McGill Institute for Global Food Security

7th McGill Conference on Global Food Security:

Food Security Beyond 2015

SUMMARY,
KEY FINDINGS AND RECOMMENDATIONS

OCTOBER 28-29, 2014

MONTREAL, CANADA

McGill Institute for Global Food Security

Institut pour la sécurité alimentaire mondiale de McGill

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

The 2014 Global Food Security Conference hosted policy makers, researchers and students working on food security projects in Africa, India, Latin and South America, the Caribbean and Canada. Although average gaps between actual and possible crop yields are still large in many parts of the world, there is cause for optimism. Since 2006, yields in South Africa, Ethiopia and Uganda have showed impressive gains.

Approximately 60% of all food purchased in Africa occurs in urban centres which are linked to rural markets by small and medium sized entrepreneurs (SMEs), both farmers and retailers, who are supplying rising and diverse demands of the increasingly wealthy urban population. The SMEs are showing dynamic growth and are a significant generator of employment in Africa.

The researchers reported many accomplishments at increasing crop and animal production, improving soil management for nutrients and water, reducing post-harvest losses, empowering women farmers and enhancing nutrition levels in diets. Upscaling innovations and new knowledge to reach a large number of people and have a significant effect on regional or national food security is the next challenge. Ideas to support upscaling knowledge, innovations and technologies are listed in the 'Recommendations' section.

Despite significant success, further work remains to be done. Getting modern and productive seed varieties to small farmers, improving water use efficiency and strengthening markets for both inputs and outputs are necessary. Different policies are needed for the widely different food security zones and the wide degree of heterogeneity across farmers and farm areas. "One size does not fit all" and government strategies need to be tailored to the different situations. Multi-sectoral partnerships and cooperation across a range of stakeholders will help to advance research, technology and policy developments and improve food security in the world.

Food insecurity is not just about developing countries; it can occur in Canada or in any developed country. In non-agricultural societies such as Canada's aboriginal communities, security of traditional foods is related to access to land, conservation of biodiversity and local knowledge and is an intrinsic part of community identity.

A new tool called the Food Insecurity Experience Scale (FIES) is being developed by FAO's 'Voices of the Hungry' (VoH) project to consistently and accurately measure food insecure households and people across different countries and cultures.

ACKNOWLEDGEMENTS

We are very grateful to the following sponsors and donors who supported the conference:

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We would also like to thank the McGill student volunteers who helped throughout the conference, Helen Fyles for her valued participation and Helen Cohen Rimmer who assisted with the conference website and all promotional materials.

We are extremely grateful to Kim Reany who helped organize everything from preliminary meetings to the program and registration to meals and accommodation.

We thank our caterers Foodie Traiteur, Compass Group Canada at McGill for making sure that food served at the conference was not wasted. Leftovers from conference meals were donated to The Old Brewery Mission which works with Montreal’s homeless people.

CONFERENCE ORGANIZING COMMITTEE

Hugo Melgar-Quiñonez (Chair), Caroline Begg, Sylvia Borucki, Sharon Campbell, Eduardo Ganem Cuenca, Helen Fyles, Katherine Gombay, Douglas Hedley, Ron Henry, Tim Johns, Kristine Koski, Chandra Madramootoo, Kim Reany, Paul Simard, Don Smith, Pascal Thériault, Paul Thomassin.

CONFERENCE BACKGROUND

Conference Organizer and Host: McGill Institute for Global Food Security

The McGill Institute for Global Food Security, the organizer and host of the conference, was created in 2010 and provides a focal point to examine issues constraining the measurement of food insecurity, malnutrition, agriculture and food production, the development of agricultural systems that produce nutritious food in a sustainable manner, the development of marketing and distribution systems and drivers of food insecurity such as climate, food safety, world markets, commodity prices, changes in land use, water resources, labour, and agricultural inputs. The Institute creates a platform for scholars and policy makers from around the world to guide and support the needs of governments, international agencies, foundations and the agri-food industry.

Previous Conferences

In September 2008, McGill University's Faculty of Agricultural and Environmental Sciences convened a high level, international global food security conference to examine the underlying causes of rapidly rising food prices. The success of this first conference at bringing together international experts and scholars, representatives of farmer organizations, policy makers from developed and developing countries, NGOs, private industry and the Canadian public for direct exchange about the long term solutions to declining world food stocks and rising food prices provided momentum for annual Global Food Security conferences and the establishment of the McGill Institute for Global Food Security.

The subsequent conferences were:
2009 ***'Impacts of the Global Financial Crisis on Food Security'***
2010 ***'Addressing the Water and Nutrition Challenges'***
2011 '***Risks and Threats to Global Food Security'***
2012 ***'Food Prices and Political Instability'***
2013 ***'Strategies against Food Insecurity and Hunger'***

Summaries, recommendations and speaker presentations from all conferences can be found at www.mcgill.ca/globalfoodsecurity.

The State of Food Security in 2014

FAO's most recent estimates indicate that 805 million people (11.3%) worldwide are undernourished in terms of caloric intake. This number is down more than 100 million over the

last decade, and 209 million lower than in 1990–92. Despite this progress there is still a great deal of room for improvement.

According to the State of Food Insecurity in the World 2014 "advances in reducing world hunger require political commitment expressed through appropriate policies, programmes, legal frameworks and sufficient resources". Such policies and programmes may be unique to countries or regions as they are developed and implemented in distinct social, political, economic and agro-ecological environments. Industry, non-governmental organizations, and academia also have a strong role to play in addressing the complex and diverse problems of global hunger, food insecurity and malnutrition. Partnerships and cooperation across a range of stakeholders or sectors are needed to advance research, technology and policy developments and continue to improve the state of food security in the world.

