes and M.T. Ruel, on "Value Chains for Nutrition", prepared for the IFPRI 2020 international conference "Leveraging Agriculture for Improving Nutrition and Health").

KNOWLEDGE GAPS AND PRIORITY AREAS FOR RESEARCH

Further research on concepts relating value chains to nutrition and health issues is required. Despite a few attempts, there is, in general, still a lack of value chain research in the CGIAR and a lack of pilots to test value chain concepts. Moreover, there is a lack of evidence from success stories/ market creation for nutrient-dense foods, and about improvement in nutrition and/or health around any value chains.

There are three important knowledge gaps. First, understanding determinants of the choices that influence diet quality, including how it is influenced by home production, provenance of local food, market access, habits, prices and income are required. Second, there is still insufficient understanding of how nutrient quality is influenced by production and postharvest handling and processing. Third, more insight on nutrition and health effects of long chains versus short value



BREAKOUT SUMMARY

chains is needed, a whole chain approach (input-suppliers to consumers) is in most cases still missing and we need understanding of long term effects of value chain building.

PARTNERSHIPS

Despite its critical importance in value chains, the role and relevance of the private sector are still discussed. Partnership should be built to allow nutrition education or health care delivery to be coupled with agricultural extension efforts. Public-private partnerships are also required for bringing economic arguments to policy makers, and the importance of economics and cost effectiveness (e.g. products should be competitive, consumers should like them, etc.) cannot be underestimated. Efforts on participatory risk assessment made by ILRI for assessing food safety in informal markets show one way ahead, as much of the work in this field will be implemented through inter-disciplinary partnerships.

BREAKOUT SUMMARY

Tuesday 24 September 14:15-17:00

BREAKOUT SESSION 9: FARM SIZE, URBANIZATION AND PRODUCTIVITY

How current trends in farm size and urbanization affect the links between local agriculture, human nutrition and health in Africa and Asia, to identify how agricultural research could become increasingly tailored to the specific needs of particular locations.

The session built on a strategic study of the Independent Science and Partnership Council (ISPC) on trends in farm size and urbanization and their implications for agricultural research.

There were four presentations: **Will Masters, Tufts University, USA**, on a synthesis of the ISPC study results; **Agnes Andersson Djurfeldt, Lund University, Sweden**, on the geographic and demographic perspectives on farm size and agriculture-nutrition linkages; **Doug Gollin, ISPC Council Member**, on economic perspectives on farm size and agriculture-nutrition linkages; and **Ken Giller, Wageningen University, Netherlands**, on farming systems and agronomic perspectives on changes in farm size. The session identified changes in supply chains, spatial polarisation, demography and farm sizes and productivity in smallholder systems, to focus on two main issues affecting nutrition and health: 1) the implications of continued decline in farm sizes across Africa even as average farm sizes in Asia begin to increase; and 2) the implications of rising commercialization in areas of both Africa and Asia with favourable access to transportation.

AREAS WHERE PROGRESS HAS BEEN MADE

Data availability has led to great progress in understanding how shifting demographics and patterns of production are linked to nutrition outcomes, thanks to the merger of geocoded household surveys with information on climate, infrastructure and other influences. There are many more high quality, publically available datasets available now than 10-20 years ago, with continued rapid improvement as field researchers take advantage of new Information and Communication Technologies (ICTs). There has been significant progress in both improving the diagnoses of the agronomic drivers of poor productivity in African agricultural systems and in demonstrating the potential for locally appropriate solutions that can bring a uniquely African Green Revolution. Spatial differences in environmental and economic conditions ensures heterogeneity across farms and location-specificity in what is needed for success, so blanket recommendations and silver bullets are not likely to work. Will Masters' presentation of the findings of the workshop highlighted the increasing diversity of global agriculture along two main axes: degree of commercialisation varying from dynamic market-linked to remote hinterland zones; and the size of farms in terms of land, animals and other capital resources, relative to labour. Having this typology in mind, when designing research on agriculture to improve nutrition, will help in tailoring specific projects to location-specific needs.

BREAKOUT SUMMARY

KNOWLEDGE GAPS AND PRIORITY AREAS FOR RESEARCH

There was considerable debate about the importance of income in determining nutrition outcomes in Sub-Saharan Africa. Doug Gollin emphasized that nutrition in terms of total calorie intake is not closely related to what farmers' produce or what the total household income and consumption might be, and there are many influences on diet quality so we see over- and under-nutrition even among different members of the same household. There is also great diversity in what happens with additional agricultural income (e.g. from increased productivity) – how it is invested or consumed. In response, Derek Headey pointed to Demographic and Health Surveys (DHS) data showing consistent stunting declines with higher wealth quintiles, and other evidence that the most consistent pattern we observe is that people with higher incomes generally acquire healthier diets. Nutritional status is influenced by many factors as well, but for agricultural research to reduce malnutrition a first priority could be to focus on innovations that help the poorest, through any combination of their own farm productivity, employment opportunities and/or lower food costs, particularly for women and children.

The role of migration influencing agriculture and nutrition was also debated. Will Masters made the case that rural people often migrate in circular or seasonal patterns in search of opportunity, with net movements typically occurring from rural to urban areas. Agnes Andersson-Djurfeldt showed how African urbanization characterised by high rates of natural increase in towns and cities, which contributes to the demographic pressure felt throughout African societies. Given limited migration opportunities, the discussion turned to what can be done to improve the nutrition of the poorest people living in remote hinterland zones. Some argued strongly that irrigation is essential and can be achieved even in remote areas (e.g. solar powered drip irrigation from groundwater for vegetables in the Sahel – see Burney *et al.* PNAS papers; 2010, 2013). Even if irrigation develops on a small proportion of the total agricultural area, it can have a significant effect on stabilising the inherent variability of rain-fed production. A related point is the role of livestock for farmers' livelihoods and consumption of animal-sourced foods, as a complement to crops in mixed agricultural systems. Thus the group highlighted gaps to include: i) more analysis of existing data on population, productivity, health and nutrition; ii) greater integration among existing datasets and additional investment in new data collection; iii) better understanding of heterogeneity in food consumption at the household level – why are some poor households food secure, while others are not? iv) new studies of the mediating factors that modify the relationship between agricultural production and nutrition outcomes, as market institutions, household behaviour and disease exposure interact to influence how higher productivity translates into improved nutrition; and v) increased focus on the health and nutrition implications of urbanization, in terms of lengthened and more complicated supply chains in which production, processing and consumption are increasingly spatially separated.

