European Commission

Brussels 15th - 17th November 2017

International Conference

Quantitative Methods
for Integrated Food and
Nutrition Security
Measurement

Brussels, 15th – 17th November 2017

International Conference

Quantitative Methods for Integrated Food and Nutrition Security Measurement

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

IFPRI

European Commission

SUMMARY

THE **CONFERENCE** BEHIND THE **SCENES**

The Joint Research Centre (JRC) of the European Commission and the International Food Policy Research Institute (IFPRI) jointly organized an International Conference on Quantitative Methods for Integrated Food and Nutrition Security Measurements. The conference provided a platform for researchers, academics, professionals and decision makers to define the state of the art for quantitative measurement of food and nutrition security (F&NS) by identifying the main practical challenges, sharing innovative methods or modeling techniques, and exploring best practices to scale up multi- and cross-sectoral F&NS collaboration and coordination at country, regional and global level. Moreover, in hosting an interdisciplinary forum, the conference offered the opportunity for participants to forge innovative partnerships for the development and promotion of improved methodologies to support evidence-based F&NS policies and decision makers.

Background and Rationale

Food and nutrition security is a key foundation for a decent life. However, it comes under stress in many parts of the world due to factors such as erratic rainfall patterns, other forms of climate variability, land degradation, violence and conflict, natural disasters, price volatility and rapid urbanization. The 1996 World Food Summit, "Food security exists when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life." This definition is still widely used and quoted today by professionals, academics and researchers. It encompasses the four pillars of food security: availability, accessibility, utilization and stability. After the World Food Summit, however, the term "nutrition security" became more prominent, in an attempt to highlight the way food is actually used by the body and how it affects health. As a broad definition, the term "food and nutrition security" (F&NS) has been used to combine the two concepts. Therefore, food security action should ensure that food systems provide all households with stable access to sufficient, adequate and safe food, while nutrition-oriented action should ensure that households and individuals have the knowledge and supportive health and environmental conditions necessary to obtain at least optimal nutritional benefits from the food they consume (FSIN TWG, 2014).

In line with the definition above, academics, researchers and other professionals (e.g. development practitioners) are developing theoretical and empirical methodologies to address vulnerability to food and nutrition security at individual, household, national and regional levels. Recently, resilience to food insecurity has further been raised as a key concept, from both the point of view of donors and decision-makers. However, none of the proposed definitions and methodologies for measuring vulnerability or resilience to food and nutrition insecurity has yet evolved into an approach that is unanimously accepted. From a purely academic perspective, methodologies related to measuring F&NS tend to be unidimensional, as it becomes more complex to address the four pillars of food security as defined by the FAO (1996) in a single modelling exercise. As such, even though a plethora of academic and research papers exist on vulnerability to food and nutrition insecurity, most of these papers typically

provide a partial view of the problem. More specifically, such exercises tend to consider food security analysis through the use of proxy variables, such as comparing caloric intake per day with a threshold, measures related to anthropometric measurements (stunting, wasting), food prices, crop production, or anomalies of biomass (NDVI anomalies). Fewer papers attempt to address food and nutrition insecurity by quantitatively combining the variables related to different pillars. Therefore, in some cases, conclusions and findings from research into F&NS may lead to misinterpretations, as focusing on one pillar may obscure its role and even interaction with the others.

The 2018 joint report (FAO-IFAD-WFP, 2018) on the State of Food Insecurity in the World reported that, for developing regions taken as a whole, the share of undernourished people in the total population decreased from 23.3% in 1990–92 to 10.6% in 2015. However has suffered an increase since then to 10.8 and 10.9% in 2016 and 2017. Although there has been substantial progress, almost 821 million people are still undernourished globally (FAO, 2018). Consequently, it is worth noting that many countries have failed to reach international hunger targets, and the report cited above highlights that natural and human-induced disasters or political instability have resulted in protracted crises with increased vulnerability and food insecurity of large parts of the population.

Today, the Integrated food security Phase Classification (IPC) and the Cadre Harmonise (CH, Harmonized Framework used in West Africa and the Sahel region) have become a widely accepted international reference for the Food and Nutrition Security community. They are in use in around 40 countries worldwide and the basis for global reporting including the Global Report on Food Crises, a joint analysis of the situation in food insecure countries published on a yearly basis. The two sister systems help inform decision makers to make timely responses to F&NS challenges, they are evidence-based and centered on a multi-stakeholder technical consensus approach.

The final findings depend of course on the quality of data, as the principle behind those approaches is to use the data available on the ground. They also depend on the quality of indicators and methods feeding into the analysis. Although those methods are useful, some components like the assessment of livelihood changes and the estimation of population in different phases of food and nutrition insecurity have still weaknesses to be addressed. With new international commitments related to the Sustainable Development Goals (SDGs), new ideas related to data collection and new methodological tools, especially quantitative with a possible modeling component, are more than needed. The benefit from these approaches is that they can help to strengthen the components highlighted above from the qualitative tools using existing information.

Jointly organized by the Joint Research Centre (JRC) of the European Commission and the International Food Policy Research Institute (IFPRI), this international conference is an opportunity to discuss and explore innovative quantitative methods used in Food and Nutrition Security (F&NS) measurement. This international conference is organized under the framework of the Global Network against Food Crises, initiated jointly by EU, FAO and WFP and launched in May 2016 at the World Humanitarian Summit in Istanbul, Turkey. It represents an excellent opportunity to generate discussion about best practices related to the promotion and expansion of multi and cross-sectoral collaboration at household, country, regional and global level related to F&NS. The conference will highlight both new developments in F&NS measurement and lessons to be learned in the field of quantitative food and nutrition security measurement.

THE **OBJECTIVES**

- To highlight new quantitative methodologies and approaches that contribute to F&NS measurements, especially assessing livelihood changes, estimation of the food and nutrition insecure population and food & nutrition insecurity in urban context.

- To share experiences in F&NS measurement using both spatial analysis and modern econometrics.

- To explore innovative approaches and technologies in order to improve F&NS measurement.

THE **TOPICS**

1. New thinking on policy support to improve F&NS measurements.

2. Quantitative methodologies to measure F&NS: new developments in study design, indicators and tools.

3. Quantitative methodologies to measure F&NS: new developments to respond to weaknesses in qualitative tools.

4. Innovative methodologies to assess the linkages between F&NS and key stressors.

5. Use of new technologies in data collection and analysis for F&NS measurements.

Arif Husain

Chief Economist, Director of the Food Security Analysis United Nations World Food Programme.

Dr. Arif Husain is Chief Economist and Director of the Food Security Analysis and Trends Service at United Nations World Food Programme (WFP) in Rome, Italy. Arif joined WFP in 2003 and since then he has served in many senior positions both in the field and at Headquarters. He has also worked for the World Bank and taught at the Hubert H Humphrey Institute of Public Affairs. Arif's work focuses on analyzing food security and welfare conditions in developing countries to inform humanitarian response. His research interests include application of information technologies to improve humanitarian response; understanding linkages between poverty, hunger, conflict and migration; and analyzing how global economic shocks impact food security, social protection and emergency and development assistance. Arif has a Ph.D. in agricultural and applied economics with a minor in forestry from the University of Minnesota.

Suneetha Kadiyala

Associate Professor in Nutrition Sensitive Development, London School of Hygiene and Tropical Medicine/LSHTM.

Dr. Suneetha Kadiyala is an Associate Professor in Nutrition Sensitive Development at the London School of Hygiene and Tropical Medicine, London. She is a core faculty member of the Leverhulme Centre for Integrative Research on Agriculture and Health (LCIRAH). Prior to joining LSHTM in 2013, she was a Research Fellow at the International Food Policy Research Institute (IFPRI) in Washington DC and New Delhi. She has a PhD from the Fried man School of Nutrition Science and Policy,Tufts University. Suneetha is a nutritionist with research interests focusing on the intersection between agriculture/food systems and food security, gender, health (HIV) and nutrition. Her expertise spans program design, operations research and theory-based complex programme impact evaluations; and innovative methods and metrics in agriculture-nutrition research. Suneetha is the Principal Investigator of IMMANA (Innovative Methods and Metrics for Agriculture and Nutrition Actions), DFID's partnership to stimulate the development and application of scientifically sound methods and metrics in agriculture, health and nutrition research. She is the Principal Investigator of UPAVAN (Upscaling participatory action and videos for agriculture and nutrition), a four-arm cluster RCT integrating maternal and child nutrition objectives into aparticipatory low-cost video driven agriculture extension platform in India. She is also a co-investigator of LANSA (Leveraging Agriculture for Nutrition in South Asia) research consortium and SCAN (Surveillance of Climate Smart Agriculture for Nutrition). Suneetha leads the Agriculture, Nutrition and Health Academy.

Alan De Brauw

Senior research fellow, Cluster Leader A4NH and PIM research programs of the CGIAR International Food Policy Research Institute.

Alan de Brauw is a senior research fellow at the International Food Policy Research Institute and a cluster leader in both the A4NH and PIM research programs of the CGIAR. He has a Ph.D. from the University of California at Davis, and 15 years of experience conducting research on topics related to agriculture and labor through primary source data collection throughout the developing world. His research largely attempts to answer questions related to social protection, labor issues, agricultural production, and agricultural extension. His resulting research has been both influential and well published. He has over 40 peer-reviewed publications in internationally recognized journals.

"Research on migration and nutrition are urgently needed, especially on the nutrition of migrant**"** *- Alan De Brauw.*

Luc D'Haese

Extra Ordinary Professor University of Stellenbosch South Africa, VECTOR FS.

Professor Luc D'Haese, from the Department of Agricultural Economics at Ghent University, was managing for more than 15 years the International Master program in "Nutrition and Rural Development" at the Faculty of Bio Science Engineering. He is currently Extra Ordinary Professor of the University of Stellenbosch. In this position he coordinated recently at the University of Stellenbosch the set-up of the "Master in food and nutrition security" and at the University of Pretoria the "Institute of Food Nutrition and Well-being". He is actually involved in household food security surveys in South Africa analyzing with a local partner with an innovative way the determinants of livelihood and household food insecurity in rural and urban areas.

"*The results obtained from Vector FS system are less expensive, more reliable and it provided with more frequently available data than ever before.***"**
- Luc D'Haese.

"*The analyses of big data, the use of mobile phones datasets and very high resolution (VHR) satellite imagery may contribute to a global public good and they definitely can support and inform decisions makers.***"** *- Arif Husain.*

"*Improving nutrition through enhanced food environments: improved food environments allow consumers to purchase and consume more nutritious and healthy foods. However more research is needed on the spatially explicit determinants of diet diversity and nutrition as little is still known about how much and to what extend food environments are key to determine people's food security and even less about their influence on nutrition in developing countries.***"***- Suneetha Kadiyala.*

Neil Hubbard

Former Head of Unit, Food Security Unit, Directorate-General Joint Research Centre European Commission

Since joining the European Commission in 1997, Neil Hubbard has worked on several scientific projects related to earth observation including the initial stages of both Galileo and Copernicus. Further posts were held concerning the European Research Area, chemicals legislation (REACH) and general management, before taking up his appointment as head of the Food Security Unit in 2011 and retiring on 2018. Focusing upon technology and methodological development, the JRC supports the implementation of the Common Agricultural Policy (CAP) including crop yield forecasting and environmental requirements in farming practices. A further key area of work concerns food security, supporting Commission services (DEVCO, ECHO, EEAS) by providing assessments in response to food security issues, and scientific & technical assistance to both the development and implementation of policy.

Leonard Mizzi

Head of Unit Rural Development, Food Security, Nutrition, Directorate-General International Cooperation and Development European Commission.

Dr. Leonard Mizzi is currently Head of Unit at the European Commission, Directorate-General (DG) for International Cooperation and Development - Rural Development, Food Security and Nutrition, since 1st of January 2017. Prior to this post he was Head of Unit for 10 years in DG Agriculture and Rural Development, first on agri trade and development issues (2007-2014) and then more recently on inter institutional matters (European Parliament, Council)- 2015-2016. He is a graduate in Public Administration from the University of Malta (BA Hons First Class); and has degrees from CIHEAM-Montpellier (Master of Science) and a Ph.D in agricultural economics from the University of Reading (UK). He has been an author of a number of articles and publications on agri-food issues and nutrition in the Mediterranean region. Dr. Mizzi has a broad working experience in the Maltese public administration and the Maltese private sector. He first worked in the Economic Planning Division of the Office of the Prime Minister (Malta) and from 1996-2006 was the Director of the Malta Business Bureau in Brussels- the office of the Malta Chamber of Commerce and Enterprise and the Malta Hotels and Restaurants Association. He was also visiting lecturer at the Boston University (Brussels campus), Open University and Malta University. His areas of specialization are governance, agriculture and food and nutrition security, the Mediterranean area, Sub Saharan Africa.