CONFERENCE OBJECTIVES

The 2014 conference "***Food Security Beyond 2015***" focused on strategies and solutions against food insecurity and hunger. Propelled by McGill's longstanding dedication and expertise in agriculture, the environment, nutrition and food security, the conference provided a unique forum to foster a global shift towards a convergence of understanding and commitment to reduce hunger and malnutrition. Eight recent or ongoing food security projects carried out by McGill researchers in different countries around the world were described as well as contributions from other researchers in Canada, Africa and Central America.

CONFERENCE PARTICIPATION

The 7th McGill Conference on Global Food Security provided an important forum for direct exchange between experts, scholars, students and policy makers from developed and developing countries, NGOs and the business community. The Conference drew about 200 participants from developed and developing countries, with representatives from international organizations, government, NGOs and many student participants, as well as academics and representatives of industry. Speaker biographies are available at: www.mcgill.ca/globalfoodsecurity/conference/2014/speakers/bios.

CONFERENCE PROGRAM

Each session consisted of a panel of experts delivering an invited presentation, followed by a lively and thought provoking question and answer period. The conference website (www.mcgill.ca/globalfoodsecurity/) contains full details of the conference program and presentations.

Public Lecture: Tuesday October 28, 2014
Agriculture means Business: An African Narrative
Stephen McGurk, Acting Vice-President, Program and Partnership Branch, International Development Research Centre (IDRC), Ottawa, Canada

Conference: Wednesday October 29, 2014
Opening Remarks: Hugo Melgar-Quiñonez, *Director, McGill Institute for Global Food Security, McGill University*

Feature address: Towards Food Security: Breaking the barriers of food production.
Chandra Madramootoo, *Dean, Faculty of Agriculture and Environmental Sciences, McGill University*

Food Security in Canada
Co-Chairs:
Murray Humphries, *CINE and Natural Resource Sciences, McGill University*
Colin Scott, *Anthropology, McGill University*

Panelists:
Naomi Dachner, Nutritional Sciences, University of Toronto
Treena Delormier, Public Health Sciences, University of Hawaii, Mano, Hawaii
Murray Humphries and Colin Scott, McGill University

Issues of Food Security in India, Kenya and Ghana
Co-Chairs:
Vijaya Raghavan, *McGill University*
François Lompo, *Directeur de recherche en agropédologie et Directeur de l'INERA, Burkina Faso*

Panelists:
***Grace Marquis**, Dietetics and Human Nutrition, McGill University*
***Gordon Hickey**, Natural Resource Sciences, McGill University*
***Valérie Orsat**, Bioresource Engineering, McGill University*

Keynote Address: Voices of the Hungry Project and the Post-2015 Agenda
Carlo Cafiero, Food and Agriculture Organization of the United Nations (FAO), Rome, Italy.

Contributions of Future Generations to Global Food Security
Co-Chairs:
Caroline Begg, *Plant Science*, *McGill University*
Timothy Johns, *Dietetics and Human Nutrition, McGill University*

Panelists:
Joanne Taylor, *IGS Program, University of British Columbia*
Husein Mohammed, *Human Nutrition, McGill University*
Rachel Krause, *Institute of Parasitology, McGill University*

Setting the Groundwork for Food Security in Latin America and the Caribbean

Co-Chairs:
Humberto Monardes, *Animal Science, McGill University*
Miguel Garcia-Winder, *Inter-American Institute for Cooperation on Agriculture (IICA), Washington, DC*

Panelists:
Ajjamada Kushalappa, *Plant Science, McGill University*
Leroy Phillip, *Animal Science, McGill University*
Jaime Carrera, *Agriculture, Natural Resources, and Environmental Institute, Universidad Rafael Landivar, Guatamala*

Wrap up Session

Facilitator: Hugo Melgar-Quiñonez, *Director, McGill Institute for Global Food Security*

SUMMARIES OF SESSIONS

Public Lecture – Stephen McGurk
Agriculture Means Business: An African Narrative

There are similarities between what is happening now in Africa and what happened in Asia 10-15 years ago.

Africa currently imports $30-50 billion in food annually. In general, there is slow growth in agricultural productivity in Sub-Saharan Africa due to limitations in water resource and input management, post-harvest production waste and lack of infrastructure.

The traditional paradigm, where agriculture is seen as a social sector, is in evidence in Nigeria where there is farming with few inputs, little output is sold, there is no quality control, traders exploit farmers, post-harvest losses are high, imperatives to increase production are lacking and value chains are stagnant.

In Ethiopia however, agriculture is treated like a business. The Ethiopia Commodity Exchange was set up in 2008 as a private company with a government partnership and the quantities of traded agricultural goods tripled in 3 years. Farmer Cooperatives, representing 2.4 million smallholder farmers, make up 12% of the Exchange membership. In Ethiopia, the government catalyzes agricultural investments, farmers are entrepreneurs, there are diverse processing technologies, inputs are used, yields have increased and food prices have declined. There is cause for optimism.

Although crop yields are generally lower in Sub-Saharan Africa than the rest of the world, starting in 2006, yields in South Africa, Ethiopia and Uganda showed impressive gains.

An important driver of change in African agriculture is the rural-urban supply chain which is central to food security. Urbanization in Africa is balanced between growth in large and medium cities and approximately 60% of all food purchased in Africa occurs in these urban centres. The links of rural markets to urban centres are due to small and medium sized entrepreneurs (SMEs), both farmers and retailers, who are supplying the rising and diverse demands of the increasingly wealthy urban population. International agribusinesses reach less than 2% of all African farmers. It is the SMEs which are showing dynamic growth and are a significant generator of employment in Africa. A lesson from Asia is that local SMEs were critical to Asia's agrifood revolution.