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PARTNERSHIPS

The merger of diverse datasets in geographic information systems (GIS) and increased communication using ICTs was seen as a potentially valuable focus for inter-sectoral partnerships. How can new GIS data and ICTs be used in measuring specific nutrition or health outcomes, or in the process of consolidating and interpreting “big data” in this sphere? Those research partnerships can then be applied to study and guide more diverse partnerships for field interventions. A recent example of a successful inter-sectoral partnership is the high iron beans, bred through the Harvest Plus initiative, which have been purchased by the World Food Program (WFP) for use in feeding programs in Africa. This is an example of how agriculture in one country in the region can play a role in meeting non-traditional demand (i.e. from the humanitarian sector) for nutritious products in another.

INNOVATIVE SCIENTIFIC APPROACHES TO ADD VALUE TO DELIVERY OF NUTRITION AND HEALTH OUTCOMES

The shift to optimising farming systems for nutrition rather than for production is a profound one and it raises a number of questions about what exactly should or could be done to achieve this. Since the most malnourished are the poorest people, and their diets improve the most in response to either increased income or reduced food prices, optimising for nutrition implies a renewed focus on the productivity and earnings of poor farmers as well as the productivity and prices of what poor consumers buy. This would argue for a continued focus on investments that raise farm productivity where the poorest farmers are, as well as productivity of value chains that deliver more nutritious and lower cost foods to poor buyers in both rural and urban areas. This includes investment in research on both staple foods whose productivity and price have an outsized influence on poor peoples’ income, and also nutrient-dense foods including fish and livestock. Given that many nutrient-rich foods (particularly fruits and vegetables) are highly perishable, there is also the potential to carry out valuable research on ways of limiting post-harvest losses.

For delivery of nutrition and health, the nutrition and health outcomes of small farmers as well as the urban poor need to be ensured. The main focus of the CGIAR (and especially the CRP on agriculture, nutrition and health) is on international exchange of agricultural innovations, much of which is technology for production by resource-poor farmers on small farms but there are also important food safety and other postharvest issues on the CGIAR agenda. For example, political science research is required to understand changes in food system regulation, such as how vested interests have blocked policy reforms on trans fats. Food safety systems should be analysed and how they evolve in the light of changing supply chains that increasingly encompass both rural and urban spheres.

BREAKOUT SUMMARY

Tuesday 24 September 14:15-17:00

BREAKOUT SESSION 10: ECONOMIC IMPLICATIONS

Analysis of economic implications of shifting investments in the primary production to better meet healthy dietary needs.

The objective of the session was to understand better the economic impacts of shifting investments towards more nutrition dense foods for healthier diets. Agricultural interventions in low income countries have often either focused on raising incomes for the poor assuming that nutrition and health benefits follow automatically, or focused on improving diets through promotion of specific highly nutritious foods but do not often consider the economic sustainability of the programs once intervention monies are removed. Furthermore, they may overlook other complex cultural and environmental issues which may be key to their success. For investments to effectively increase nutritional levels and incomes, a multi-dimensional approach including nutrition education, technical assistance, environmental awareness and community organization support may be needed to address the complex economic and social linkages between nutrition and agriculture. This session looked at the results from several field research projects aimed at improving nutritional and income outcomes using a multi-dimensional approach. Among the research questions these projects addressed were: How do initiatives to improve dietary and income outcomes need to be structured to reap benefits of both at present and over time? How can the multi-dimensional nature of the nutrition-income linkage be integrated into investment projects in this area? What are the knowledge gaps in developing and implementing these strategies? Are new research approaches needed in developing interventions aimed at double objective outcomes?

The first session speaker, **Benoy Barman, WorldFish**, presented the results of a participatory action research project on the production of micronutrient-rich small fish and its impacts on incomes and nutrition in Bangladesh over the 2011-2013 period. Small investments significantly increased fish production and incomes of participants and monthly consumption surveys indicated increased consumption of small fish, due in part to education programs. Spillover effects in nearby communities were also observed. The next presentation, by **Victor Afari-Sefa, World Vegetable Center (AVRDC)**, looked at the impact of traditional vegetable production and marketing on livelihoods and nutritional outcomes in Tanzania. The study investigated: i) pathways for promoting nutritional awareness of farmers and adoption of selected traditional African vegetables; ii) production constraints in their cultivation; and, iii) how to improve smallholders' market participation by linking nutritional awareness and production of African traditional vegetables.

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Ugo PicaCiamarra, FAO, reported results of a recent study examining the potential direct connection between ownership of animals and consumption of animal foods in rural areas in seven sub-Saharan African countries. Livestock ownership appears to be positively associated with consumption of livestock sourced foods, and helps ensure avoidance of protein and micronutrient malnutrition. The potential impact of increased livestock production and productivity on household nutrition were also explored and research priorities identified. **Thomas Randolph, CGIAR Research program on Livestock and Fish**, presented findings on a study aiming at a pro-poor transformation of smallholder based animal source food systems. Randolph provided an example of dairy development project showing how part of the food system (dairy) could be designed to contribute more directly to the nutritional security of poor rural and urban communities.

The discussions following each of the presentations and the more general discussion toward the end of the session were guided by specific questions related to the economic implications of shifting investments in primary production to better meet healthy dietary needs.

AREAS WHERE PROGRESS HAS BEEN MADE

Systematic conceptualization of food systems to understand the links between agriculture and nutrition.

KNOWLEDGE GAPS AND PRIORITY AREAS FOR RESEARCH

- Harmonized protocol for collecting food security and consumption data;
- How to replicate successful 'boutique' small scale operations cost effectively?
How to sustain success after the "project" (financial sustainability)?
- Role of different food commodities in achieving appropriate diet accessible to the poor;
- Implications for policy including trade-offs and substitution effects;
- Demand analysis (market, culture etc.) to identify appropriate design interventions
(emphasize demand creation, tackle cultural taboos, nutrition education, profitability etc.).

PARTNERSHIPS

Research organizations piloting innovative approach with the active engagement of governments, should be scaled up with additional donor or national support. A4NH has a coordination role in forming multi-sectoral teams across expertise and commodities.