"*This conference is an opportunity to discuss these and other concerns, (estimation of population, monitoring of livelihood status, assessing the impact of multiple stressors) and to move forward towards enhanced collaboration and coordination amongst partners***"** *- Leonard Mizzi.*

Thierry Negre

Team leader, Food Security Unit, Directorate-General Joint Research Centre European Commission.

Thierry Negre is Head of the Food Security Group in the Food Security Unit of the European Commission Joint Research Centre (JRC). A French national, Thierry Negre was born in Limoges in 1963. After graduating from the Institut National Agronomique Paris-Grignon in 1987, he worked for the Food and Agriculture Organization of the United Nations on the development of national food security information systems in Africa and Asia. He joined the European Commission in 1997 and was the initiator of food security information activities in JRC in 2001. Subsequently, Thierry Negre served as scientific counsellor in the European Union Delegation to the Holy See, the Order and Malta and the United Nations Organisations in Rome.

Sergio Gomez y Paloma

Head of Sector, Economics of Agriculture Unit, Directorate-General Joint Research Centre, European Commission.

Sergio Gomez y Paloma is graduated in Agricultural Sciences (Napoli University). Later he obtained a Master in Agribusiness (Milano, Catholic U.), a DAA (Masters in Agricultural Development, Agro-Paris-Tech, Paris), and a PhD in Agricultural Economics (Bologna U.). In 1991-1996 he was a lecturer at Roskilde Universitetscenter Department of Economics and Planning (Denmark). He has been Advisor to the EU Economic and Social Committee, Brussels (1992-5). Since 1996 he works at the EC-JRC (European Commission Joint Research Centre), where he has coordinated the Project on Mediterranean and Regional Perspectives (1997-2000) and the Action on Sustainable Agriculture and Rural Development (2007-2014). He is currently coordinating a number of JRC activities related to quantitative analysis of the farming sector in the EU, the Eurasian area and in Sub-Saharan Africa. He was 2011-2014 Member of the Editorial Board of the Applied economics perspective and policy Journal (Oxford University Press). He is 2015-2017 Associate Editor of Agricultural Economics, the Journal of the International Association of Agricultural Economists (IAAE), Blackwell/Elsevier. He has published on agricultural economics, transition and development economics.

"*Since FSSIM-Dev reproduces the dual character of farm households in developing countries, it is particularly appropriated for the computation of various indicators of FNS outcome and to assess the FNS impacts of agricultural policies. More reliable FNS modelling would require very detailed information on household FNS status and better linkage between agricultural production systems and nutritional status.***"***- Sergio Gomez y Paloma.*

Tharcisse Nkunzimana

Policy officer DG International Cooperation and Development Unit C.1 – Rural Development, Agriculture, Food & Nutrition Security, European Commission.

Tharcisse Nkunzimana is engineer in agricultural sciences and holds a PhD in agricultural economics from the Universite Catholique de Louvain (UCL, Belgium) in 2005. He is a senior researcher with experiences in food and nutrition security assessment and information systems. From 2008 to 2011, he worked as post-doctoral researcher (UCL, Ghent and Antwerp Universities) on various socio-economic research projects with a focus on poverty dynamic and food security analysis and monitoring-evaluation of projects. End of 2011, he joined the Joint Research Centre of European Commission in Ispra/Italy as a Scientific Officer. Recently, in November 2018 he joint the DG International Cooperation and Development Unit C.1 – Rural Development, Agriculture, Food & Nutrition Security in Brussels. His researches are focused on food and nutrition security analysis, agriculture information systems, food market analysis and causes of malnutrition in developing countries using statistical and econometric models.
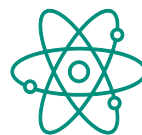
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THE **ACKNOWLEDGEMENTS**

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ABSTRACT

Despite the importance of Food and Nutrition Security, great challenges remain to be addressed worldwide to reduce and eradicate hunger and malnutrition. The most recent report on the State of Food Insecurity in the World (2018) stated that: for developing regions taken as a whole, the share of undernourished people in the total population has recently increased in the period 2015-17 to 10.9% compared to its lowest (10.6%) in 2015. Although there has been substantial progress in the last decade, almost 821 million people are still undernourished globally. In part, the inability to tackle the problems relates to the lack of timely and spatially explicit information to inform decision-making in food and nutrition security (FNS), humanitarian and development initiatives. On the other hand, monitoring progress of policies and actions to combat hunger and malnutrition requires innovative and practical measurements that take into account FNS updated information. The availability of joint measurements for FNS is still low for the great demand of information in this subject. Nonetheless, some efforts have initiated in recent years by researchers and practitioners. Thus, in 2017 the Joint Research Centre (JRC) of the European Commission and the International Food Policy Research Institute (IFPRI) jointly organized an International Conference: "Quantitative Methods for Integrated Food and Nutrition Security Measurements". The conference provided a platform for researchers, academics, professionals and decision makers to define the state of the art for quantitative measurement of FNS and important research gaps. The research work and keynotes presented helped identifying the main practical challenges, innovative methods or modeling techniques, and exploring best practices to scale up multi and cross-sectoral FNS collaboration and coordination at country, regional and global level. Moreover, in hosting an interdisciplinary forum, the conference offered the opportunity for participants to network. The conference gathered research work mainly from Africa but also from Asia, included 80 participants from Africa, Asia and Europe. This document summarize the presentations, which included keynotes and research projects. Research projects presentations are summarized presenting when possible, their main motivation, methods and results, or else their title and authors for those under publication in scientific journals.

THE **CONFERENCE** IN **NUMBERS**

Country of origin of participants
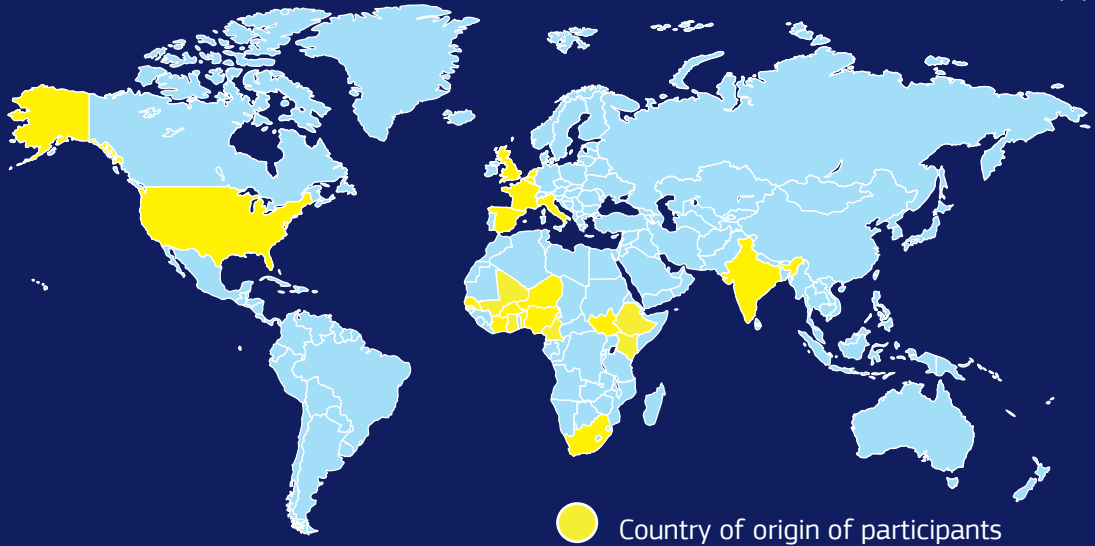
More than **80** participants

14 hours of **lectures**

41 speakers at the **conference**

More than **100** submitted **papers** with predominant of Sub-Saharan Africa

KEYNOTE SPEAKER **DR. ARIF HUSAININ**

Chief Economist, Director of the Food Security Analysis
United Nations World Food Programme.

TOPIC: FOOD AND NUTRITION SECURITY MEASUREMENT: A FIELD EXPERIENCE.

Dr. Arif Husainin highlighted that in the field of food and nutrition security (F&NS) measurement the methods used must determine: Who is food insecure or vulnerable?, Where do they live?, What should be done to save their lives and livelihoods?, How is the situation likely to evolve and what are the risks threatening them?, How many are they? and Why are they food insecure?. In addition to new indicators, new technologies and methods that can be used in F&NS are also shaping new research ideas in the field. One international food aid agency that is advancing in innovative methods is WFP.

At this conference, this agency presented their field experience and efforts to apply cutting-edge technology to conduct food security and nutrition assessments. For example, advancements in using very high-resolution imagery for estimates of crop production in conflict areas, evolution of IDP camps (increase and decrease of population, etc; Using Call Detailed Records to estimate population movements after a natural hazard using SIM card movement and population data to make the estimates). Examples from Hurricane Mathew evaluation in the Caribbean, and the earthquake in Nepal were shown. In addition the mobile Vulnerability Analysis and Mapping (mVAM) which aims at delivering real-time food security data through mobile technology; employing phone conducted surveys with households members data can be captured fast, synchronized and cleaned, stored and analysed by a stats engine and results re shared with wide audience to inform decision making. The mobile Vulnerability Analysis and Mapping (mVAM) is present in 33 countries and planned in other four. The main advantages is that they are safe, no need for "boots on the ground", the cost of them is between $5-9, compared to $20-40 for a face-to-face survey. Less time consuming: 1-2 week turnaround compared to 6 weeks for a face-to-face survey. They have some flexibility since it can be used to collect other indicators. The analyses of big data, the use of mobile phones datasets and very high resolution (VHR) satellite imagery may contribute to a global public good and they definitely can support and inform decisions makers.

WHO?   **WHY?**   **WHERE?**   **HOW MANY?**   **WHAT?**   **HOW?**

> "The analyses of big data, the use of mobile phones datasets and very high resolution (VHR) satellite imagery may contribute to global public good and they definitely can support and inform decisions makers."

KEYNOTE SPEAKER **DR.LEONARD MIZZI**

Head of Unit Rural Development, Food Security, Nutrition, Directorate General International Cooperation and Development European Commission.

TOPIC: FOOD AND NUTRITION SECURITY MEASUREMENTS: WHAT ARE THE NEEDS FOR DONORS AND DECISION MAKERS?

Since 2013, JRC was requested by DEVCO to contribute to monitoring the food and nutrition security situation in selected so as to enable DEVCO to prioritize its support under the GPGC framework. This exercise has been strengthened by the collaboration of the UN Agencies (WFP and FAO) that were invited to join the initiative in 2016. This collaboration led to the Global Report on Food Crises; The Global Network Against Food Crises was launched jointly by EU, FAO and WFP in May 2016 at the World Humanitarian Summit in Istanbul/Turkey. Therefore, for DEVCO this event represents an excellent opportunity to discuss best practices in food and nutrition security measurements also with a view at improving existing tools such as the Integrated food security Phase Classification (IPC) and the Cadre Harmonise (used in West Africa and Sahel region). To support Decision Making we need accurate and timely information on food and nutrition insecure population, in particular:Who and how many are food and nutrition insecure in terms of severity, magnitude?; Who and how many are chronically food and nutrition insecure?; Where these groups are located?; What are the immediate and long-term causes? ;How the situation can be addressed? Since 2015 the EU and its partners produce the Global Report on Food Crises which is considered a global reference and a useful tool for decisions on allocation of resources. However, some additional elements are still needed to optimize the process from the diagnostic to the response implementation, in specific: to get timely regular updates of IPC/CH outputs; To obtain reliable data on acute and chronic malnutrition so as to help operationalize the humanitarian/development nexus; To categorize causes and typologies of food crises as regards immediate and long-term components; To get figures in situations where IPC and CH are not available; To improve quality of data. New challenges ahead of DEVCO and its partners are quantitative and qualitative methodologies to measure food & nutrition insecurity in urban context; quantitative and qualitative methodologies to measure resilience quantitative tools to assess the impact of climate change to food and nutrition security; tools to assess the impact of migration, displacement and conflict on food and nutrition security status. Tools to deal with big data in the food and nutrition security domain.