While international agribusinesses are still a relatively small presence, African value chain efficiency needs to be improved at all levels to compete successfully with imports in the domestic and regional agribusiness markets.

The Canadian International Food Security Research Fund supports projects which address food security in countries around the world. Since its inception it has involved 17,000 poor farmers in 20 countries and is now looking to scale up successful projects to reach a larger population and amplify the benefits.

Three projects were highlighted:

1. Safe, easy-to-use, non-perishable vaccines against livestock diseases are under development in a project involving the South African Agricultural Research Council, the Kenyan Agricultural Research Institute and the University of Saskatchewan. Livestock production is a critical industry in Africa, providing food and animal products for local use and export. However, livestock diseases currently cause an estimated 17% loss in production worldwide and a 33% loss in Western Kenya. The vaccines under development will replace existing vaccines which have low efficacy; cause side effects; are expensive to manufacture; and require refrigeration.

2. Improving human nutrition through plant breeding and soil management is ongoing in Ethiopia under a partnership between the University of Hawassa and the University of Saskatchewan. Soil moisture in southern Ethiopia is sufficient for only one crop per year, soil fertility is poor and yields are low. The researchers identified local and abundant nitrogen-fixing bacteria (Rhizobia) that can coat the seeds of improved pulse varieties, increase crop yields up to 60% and leave valuable nutrients in the soil for the next seasons' crop. Improvements to soil management and rain water retention allowed the growth of a second crop and since this crop fixed nitrogen soil nutrient levels improved.

3. Sustainable production, marketing and processing of underutilized indigenous vegetables in Nigeria in partnership with the Universities of Manitoba and Cape Breton will provide nutritious additions to diets. Simple but innovative farmer-friendly agronomic technologies that have benefited more than 1400 farmers (~50% women) and increased

production and consumption of nutrient-dense vegetables have been developed. The market for these vegetables is growing and cooperatives are needed to empower women to negotiate with truck drivers, processing facilities etc.

Summary Points

- Food insecurity is fragmented and uneven across Africa and there needs to be distinct strategies for the different segments. Development of farmer cooperatives to achieve scale, clusters of small and medium food supply chain firms with training and market-linking assistance to maximize efficiency and innovation, and coordination over agriculture, energy, commerce and infrastructure ministries, are all needed to bring about integrated solutions to food insecurity bottlenecks.

- Investments in infrastructure (feeder roads, power and phone grids for example), research and development, input chains, institutions, extension services are necessary. .
- The research and development focus of food security cannot just be on productivity but also on improvements to processing, storage and food distribution as well as coordination between partners and ways to successfully scale up research innovations. The most effective government interventions occur with activities that support various parts of the value chains in integrated ways.

- A variety of policy and program measures are needed at various levels of the supply chains to stimulate the efficiency and competitiveness of expanding food markets.

- Different policies are needed for the widely different food security zones and the wide degree of heterogeneity across farmers and farm areas. “One size does not fit all” and government strategies need to be tailored to the different situations. In particular, marginal farmers (compared with small and medium farmers) are at a disadvantage in these food security transformations. Hinterland zones can be at an initial disadvantage, but can learn from the experiences of dynamic zones where value chains are rapidly transforming.

- The growth, market modernization, agribusiness and food industry themes and debates should not be held at arm’s length from policy discussions on poverty reduction and food security. Value chain transformation is important to farmers’ incomes, rural employment, and access to and affordability of staples for urban consumers.

- Land tenure problems means that land is not profitably used; farmers do not want to invest in land because their future is uncertain. Weak economic growth in Southern Africa is a result of this.

- Successful donor collaboration includes demand driven research, quick success on the ground and mobilizes young people.

Feature Address – Chandra Madramootoo

Towards Food Security: Breaking the barriers of food production

The drivers of global insecurity include rising populations creating increased demand for food, an urban class with changing diets, water scarcity, a limited land base for agricultural expansion, and climate extremes.

Rainfed areas are four times larger than irrigated lands but large losses occur particularly in Northern Africa, India and Asia due to extreme droughts and heat. Improving agricultural production in these areas requires irrigation. Globally 20% of irrigated lands produce 40% of the world's food and in Sub-Saharan Africa 5% of the agricultural land is irrigated and produces 20% of the food. Africa has a great deal of water but is unable to tap it due to policy limitations. Transboundary treaties are needed in order to share water resources between countries although this would involve expensive investments in infrastructure.

The rate of increase in average global yields of the world's major crops has declined over the last 25 years. This decline is most apparent in wheat where yields were rising 2.7% annually from 1961-1989 compared to 0.5% between 1990 and 2007 (see Figure 1).

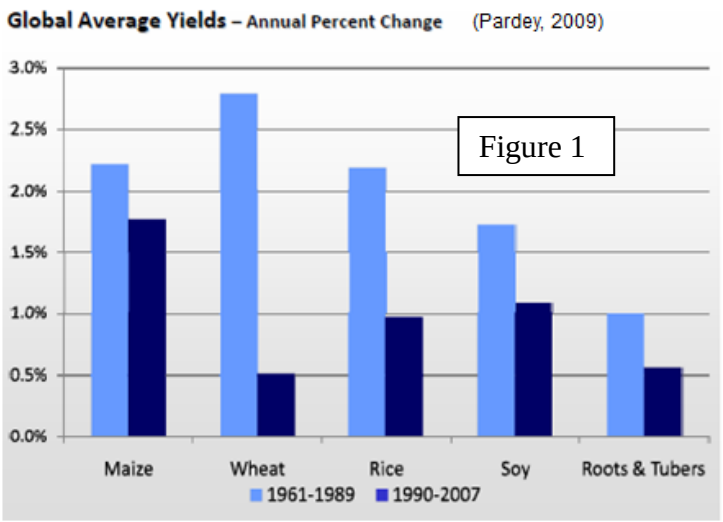


Figure 1

At the same time consumption of all major crops has increased with the exception of pulses. This indicates a shift in preferences of consumers and is also a result of the labour intensive requirements for growing pulses reducing their availability.