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INNOVATIVE SCIENTIFIC APPROACHES TO ADD VALUE TO DELIVERY OF NUTRITION AND HEALTH OUTCOMES

- Acknowledge role of medium and large farmers when needed (and, potentially, actively target);
- Shift from production dominated research agenda to a stronger focus on consumption (urban & rural);
- Long-term projections to underlie longer-term research: Systems approach / scenario analysis to put nutrition objectives into a food systems context, and understanding how different food systems contribute to an appropriate diet;
- Analyze net-benefit by explicitly addressing unintended negative impacts (women's time, zoonotic diseases, etc.).



Independent Science
and Partnership
Council

SCIENCE FORUM 2013

**NUTRITION AND HEALTH OUTCOMES:
TARGETS FOR AGRICULTURAL RESEARCH**

BREAKOUT SUMMARY





PLENARY SUMMARIES

PLENARY SUMMARY

Monday 23 September

OPENING PLENARY: LINKS TO NUTRITION MEETINGS/INITIATIVES

Rajul Pandya-Lorch, International Food Policy Research Institute (IFPRI), chaired this session and commenced by noting the increased momentum around agriculture for nutrition and health in the last two and a half years since the IFPRI 2020 conference on “Leveraging Agriculture for Improving Nutrition and Health” was held. A number of major meetings and nutrition initiatives had taken place globally since then and she called upon five people to share highlights of some of these key events.

Jeff Waage, Leverhulme Centre for Integrative Research on Agriculture and Health (LCIRAH), UK, mentioned the conferences that LCIRAH had set up for development and evaluation of methods for agriculture, nutrition and health research. These conferences strive to bring together experts from different sectors and particularly encourage early career professionals. The report of the last meeting held in June 2013 will be published in the journal *Food Security* while the conference in June 2014 will focus on “Methods and metrics for measuring policy interventions in agriculture, nutrition and health”. He also provided a brief update on an Agriculture, Nutrition and Health Academy that will be launched by LCIRAH and the CGIAR Research Program on Agriculture For Nutrition and Health (A4NH), to engage the academic community interested in the area to develop inter-disciplinary collaborations across institutions and avoid working in silos. A meeting was held earlier this year in June with 14 academic institutions from Africa, Asia, Europe and North America and there was agreement around the following two objectives: a) to bring together researchers with their innovative ideas on how to measure agriculture, nutrition and health research outputs and impacts; and b) provide mentoring and support to early career professionals, particularly from low- and middle-income countries.

Hans Biesalski, University of Hohenheim, Germany, reported on the outputs of the international congress on “Hidden Hunger - From Assessment to Solutions” that took place on 6-9 March 2013, in Stuttgart, Germany. The conference was attended by approximately 380 participants from 21 countries (60 sponsored participants from Africa and Asia), with 80 oral presentations and 86 posters. Unlike the problem of hunger that has been widely addressed, “hidden hunger” (i.e. micronutrient deficiency) has not yet received adequate attention. Feeding the world is usually based on availability and food quantity, not food quality. Far more young females suffer from malnutrition rather than undernutrition. Conference participants from Africa and Asia had emphasized the need for increased communication and networking to improve knowledge about hidden hunger and in response, the website Nutri-matrix was created. He further stated that the presentations from the conference were available on the conference

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website, and the conference report had been published in the journals *Food Security* and *Annals of Nutrition and Metabolism*. Finally, a second conference on Hidden Hunger was scheduled to take place from 2-6 March 2014 at the same location.

Srinath Reddy, Public Health Foundation of India, informed the Forum about the Global Panel on Agriculture and Food Systems for Nutrition that was conceived, catalyzed and created in June 2013 by the UK Government through DFID. It is an independent panel consisting of agricultural scientists, economists and health experts with the mandate to review research evidence and provide global leadership for investments and policies in agriculture that support nutrition and help eradicate hunger. The Panel is taking a life course approach to nutrition, with the first priority being the elimination of undernutrition. There are currently 13 members of the Panel, it is hosted by the London International Development Center and funded by DFID and the Bill and Melinda Gates Foundation. The first formal meeting to define the process and products of the Panel's work will be held on 28-29 October 2013 in London. He also introduced the Sustainable Development Solutions Network, an initiative that is currently underway, and performs as an independent think tank with 12 thematic groups. The thematic group on agriculture recently released a report on "Solutions for Sustainable Agriculture and Food Systems"¹.

Jennifer Nielsen, Helen Keller International, shared a summary of take home messages from selected panels she attended at the IUNS 20th International Congress of Nutrition that took place right before the Science Forum 2013 on September 15-20 in Granada, Spain. Key highlights included a celebration of the impact of the 2008 Lancet series in galvanizing and unifying the nutrition community and the global response to the "triple burden" of malnutrition. The SUN initiative is also gaining momentum- over 30 countries have joined to develop interdisciplinary and intersectoral strategies to reduce undernutrition. With regards to the use of stunting as an indicator to measure progress, research is still needed to understand how to combat stunting. Another theme was that a key element of the strategy must be a focus on women's nutrition starting in adolescence, reducing early marriage and enhancing women's empowerment. Discussion around nutrition-sensitive agriculture and its potential recognized the complexity of the program impact pathways, which are more web-like than linear, and the various mechanisms by which undernutrition might be reduced. The use of interesting tools such as ProPAN and Optifoods to identify the most affordable local food sources for improving nutrition quality or where supplements might be required was also examined.

Brian Thompson, FAO, described the process leading up to the Second International Conference on Nutrition (ICN2) that will be held on 19-21 November 2014 in Rome, Italy. Approximately 2000 high-level Ministers and policy makers from agriculture, health, foreign affairs and other relevant sectors are expected at this event. Prior to ICN2, a preparatory technical meeting will take place

1. <http://unsdsn.org/report-solutions-for-sustainable-agriculture-and-food-systems-released/>



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on 13-15 November 2013 at which senior level experts (not policy-makers) will discuss issues related to measurement, nutrition trends and learning from the past in terms of identifying a flexible policy framework for countries. The intent is to ensure that their sectors make a more direct impact on improving diets and raising levels of nutrition as well as stimulating institutional partnerships for positive health and nutrition outcomes. The hope is for ICN2 to capitalize on all other ongoing meetings and ideas and bring it together for the policy makers to make the changes identified by the scientific and technical community. ICN2 is a joint FAO and WHO event but there are 8 additional members on the Steering Committee including CGIAR, represented by IFPRI.