> "This conference is an opportunity to discuss, among other concerns, the estimation of the affected population, the monitoring of livelihood states, the assessment of impacts from multiple stressors and to move forward towards enhanced collaboration and coordination amongst partners."
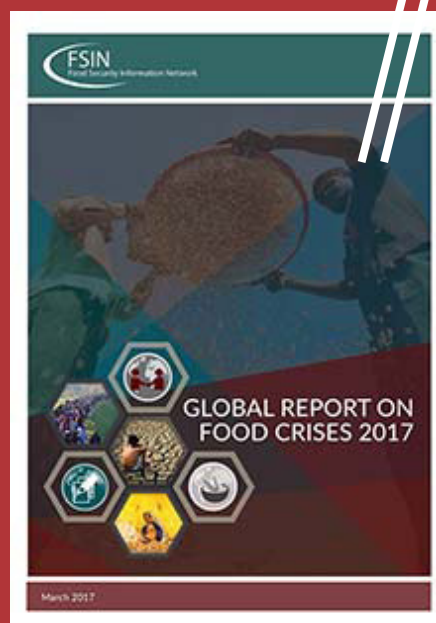
EFFECT OF REFUGEE INFLUX ON NUTRITION SECURITY IN HOST COMMUNITY IN CAMEROON. A DIFFERENCE-IN-DIFFERENCES APPROACH.

Lambed Tatah MD MPH [1,2], Jose Manuel Rodriguez-Llanes[3], Tharcisse Nkunzimana[3], Francois Kayitakire[3]
1 University of Cambridge (Visiting Researcher). Human Development (2HD) Research Group, Douala, Cameroon;
2 Ministry of Health, Cameroon. 3. Join Research Centre, European Commission.

Emerging topics, migration and F&NS

Background and objectives

An emerging literature addresses the impacts of refugees' presence on host communities, in particular through the goods and labour markets, as well as on the provision of health services. Yet, our understanding of their impact on nutrition in the hosting communities is in its infancy. We, therefore, designed this study to determine the impact of the refugee influx on nutrition security in the refugee-hosting community in Cameroon, focusing on the outcome (nutrition) axiom of food security.

Methodology

We used Cameroon's 2004 and 2011 Demographic and Health Surveys to evaluate the effect of a refugee influx (above 100,000 people) mainly from the Central African Republic to Cameroon on nutrition security in the hosting community. Our outcome variables were hemoglobin levels for women (15-49-year-old) and children under five, stunting and wasting in children under five as well as women's body mass index; whereas, our exposure variable was residence in the refugee-hosting community. We used a difference-in-differences approach to compare changes in outcomes of the refugee hosting community to a control group selected through propensity score matching from the rest of the country.

Results and conclusions

In the analysis, we found more underweight women in the refugee zone (7% increase [95% CI: 4 to 10%]) whereas women and children inhabiting the refugee zone were more likely to have normal hemoglobin, 15% more [95% CI:10 to 20%] and 10% more [95% CI:5 to 15%], respectively. No significant difference was observed in the stunting and wasting levels of children. These preliminary results were contrasted and should be observed with caution.

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LESSONS LEARNED

"**F**urther analysis foresees a revision of the matching variables and the inclusion of disease and mother-child care proxies to attribute these changes, to the best extent, to food and nutrition security. "

WOMEN'S BEHAVIOR IN THE FIELD OF FOOD INSECURITY IN THE CENTRAL SOUTH REGION: BAZEGA PROVINCE BURKINA FASO.

Ilboudo Maimouna[1,2], Bazongo Patrice[1].
1 University of Ouagadougou, UFR-SVT, Burkina Faso.
2 Network of African Youths for Development

Emerging topics, Gender aspects on F&NS

© Authors

Background and objectives

Food security is a major concern for a Sahelian country such as Burkina Faso, which depends on climatic conditions and has precarious resources in the face of strong demographic pressure. The province of Bazega located in the south centre of the country, with an area of 3947km^2. It has seven departments, six of which are rural communes and 214 administrative villages. Its population in 2006 is 238 425 habitants of which 60.4% are under 20 years, a poverty rate 66.1% and 31 101 households. The objective of the study is to show the strategies adopted by women to deal with the problems of food insecurity in their communities and to show the spatial and temporal evolution of this strategy on the environment.

Methodology

This longitudinal study (January 2006 to December 2010) is based on qualitative methods - mainly observations, group and individual interviews, and quantitative methods (including 24-hour recalls, dietary diversity surveys). In total, the study grouped together 100 households and 50 women.

Results and conclusions

Domestics works are the responsibilities of women. They have to go to the bush for cooking, which requires 2.5 hours. In order to have some income, women develop agro-pastoral activities in line with their domestic activities: they sell some of the wood, fruits, vegetables from gardening or dolo (local beer obtained by sorghum fermentation). During the rainy season, agricultural work takes place and mobilizes the family. Most women come to work in the bush from morning to night with their young children under two years of age. Some pregnant women sometimes cannot access to the health center and give birth in the bush.

LESSONS LEARNED
"This study illustrates the importance that should be given to gender issues in the fight against food insecurity. It is also very important to monitor and evaluate any action taken in gender aspects related to food insecurity. There are significant statistical differences between the sexes regarding the adequacy of proteins groups for over five years of age and always to the advantage of men. This seems to increase in times of food shortage. **"**

ROAD TRANSPORTATION CHALLENGES TO FOOD SECURITY IN IKERE-EKITI LOCAL GOVERNMENT AREA OF EKITI STATE, NIGERIA

Olorunfemi, Samuel O. Adenigbo Adedotun .J.
Department of Transport Management Technology, Federal University of Technology Akure, Nigeria.

Emerging topics, Urbanization and F&NS

© Authors

Background and objectives

Most rural areas in Africa constitute people who are poor and suffer a great deal of hunger but these areas offer the greatest potential for the sustainable development of the continent through increased agricultural production supported by efficient transportation and distribution. Transportation plays a major role in the distribution of farm produce for sustainable food security. The challenges of the road transportation system in food security are not simply a matter of costs, they have to do with the way transport interact with communities, market, and storage and distribution facilities. This study was meant to assess the road condition of Ikere- Ekiti Local Government Area, to identify the major transport challenges facing farmers in the study area, and to investigate the efficiency of the ministry/agency in charge of road transportation in the Local Government. The study area is noted for the high production of both food and cash crops capable of supporting the sustainable food security of Nigeria, only if the road transport system of the area can function efficiently.

Methodology

Major data for the study were sourced using primary techniques of data collection involving personal observation and questionnaire administration. Desk research was also used to gather relevant information from the literature. Structured and self-administered questionnaire was used to collect data from a total of 171 farmers representing 10% of the members of farmers associations identified in the area using a systematic sampling technique. Data collected were analysed using descriptive statistics in the form of frequency and percentages and Pearson Product Moment Correlation analysis.

Results and conclusions

The results indicate a poor state of the road network is hampering supply chain system for sustainable food security in the area. This increases the rate of destruction to food crops because most farmers could not afford the costs of transporting. Farmers are also hindered from ensuring optimal output of the farm through ineffective management triggered by the poor transport system.

LESSONS LEARNED

"There is the need to improve the road network by building access roads with infrastructure such as bridges that will improve food marketing, also it would be needed the establishment of private-public partnership in road and agricultural development. **"**

AFFORDABILITY OF NUTRITIOUS DIETS IN AFRICA: MAINSTREAMING NEW METRICS IN GHANA'S FOOD PRICE MONITORING INSTITUTIONS.

Daniel Sarpong[1,] Anna Herforth[2], William Masters[3], Jennifer Coates[3.]
1 University of Ghana. 2 Columbia University. 3 Tufts University.

Nutrition measurements

Background and objectives

Without data on the basic situation, policy solutions to the problem of expensive nutritious diets are much more difficult to devise. The "Indicators of Affordability of Nutritious Diets in Africa" (IANDA) project has worked with Ghanaian authorities to expand data collection to include all food groups throughout the year, compute new indexes for the cost of dietary diversity, the cost of nutrient adequacy, and the cost of recommended diets in each region, and help officials use these data for policy analysis and program management. In the key area of agriculture-nutrition linkages, metrics are inadequate. This paper presents the methods and results of mainstreaming nutrition-sensitive food price data collection in Ghana, and its implications for mapping food and nutrition security across sub-Sahara Africa.

Methodology

The Statistics, Research and Information Directorate (SRID) in the Ministry of Food and Agriculture collects monthly price data from food markets in all 10 regions of Ghana, for the purpose of poverty monitoring and food security measurement.. We used price data collected, including a wider range of nutrient-dense vegetables and fruits, to compute the cost of reaching international standards of diet quality.

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Results and conclusions

These new indexes can be compared with traditional measures of food security, revealing wide variation in access and affordability of healthy diets across regions, seasons and years in Ghana. Collaboration with the University of Ghana through the IANDA project has enabled the Ministry of Food and Agriculture to expand its collection and analysis of food price data, constructing new indicators that reveal wide variation in access and affordability of nutritious diets. Information on more diverse foods presents more potential business opportunities as well. Ghana has demonstrated that existing food price data monitoring systems can be used, with very little added cost, to provide better information for nutrition impact.

LESSONS LEARNED AND STEPS FORWARD

"**T**he data obtained from this study reflect nutritious-diverse food prices and the resulting indicators can be used for decision-making toward a more nutritious food system. Ghana may be the first country to commit to monitoring the cost of nutritious diets. Future research should focus on addressing the causes and consequence of price variation, to guide nutrition-sensitive interventions in agricultural production and food systems that deliver more stable and secure access to healthy diets."

KEYNOTE SPEAKER **DR. SUNEETHA KADIYALA**

Associate Professor in Nutrition-Sensitive Development, London School of Hygiene and Tropical Medicine/LSHTM

TOPIC: UNDERSTANDING AGRICULTURE/FOOD SYSTEM-NUTRITION LINKAGES INNOVATIONS IN METHODS AND METRICS.

Dr. Suneetha Kadiyala in her keynote highlighted that "Malnutrition rates remain alarming: stunting is declining too slowly while wasting still impacts the lives of far too many young children" UNICEF. In the Global Nutrition Report 2016 it was evidenced that high socioeconomic inequities persist and that in the rural-urban areas inequities persist but stunting in urban areas is also high. Poor diets are a top risk factor for disease. So after presenting all the alarming facts and figures the question that reminds is What do we do? On one hand different studies support that income growth does reduce under nutrition, a 10% increase in GDP/PC leads to a 6% reduction in stunting. On the other hand income growth can also have unintended consequences such as a 10% increase in GDP/PC leads to a 7% increase in overweight and obesity (Ruel and Alderman; Lancet 2013). She also pointed out that there is increasing attention to the underlying determinants, agriculture/food systems and women's empowerment which play a key role in Food security, including availability, economic access and use of food. The hygiene and sanitation determine also the access to and use of health services, a safe and hygienic environment, contributing all together to the optimum feta land child nutrition and development. Others factors, such as rapid changes also affects the underlying and basic determinant of nutrition status, these are: climate change/environmental fragility; migration and conflict, rapid urbanization and rural transformation, changing food system governance, production & distribution, shifting grounds for women and men as they respond to evolving risks and opportunities. How do we make our agriculture-food systems sustainable and healthy to all people in this rapidly transforming context?. How do we make nutritious diets physically and economically accessible in an equitably and just way? So the answer to these questions might be in the fact that agriculture is fundamental to structural transformation of economies and poverty reduction but pathways to nutrition are diverse and interconnected. As food security and agriculture have been traditionally interlinked in terms of research topics, there is more data and evidence linking agriculture to improvements in food security, although

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> **"We** are making progress on having better tools in our tool box but more work is needed to integrate datasets. Building a consensus on emerging concepts still remains a priority. We need better methodologies to unpack and measure "food systems" and diets. Field friendly assessment methods for micronutrient biomarkers.**"**

showing this link is still challenging. However, evidence on the link between agriculture and nutrition is scant. Currently more interdisciplinary work is needed to address many of the research challenges in food systems and nutrition. Today, some examples are implemented like the Innovative Methods and Metrics for Agriculture and Nutrition Actions (IMMANA program). It aims to accelerate the development of a robust scientific evidence base needed to guide policy investments in agriculture for improved nutrition and health. Other initiatives are also on going such as the agriculture, nutrition and health (ANH) Academy aims to foster a global community of interdisciplinary researchers working on agriculture and food systems for improved nutrition and health.

MULTILEVEL ANALYSIS APPLIED TO DIETARY DIVERSITY IN RWANDA AND BURUNDI.

Estefania Custodio[1], Tharcisse Nkunzimana[1], Ana Perez Hoyos[1], Dorota Weziak-Bialowolska[2,3] and Francois Kayikatire[1]. 1 European Commission, Joint Research Center, Food Security Unit. 2. European Commission, Joint Research Centre, Competence Center on Composite Indicators and Scoreboards. 3 The Center for Health and the Global Environment, Harvard T.H. Chan School of Public Health.

Nutrition measurements

Background and objectives

Inappropriate dietary intake is one of the immediate causes of malnutrition, and lack of dietary diversity can be a severe problem among infants and young children, as they need energy-and nutrient-dense foods to grown and develop both physically and mentally. The objective of this study was to determine the factors associated with the children dietary diversity in rural Rwanda and Burundi taking into accounts the different levels of community, household and individuals.