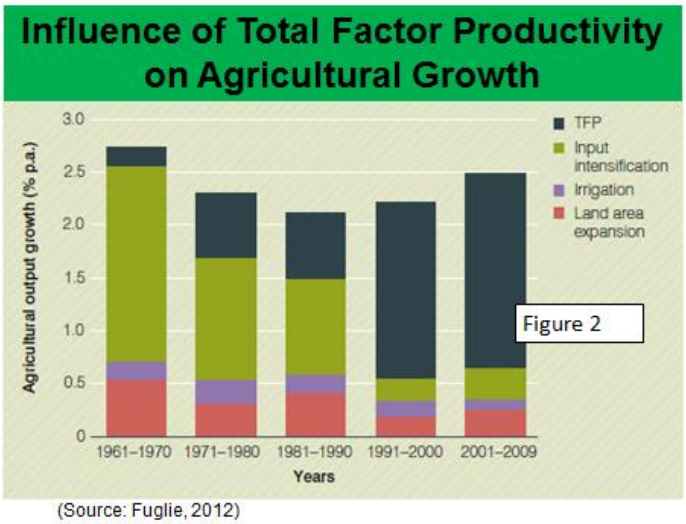
An examination of the wheat yield gap in the Middle East and Africa shows that under rainfed conditions a yield of 1.8t/ha is obtained while under irrigation and progressive farming yields reach 6.5 t/ha.

In order to close crop yield gaps higher quality germplasm is needed to increase production. Genomics assisted breeding can select traits that will address biotic (diseases) and abiotic (temperature, drought) stresses. Better soil management – such as conservation agriculture- will lead to higher levels of soil nutrients, fewer weeds and increased water storage. Water saving technologies will allow more food to be produced from less water.

Getting modern and productive seed varieties to the farmer remains a problem in Africa. There are often conflicts between government institutions and private companies that restrict the multiplication of certified seed. This is a bottleneck that needs to be addressed.

The number of new cultivars released has slowed in the last decades for many crop varieties. Maize is an exception to this trend where the majority of the new releases came from the private sector. Some noticeable improvement in cultivar releases have also occurred for beans, cassava, groundnuts, sweet potato and wheat.

Total Factor Productivity (TFP) is critical to global food security and are under developed in South Asia and Sub-Saharan Africa. These off-farm factors include:



(Source: Fuglie, 2012)

- Availability of research and extension services
- Availability of credit
- Institutional support
- Government policies
- Markets and prices
- Physical infrastructure servicing the agricultural sector
- Roads, railways, ports
- Transportation services
- Labour availability and quality
- Educational services and skills training
-

Keynote address- Carlo Cafiero
Voices of the Hungry Project and the Post-2015 Agenda

Food security monitoring is one of the primary functions of the FAO and it has been collecting data for over 50 years. Over the last 20 years, our understanding of food insecurity has deepened but the actual measurement has lagged behind. At the global level, there are no direct estimates of the number of food insecure people. The most widely cited indirect measurement "Prevalence of undernourishment" gives no sense of the severity of hunger. Consumer surveys were carried out for many years but measuring food consumption is difficult and expensive and requires an understanding of habitual food consumption and individual requirements. Using food availability at the household level over a short period of time as a proxy of food consumption is problematic since the role of household food storage, number of partakers and seasonality, all cause important variations. Dietary diversity scores, food consumption scores, food expenditures are all very useful but none are detailed or direct enough to consistently measure food insecurity.

A measurement system is made of a measurement tool, a measurement protocol, and a standard of reference. Using the tool according to the protocol, values are assigned to a variable on a scale that correspond to the attribute of interest A measurement system is valid for a certain attribute if a change in the attribute in a given magnitude and direction, causes a change in the measure in the same direction and of the same relative magnitude

FAO's 'Voices of the Hungry' (VoH) project is developing a new global standard for estimating the prevalence of food insecurity through the use of a tool called the Food Insecurity Experience Scale (FIES). The FIES is an experience-based metric of food insecurity severity that relies on people's direct responses to questions regarding their access to adequate food:

A long established psychometric model (Rasch measurement model) is used to estimate the severity of each respondent's condition, based on the reported experiences. The individual measure of severity depends on the entire pattern of responses. The answers given to all questions contribute to the precision of the measurement. The entire pattern of response, which is designed to pick out inconsistent answers, can be reported as a single piece of information which is very important for statistical analyses.

The FIES produces timely and meaningful information on the degree of food insecurity (moderate or severe) at the household or individual level in terms of struggle in access to food. It is a sound statistical methodology which allows reliable and precise assessment. Using this tool the most severely food insecure households and people are consistently identified across different countries and cultures. It is easily applied, rapid and at low cost, and can be included in virtually any survey. The food security status can thus be properly linked to other socio-demographic characteristics (such as gender) and health conditions of individuals.