PLENARY SUMMARY

Monday 23 September 10:45-12:15 hrs

KEYNOTE PLENARY: WHAT DO WE KNOW ABOUT NUTRITION AND HEALTH OUTCOMES OF AGRICULTURE?

KEYNOTE PRESENTATION

Patrick Webb, Tufts University, USA

Agriculture and Nutrition: What do we know now, and what do we still need to know?

This keynote talk set the scene for debate on the evidence regarding links between agriculture and nutrition. In recent years, a slew of initiatives have brought attention to the potential of agriculture to contribute to improved nutrition outcomes. The Lancet 2013 series on Maternal and Child nutrition explicitly brought together targeted nutrition specific actions and nutrition sensitive actions as a complement. It identified 10 targeted nutrition specific interventions that, if implemented at 90% coverage, could cut stunting by 20% and mortality by 15%. However there are very large associated costs and even at 90% coverage, 80% of stunting would remain – this has brought renewed focus on the potential of nutrition sensitive actions, including agriculture, education, welfare schemes, safety nets, etc .

A review by Masset *et al.* (2011), taking into consideration existing literature, found that evidence of the overall impact of agriculture interventions on improved nutrition was very slight. However, this does not mean that investments in agriculture cannot lead to positive nutrition outcomes- there is evidence that they do, through productivity increases and women's empowerment. Multi-country data exists showing that increased per capita income derived through agriculture is associated with reduction of stunting by 15-20%. Agricultural interventions can improve nutrition through productivity enhancement and gender empowerment, but other mechanisms are also involved such as diet quality, food system safety and delivery platforms. Plans for agricultural research need to be reviewed for nutrition sensitive approaches or, at least, to ensure that they will do no harm to nutrition priorities.

The paper by Ruel and Alderman in the Lancet 2013 series found that evidence for nutritional impacts of targeted agricultural programs, except Vitamin A, was limited- mainly due to weaknesses in program goals and study design, and lack of rigor in impact evaluation. This second Lancet series also identified over 60 priority research questions, a few of which relate specifically to the nutrition sensitive agenda including cost-effectiveness, understanding intermediate outcomes, entry barriers, integration of interventions across sectors and scalability.

Additionally, a study published by LCIRAH last year (that reviewed 151 current and planned research activities) as well as the 2013 assessment from the Food Security Learning Network,

PLENARY SUMMARY

identified priority areas and research questions in agriculture and nutrition, including completing the links in the whole research chain, cost-effectiveness, focus on population subgroups, food hygiene, indirect effects on nutrition, through health, income and economic growth, mediators by context, combinations of interactions and interventions, value chains, governance and policy processes and incentives.

Within the CGIAR Strategy and Results Framework, System Level Outcome 3 focuses on health and nutrition. It is important that all CGIAR Research Programs and not just the one focusing on nutrition and health (Agriculture for Nutrition and Health - A4NH) understand the mechanisms and choke points.

Discussing the way forward, Patrick Webb stressed that as stewards of scarce resources, we must understand and document investment impacts (and explain how and why). Much more high quality research is needed (beyond agronomy, agricultural economy, environment and resource management). Evidence-capture is required that passes the bar of future meta-analyses (but not just Randomized Controlled Trials -RCTs). We need less claiming/modeling of “potential” impact, and more demonstration of actual net impacts. We must also link agriculture with public health research to fill knowledge gaps on “dose-response”, effect modifiers, cost effectiveness, inter-sectoral processes, etc. In summary:

1. Effective agriculture-nutrition research needs honesty (i.e. clarity, specificity and transparency about agriculture’s feasible contribution to health and nutrition), greater engagement across sectors (especially around what are the appropriated standards of evidence), and rigor (outcome-appropriate methods).
2. This is only possible with agriculture researcher involvement in public health dialogue, priority-setting, integrated research.
3. An expanded research agenda is required - highest impact may be in “novel” domains and extending into new areas may be necessary.

RESPONDENT 1

Lindsay Allen

Agricultural research and nutrition: what we know and don’t know

Lindsay Allen commenced by stating that this topic was not new and that she had been involved in the area for about 30 years. In her response, she addressed parts of Patrick Webb’s talk that focused on areas of measurable impact. Reiterating the findings of the review by Masset *et al.* (2011), she noted that very few programs measured change in intake. In general, dietary diversity was a poor measure since sufficient quantities of any of those foods had to be ingested. She further stated that anthropometric measures of stunting and underweight were some of the least sensitive indicators to be measured in an agricultural intervention project (also holds true for supplements). With regards to nutritional status, of all the measures that had been looked at in all the meta-analyses, changes on serum retinol could be detected. However, levels of other micronutrients like zinc and iron were more difficult to measure and to demonstrate effects.

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A meta-analysis by Olney, Pearson and Allen (2009) showed that the proximal effects of supplements and food-based complementary approaches on growth of children were very small (0.2 overall). On the other hand, animal source foods do improve child growth and development and there had been efficacy trials to show that these worked (milk and meat intervention trial in school children in Kenya in 2002 and a meta-analysis of dairy products and physical stature conducted by de Beer *et al.* in 2012).

She noted that the agricultural community's approach to improving nutrition to date has been to focus mainly on key cereal, legume and rootcrops to reduce hunger, for income, biofuels, etc., with some emphasis on biofortification, animal source foods and approaches for smallholders. The nutrition community's approach has been a focus on complementary micronutrient interventions such as supplementation (mainly in early life), fortification (sometimes without adequate assessment of what the community needs), micronutrients, for example peanut based micronutrients that seem to increase birth weight, and dietary quality improvement. Current micronutrient policies and strategies include breast milk for babies up to 6 months, fortified complementary food for children up to 5 years, and for women and children fortified staples in addition to iron.

She went on to present a model emphasizing that future work should focus on measuring total food intake, followed by determining how many people have low or high intakes of these nutrients. Then plant sources should be looked at that could provide the missing nutrients (energy, Vitamins A,C and folate, biofortified foods for iron and zinc) together with animal source foods and then fortification and supplementation should be used to fill the gaps. Efforts on agriculture and nutrition have often been sidetracked by micronutrient supplementation and fortification.