Methodology

Data from the 2010 DHS surveys from Rwanda and Burundi. In Rwanda 1049 children aged 6- 23 months were analyzed and in Burundi 957. The dietary diversity score was created using 24-hour recall data, and grouping it in 7 food groups, as recommended by WHO. The Minimum Dietary Diversity was calculated as the proportion of children who received foods from 4 or more FGs in the previous 24 h. We used frequencies and percentages to summarize data, and student's t-test and Chi-squared tests for assessing differences between Rwanda and Burundi in the continuous and categorical variables, respectively. We assessed the intra-community heterogeneity in levels of dietary diversity that numerically justified the two-level modelling calculating the intra-class correlation coefficient and the median odds ratio.

Results and conclusions

Only 16 % of the 6-23 months old in Burundi were achieving MDD as compared to 23% in Rwanda. The preventive factors in Burundi improved living conditions, older age of the child and education level of the mother's partner. In Rwanda, they were the children's and mothers older age, older age of the mother at first pregnancy, number of children in the household and unimproved living conditions. Results show that the child dietary diversity is low in Rwanda and Burundi. Although results showed an intracommunity heterogeneity none of the community's variables entered in the model showed significant associations with the outcomes. There is considerable variability in dietary diversity related to community areas in both countries. The individual and household variables associated with dietary diversity vary according to the country.

LESSONS LEARNED AND STEPS FORWARD

"The multilevel analysis approach is appropriate for the study of child food consumption and should be taken into account when determinants are analysed. The community variables selected poorly explained the intra-community heterogeneity observed. Results are robust against methodological assumptions. New community variables should be explored to account for the intra community variation. The study contributes to the Food Security and Nutrition measures by presenting a multilevel case study including both dimensions."

MALNUTRITION GAP AS A NEW MEASURE OF CHILD MALNUTRITION: A GLOBAL APPLICATION.

Juan Feng[1], Shamma Alam[2], and Patrick Hoang-Vu Eozenou[3].
1 Economist, Food Security and Nutrition Statistics, Food and Agriculture Organization, Rome, Italy. 2 Department of Inter-national Studies, Dickinson College, Carlisle, PA, USA. 3 Senior Economist, Health, Nutrition and Population, The World Bank, Washington D.C., USA.

Nutrition measurements

Background and objectives

To better understand the current nutrition security challenges across the world, this study develops a new quantitative method of measuring nutrition security. The goal of this study is to develop a measure that enhances overall nutrition security measurement, i.e. malnutrition. The current key measures of malnutrition, such as stunting and wasting, are based on headcount measures, i.e. the proportion of children who are suffering from malnutrition. However, a potential drawback of these headcount measures is that it does not inform us about the severity or extent of malnutrition. It is possible that a country with a low headcount rate for a particular malnutrition measure may also have a high severity of malnutrition compared to countries with similar headcount rate. Therefore, it is important to develop a measure of severity of malnutrition.

Methodology

To develop such measure, this study adopts a particular technique used in the development literature, specifically the Foster, Greer and Thorbecke (1984) class of poverty indicators, in the context of child malnutrition. Employing this new technique, we develop eight new measures of malnutrition in this study: (i) stunting gap, (ii) stunting gap squared (iii) underweight gap, (iv) underweight gap squared, (v) wasting gap, (vi) wasting gap squared, (vii) overweight gap, and (viii) overweight gap squared. We employ over 20 years of malnutrition data from 94 developing countries to calculate these measures of severity.

Results and conclusions

Malnutrition gap as a new measure enables us to monitor the progress of those furthest away from the reference line. Employing the new measures, we are able to identify countries that have low levels of headcount for a malnutrition measure, but have comparatively high severity of malnutrition according to the gap measures, and vice versa. This allows us to identify numerous cases where headcount measures may be providing misleading description of a certain country's malnutrition status.

LESSONS LEARNED AND STEPS FORWARD
"This study is extremely important from a policy perspective because comparing countries with similar headcount measures could hide important differences in the depth of malnutrition as reflected by differences in the malnutrition gap"

LESSONS LEARNT IN JOINT NUTRITION AND FOOD SECURITY ASSESSMENTS AND ANALYSIS (JANFSA).

Elliot Vhurumuku, Sergio Regi, Jo Jacobsen, Cyprian Ouma, Patrick Codjia and Stien Gijsel
WFP Regional Bureaux for East and Central Africa and Southern Africa, and the UNICEF Regional Office for Eastern and Southern Africa (ESARO).

Joint measurement of FS&N

Background and objectives

The need for a joint methodology that meets the information needs and standards of both nutrition and food security sectors (set of minimum indicators)- led to the Technical Guidance for the Joint Approach to Nutrition and Food Security Assessments (JANFSA) The goal of JANFSA is to provide an approach to investigate the prevalence and severity of household food insecurity and malnutrition and any interrelationships between them, triangulating nutrition and food security information in each context. The JANFSA guidance also helps to define appropriate programme responses and supports the design of existing food or non-food based interventions in the study area.

Methodology

The JANFSA was development based on a consolidation of experiences from pilot joint nutrition and food security studies between 2011 and 2014. The methodology applied is based on a combination of best practices used in nutrition and food security standard surveys. Information on both food security and nutrition is collected for the same population, allowing for a joint analysis of the relationship between the two, as well as of the underlying causes of food and nutrition insecurity to better inform policy and programme decision-making. Based on the pilots, from design to analysis, a draft guidance manual was produced in 2015 followed by a global UNICEF/WFP consultation workshop. Inputs from the workshop were used to finalize the guidance.

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Results and conclusions

The JANFSA achieved a joint sampling with international acceptable precision levels for both food security and nutrition. It ensured one household questionnaire with pre-agreed critical food security and nutrition indicators. The pilots in different contexts, demonstrated beyond reasonable doubt that food security and nutrition assessments can easily be linked, thereby providing better information for programme design compared to separate assessments. In conclusion, WFP and UNICEF intend to roll-out the JANFSA at the global level by building adequate capacity of nutritionists and food security officers to effectively undertake joint analysis for decision support.

> ### LESSONS LEARNED AND STEPS FORWARD
> **"B**enefits of applying JANFSA: the JANFSA allows harmonization of approaches, cost savings, integrated analysis, more effective joint programming in addressing underlying factors of food insecurity and malnutrition. Some areas may require further (development) such as results validation, report writing, and dissemination.**"**

A NEW APPROACH TO MEASURING INDIAN DIET DIVERSITY: HEALTHY EATING INDEX.

Mousumi Das[1], Suresh Babu[2].
1 Institute of Financial Management & Research (IFMR), Chennai, India World Bank, South Asia Region, India.   2 International Food Policy Research Institute, Washington D.C.

Nutrition measurements

Background and objectives

Food security measurement and subsequent policies framed in India primarily focus on calorie intake. However, this needs serious reconsideration given that the country is suffering from the triple burden of malnutrition (simultaneous presence of underweight, overweight and micro nutrient deficiency diseases). Focus on dietary diversity measures is required at present, which incorporates the consumption of both macro, micro and phyto nutrients required to eliminate a plethora of diseases. Using nationally representative Indian household survey data from 2004-2012, a new measure of dietary diversity called the Healthy Eating Index based on the Indian Food Pyramid is constructed (Drescher et al., 2007). The index takes into consideration the diverse food consumption pattern of Indian households, lifestyle, gender and age. It is easy to compute, based on nutrient intake and provides easy comparison across different households.

Methodology

The Healthy Eating Index (HEI) has been computed for males between 15 and 65 years of age, regular wage/salary earnings, non-vegetarians and have a sedentary job profile using data from different rounds of NSS and the rural and urban sector. The HEI $=\sum_{j=1}^{m} w_j (-\sum_{i=1}^{n} w_i \ln(w)_i$, where j is the total number of food groups and n is the number of food items belonging to each food group. This is a weighted measure of the Entropy Index, the weights being computed from the Food Pyramid. Since the range of the Entropy measure is [0, ln n], the range of HEI is dependent on the number of food items belonging to each food group.

Results and conclusions

Results show positive correlation among the HEI and the other existing measures of dietary diversity like the count measures, Simpson and the Entropy indices. We find that there is an improvement in the consumption of pulses, milk, sugar and fats in both rural and urban India. There is an indication of a consumption of a diverse diet by the specific household groups examined but to a very minimal extent. Consumption of cereals are way above the threshold requirement. This can be attributed to the successful and large scale initiatives of the government primarily the Public Distribution System. We also observe a dietary shift in the consumption of more high calorie food and away from that of nutritious ones. This has important implications for the implementation of food security policies in the country given that the National Food Security Act proposed to distribute food grains in the country. However, recent developments of cash transfers might have different implications.

LESSONS LEARNED AND STEPS FORWARD

"**A**n immediate policy implication is to update the food component of the Indian poverty line using the Healthy Eating Index. The government needs to be proactive in the promotion of the consumption of a diverse diet. Need to focus on other strategies - cold storage, promotion of production of eggs, fish & meat, nutritious cereals like jowar & bajra rather than just cereals."

TOWARDS A COMPENDIUM OF METHODS AND METRICS TO MEASURE THE MARKET FOOD ENVIRONMENT: A CONCEPTUAL FRAMEWORK.

Djeinam Toure[1,] Mduduzi NN Mbuya[1], Bonnie McClafferty[2], Tom Reardon[3], David Tschirely[4], Lynnette M Neufeld[4]. 1 Knowledge Leadership, Global Alliance for Improved Nutrition, USA. 2 Food Value Chains and Business, Global Alliance for Improved Nutrition, USA; 3 Department of Agricultural, Food, and Resource Economics, Michigan State University; 4Knowledge Leadership, Global Alliance for Improved Nutrition, Switzerland.

Emerging topics

Background and objectives

Increasingly, there is consensus that intervening at the point of consumption is inadequate and that more attention is warranted upstream in the food system to help improve nutrition at scale. The majority of the poor worldwide are net food-buyers, therefore markets represent an important entry point to improve nutrition. This calls for interventions and measurement tools that focus on the complex pathways linking agricultural production and consumption. While traditional research methods can be used in contexts where the value chains from production to consumption are relatively short (e.g. home-gardening; linking farmers to nearby markets), these are not often applicable for more complex pathways where interventions are delivered at scale and are more diffuse.

Methodology

To generate robust evidence for these upstream actions, we need methods and metrics that capture changes at points of purchase by consumers and sale by farmers, traders, wholesalers, and retailers. Assessments of access to nutritious foods in markets will require alternative methods (e.g. longitudinal spatial mapping of food availability; "stacked survey" approaches where full surveys are done at every segment of the supply chain from farmer to consumer, which we have found to add significant testable variation) than those traditionally used to assess nutrition interventions (e.g. RCT; population-based sampling). Developing methods to assess the impact of such interventions is a priority. In this paper, we present a framework that can be used to describe market food environments and corresponding methods (e.g. market mapping techniques, surveys of each segment of the supply chain, consumer surveys, outcome modelling, etc.) and metrics.

Results and conclusions

The study reveals that markets in part shape diets, and measuring and understanding aspects of market food environments is important for nutrition. The market food environment is a useful concept to understand the impact of supply chain interventions. Combining data collected at vendor, consumer and market levels and triangulating findings is an informative methodology to assess market food environments in the context of a mid-stream supply chain intervention. Last, longitudinal data and evidence of program impacts are needed.
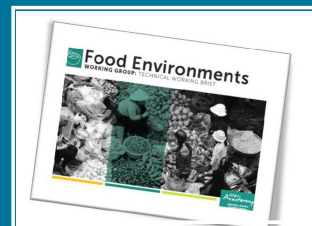
LESSONS LEARNED AND STEPS FORWARD

"Markets in part shape people's diets and have an important role to play in the access to adequate and nutritious foods. The Marketplace for Nutritious Foods (MNF) Program: provides a support to small and medium enterprises that produce nutritious foods. Aim is to improve availability and affordability of foods in a way that is inclusive of low income consumers."

MODELLING THE IMPACT OF URBANIZATION ON HOUSEHOLDS FOOD AND NUTRITION SECURITY STATUS IN NIGER DELTA REGION OF NIGERIA.

Nsikak-Abasi A. Etim
Department of Agricultural Economics and Extension, University of Uyo, Akwa Ibom State, Nigeria.