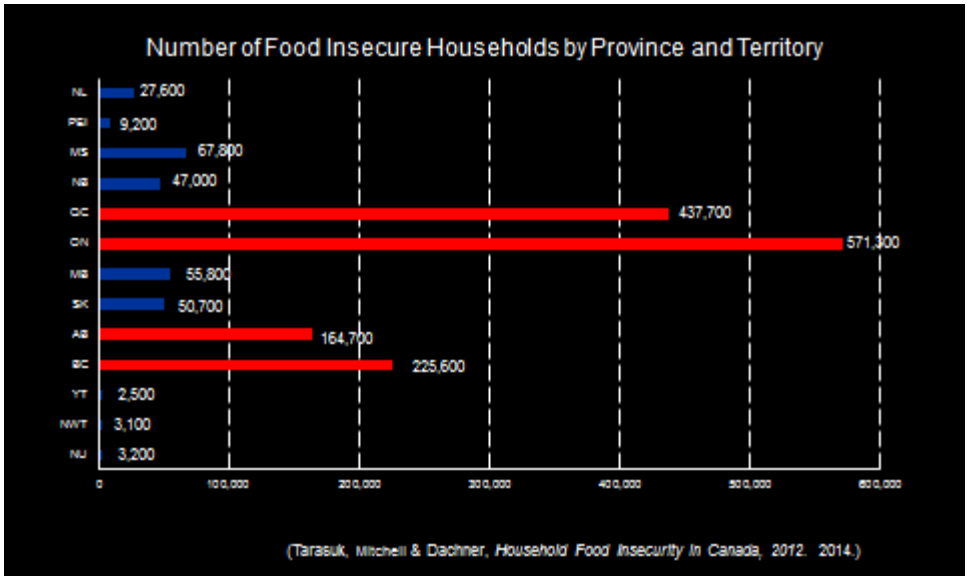
Data from 30 countries have been received and processed, confirming the validity of the survey vehicle and the robustness of the measurement approach in countries with very different conditions. The first comprehensive (150+ countries) assessment will be published in spring 2015.

Food Security in Canada

Food insecurity in Canada ranges from marginal (worry about food shortages) to severe (not eating enough) and increased between 2007 and 2012 to affect 13% of households or 4 million people. This number does not include aboriginals living on reserves or the homeless so is an underestimate.

There is a large variation in food security across the country with higher levels in the eastern provinces than in the west (Figure 3). Lowest levels of food insecurity were measured in Alberta (11.5%) and highest levels in Nunavut (45%). Even higher levels are measured in some northern communities where a very serious crisis of food insecurity exists. The likelihood of being food insecure if one is aboriginal is 27%. Specific reasons for such high levels in aboriginal communities in the north are colonialism which denied people access to their cultural practices which were critical to the supply of traditional foods, a lack of food sovereignty and residential schools which caused a loss of local knowledge about foods and nutrition.

The majority of food insecure people (84%) live in Canada's four largest provinces (Alberta, British Columbia, Ontario, Quebec; Figure 3). Solving food insecurity problems in Nunavut would therefore have little effect on Canada's overall level of food insecurity.



Rising food insecurity has negative impacts on health and is linked to an increase in health care costs. A study from Ontario (people 12 years old and up) showed that per capita, food secure people cost the health care system $1600/y and severely food insecure people cost $3930/y per capita.

The best predictor of food insecurity in Canada is household income although even at the lowest income level, only 46% are food insecure. Asset levels, shelter costs, access to credit, health care and other expenses also affect food insecurity regardless of income.

Of the food insecure in Canada, 62% are reliant on employment income. This suggests that low wages; short term or part time employment; or inadequate income transfers to offset low earnings are a major part of the food insecurity problem. In contrast senior citizens are only 7% of Canada's food insecure because they have guaranteed annual income indexed to inflation, drug coverage, transit subsidies etc. Of the people who receive social assistance, 70% are food insecure with levels highest in Alberta (79%) and lowest in Newfoundland and Labrador (46%). The levels in the latter province dropped from 60% in 2007 and are a result of an ambitious provincial multi-sectoral, poverty reduction strategy.

Charitable food assistance is the major response to food insecurity in Canada although community kitchens and gardens, farmer's markets, 'good food' boxes and nutrition education are also available in some places. Less than 25% of food insecure people make use of food banks and there is an even lower participation rate in the other programs. These efforts are not designed to address food insecurity – they are a band aid approaches at best.

Canada does not currently have food policies at local levels or a national food strategy. A national strategy should include a nutrition component, tackle obesity as well as food insecurity and all stakeholders at municipal and provincial levels as well as experts should be consulted. In northern regions the strategy needs to include poverty reduction and economic development, improved access to and availability of food and involve the health and education sectors. It needs to build community strengths and assets and value indigenous perspectives and knowledge. It was noted that many food secure households in the north have a male hunter and a female wage earner.

Food security in northern regions of Canada depends heavily on traditional foods, (plants and animals) that are harvested locally. More than 540 species are used as traditional foods. In one particular community, Old Crow, for example, people eat caribou 204 days/year. Many different species are harvested at different times of year and the availability of traditional food varies from season to season and year to year. The traditional food system provides many nutritional benefits and is deeply connected with community ethics and identity. The security of traditional foods is related to access to land, conservation of biodiversity and local knowledge at a time of rapid environmental change. Wildlife management and habitat preservation are therefore critical to ensuring traditional food security in the north.

In one example, the Brant goose, a very important food source in Chisasibi, Quebec, was traditionally harvested at migratory stops in James Bay. The goose depended heavily on widespread areas of eel grass that grew in the waters along the coast. In the mid-1990s the eel grass ecosystem disappeared and with it, the Brant goose. The eel grass destruction was possibly caused by increased hydro development in the area which had changed water discharge patterns, temperature and turbidity. The usual models of development need to be reconsidered when health and identity depend on fishing, hunting and trapping. The Cree consider that food from the land is strong while food from the store is not real food and a community based strategy for land and marine protection is fundamental to their food security.