She then described a couple of successful examples of planning agriculture for nutritional needs:

1. The ENAM project in Ghana (**E**nhancing child **N**utrition through **A**nimal source food **M**anagement) developed a problem model for key constraints on the availability, accessibility and utilization of animal source food, followed by a three-legged approach (microcredit loans and savings for fish smoking and sales, poultry and eggs, etc., entrepreneurship education and nutrition education – all reinforced in weekly meetings where the loans were paid back). Results included reduction in food insecurity, increase in height and weight as well as higher intake of protein, calcium, zinc and iron. Parenthetically, she noted that poultry and eggs had never been evaluated for nutritional outcomes in spite of their huge potential.
2. Homestead production in Bangladesh (HKI) to scale-up implementation led to tripled vegetable production, increased income, increased consumption of micronutrient-rich foods and increased food security.

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Adding to Patrick's what don't we know, she asked:

- What strategies are best to improve dietary quality of the poor?
- How and why diets are changing with and across households, countries? How to influence this?
- How effective are longer-term agricultural interventions for improving nutrient status and growth vs. cardiovascular risk?
- What are the unintended effects on diet (food sold and purchased; earlier breastfeeding), body mass index, water quality, food security and safety?
- How best to integrate micronutrient interventions?

She concluded by summarizing what is known:

- Few interventions improve growth directly, but animal source foods, especially milk do.
- Growth is an insensitive outcome for measurement.
- Anemia is also an insensitive status outcome (project and program outcome target should be matched to the intervention).
- Agriculture should impact the whole household, not just focus only on pregnant women and young children.
- Agricultural interventions should be planned to meet nutrient gaps. If not, little effect will be seen.
- Impact on whole diet should be well measured, for several household members.
- Education, behavior change, microcredit, women, local practices, etc., should be taken into account.

RESPONDENT 2

Chizuru Nishida

Agricultural and nutrition: What do we know now, and what do we still need to know?

Chizuru Nishida asked four additional questions from the policy and program implementation, and delivery mechanism perspectives:

1. What are the effective food and agriculture policies to improve nutrition?
Food and agriculture policies should ensure more availability, more affordability and higher nutritional quality of foods. Nutrition sensitivity therefore should encompass the prevention of Non Communicable Diseases (NCDs) as well. What policy actions can be taken, not only to have positive impact, but also to mitigate the unwanted effects on health and nutrition?
2. What is the effective governance for nutrition-sensitive action to impact on nutrition?
The governance issue was highlighted in the 2008 Lancet series. As part of the landscape analysis funded by BMGF, in determining why progress was not faster in reducing malnutrition, one of the factors identified was inadequate nutrition governance. Nutrition governance encompasses the processes by which policies and programs are developed to improve

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nutrition. Then the strength of the Nutrition Governance score was calculated with several key elements. Having a single element of nutrition governance by itself did not have any significant relationship with progress of achieving Millennium Development Goal 1, except with adopted national nutrition plan, policy/strategy and being part of a development plan, and regular nutrition surveillance. So what are the elements of governance for nutrition sensitive action? What kind of institutional mechanisms need to be established to allow health objectives to be embedded in food, agriculture and trade policies? Most countries have some kind of coordination mechanisms in place – is that sufficient?

3. What kind of human capacity resource is required to deliver effective nutrition-sensitive actions? What kind of training is needed? What kinds of competencies are needed at different levels?
4. What kind of surveillance system is required to monitor and evaluate effective nutrition-sensitive actions? What are the indicators to monitor nutrition-sensitive actions and evaluate their impacts?

PLENARY SUMMARY

Monday 23 September 16:45-18:15 hrs

PLENARY: GENDER AND NUTRITION

MAIN PRESENTATION

Jemimah Njuki, CARE

Gender, Women's Empowerment and Links to Agriculture and Nutrition

Jemimah Njuki noted her excitement at the growing movement within the CGIAR to work on gender issues related to agriculture. She indicated that we have moved beyond issues, and mentioned the FAO report on the impact to be gained if gender inequality was addressed, including a 20-30% increase in agricultural productivity. Her presentation focused on gender mediated pathways between agriculture and nutrition. She presented a framework that did not focus solely on agriculture, rather on what other interventions were needed for health and nutrition, including education, strengthening health systems, as well as poverty reduction and women's empowerment.

She highlighted the role that women play in food production in addition to being the primary caregivers that influence child nutrition. Looking at the direct and indirect pathways between gender and nutrition; it is not clear where the intervention emphasis should be to make the most impact. What are the biggest contributors to nutrition and what is their relative importance? What would the policy message be? How should we allocate resources? There had also been a lack of information on the impact of agricultural interventions on women, such as on time use and the consequent implications on child nutrition and child care. As we do agriculture, we need to understand how this fits into the larger context and its impact on areas outside of the realm of agriculture. For example, the Gender and Agriculture Assets Project (collaboration between CARE and IFPRI) determined that in Mozambique, introduction of dairy cattle increased women's time use on livestock production by close to 600%. Similarly, qualitative studies from an irrigation project showed opportunity costs by women from irrigated agriculture in terms of child care and leisure.

She elaborated that while increasing household incomes led to a higher purchasing power, expenditure patterns differed by gender and thus commercialization of agriculture could have impacts on consumption patterns and decision making on household expenditure patterns, for example food and health input purchases. With regards to intra-household dynamics, disparities and nutrition, increasing women's control over assets had positive effects on a number of important development outcomes for the household, including food security, child nutrition and education.

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Women's empowerment is a complex issue and exerts a significant influence on child nutrition. A CARE program in Bangladesh, SHURHADO, found that combining other interventions with maternal and child health and nutrition produced big results and no single intervention reduced child stunting. More robust evidence is needed on what kinds of empowerment are critical for what nutritional outcomes. Integrated programs that combine multiple interventions and approaches are necessary and the impact pathways for such programs need to be more robust. Other important factors that ought to be considered are the balance between the different approaches, evaluating which interventions work, the magnitude of their impact and sequencing of these interventions. She concluded by stating that since development programs are often broad based, there are opportunities for strategic partnerships with researchers starting from the design phase and balancing research rigor with the practicalities of program implementation.