Emerging topics, urbanization and F&NS

Background and objectives

World Bank report 2012 revealed that urban population in Nigeria increases at approximately 4% per annum whereas rural population grows at approximately 1%. As urbanization increases, the problem of food security becomes more prominent and should no longer be treated with levity. But the empirical understanding of factors affecting the food security status of households is a pointer to rational food policy decisions. This study was conducted to show how urbanization and other factors influence food security status of households. Nigeria is one of the most populated countries not only in African continent but globally as it ranks 7th in the list of countries by population.

Methodology

An empirical study was conducted to determine the impact of urbanization on households food security and hunger status, and estimate the factors influencing food security of households in Akwa Ibom State, Niger Delta region of Nigeria. Multistage sampling technique was employed to select the representative families for the study. A questionnaire was used to gather primary data from a sample of 240 households. Food security index was used to analyze the food security status of households; Foster, Greer, Thorbecke (FGT) weighted poverty measure was adapted to analyze the incidence and severity of hunger in the urban households whereas Tobit regression model was employed to analyze the determinants of food security in the households.

Results and conclusions

Findings revealed that food insecurity and hunger incidences were 0.52 and 0.61 respectively, and rose with increase in age and family size. Hunger was less severe in households with skilled labour than those with extractive occupation. Results further showed that food insecurity increased with urbanization. Result further showed that age, educational level, occupation, income level of household heads, household size and location of residence were the most critical determinants of food security. Highly educated household heads have the tendency to adopt and are receptive to new agricultural techniques better than the less educated ones. Families with social inclusion (that is those with access to credit facilities) have a higher probability of accessing and utilizing diverse foods due to the augmenting effect of credit on household income.

LESSONS LEARNED AND STEPS FORWARD

"Policies to improve the living standard in rural communities would be a sensible policy decision to prevent the influx of rural people into urban areas. Efforts should also be geared at increasing urban food production by integrating urban farming in urban development and planning. This will not only increase food supply but ensure food and nutrition security."

MODELLING THE EX-ANTE POLICY IMPACTS ON FOOD AND NUTRITION SECURITY INDICATORS. THE CASE OF SMALL IRRIGATION PROGRAMME IN NIGER.

Pascal Tillie, Kamel Louhichi and Sergio Gomez-Y-Paloma.
European Commission, Join Research Centre, Seville, Spain.

Emerging topics, impact assessments accounting for F&NS

Background and objectives

In semi-arid agro-ecological areas, such as the Southern regions of Niger, water is by far the limiting factor for agricultural production. Irrigation has therefore an important potential to both foster and stabilize agricultural production as well as food and nutrition security of smallholder farmers. Smallholders are the most vulnerable but they are key to global food security and nutrition. Niger has recently adopted a strategy for the development of small irrigation schemes, which require less investment compared to large irrigation infrastructure and allow for a more efficient water management at community level. In addition, farmers with access to small irrigation in Niger usually develop off-season production of vegetables and legume crops, for their own consumption or commercialization. The objective of this paper is to assess the impacts that the implementation of a small irrigation programme could have for the FNS of farm households in Niger, using a modelling tool to represent household behaviour.

Methodology

The model used for this policy simulation, called FSSIM-Dev, is a non-linear, static farm-level model. We use the 2011 & 2014 World Bank LSMS-ISA survey data that provide detailed information about the production and consumption decisions of a sample of 2,300 farm households in Niger. FSSIM-Dev has several features that are especially appropriated to the context of developing country agriculture. Household's production and consumption decisions are solved simultaneously, in an attempt to replicate the non-separability of both decisions at household level. In addition, FSSIM-Dev uses the Positive Mathematical Programming for its calibration at farm level that enables to capture the effects of factors that are not explicitly included in the model such as price expectation, risk-adverse behaviour, labour requirement, capital constraints and other unobserved costs specific to developing country.

Results and conclusions

FSSIM-Dev reproduces the dual character of farm households in developing countries, it is particularly appropriated for the computation of various indicators of FNS outcome and to assess the FNS impacts of agricultural policies. The results show that FSSIM-Dev can successfully contribute to the ex-ante measurement of FNS indicators at household level in order to support the design of agricultural policies.

LESSONS LEARNED AND STEPS FORWARD
"FNS indicators modelling may provide useful information for decision makers beyond the classical production change expectations. More reliable FNS modelling would require very detailed information on household FNS status and better linkage between agricultural production systems and nutritional status.**"**

HARMONIZED FOOD SECURITY AND NUTRITION ASSESSMENTS IN EMERGENCY SITUATIONS – A CASE OF SOUTH SUDAN.

Kiross Tefera[1], Isamil Kassim[1], James Bwirani [2], Lia Pozzi [3], Dorothy Nabiwemba[3], Nicholas Kerandi[2].
1 UNICEF, 2 FAO, 3 WFP.

Emerging topics, conflicts and F&NS

Background and objectives

Given the precarious humanitarian situation of South Sudan, periodic food security and nutrition assessments have been very crucial in informing decisions on appropriate responses and preventive measures. The Food Security and Nutrition Monitoring System (FSNMS) assessments have become critical data sources for the IPC analysis. The FSNMS provides and allows for national and state level monitoring of trends and changes in key food security and nutrition indicators over time. Data is usually collected in December (post-harvest) and July (peak of the lean season). FSNMS is a joint initiative between WFP, FAO and UNICEF and was started in June 2010. Since then, it has been conducted 20 times and currently, data collection is done using tablets.

Methodology

Since 2014, the FSNMS became a cross-sectional survey based on a two-stage cluster random sampling design that also includes anthropometric measurements as opposed to just MUAC screenings. An independent sample size is calculated for each State and enumeration areas/clusters are generated by the South Sudan National Bureau of Statistics.

Results and conclusions

As FSNMS reports form the main source of information for humanitarian response planning, the assessment timeliness are aligned to the main IPC comprehensive analysis timelines. The FSNMS informed IPC process continues to be important in understanding the magnitude of the humanitarian needs and in effect, drives resource mobilization. Integrated food security and nutrition assessments/surveys should be encouraged as they give a better and more comprehensive picture of the situation, and also save costs because both sets of data can be collected in one exercise. Where possible, stand-alone anthropometry surveys should include basic food security modules (FCS, HHS and HDDS) for better interpretation of the results and to also inform the IPC process.

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LESSONS LEARNED AND STEPS FORWARD
"FSNMS informed IPC process continues to be important in understanding the magnitude of the humanitarian needs. In emergencies, there is need to develop standardized guidelines for joint food security and nutrition assessments. We recommend that food security data quality check guidelines for practitioners should be create since they help the collection and analysis of food security data.**"**

RESILIENCE TO FOOD INSECURITY IN SENEGAL: CLIMATE SHOCKS VS NON CLIMATE SHOCKS EFFECTS.

Ahmadou LY,
Ph.D. student in Economics, Université Gaston Berger, Saint-Louis, Sénégal.

Emerging topics, resilence and F&NS

Background and objectives

Food insecurity is one of the most pressing challenges in developing countries. Agriculture, a main driver for rural livelihoods in Senegal, is facing a deep mutation of environmental conditions. Therefore, there is a gap of information concerning the clear estimation of marginal effects of climate shocks comparatively to non-climate shocks. In addition, there is a need to build consistent indicators of food security since many studies do not take into account the complexity of the concept. The objective of this paper is to build a resilience food insecurity indicator based on multivariate analysis which reflects its different pillars. Thus, we focus on the consequences of each type of shock (climate, non-climate) on the variable of interest.

Methodology

Data of the study have been collected between 2008 and 2010 (panel of three-round survey) and refer to a sample of 384 households in 8 regions of Senegal. Climate data come from the National Meteorology Agency which provides rainfall and temperature from 1980 to 2010. To measure the effects of each shock, we use the Resilience Index Measurement Analysis (RIMA) of the FAO. As resilience is a non-observable variable, we firstly derive from Principal Component Analysis (PCA) pillars which traduce the different faces of food security. Using structural model equations, those pillars are aggregated in order to estimate the resilience and its extent.

Results and conclusions

We found that the composite index of food insecurity resilience is negatively affected both by climate and non-climate shocks. Therefore, the intensity of the effects is more perceived on climate shocks, especially in rainfall long-term deficits. The results found show a reliable RIMA which clearly explains the underlying relationships between shocks and food security. Further studies are therefore necessary to predict future climate shocks and their effects on food insecurity resilience. Policies should better consider the adverse effects of extreme climate events on households' welfare. New innovative tools, like index insurance need to be explored.

LESSONS LEARNED AND STEPS FORWARD

"**F**urther studies are therefore necessary to predict future climate shocks and their effects on food insecurity resilience. Therefore, public policies should be more sensitive to the access of populations to basic social services. It is also adviced to promote a better management of rainfall induced risks for farmers. New tools like index insurance impact and its impact should be explored. In conclusion, climate shocks affect more resilience to food insecurity than non-climate shocks.**"**

MAPPING URBAN FOOD SECURITY IN WEST AFRICA.

Cornelia F.A. van Wesenbeeck[1], Thomas Allen[2].
1 Amsterdam Centre for World Food Studies, VU University, Amsterdam and OECD/Sahel and West Africa Club Secretariat (consultant). 2 OECD/Sahel and West Africa Club Secretariat.

Emerging topics, new digital information technologies and F&NS

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Background and objectives

Even though the numbers of urban and rural residents in West Africa are now roughly equivalent, analyses are lacking and the available tools are insufficient for providing an accurate picture of the FS&N situation in urban settings and designing effective response mechanisms. The objective of this research is to provide key statistics on FS&N in urban areas in West Africa, estimating and mapping key nutritional and food consumption indicators (wasting, stunting, caloric intake and BMI). The research is spatially explicit and relies on geo-referenced survey data as well as the unique dataset available at OECD/Sahel and West Africa Club Secretariat that identifies urban settlements (Africapolis database). This spatially explicit approach allows identifying urban areas where FS is particularly fragile, and within cities, to highlight the diversity in FS usually obscured in aggregate data.

Methodology

The research includes the following countries: Benin, Burkina Faso, Cabo Verde, Chad, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Mauretania, Niger, Nigeria, Senegal, Sierra Leone, and Togo. For each of these countries, survey information is available on nutritional indicators mentioned (DHS or MICS). 12 out of 17 country surveys include detailed geo-referenced data. Integrated statistical analysis is applied, using the geo-reference and an urban/rural indicator to combine survey data with the Africapolis database as well the Landscan population data. We arrive at spatially explicit number estimates for rural and urban food insecure populations. Using additional variables that are indicative of slum/non-slum conditions, further disaggregation of estimates is made.

Results and conclusions

Our main results are a set of spatially explicit indicators of urban food security that can be used to develop innovative methods for monitoring urban food insecurity, to estimate the total caloric need of urban agglomerations to assess challenges in feeding cities; to assess rural urban food security differences. This work lies in the combination of different sources of information to generate policy relevant indicators.

LESSONS LEARNED AND STEPS FORWARD

"**U**rban slum areas deserve attention in FNS policies since the levels of under nutrition getting close to rural ones and obesity is already a severe problem. Spatially explicit indicators of urban food security are a good tool deserving more attention. They provided DHS-based data that are georeferenced, directly measured, allow conditional estimates and tracking data."

KEYNOTE SPEAKER **DR. ALAN DE BRAUW**

Senior research fellow, Cluster Leader A4NH and PIM research programs of the CGIAR International Food Policy Research Institute.

TOPIC: MIGRATION AND DEVELOPMENT, IMPLICATIONS FOR RURAL AREAS.

Dr. Alan De Brauw highlighted that due to the recent high migration from many developing countries, this topic has emerged with great importance for F&NS. In fact, migration has several implications for F&NS of the populations affected and the hosted areas. During his lecture he pointed out to some gaps and challenges in conducting research to F&NS. A great data gaps exists FNS. There is little talk in the mi- for in the FNS literature about mi- mentioning for the research is effects. Lack of understanding of causal factors is an important li- with F&SN. At a glance he also impacts of migration: a robust non-ag. "premium" is for labor. It there is no evidence that migra- cultural production. The impacts cific meaning that durables are

on migration as well as their links for studies addressing effects on gration literature about FNS, as gration. Another challenge worth the potential long causal chain of the migration patterns and their mitation to understand the links presented some evidence on rural debate exists over how large the is also important to mention that tion has negative impacts on agri- on investments are context spe- secure investment. Productive in- vestments are risky but they seem bringing some clear impacts on entrepreneurship. Migration has complex interactions with risk profiles of households and communities.