Issues of Food Security in Kenya, India and Ghana

Despites millions of dollars in funding over the last decades, food security in Kenya has not improved. This is not due to a lack of knowledge but more about a lack of integration of the different sectors involved. The project described here: *Upscaling resilience enhancing agricultural innovations for food and nutrition sectors in semi-arid Kenya* applied a complex systems approach and brought together a wide range of stakeholders involved in the food

system to understand constraints to household food security in the region. Agriculture in semi-arid Kenya is rainfed, soil is poor and there are frequent droughts. There has been a reliance on food aid for three months each year. Research questions included how to accelerate adoption of technological innovations to improve agricultural productivity; how to build resilience in the farming systems through diversification of high value traditional crops; how to improve utilization of locally available nutritious foods and how to enhance market development to create demand for technologies and improve incomes?

An inventory of 50 years of agricultural research in Kenya found 70 on-farm technologies that could improve farm production. With the help of local farmers (316 men and 684 women) 8 technologies to do with weeding, water management, and seed and chicken production were selected for testing. Primary and secondary farmer's groups were created to learn the new technologies. 'Knowledge champions' were selected to become local experts and teach nutrition and cooking; seed production; and marketing. Farmers compared old and new practices themselves and discussed within their farmer group: 'learning by doing' was a very powerful tool. Over the course of the project, land area allocated to high value legume crops increased significantly along with increased usage of manure/fertilizer combinations and water harvesting practices and improved produce prices. However, 'learning by doing' is resource intensive and upscaling to reach one million people will have to utilize information communication technologies (ICTs). In addition, farmers need access to the inputs they have learned about and market structures must be built up. The study resulted in an increased trust between farmers, between farmers and researchers and between farmers and government which will lay the groundwork for successful upscaling. There is a need for enhanced partnerships across institutions and better contextualized enabling policies for long term success.

Enhancing food security of rural families through production, process and value addition of regional staple food grains in India focused on millet. Although a very nutritious food and consumed traditionally, use of millet in diets declined due to the public food distribution system in India which focused on rice. Project objectives included: reduction of drudgery of women through simple and affordable crop management and post-harvest operations; farmer participatory interventions with agronomic practices for increasing the productivity and production of local food grains; women-centric farm-to-market value chain with value added products developed from local crops for enhancing household income and empowerment of women; improving the nutritional status of the rural households through nutrition education to women and children. Millet production, a woman's job, is very labour intensive and simple tools were developed to lessen the effort involved in weeding and harvesting and diminish post-harvest losses. All equipment was designed to be built locally. Gender issues arose as the new post-harvest equipment attracted the interest of the men. Training programs were developed, with women as the trainers, to teach women to operate the equipment and empower them to run the post-harvest processing.

Farmers participated in selecting the best millet cultivars for their region; intercropping finger millet with tapioca (for diversity and yield improvements) and vermicomposting were

introduced. Millet-based products were developed and women were trained as entrepreneurs and encouraged to develop 'house brands'. Nutrition education was carried out to promote millet's benefits particularly targeting children who would take the ideas home to their families. The project noted that increased demand for millet due to its high nutritional value resulted in rising prices and made millet too expensive for poor families. Policy change to promote millet has to go hand-in-hand with production improvements.

Food Insecurity among households with young children in rural Ghana is in its second year of a five year study. In the study area, overall food insecurity is 58%, 12% of household are severely food insecure and food insecurity is dispersed throughout the region. Many sectors influence the well-being of vulnerable households. For example, farming is not only risky but it is labour intensive which in turn influences health and child care. This project incorporates psychology, nutrition, and finance and involves training local staff on a wide variety of subjects. It is targeted to children or to teens, particularly to keep girls in school. Baseline work determined that food insecure households reported fewer assets and food insecurity was more common among households with unmarried caregivers and those with low/no education. Next steps involve improving and diversifying incomes to improve lives and the ability of households to withstand fluctuations in economic demands; improving conditions for women to help the household situation; more formal education and delaying the age of first pregnancy; improving rural health services. Expanded agriculture and financial services for rural women, establishing the connectivity of households, the diet diversity of babies less than six months old, developing gardens with Vitamin A rich foods and raising chickens for egg consumption and sale are also part of the project.

An earlier study in Ghana (described at the 2010 GFS Conference and available at http://www.mcgill.ca/globalfoodsecurity/conference/2010/presentations) reported on the importance of existing banking structures to the long term success of a microcredit project. Rural banks were trained to take over microcredit loans to 200 women who for 16 months had proved they could make interest repayments. After two years the number of loans to women had increased to 2000 and the amount of money had increased 100 fold. However, during the study, the microloans were given out only if the women also took courses on nutrition. These courses have apparently been discontinued by the rural banks.

Contributions of Future Generations to Global Food Security

Three graduate students reported on their research in British Columbia, Ethiopia and Panama. *Is Food Security Threatened in the Creston Valley of British Columbia?* Joanne Taylor talked about food security and governance along the Kootenay River in the Creston Valley. Water for irrigation is currently plentiful but the revitalization of indigenous sturgeon up-river of the valley determines the current operation of Kootenay River's Libby Dam in the U.S. Unpredictable recent rain patterns due to extreme climate change create a flooding hazard threatening crops grown in the valley. Due to the modern operating regime of Libby Dam, original diking infrastructures that protect the valley bottom are now degrading and are not

up to provincial standards. The area is a major exporter of alfalfa and timothy hay, has a successful dairy industry, emerging niche markets such as canola, ostrich farms, hot pepper production, organic farms, and a small but growing wine industry. Renewal of the Columbia River Trans-boundary Treaty is currently under discussion but agriculture is largely ignored. It is imperative that policy makers support and facilitate agriculturalists to produce their crops in a safe and secure environment where impediments to water, land, and infrastructure are addressed for the long term success of this area.