CASE STUDY 1

Nozomi Kawarazuka, University of East Anglia

Understanding gender relations: a case study in South Kilifi, Kenya

Nozomi Kawarazuka emphasized that the expected pathways from agriculture to women to nutrition depended on the social context of the situation. Through ethnographic fieldwork research conducted over a period of 8 months in Kenya, she studied gendered processes in which local agriculture/fishery resources were utilized to unearth a complex system which affected women to various degrees. She discovered that gendered negotiations and relations were central in local processes of production and trading. Fishermen, for example, sold their catches to particular female traders who supported them by providing credit in times of need. Female traders also benefited from a particular fisherman's catch, his assets, his kinship relations and his access to other resources. Such informal and flexible trading methods based on gender relations play an important role in livelihood security.

Another interesting finding was that men's primary control over local resources is a base for demonstrating masculinity which helps maintain fatherhood, leading to men's responsibility for and emotional attachment to their children's well-being, health and nutrition. Finally, the quality and quantity of everyday meals was not simply determined by the woman's income on that day. Each woman used different sources of daily meals by using her relationships with men. Furthermore, the extent to which a woman or her family members could spend their time on cooking and nurturing depended largely on household composition and social support networks which also determined the quality of their diet.

In conclusion, "women" are not a homogenous group and gendered behaviors influence women's practices. As such, the local gender processes of production and redistribution, and men's indirect roles should be considered in development policies on agriculture and nutrition. There is also a definite need for more sociologists and anthropologists to be involved for a more nuanced understanding of impacts on the status and role of women.

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CASE STUDY 2

Bader Mahaman, Action contre la Faim

Contribution of the NCA research project to gender and nutrition

Bader Mahaman presented a case study describing an operational research project, the Nutritional Causal Analysis (NCA) conducted by Action Contre la Faim (ACF) and its scientific partners. The NCA was a structured, participatory and holistic study to build a case for nutrition causality in a local context, and investigate why sectorial programs were having limited impact on nutrition, as well as understand pathways to under nutrition (how, where, when). The NCA methodology combined both quantitative and qualitative data collection methods and analysis.

He further explained that this type of study allows for a more nuanced analysis given the local context and provides a more complex understanding of the role of men and women as well as their social status within the community. This type of study also offers a clear understanding of “who controls resources”. Results of the NCA in Burkina-Faso and Tchad showed that household access to water, spacing between births, economic security of women and their access to production resources and livelihoods were major determinants of under-nutrition.

Strengths of the NCA include its qualitative nature. Used as a practical field assessment tool, it allows for a socio-anthropological point of view to be incorporated within the assessment. The main weaknesses, however, are that there is no means of measuring the relative importance of each cause, and the complexity of integrating gender and nutrition indicators.

COMMENTATOR

Esi Colecraft, University of Ghana

Esi Colecraft commented on the presentations noting that gender and nutrition have distinct and sometimes overlapping male and female domains at both the community and household levels. However, the domains occupied by women directly impinge on household dietary intake and consequently the nutritional status of household members, particularly young children. She emphasized that care should be taken to avoid the negative impact of agricultural interventions that aim to enhance agricultural productivity on women’s abilities to provide child care and women’s control over resources. It is vital that men are not left out from the dialogue and actions on gender. Context is central and there is no one-size-fits-all approach with regards to gender. She alluded to the importance of qualitative processes, and the importance of not neglecting the reality in that many variables influence nutrition, not just agriculture. Lastly, the capacity within the various institutions needs to be assessed to effectively integrate gender into agricultural programs.

PLENARY SUMMARY

Tuesday 24 September 08:30-10:00 hrs

PLENARY: EVALUATING NUTRITION AND HEALTH OUTCOMES

MAIN PRESENTATION

Matin Qaim, University of Gottingen, Germany

How to evaluate nutrition and health impacts of agricultural innovations

Matin Qaim's presentation argued that future impact studies of agricultural innovations should include nutrition and health dimensions more explicitly and discussed different metrics of nutrition and health outcomes. Agricultural innovations can have important impacts on nutrition and health, but relatively little is known about the types and magnitudes of these effects at the micro level. To date, most impact studies have primarily looked at productivity, few have looked at income, and very few have explicitly looked at nutrition and health impacts, which is surprising in a CGIAR context.

While there are no standard approaches for impact analysis, and neither is there a blueprint for how this can be achieved, there are some possible approaches and issues that need to be considered. He presented a conceptual framework that focused at the micro-level for farm households. Beyond direct effects on nutrition through changes in the quantity, quality, and diversity of foods produced, indirect effects could occur through the income pathway. Health effects of agricultural innovations could happen through the nutrition pathway or directly through occupational health hazards, zoonoses, or water-borne vectors of infectious diseases.

He described the four most prominent kinds of metrics used for measuring nutrition: 1) subjective food security assessment; 2) food consumption based measures; 3) anthropometric measures; and 4) clinical assessment. The metrics chosen depend on the type of agricultural innovation and its expected impact pathways, as well as the target group, the intended sample size and regional coverage, as well as the financial and human resources available. Health outcomes could be measured through disease incidence data and cost-of-illness or disability adjusted life years (DALY) approaches.

To evaluate impacts of agricultural innovations, the nutrition and health metrics have to be compared between adopters and non-adopters of a particular innovation. However an attribution problem is whether the observed differences are only due to the innovation. A potential solution for such issue is to assign innovation randomly (Randomized Control Trial - RCT) – but this cannot be used in all innovation technologies, and cannot be considered a standard tool. Other statistical options need to be considered.

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Qaim then provided empirical examples, to illustrate how these methodologies may be used. One study was on the tissue culture (TC) bananas project in Kenya. The study collected data from 385 farms in 2009 to assess impacts on household income and food security. Food security was measured using the Household Food and Security Access Scale developed by the USAID FANTA project. The study found that TC adoption did reduce food insecurity in a significant way.

Another study was on the adoption of Bt cotton in India, an example of examining an impact pathway of an agricultural innovation not related to a food crop. The study collected panel data of over 500 farmers in four rounds between 2002 and 2008 (in four states). Bt adoption resulted in chemical pesticide reductions of 40-50%, yield increases of 20-30%, and profit increases of 50%. The study determined that Bt cotton adoption significantly improved calorie consumption and dietary quality, resulting from increased family incomes, and reduced food insecurity among Indian cotton growers by 15-20%. Bt cotton adoption also resulted in reduced chemical pesticide use leading to decreased incidence of pesticide poisoning and USD 15 million lower cost-of-illness.