Some policies implications

"The policies design to address migration may consequently trigger a loss of rural labour. However other kind of policies may foster rural investment in either housing or productive investments. It is also important to mention that some policies that might seem unrelated to migration may have important interactions with migration. Research on migration and nutrition are urgently needed, especially on the nutrition of migrant..**"**

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KEYNOTE SPEAKER **LUC D'HAESE**

Extra Ordinary Professor University of Stellenbosch, South Africa, VECTOR FS

TOPIC: DIGITALLY-ENABLED FOOD SECURITY AND LIVELIHOOD RESEARCH SYSTEM

Professor Luc D'Haese highlighted the well known fact that household food security issues are increasingly at the top of the global agenda. As the human, social and security impact of food security become more obvious, growing interest from policy makers and the public is creating an opportunity for advancing our knowledge of the field and strengthen the framework with which policy makers take decisions. He presented the project Vector FS, which is a comprehensive, digitally-enabled food and livelihood research system, providing researchers and policymakers with the means to streamline research on food and nutrition security. The result is less expensive, more reliable and more frequently available data than ever before. The Vector FS system provides results in a very short time post data-collection due to pre-programmed analytics and facilities including cross tabulation, statistical analysis and graphs. Additionally, per request of the client, the

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system is also able to provide complex analysis, cluster analysis and regression analysis. The preconfigured foundation survey can be implemented and it can apply on very short timeframes. It can addresses the full complexity of food and nutrition security. Other tools, such as digital data collection and management leads to reduced implementation risks, improved data quality and significantly faster project completion. Once all data is collected the researcher/policymaker can verify different hypotheses; make graphs and statistical analysis with various statistical packages.

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KENYA CASE STUDY: FEASIBILITY AND ACCURACY OF USING INNOVATIVE MOBILE METHODOLOGY TO COLLECT NUTRITION DATA REMOTELY.

Kusum Hachhethu, Christine Lamana[2], Sabrina Chesterman[2], Gaurav Singhal[1], Beatrice Mongwela[3], Mary Ng'en-do[2], Silvia Passeri[1], Arghanoon Farhiktah[1], Suneetha Kadiyala[4], Jean-Martin Bauer[1], Todd S. Rosenstock[2]

1 United Nations World Food Programme. Rome, Italy. 2 World Agroforestry Centre (ICRAF). Nairobi, Kenya. 3 United Nations World Food Programme. Nairobi, Kenya. 4 London School of Hygiene and Tropical Medicine, London, UK.

Emerging topics, new digital information technologies and FS&N

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Background and objectives

Regularly updated nutrition data can help provide early warning of deteriorating nutrition situations and support global efforts to strength nutrition monitoring. However, collecting data through traditional face-to-face (F2F) surveys can be time-consuming, costly and difficult. With rapid growth in mobile phone access and ownership in low and middle-income countries, remote data collection using innovative mobile technologies offers a quick and affordable way to collect nutrition data. The United Nations World Food programme (WFP) and ICRAF (World Agroforestry Center) conducted a mixed-methods study in Kenya to assess the feasibility and accuracy of using Computer - Assisted Telephone Interviewing (CATI) for collecting data on two internationally validated nutrition indicators - Minimum Dietary Diversity for Women (MDD-W) and Minimum Acceptable Diet (MAD) for Infants and Young Children.

Methodology

The study was conducted with 2,200 women in two counties of Kenya: Kitui and Baringo. A test-retest experiment was used to compare individual scores and population prevalence of MAD and MDD-W collected via CATI with data collected via traditional face-to-face (F2F) surveys.

Results and conclusions

The magnitude of measured differences in scores between the modes was small enough to make CATI a valid mode of data collection for MDD-W (0.1 food groups on a scale of 0-10 food groups). However, for the two components of MAD (Minimum Dietary Diversity and Minimum Meal Frequency), the magnitude of differences in score with mode was large. When the CATI mode was used, caregivers reported that children were consuming an average of 0.5 more food groups per day (on a scale of 0-7 food groups) and eating an average of 0.75 more meals per day. This resulted in 17% higher prevalence of children meeting the minimum acceptable diet via CATI.

LESSONS LEARNED AND STEPS FORWARD

"**O**ur findings suggest that CATI has the potential to be used as a rapid and cost-efficient method to collect data on MDD-W and MAD in both development and emergency contexts. MAD data collected via CATI is biased towards higher dietary diversity and more adequate diets for young children; however this bias is consistent across locations and indicators, and may be corrected through use of advanced statistical methods."

CAN SOCIAL NETWORK ANALYSIS INFORM AFRICAN DEVELOPMENT POLICIES? AN APPLICATION TO FOOD SECURITY, MARKET ANALYSIS AND GENDER.

Simon Renk[1,] Olivier J. Walther[2].
1 Regional Bureau for Africa, World Food Programme.
2 Department of Political Science, University of Southern Denmark and Center for African Studies, University of Florida, USA.

Emerging topics, new digital information technologies and F&NS

Background and objectives

Fueled by conceptual and computational advances in network science and the growing popularity of social media, formal approaches that map and model social structure – known as Social Network Analysis or SNA – have spread across academic disciplines. Thus far, however, the vast majority of these studies have been conducted in North America and Western Europe. In the rest of the world, where relational issues are just as important, the use of SNA to understand social structures is in its early stages. In Africa, especially, very little is known of the ties that bind individuals, groups and organizations, how they serve as channels for flows of material and information flows, and how they influence social, economic and political outcomes.

Methodology

The objective of this paper is to contribute to filling this gap, by showing how a more formal approach to social networks can inform current development policies in Sub-Saharan Africa. After reviewing some of the studies conducted in Africa, we discuss how SNA can be used as a policy and empowerment tool by development and humanitarian organizations. Focusing on West Africa, we are particularly interested in the application of SNA to the fields of food security, market analysis and gender, three policy areas that, despite being fundamentally relational by nature, have received little attention from network science so far.

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Results and conclusions

The note shows that a better understanding of social structure can shed light on hidden constraints that ultimately influence social capital, integration and re-silience and thus ideally complement existing approaches that focus on the attributes of the social actors instead of their relationships.

Gender and Markets Initiative

Empowering West African Women through Market-based Food Assistance

Phase II Progress Briefing October 2017

WFP World Food Programme
USAID

LESSONS LEARNED AND STEPS FORWARD

"SNA can highlight structural constraints and opportunities that remain largely unknown **SNA** can complement qualitative and quantitative studies and surveys. Considering ties rather than just attributes is key to understand gender and market inequalities.**"**

EXPLORING LINKAGES BETWEEN LIVELIHOOD ASSETS AND SMALLHOLDERS' FOOD SECURITY IN RURAL MALI, WEST AFRICA.

Sognigbe N'Danikou[1], Raymond Vodouhe[2], Mauricio Bellon[3], Amadou Sidibé[4], Harouna Coulibaly[4].
1 Laboratory of Genetics, Horticulture and Seed Sciences, Faculty of Agronomic Sciences, University of Abomey-Calavi, Benin and Biodiversity International, West and Central Africa office, Benin; 2 Biodiversity International, West and Central Africa office, Benin. 3 Biodiversity International, Rome, Italy. 4 Unité des Ressources Génétiques, Centre Régionale de la Recherche Agronomique de Sotuba, Institut d'Economie Rurale, Bamako, Mali.

Emerging topics, new digital information technologies and FS&N

Background and objectives

Household food security (HFS) is under the control of a complex of factors that can be grouped into livelihood assets. However, studies on the enabling factors for HFS most often used simplified models looking into the links with a selected set of stressors, overlooking the role of some other factors like social network, agricultural biodiversity and off-farm resources. The current research aimed at determining the most significant livelihood assets for HFS in the dryland agricultural systems in rural zones of Koutiala, Mali, West Africa.

Methodology

Elements of the five livelihood assets were assessed through structured interviews with a sample of 180 households, and focus group discussions in three communities in southern Mali. HFS was evaluated using the coping strategy index approach which directly captures physical (availability, accessibility, and utilization) and temporal (stability or vulnerability) dimensions of food security. We used correlation coefficients, Kruskal-Wallis, Chi-square, random Forest, the conditional inference tree models with CTREE algorithm, the generalized linear models with Poisson error structure, the generalized additive models and the mixed-effects models fitted to the maximum likelihood, where appropriate to explore, select and test the effects of the most significant variables that played as indicators of household food security status.

Results and conclusions

Findings indicated that HFS improved with the diversity of wild food plants and hunting, the diversity of local crop varieties, the existence of sustainable water sources, and extra-farm employment. HFS also improved along the urban-rural continuum and rural households seemed to be more food secure. The most vulnerable households participated more in development programmes and social groups, and also took higher risks. However, HFS was not directly determined by household size, size of family labour, community roles, and landholding size. We concluded that access to higher agricultural biodiversity improves household food security, and the existence of vital infrastructures (dams, bore wells and market) and access to extra-agriculture income should improve this contribution. However, panel data are required to confirm the main indicators identified.

LESSONS LEARNED AND STEPS FORWARD

"IT is strongly advised to invest in the conservation and increase access to wild food biodiversity to local communities (through domestication and agricultural systems diversification). It should be promoted a better national and regional seed policies that recognize and support the traditional seed system for its backbone function to HFS of smallholder farmers.

BUY AS YOU NEED, NUTRITION & FOOD STORAGE IMPERFECTIONS.

Jeremie Gross, Catherine Guirkinger and Jean-Philippe Platteau.
University of Namur, Center for Research in the Economics of Development (CRED).

Emerging topics, impact assessments accounting for F&NS

Background and objectives

In this paper, we investigate how the activation of local food markets impacts the nutritional status of both children and adults, in a context characterized by large seasonal fluctuations in the price and availability of food grain. This paper offers a first and necessarily incomplete approach towards explaining the behavior of households subject to nutritional stress in conditions of highly imperfect food grain markets.

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Methodology

SOS faim (Belgium) and FNGN (Burkina Faso) reactivated a network of former cereal banks in Northern Burkina Faso and created the so-called 'Food Security Granaries' (FSGs). In each village, set up of an informal storing and marketing cooperative that buys (mainly) food grain outside the village and sells throughout the year (through the network of such cooperatives, grain shifts from surplus to deficit regions). Each village cooperative has access to annual credit (gradually scaled up) while credit performance is carefully monitored and future access to loan is strictly denied in case of problem. Local management teams are trained, monitored and receive continual technical assistance. We propose a simple framework to analyze the household's problem of allocating food consumption across two periods that follow a single harvest.

Results and conclusions

First, especially in remote areas where local markets are thin, food market activation considerably dampens nutritional stress. The effect is strongest among children, and young children in particular. Second, and surprisingly, this beneficial effect is obtained despite the fact that total food consumption does not increase as a result of the external intervention. Third, it is a change in the timing of food purchase, translated into the timing of consumption that drives the nutritional improvement. A simple two-period model shows that an increase in consumption needs not take place when the price surge in the lean season is dampened.

LESSONS LEARNED AND STEPS FORWARD

"**H**ow nutritional status can improve in the absence of an increase in consumption? The underlying mechanism is the better ability of the household to mitigate food storage imperfections understood in a broad sense. The problem of storage imperfections has not received adequate attention in the literature dealing with nutritional stress and savings behaviour."

IDENTIFYING THE ESSENTIAL COMPONENTS OF A PROPOSED FOOD AND NUTRITION SECURITY TOOL: LESSONS LEARNT FROM EXISTING METRICS.

Vongai G. Murugani, Joyce M Thamaga-Chitja.
Food Security, African Centre for Food Security, University of KwaZulu-Natal, Pietermaritzburg. KwaZulu-Natal, South Africa.

Joint measurement of food security and nutrition

Background and objectives

Food and nutrition security is a human right; however, it is not enjoyed by at least 795 million who have no access to adequate and nutritious food and a further 2 billion individuals who suffer from hidden hunger. Accurately determining the incidence and severity of food and nutrition insecurity remains a challenge, since it is an outcome of several transdisciplinary processes, and its attainment is dependent on other aspects of the human condition.

Methodology

Single indicators, which allow for the accurate measurement of different aspects of the four food and nutrition security pillars and a single outcome need to be developed. This study pursues to document the existing food and nutrition security indicators, highlight their gaps and propose a way forward. Peer reviewed papers and grey literature with the key words 'food and nutrition security measurement', 'food security measurement' and 'nutrition security measurement' will be reviewed.

Results and conclusions

The results show the absence of a universal measurement, instead different indicators developed by various stakeholders for specific contexts, which measure food access (e.g. quality, quantity) and utilization (food consumption, anthropometric measures), mostly at the household and individual level were identified. In addition, the different units of analysis and the application of the indicators either individually or in combination were discussed. The successes of the different indicators, for example allowing researchers and policymakers to quantify and characterize the incidence of hunger and malnutrition worldwide, was better highlighted. As will the shortcomings of individual indicators, challenges associated with the use of multiple but different indicators, for example, limited capacity to perform accurate assessment and spatial and temporal comparisons. This was linked with the challenges associated with developing accurate, well-targeted intervention and sustainable strategies.