Food security is associated with infant development and child mortality in the Amhara Region of Ethiopia. Husein Mohammed reported that most of the households in the study area have agricultural land, rear livestock but have low assets, poor water quality and sanitation, and the majority of mothers have no formal education. The mothers were mostly farmers and have low dietary diversity. The prevalence of underweight children was 20%, wasting was 5%, and stunting was 32%. In addition, 38% of children reported sick in the two weeks prior to the survey and 28% of households experienced mortality of children under 5 years. Food insecurity in the study area was however, lower than expected: 11% compared to 40% two years previously. This may be due to the research being conducted at a bumper harvest time. Food insecurity was still an important risk factor for nutritional status during pregnancy, adverse pregnancy outcomes, poor child growth and under 5 mortality. Further studies need to be conducted in the study area, in different seasons, and using different tools to understand the importance of food security in these vulnerable groups.

Case study of an agriculture intervention for subsistence farming families in Panama. Rachel Krause described her study with VERASAN in Panama which examined how intensified household agriculture (increased use of agricultural methods such as irrigation, collecting and applying manure) by subsistence farmers might affect child exposure to environmentally transmitted parasites: *Ascaris lumbricoides*, hookworm and *Giardia duodenalis*. It was found that if the family caregiver worked in the farm plot, child diet diversity decreased. Incidence of *Ascaris* and hookworm in children increased when the caregiver went to the plot and the child accompanied the caregiver. Increased *Ascaris* was also related to a higher number of agricultural methods used. Nutritional gains in child growth were diminished by infection. Attention to child intestinal infections will increase the effectiveness of the agricultural methods to improve food security. A multi-sectoral approach is needed that includes education of farmers in health care and sanitation as well as agricultural extension.

Setting the Groundwork for Food Security in Latin America and the Caribbean

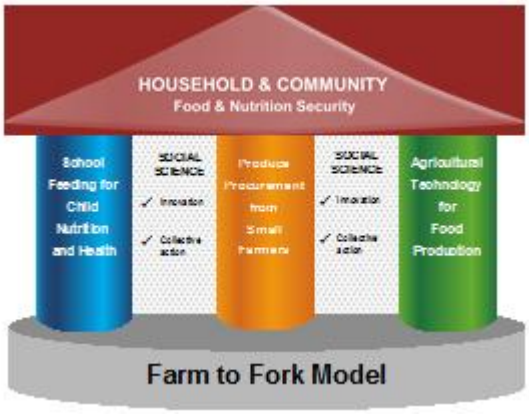
Latin America and the Caribbean are important to the world as they have 40% of the fresh water resources, 30% of the arable land, are the most ecologically diverse and thus have a large reserve of unexploited genetic material and have good human capital. Some of the countries with the greatest progress towards the Millennium Development Goals are in this region. In the past 20 years many of the countries have become stable democracies and

productivity has risen. Future challenges in the region include the large gap between rich and poor, the number of food importing countries, drug trafficking and the need for new ways to look at food systems to sustain the intensification of agriculture.

Indigenous communities in the Andean region of Columbia have very high rates of food insecurity. The study described had three major themes: Nutrition and health; Family roles and gender and Potato crop improvement. Under the nutrition and health theme, characterization of community food insecurity and health in 5 municipalities was carried out, a booklet with recipes produced and school children and communities were educated to improve nutritional quality. Under the second theme, family roles in agriculture, family roles in child nutrition and women empowerment as a member of the family were examined. Women were most responsible for family care while men carried out crop production, marketing and shopping. New trends suggest women consider they have more opportunities than their mothers and are performing new roles to generate income. Under the third theme, ten new potato genotypes were evaluated using participatory research for: yields; nutrient contents; processing qualities and resistance to late blight. Three new cultivars were selected but late blight is a serious problem. Using genetically resistant wild potatoes, cisgenic potato plants were created that reduced the number of fungicide applications required during the growing season from 15 down to about 3.

People are not traditionally malnourished in the Caribbean Community (CARICOM) but food and nutrition insecurity has taken the form of obesity, especially among women. There is low intake of fruits and vegetables and low levels of physical activity. In addition there are low levels of technology adoption and innovation to diversify food production and limited domestic capacity for food production and market penetration. There has been a steady increase in import of crops and livestock products by CARICOM since the mid-1990s.

The project "*Linking school feeding programmes and small holder farmers to improve nutrition outcomes of children, and enhance agricultural diversity in the Caribbean: A "farm to fork" model for food and nutrition security*" recognized that obesity was a multi-sectoral problem and involved ministries of agriculture, education and health. The objectives were to: improve nutrition and health outcomes of children through increased intake of vegetables, fruits, and micronutrients and equip small-holder farmers with technologies to enhance agricultural productivity and diversity and capture emerging markets such as school lunches. The project was successful in raising the amount and diversity of fruits and vegetables delivered to school lunch programs but over the course of the study, the number of overweight or obese children increased by about 6%. Use of drip irrigation raised vegetable crop production significantly although use and adoption of new technology was low. Understanding the way knowledge flows in the communities – the social



learning network – would likely improve technology uptake.

Important investments in food security and nutrition have been made in Guatemala during the last two decades but child malnutrition remains very high. The lack of success of government policies at addressing food insecurity is due at least in part to the wide diversity in the country: 23 Mayan languages and 14 ecological zones. This project: *Synergies between research and policy advocacy to improve food security and nutrition* focused on smallholder farmers living in four territories. A household survey was used to characterize farmers based on: housing conditions; agricultural production; income; natural resources use; participation in capacity building programs; anthropometric data. Results illustrated diversity among and even within territories. A participatory approach was used and stakeholders at the local level were interviewed to capture their perception of the problems and identify why policies targeting food insecurity were not working. A model was created to show variables and relationships. For example, in Territory #1 farmers had little access to land or technical assistance therefore agriculture policies were important to improve food security. Territory #2 had better access to land so perhaps health or education policies would be more useful here.