RESPONDENT 1

Linxiu Zhang, Chinese Academy of Sciences, China

Better nutrition and health through impact evaluation!?

Linxiu Zhang elaborated on the need for impact evaluation and the associated challenges. There was little empirical evidence that programs and innovations worked to positively affect the lives of the poor and in a cost effective manner. She stressed that impact varied over time though not enough attention was given to this. She cited the example of a long term study in Guatemala that showed the importance of nutritional intervention in the earliest childhood years for later cognition, schooling and income (Maluccio *et al.*, 2009). With regards to the selection of methods, RCTs were the gold standard, but only where random assignment was possible. Managing impact evaluation required *ex ante* designs with baseline, a credible design with clear objectives and management of feedback loops. Other important questions to be addressed included *ex post* or *ex ante*, existing data or new data, qualitative and/or quantitative, rounds of data collection, sample size and optimal time for estimating impact.

Nutrition and health involved more than just agricultural innovations. For example, in China the agricultural growth rate was 3-4% with rapidly increasing rural and urban incomes, yet the country's challenge in nutrition and health was huge. Her group had tested 60,000 children across China for iron-deficiency anemia (33% suffered from anemia in the poor areas compared to 8% in the non-poor areas) and more than 4000 children for intestinal worms in rural China (37.5% were infected in Guizhou Province). Of the approximately 1000 babies and their mothers tested in Southern Shaanxi, 55% were anemic but less than 20% were stunted/wasted, indicating a micronutrient problem. In addition, 35% were cognitively delayed while 57% were significantly delayed in their motor development. In harshest terms, this translates to 20-30% of China's future

PLENARY SUMMARY

population being in danger of becoming permanently physically and mentally handicapped – a powerful message for policy makers. She introduced the Rural Education Action Program (REAP) that aims to inform sound education, health and nutrition policy in China.

In conclusion, she stated that nutrition and health improvement do not necessarily go hand in hand with income and productivity growth. Therefore there was a need to identify and map the complete causal-chain between agriculture/income –nutrition/health, that would include care, knowledge, health system reform, gender and governance and more.

CASE STUDY

Shibani Ghosh, Tufts University, USA

Studying effectiveness: Considerations in research design and implementation

Shibani Ghosh presented a case study from Feed the Future Innovation Laboratory for Collaborative Research on Nutrition, hosted by Tufts University and funded by USAID. Their mandate is to study impact as well as effectiveness, i.e. moving away from impact assessment to evaluation effectiveness, and results from Uganda and Nepal were presented. In Uganda, work was being done in collaboration with the Community Connector program, being implemented by FHI 360 in Uganda. This is an integrated agriculture, livelihoods and nutrition program which aims to provide support in a number of areas such as risk management, micro-credit savings, agricultural and post-harvest technologies and gender approaches. In Nepal, work was done in association with Suaahara that focusses on agricultural extension services, home gardens and livestock management. Both programs also provide support to the health service system through Essential Nutrition Actions (ENA), Essential Health Actions (EHA), service quality and sectoral coordination. In Nepal, Kisan, a Feed the Future program, was also taken into consideration. The Innovation Laboratory was interested in determining how these programs contributed to income, health and diet quality and more importantly the effect on maternal and child health nutrition.

These programs are often tailored to be implemented on a district basis and therefore address the needs of the target populations. Designing research around these programs is difficult as the number of treatments, given the variability in the implementation, is not amenable to RCT design. Moreover, the resource and management scope is quite large, and after careful consideration, RCTs were not possible. Randomly rolling out treatments was also not possible. Finally, there was a need to understand “how” the impact was achieved.

The result was a reasonable design which included observational design with randomized site selection with counterfactuals and pre-post evaluation in Nepal and Uganda. Due to different contexts, the design also included observational cohort annual panel survey and longitudinal sentinel sites in Nepal, and cohort panels and quasi experimental longitudinal birth cohort in Uganda. Details on the research design and implementation in both countries were shared.

PLENARY SUMMARY

Wednesday 25 September 09:00-11:00 hrs

PLENARY: REGIONAL PERSPECTIVES ON NUTRITION AND HEALTH OUTCOMES

MAIN PRESENTATION 1

Lawrence Haddad, Institute of Development Studies, UK
Bigger Impacts of Agriculture on Nutrition: What Will it Take?

Lawrence Haddad's presentation focused on two points: the puzzling evidence on the links between agriculture and nutrition, and the features of an "Enabling Environment" that can strengthen the links between them.

With regards to the evidence, he reported that at the macro level globally (116 developing countries over a 40 year period), food availability was just as important as the other underlying determinants for reductions in stunting, such as safe water, sanitation, female secondary school and gender life expectancy ratio. This result is quite encouraging. However, in another cross country analysis, when income was broken down into agricultural and non-agricultural growth, there was a lack of association of agricultural growth and stunting decline. For evidence at the micro level, a systematic review of agricultural interventions that aim to improve nutritional status of children carried out by his group in 2011 found that the stunting impact of agricultural interventions that were designed to have an impact on nutrition was weak. But looking at the studies a bit more closely, it was clear that half of the non-significant stunting findings had sample sizes that were too small to detect impacts, even if they existed. Additionally, while these studies showed few effects on stunting, about half of them showed positive impacts on "diets".

He also made reference to the conclusion of the Ruel and Alderman 2013 paper from the Lancet Series, i.e. the potential of nutrition sensitive programs to improve nutrition outcomes is clear but it has yet to be unleashed. So how to unleash this potential? There is a need to create an "enabling environment" for nutrition. He went on to present a simple framework that was also highlighted in a paper that he co-authored in the Lancet 2013 series. The framework includes building commitment and converting commitment to impact. The important components that go into achieving these objectives are framing, narratives and evidence, politics and governance, and capacity and financial resources (summarized below):

PLENARY SUMMARY

| | Building commitment | Converting commitment to impact |
|---|--|--|
| Framing, Narratives and Evidence | <ul style="list-style-type: none"> • What is agriculture for? • Reframing foods • Understand agriculture policymakers when it comes to nutrition | <ul style="list-style-type: none"> • Convincing evidence on what works • Nature of evidence: associations are fine if no systematic bias and vast majority of studies telling same story. RCTs helpful in some key studies but not always. |
| Politics and Governance | <ul style="list-style-type: none"> • What does commitment of agriculture to nutrition look like? • A commitment to food security is not identical to a commitment to nutrition | <ul style="list-style-type: none"> • Horizontal coordination: integration or co-location? • Empower women to improve delivery of agriculture that is pro nutrition - but how? |
| Capacity and Financial Resources | <ul style="list-style-type: none"> • Leadership and training: where are the next generation being developed to think about the links? • Leadership opportunities and training for women in agriculture | <ul style="list-style-type: none"> • Increased potential for public sector resources in agriculture to work for nutrition (e.g. A4H) • Increased potential for private sector resources in agriculture to work for nutrition |

He concluded by saying that agriculture does have the potential to dramatically accelerate stunting declines and that potential has to be realized, because nutrition specific programs on their own can, at best, reduce stunting by 20%. And finally, to realize that potential, we need to build an enabling environment for agriculture.