LESSONS LEARNED AND STEPS FORWARD

"The results obtained can be used to identify components, which could be included in a universal food and nutrition security indicator that would reflect the evolution of the sector, particularly in a period where food and nutrition security are considered prerequisites for sustainable development.."

FOOD SYSTEM METRICS OF RESILIENT NUTRITION SECURITY IN AFRICA: A PROPOSAL.

Mohammadou Nourou
Department of Quantitative Methods for Economic Analysis, Faculty of Economics and Management. The University of Maroua, Cameroon.

Emerging topics, resilience and F&NS

Background and objectives

Addressing food accessibility and affordability, micronutrient adequacy and dietary diversity effects of extreme events such as large changes in food prices, climate change or socio-political instability has been nearly absent from analyses of food security in Africa. Therefore, there is a need for academics to analyse the nutrition and health effects of global shocks. But prior to it, there is a need for developing a composite indicator for measuring the vulnerability or the resilience of nutrition outcomes of a food system. This paper proposes a methodology in use for the measurement of resilient nutrition outcomes of food systems in African instable environment.

Methodology

The metrics proposed consider: nutritious food abundance (crop yields, food accessibility and food affordability), availability of adequate calories, micronutrient adequacy, and dietary diversity. Hence, it was defined a limited number of metrics for the resilience of each aspect of nutrition security. Each metric is a weighted combination of a number of indicators. These indicators are derived from a set of variables whose data are collected through appropriate modelling. The method for selecting the pertinent metrics, the set of variables, the weighting system and the scoring of the index is based on literature review and on consultations with experts on food, nutrition, health, climate change, finance, politics and security.

Results and conclusions

The study above is an innovative food system metric that could serve as a measurement tool for assessing the state of the resilience of nutrition security and for the analysis of the effects of policy interventions on this nutrition security's resilience. The results provide metrics adapted to African context that could be incorporated into integrated models for the assessment of the impact of policies on nutrition and resilience outcomes.

LESSONS LEARNED AND STEPS FORWARD

"Next steps will be to select the appropriate indicator if this already exists in the community or in the literature, define the set of variables to be included in the indicator in the community or in the literature. It will be needed to combine indicators to have an aggregate index and to develop methodologies for the integration of the index in impact evaluation models."

SPATIAL EPIDEMIOLOGY OF CHILD UNDER NUTRITION IN ETHIOPIA. EVIDENCES FROM EDHS 2011 DATA.

Zewdie Aderaw Alemu
Public Health Department, College of Health Sciences, Debre Markos University. Ethiopia.
School of Public Health, College of Health Sciences, Addis Ababa University.

Emerging topics, new digital information technologies and FS&N

Background and objectives

In Ethiopia, food insecurity remains a major public health challenge. The Agro ecosystem characteristics which vary geographically have a potential to determine household food insecurity. Therefore, this study was designed to determine the spatial patterns of household food insecurity across different Agro ecosystems in East Gojjam Zone.

Methodology

An agro ecosystem linked cross sectional survey was done among 3108 study participants. The study area is divided in to five agro ecosystems: namely hilly and mountainous highlands, midland plains with black soil, midland plains with brown soil, midland plains with red soil and lowlands of Abay valley. Data were collected using interviewer administered questionnaire on socio demographic variables, food access and geographical location after five days training and pre testing of the tool to maintain data quality. Data were entered using EPI Info version 3.5 and exported to SaTScan and SPSS 20 for further analysis. To identify the most likely clusters using SaTScan software, the Log Likelihood Ratio (LLR) at 95% Confidence Interval (CI) and P value less than 0.05 as the level of significance were considered.

Results and conclusions

The overall prevalence of household food insecurity was found to be 65.3% (95% CI: 63.5, 67.00). The lowlands of Abay Valley (70.6%, 95% CI: 66.9, 74.2) and hilly and mountainous highlands (69.8%, 95% CI: 65.9, 73.3) showed significantly higher household food insecurity prevalence compared to midland plains with black soil (61.7%, 95% CI: 58.1, 65.6), midland plains with red soil (63.5%, 95% CI: 59.9, 65.0) and midland plains with brown soil (61.5%, 95% CI: 57.4, 65.3). Similarly, the SaTScan spatial analysis identified clusters from hilly and mountainous highlands (LLR: 11.64; P: 0.0088) and lowlands of Abay valley (LLR: 8.23; P: 0.025) as the most likely primary and secondary clusters for food insecurity, respectively. Higher prevalence of household food insecurity was observed with significant micro level geographical variations. The lowlands of Abay valley and hilly and mountainous highlands were the most vulnerable areas.

LESSONS LEARNED AND STEPS FORWARD

"Intervention strategies and plans shall consider agro ecosystem based micro level food insecurity inequalities in planning interventions. Further research is needed to determine the temporal variation of household food insecurity. Also it is very important to validate the spatial analysis results applicability to design geographically targeted interventions."

LINKAGES BETWEEN MARKET ACCESS & CHILD DIETARY DIVERSITY. EVIDENCE FROM RURAL MALAWI.

Jackson Mason-Mackay[1], Sarah Muir[1], Nancy J Aburto, Trust Mlambo[2], Jason Nyirenda[3].
1World Food Programme, Rome, Italy. 2World Food Programme, Lilongwe, Malawi. 3World Food Programme, Ntchisi, Malawi.

Emerging topics, new digital information technologies and FS&N

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Background and objectives

WFP, in collaboration with World Vision and with financial support from the Children's Investment Fund Foundation (CIFF), has been supporting the Government of Malawi to implement a comprehensive stunting prevention programme in Ntchisi district since 2013. The programme includes a range of both nutrition-specific and nutrition-sensitive interventions and targets children aged 6-23 months and pregnant and lactating women (PLW). Our objective for this research is to better understand how the location of beneficiary households (in terms of proximity to markets) impacts household and child food consumption patterns, as well as to determine whether young children living further away from markets are less likely to reach Minimum Dietary Diversity.

Methodology

The programme conducts representative surveys three times per year and collects a range of beneficiary information, including both household-level and individual-level data on food consumption and food acquisition patterns to calculate infant and young child (IYCF) indicators including Minimum Dietary Diversity (MDD). We conducted geospatial analysis to model and quantify household accessibility to markets. The method derives a general travel time for each household to reach the nearest market.

Results and conclusions

We found that households living further from markets are less likely to purchase food from markets (p<0.05), and children living in households that purchase less food from markets are less likely to reach MDD (p<0.05). GIS mapping revealed that children who reach MDD are often clustered in areas with good market accessibility, while those not reaching MDD often cluster in less accessible areas.

LESSONS LEARNED AND STEPS FORWARD

"The monitoring and collection of geospatial data can reveal important trends that impact nutrition. In the context of a humanitarian response, the above results can inform programming decisions on the resource transfer modality (e.g. cash versus in-kind) based on household purchasing habits. For example, in-kind transfers of certain foods may be advantageous for those living in particularly hard-to-reach areas, as opposed to cash-based transfers."
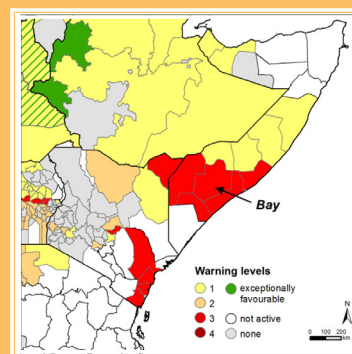
REMOTE SENSING FOR FOOD SECURITY EARLY WARNING AND RESTORATION PROJECT MONITORING.

Felix Rembold, Michele Meroni
European Commission Joint Research Centre, Ispra, Italy.

Emerging topics, new digital information technologies and FS&N

Bay

Warning levels
1 exceptionally favourable
2
3 not active
4 none
N
0 100 200 km

Background and objectives

Remote sensing is a cost-effective tool to monitor the seasonal development of crops and rangelands. Thus, it provides direct inputs to the quantitative assessment of the food production. In addition, it can be used to monitor the impact of rural development interventions aiming at improving food security in the medium to long term. These include for example ecological restoration interventions to combat desertification and agricultural infrastructure improvement projects.

Methodology

In this contribution we present two recent remote sensing applications developed by the JRC which can directly support food security analysis. First, the ASAP (Anomaly hot Spots of Agricultural Production) early warning decision support system, an online tool to provide timely warning of production deficits for agricultural systems worldwide. Warnings are triggered automatically at the first sub-national administrative level using remote sensing and meteorological data.

Results and conclusions

Warning maps and summary information are published on a web GIS every ten days and then further analyzed by agriculture experts every month. This results in the identification of hotspot countries with potentially critical agricultural production conditions for which a short narrative about the main limiting factors and expected impact on agricultural production is compiled by the analysts. The second application refers to the use of a statistical sampling design applied to remote sensing data for assessing the success of rural development interventions implying an increase of biomass. The method does not allow scrutinizing the impact of the intervention on food security. However, by assessing the in terms of vegetation cover, it represents a first check of implementation and biomass related impact. The method is currently being implemented by WFP for project impact monitoring.

LESSONS LEARNED AND STEPS FORWARD

"The information generated by ASAP contributes directly to multi-agency early warning products such as the GEOGLAM Early Warning Crop Monitor, or can be used as input for more detailed food security assessments following the IPC-Cadre Harmonisé framework. Rural intervention monitoring with Remote Sensing: it is an objective and cost-effective method to provide a first screening of restoration/rural development interventions."

ENHANCING FOOD SECURITY MEASUREMENT THROUGH IMPROVED CASSAVA VARIETIES, RESILIENT TO CLIMATE CHANGE IN NIGERIA USING GIS.

Ajala O.N
Department of Agronomy University of Ilorin, Ph.D. student, University of Ilorin, Ilorin, Kwara State, Nigeria.

Emerging topics, new digital information technologies and FS&N

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Background and objectives

Food security is a major priority for over 180 million people in Nigeria and other African countries. The need to feed the ever increasing population puts pressure on the Farmer's cassava variety which makes it inadequate to meet people's demand for food due to its long-time maturity and low yield. There is need for improved crop varieties. They must be adapted to a wide range of agro-ecologies conditions in Nigeria. Improved cassava varieties are choice for such situation as cassava serves as one of the major staple food crops among the people of Nigeria. The quality of cassava to environmental features and yields make it the best crop for food security in the country. To better harness the potential of cassava for food security in the face of continued land degradation and climate change, there is need to adopt, adapt and promote well suited cultivars supported by efficient multiplication and distribution system. This study aimes to assess soil and climatic condition suitable for cassava varieties using GIS tools and to identify the best means of distribute them.

Methodology

The research study was carried out using five improved varieties and a traditional farmers' variety in two adopted villages. Randomized complete block design (RCBD) was used; the villages were used as factor A while the cassava varieties were used as factor B. Two hectares of land were used for each cassava variety at spacing of 75cm between the plant stand. Data collected were subjected to analysis of variance (ANOVA) using GenStat statistical package.

Results and conclusions

The results show that the improved varieties could enhance food security due to their resistance to climate and short time production with high quality yield of 25 tons per hectare compared to farmers' variety of 5 tons per hectare. The findings will also assist decision makers; land planner, government and individuals to identify the suitability level of the improved varieties in relation to the trend in climate change.

LESSONS LEARNED AND STEPS FORWARD

"The improved cassava varieties could help enhance food security under good management. Farmers should be inform of new technologies in order to improve cassava varieties. A continuous monitoring and assessment process using GIS technologies should be implemented to support agricultural development in the region."

ONTOLOGY FOR FOOD AND NUTRITION: A SOLUTION FOR MULTIPLE LEVEL MEASUREMENT, DATA INTEGRATION AND ANALYSIS.

Chen Yang[1], Filip Pattyn[2], Francesco Vitali[3], Duccio Cavalieri[3], Jildau Bouwman[4], Bernard De Baets[5], Antoon Bronselaer[6], Guy De Tré[6,] Carl Lachat[1.]

1 Departments of Food Safety and Food Quality, Ghent University, Belgium; 2 PhD Ontoforce, Belgium; 3 PhD, Institute of Bio-meteorology, Department of Biology, University of Florence, Italy; 4 PhD, TNO, Microbiology and Systems Biology, The Nether-lands.5PhD, Departments of Mathematical Modelling, Statistics and Bioinformatic, Ghent University. 6 PhD, Departments of Telecommunications and Information Processing, Ghent University, Belgium.