KEY MESSAGES

- A new tool called the Food Insecurity Experience Scale (FIES) is being developed by FAO's 'Voices of the Hungry' (VoH) project. The FIES is easily applied and has sound statistical methodology which allows the most severely food insecure households and people to be consistently identified across different countries and cultures.

- The rate of increase in average global yields of the world's major crops has declined over the last 25 years. This decline is most apparent in wheat where yields were rising 2.7% annually from 1961-1989 compared to 0.5% between 1990 and 2007. The number of new cultivars released has slowed in the last decades with the exception of maize where the majority of the new releases came from the private sector.

- Although crop yields are generally lower in Sub-Saharan Africa than the rest of the world, starting in 2006, yields in South Africa, Ethiopia and Uganda showed impressive gains.

- Approximately 60% of all food purchased in Africa occurs in urban centres and this food is supplied by small and medium sized entrepreneurs (SMEs), both farmers and retailers. These SMEs which are showing dynamic growth are a significant generator of employment and are central to food security in many parts of Africa. While international agribusinesses are still a relatively small presence, African value chain efficiency needs to be improved at all levels to compete successfully with imports.

- Getting modern and productive seed varieties to the farmer remains a problem in Africa. There are often conflicts between government institutions and private companies that restrict the multiplication of certified seed.

- 'Learning by doing' is a very powerful tool but is resource intensive. Upscaling to bring technology and innovations to large numbers of farmers will require the use of information communication technologies (ICTs).

- The introduction of simple tools and equipment to women farmers must be accompanied by training programs to empower the women to use and benefit from new technologies.

- Post-harvest losses continue to contribute to food insecurity and new methods can fairly easily reduce waste.

- Understanding the diversity of a region and distinct underlying causes of food insecurity helps to identify specific government policies that will improve food security.

- In some parts of the world such as the Caribbean Community, food and nutrition insecurity have taken the form of obesity and reflect low levels of fruits and vegetables in diets as well as low activity levels.

- Many examples were given where the lack of a multi-sectoral approach was negatively affecting solutions to solving food insecurity.

- Food insecurity is not just about developing countries; it can occur in Canada or in any developed country. The best predictor of food insecurity in Canada is household income although even at the lowest income level, only 46% are food insecure. Asset levels, shelter costs, access to credit, health care and other expenses also affect food insecurity regardless of income.

- In non-agricultural societies such as those in Canada's northern regions, security of traditional foods is related to access to land, conservation of biodiversity and local knowledge and is an intrinsic part of community identity. Wildlife management and habitat preservation are critical to ensuring traditional food security**.**

RECOMMENDATIONS

- Understanding who is food insecure, where they live and if they are moderately or severely food insecure is fundamental to solving the problem of global food security. FAO's 'Voices of the Hungry' (VoH) project is developing a new global standard for estimating the prevalence of food insecurity through the use of a tool called the Food Insecurity Experience Scale (FIES). Its worldwide use may make food insecurity data more accurate and effective.

- Different policies are needed for the widely different food security zones and the wide degree of heterogeneity across farmers and farm areas. "One size does not fit all" and government strategies need to be tailored to the different situations.

- Agricultural growth, market modernization, agribusiness and food industry themes and debates should not be held at arm's length from policy discussions on poverty reduction and food security. There is a need for enhanced partnerships across institutions and better contextualized enabling policies for long term success.

- Government ministries or institutions of agriculture, water resources, fish and wildlife, environment, health, sanitation, education, energy, commerce and infrastructure may need to be informed about food insecurity issues and their support coordinated if policies and investments aimed at reducing food insecurity are to be successful and sustainable over the long term.

- The research and development focus of food security cannot just be on productivity but also on improvements to processing, storage and food distribution. Value chain transformation is important to farmers' incomes, rural employment, and access to and affordability of staples for urban consumers. Farmers need access to the inputs they have learned about and market structures must be built up.

- Train students to be excellent in their own areas of expertise but also teach them how to communicate and engage to people working in complementary sectors.

***Scaling up successful research innovations to reduce the number of food insecure people in the world is a new challenge. Ideas included**:*

- Invest in infrastructure (feeder roads, power and phone grids, for example), input chains, institutions and extension services.
- Develop farmer cooperatives (for transporting, marketing, processing for example) to achieve economies of scale.
- Create clusters of small and medium food supply chain firms with training and market-linking assistance to maximize efficiency and innovation.
- Understand how knowledge flows in a community in order to increase uptake of innovations.
- Use information communication technologies to spread the word.
- Build a solid foundation of trust between farmers, between farmers and researchers and between farmers and government to lay the groundwork for successful upscaling.
- Find an easily implemented business model that can apply to a more general set of problems rather than the localized or case by case model currently in use.
- Find the right partners. In addition to researchers and farmers include non-traditional actors: SMEs from the private sector such as the local welders, transportation companies or banks.
- Understand the local context and include the possibility of luck and chance – be prepared to seize opportunities. Be nimble. Have partners whose role is to scan the socioeconomic environment and see what is happening in the rest of the world: consumer trends, regulatory changes, new technologies for example.
- Train leadership for the long term. Commitment over the long term is necessary to carry out the implementation and upscaling. Think beyond the research project to what comes next.

APPENDIX 1: Conference Photos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