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MAIN PRESENTATION 2

Prabhu Pingali, Cornell University, USA

Agricultural Pathways to Improved Nutrition – Getting Policies Right!

Prabhu Pingali's presentation focused on the policy environment for agriculture and nutrition and the pathways between smallholder agricultural productivity growth and nutrition improvement, with an emphasis on improving the nutritional status of women and children. He introduced the Bill and Melinda Gates Foundation conceptual framework for the agriculture-nutrition pathway which is fairly simple and a more complex representation of the pathway developed by the Tata-Cornell Agriculture and Nutrition Initiative, which starts from the individual. A policy environment that gives incentive to all the players along this pathway is needed but quite often breakdowns in policy prevent the pathway from functioning.

In developing countries' agriculture and food supply policies, there is persistence of the Green Revolution focus on staple grains with poor support for coarse grains, legumes, lentils, etc. Additionally, there is lack of attention to high relative prices of micronutrient dense food such as fruits, vegetables and livestock products. So what are the options for crop neutral intensification? Is there a way to promote future intensification of agriculture in developing countries by creating all the necessary conditions to increase crop productivity but leave the choice of the crop to be cultivated to the farmer, for example in response to market signals?

He then went on to discuss food based interventions. For promotion of biofortified food, *ex ante* assessment and enabling policies are needed. There is also a gender difference with regards to the kind of safety net programs that work, and therefore impact of food and cash based safety net programs needs to be taken into account. With regards to behavior change, community participatory approaches to learning and change are important – the real change often happens through women and women's organizations within rural communities. ICTs have a key role to play in scaling up behavior change messages (for example Digital Green in India).

He concluded by addressing the breaking of silos and building convergence across sectoral interventions. For this to happen: 1) clear and measurable goals need to be set (for example reduction in child stunting by some percentage in a certain number of years); 2) goals and performance indicators must cascade down to the community level; 3) convergence of disparate government interventions happens at the community level and ought to be locally managed; and 4) frequent and transparent monitoring of progress towards goals should be established.

CASE STUDY 1

Frederick Grant, Helen Keller International

Nutrition and health outcomes in enhanced homestead food production programs

Fred Grant presented HKI's experience with enhanced homestead food production (EHFP) programs, which have been implemented for over 20 years. At its core, EHFP is about home

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gardening of nutrient rich crops as well small animal production with very strong engagement of government, civil society and private sector, and delivery of evidence based essential nutrition actions (ENA) guided by a behavior change strategy.

Between 2008 and 2012, HKI implemented the program in two food insecure settings using cluster-randomized assignment to treatment or control conditions. In Burkina Faso, the program followed a cohort of children 3-12 months while in Nepal, the program used a cross-sectional design to evaluate impact of exposure on children under 2 years and women of reproductive age. In both settings, significant impact was documented on all impact pathways comparing treatment to control communities, for example maternal nutrition knowledge of optimal ENA practices; nutrition practices among women and their children; production of an increased variety and quantity of vitamin-A rich plant and animal foods; and, income benefits likely attributable to improved food production. In Nepal, impact was also seen on perceived food security. Neither site found significant improvements in child anthropometry, but showed modest impact on child hemoglobin concentration. In Nepal, there were significant and important improvements in women's underweight and anemia, which merit further exploration.

In terms of lessons learnt, nutrition impacts are possible from agriculture programs, but timeline, sequencing, program impact pathways, etc. are critical. Collaboration between research institutions and implementing partners ensures good program design and monitoring and evaluation for course correction, although it is challenging to measure impact in multi-sectoral interventions. Evidence-based and context-appropriate programming is a very important component together with developing program impact pathways based on Theory of Change. Finally, pertaining to the timeline for impact, project timelines of 3-4 years are inadequate for assessing impact in complex programs such as EHFP. It is essential to realize what is feasible for the research, agriculture interventions, behavior change and donor deadlines. HKI is continuing this research in a number of sites, including through its partnership with IFPRI in sub-Saharan Africa.

CASE STUDY 2

Katherine Gray-Donald, McGill University, Canada Putting CARICOM Food Security Research into Action

Katherine Gray-Donald described an innovative "farm to fork" approach in a project being carried out by the University of the West Indies and McGill University in Canada, in collaboration with regional and local institutions, and funding from the Canadian International Food Security Research Fund (CIFSRF). This subproject was undertaken in St Kitts-Nevis and aimed to link the enhanced agricultural production to school lunch program provisioning to improve the food offerings.

The current school meals program in intervention vs. control schools was being investigated to improve child health outcomes and provide a market opportunity to increase economic returns

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for small holder farmers. A baseline nutritional survey of 188 children and their caregivers was undertaken to assess their height and weight, child 24 hour recall and hemoglobin status. Virtually no stunting was found, but 23% of the children were overweight or obese. The school lunches were modified with dietary interventions introduced to increase vegetable and fruit intake, increase iron intake and reduce sugar intake.

In terms of process evaluation, it was found that there were additions in watermelon, carrots, pumpkin, tomatoes, cucumber issued from the storeroom and the quality of meat increased. The food purchase records for cost demonstrated that the new menu cost 70% more (mainly due to better meat cuts than to the costs of fruits and vegetables) and 29% of the food budget was for a sugar drink. With the implementation of new school lunch menus based on local food habits and available foods and agricultural innovations, farmers' supplied intervention schools with fruits, vegetables and goat meat leading to increased income. However, ensuring a regular supply for some foods remained a challenge to overcome. In the school kitchens, more vegetables led to increased workload and an increased cost. Reducing the sugar in the diet was a real challenge.



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