Emerging topics, new digital information technologies and FS&N

Background and objectives

The development of effective policies and programs for health and sustainable development requires integration of nutrition data from various disciplines. However, as FS&N data are heterogenic in terms of quality and nature, integration of data from different levels is challenging. In FS&N science, there is lack of a common, unambiguously and unified language to enable comprehensive computational analysis. We developed the Ontology for Nutritional Studies (ONS), a controlled vocabulary describing terms and their relations to integrate nutritional data from different fields. It enables tracking of relevant information from food properties to disease outcomes and environmental consequences of human diets. As an ontology for an interdisciplinary science, our aim was not to introduce new concepts rather to reorganize, link and standardize existing concepts for nutritional research.

Methodology

The ONS was used to create a set of Extraction Transformation and Loading scripts for mapping datasets stored in an OPAL database containing nutritional epidemiology datasets from different projects. The scripts are bundled in a bioinformatics workflow using DISQOVER, a semantic search and data integration and visualization platform, that allows to process data collected with different measurements of various disciplines, at different time points, and named by different terminologies. The resulting data is standardized as semantic data and represented in Resource Description Framework format. With DISQOVER, the integrated data can be easily searched, filtered and exported in tabular format.

Results and conclusions

ONS is the first formal ontology framework for the description of nutritional studies. The ONS facilitates integrated and comprehensive data analysis in nutrition. The immediate benefit of ONS for standardization and mapping of nutrition data were demonstrated.

LESSONS LEARNED AND STEPS FORWARD

"Hereby, we welcome cooperation and contribution to further develop and adapt ONS. In the future, more nutrition data will be mapped to the ONS and will be searchable with DISQOVER. Case studies will therefore be organized for testing automatic data query, data integration, and data analysis."

INTERACTIVE SPATIAL DATABASE FOR KEY NUTRITION AND FOOD SECURITY INDICATORS IN PARTS OF KENYA.

Lucy Gathigi Maina[1], Louise Masese Mwirigi[2].

1UNICEF Kenya, Nairobi, Kenya. 2 UNICEF New York, USA.

Emerging topics, new digital information technologies and FS&N

© Authors

Background and objectives

The arid and semi-arid parts of Kenya remain vulnerable to elevated levels of food insecurity and acute malnutrition. These areas are closely monitored using SMART nutrition surveys that collect nutrition and household food security indicators to assess the nutritional status of the population and the main contributing factors. To enhance the analysis and dissemination of nutrition information and contributing factors, the nutrition sector developed a spatial database for all surveys collecting nutrition, food security, health and WASHES indicators, with the main aim of improving situation analysis processes such as the IPC, facilitating trend analysis and increasing access to data and information, for stakeholders for appropriate decision making.

Methodology

The Ministry of Health, Nutrition Unit with support from UNICEF and partners, through the Nutrition Information Working Group (NIWG), led the process of designing and collating survey data to be included in the nutrition dashboard accessible on the nutrition website. Indicators and thresholds were design for the routine SMART surveys, especially where there was no international guidance. The routine nutrition surveys include anthropometry, health and WASH indicators, food consumption score, household dietary diversity, micronutrient consumption and coping strategy index. To translate indicator results to the visual form for example on the maps, there was a need to define thresholds for all the indicators, ensure consistency in analysis, especially retrospectively, this meant some of the survey data needed to be reanalyzed before being included in the database. The NIWG validates the quality of all surveys.

Results and conclusions

Validated nutrition and food security indicators for ASAL areas in Kenya are accessible online allowing easier access to stakeholders, enhancing analysis processes such as the IPC and response analysis, by ensuring data is available to support decision making and efficient response.

LESSONS LEARNED AND STEPS FORWARD

"The indicators resulted from close collaboration of nutrition and food security experts in the design, implementation, and analysis and reporting of nutrition and food security assessments. Herein, we conclude that more collaboration between stakeholders, data dissemination, improving data accessibility and enhancing analysis processes (IPC) are required.**"**

CONFERENCE REPOSITORY

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LIST OF OMITTED **ABSTRACTS**

The following presentations were part of the conference but their abstracts are no included in this report as per request from authors that have submitted their work for publication by peer reviewed journals.

1. FOOD SECURITY AND INCOME SHOCKS: THE ROLE OF SOCIAL CONFLICT AND ETHNIC CLEAVAGES IN AFRICA. Beatriz Manotas Hidalgo[1], Miguel Campo-Bescós[2,] Fidel Pérez –Sebastian[3]. 1Department of Economics. Public University of Navarra (UPNA), 2 IS-FOOD Institute, Public University of Navarre (UPNA), Pamplona, Spain. 3 School of Economics, University of Alicante, Alicante, Spain.

2. DOES AGRICULTURAL AND FOOD AID REDUCE CHILD STUNTING?. Sebastien Mary[1,] Kelsey Shaw[2,] Liesbeth Colen[3], Sergio Gomez y Paloma[3]. 1 DePaul University, Chicago, IL, USA. 2 Coherent Economics, Highland Park, IL, USA. 3 Joint Research Centre, European Commission. Sevilla, Spain.

3. UNLOCKING THE POTENTIAL OF AGROBIODIVERSITY CONSERVATION FOR FOOD AND NUTRITION SECURITY AND MITIGATING THE EFFECTS OF CLIMATE CHANGE. Simon Wambui Mburu; Gilbert Koskey, Department of Microbiology, Kenyatta University, Nairobi, Kenya.

4. A MULTIDIMENSIONAL FOOD AND NUTRITION SECURITY MEASUREMENT: EVIDENCE FROM A HOUSEHOLD SURVEY IN RWANDA. Tharcisse Nkunzimana[1], Jean Baptiste Habyarimana[2]. 1 Scientific officer Food Security Directorate-General Joint Research Centre European Commission. 2 Department of Economics and Finance, University of Rwanda.

5. CONCORDANCE BETWEEN THE ESTIMATES OF WASTING MEASURED BY WEIGHT-FOR-HEIGHT AND BY MUAC FOR CLASSIFICATION OF SEVERITY OF NUTRITION CRISIS. Oleg Bilukha, Eva Leidman. Emergency Response and Recovery Branch, Division of Global Health Protection, Center for Global Health, Centers for Disease Control and Prevention, Atlanta, Georgia, USA.

6. MINIMUM DIETARY DIVERSITY FOR WOMEN (MDD-W) INDICATOR IS RELATED TO HOUSEHOLD FOOD INSECURITY AND FARM PRODUCTION DIVERSITY EVIDENCE FROM RURAL MALI. Laura Adubra[1], Sonia Fortin[1], Agnès Le Port[2], Yves Kameli[1], Niamke Ezoua Kodjo[3], Kamayera Fainke[3], Tanimoune Mahamadou[4], Marie T. Ruel[5], Yves Martin-Prével[1], Mathilde Savy[1]. 1 UMR 204 Nutripass, IRD-UM-Supagro Institut de Recherche pour le Développement, France; 2 Poverty Health and Nutrition Division, International Food Policy Research Institute, Dakar, Senegal; 3 Nutrition Unit, World Food Program, Bamako, Mali; 4 Nutrition Unit, World Food Program, Kigali, Rwanda; 5 Poverty Health and Nutrition Division, International Food Policy Research Institute, Washington DC, USA.

7. IMPROVING WOMEN PURCHASING POWER THROUGH LAND ENHANCING TECHNOLOGIES: THE CASE OF BIO-RECLAMATION OF DEGRADED LAND IN NIGER. Alphonse Singbo[1], Quarshies James[2,] Bonou-Fandohan, Alice[3], Lokossou, Jourdain[1], Fatondji Dangbedji[4] and Dandedjrohoun Lidia[4] . 1 International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Mali. 2 Catholic Relief Services (CRS), Kinshasa, Democratic Republic of Congo. 3 African School of Economics (AES), Cotonou (Benin). 4 International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Niamey, Niger.

CONCLUDING REMARKS

Herein, it is summarized the main lessons learnt during the conference. Given the high level of expertise of conference participants, these lessons are of great value for researchers, policy makers and stakeholders dealing with food security issues worldwide.

Some progress in the development of food and nutrition security metrics occurred in recent years. Large humanitarian agencies are investing resources into this route and generating new technologies and methods for joint food security and nutrition measurement. Although there are pending challenges for advancing in such effort, this conference attracted different research work that highlighted some of the pending challenges, new ideas, tools and methods to foster advancement and potential options in the creation of joint FNS quantitative measurements. Thus, the collection of work summarized in the conference, did not only address the general topic of the conference but represents a good collection of the recent research on food security, nutrition and their joint measurements in developing countries. Together, the research works presented offer some basic principles and points of departure to continue in the advancement of joint FNS measurement.

The demand for advancements in joint FNS is very high, as stated by Dr. Mizzi (Head of unit Devco.C1) in his talk, indicating that there is great need for this type of information, and more importantly, it is required to be timely and regularly updated for decision makers. As new development challenges have recently arise, joint FNS measurements need to quickly address a new set of questions, such as, impacts of climate change, migration, conflict and displacement on FNS. Moreover, these new research challenges point to additional knowledge gaps in understanding and monitoring livelihoods as well as understanding and quantifying the effects of multiple stressors.

From an academic perspective, keynote from Dr Kadiyala emphasizes the great challenges and research gaps remaining FNS:

- Most countries show progress towards malnutrition reduction, however, there are still 34 countries that concentrate most of the malnourished people of the world.

- Large socio-economic inequalities are contributing to FN insecurity and high prevalence of stunting, even in the high socioeconomic quantiles in developing countries. Stunting and mal nutrition are not only problems in rural areas any more but are increasing in urban areas.

- Diet trends in the world are not encouraging and inclining towards unhealthy foods; econo mic growth shows some correlation with stunting reduction but also with faster rate of in crease in overweight prevalence than the rate of reduction seen in stunting.

The set of research work included in this conference highlights the fact that in despite of the importance of the topic and the recent efforts, there is still a great need for more joint work between food security and nutrition scientists. Recent efforts in this direction has helped to identify remaining

challenges in each field, which have to be addressed before any advancement in FNS joint measurement can be achieved.

Although fewer than expected advancements in joint quantitative FNS measures are happening, some of the research work presented at the conference is gearing towards this direction. The advancements are in new indicators, innovative methods, approaches, and new ideas on how to move forward.

An approach presented at the conference for joint FNS measurement are "multilevel analysis" that combines analysis at individual, households and community level using anthropometric measures of nutritional status and basic food consumption information as a way of utilizing FNS data in combined analysis. This approach can also help in identification of determinants of food and nutrition security. Other existing approach for joint FNS measurement are assessments in which data from both is used in combination via expert's judgment to define a single measure of the magnitude and severity of FN insecurity. Efforts well known such as Integrated Food Security Phase Classification (IPC) are an example. One approach applied in emergency situation the Food Security and Nutrition Monitoring System (FSNMS) assessments carried in South Sudan which have been the main source of IPC based analysis that prevented the food security situation from advancing to worse levels during the duration of the conflict. A similar initiative by WFP and UNICEF was presented in this conference, the Joint Nutrition and Food Security Assessments and Analysis (JANFSA). New indicators that offer joint FNS measurement were also proposed: the multi-dimensional indicator that captures food and nutrition security status of single households. This allowed for capturing additional informa-tion than when using data separately. Examples from Rwanda and India case studies were presented.

New promising technologies for large-scale assessments are already being use by scientists and or-ganizations. Examples are: cell-phones used for surveys capturing food security and nutritional information in developing countries, and very high-resolution imagery to collect data and information in food security.

Collecting data in nutritional composition of diets via phone surveys is facilitating integrating food security and nutrition information that can be used in FNS measurements. WFP has piloted collection of MDD-W and MAD via mobile phone obtaining acceptable results that can be improved with bias correction. Digitally enabled surveys are a new possibility to facilitate and speed data gathering in food security and nutrition. The uptake of this new technologies is however still to be seen as is a new form of data gathering in the field that requires access to tablets or computer by respondents or enumerators. Nonetheless, these options present a new form or saving costs and doing larger scale data collection.

New ideas that can help advancing in joint FNS were also presented: including nutrition sensitive market monitoring as another new innovative idea that can help improving the understanding of diets and food access. Often market price monitoring is done for staple foods but important items for balanced diets are often neglected. Research presented in this conference provide an example of such scheme with already good results. One project in this direction provided evidence of the effects of better market access on households' capacity to obtain food and child dietary diversity in Malawi.

Presentations on advancements in each field were also included in the conference. In nutrition, new indicators are being developed as there is increasing demand for effective measures to compare advancement towards the SDGs.

A promising measure presented is the "Nutrition Gap indicator". This research highlighted that traditional nutrition status prevalence measures could be providing misleading results. Gap indicators could shed light into the weaknesses of prevalence indicators and help triangulating results. It was discussed that there is potential for this indicator to be combined with "Food Poverty" indicator in order to identify which children are likely to fall under any malnutrition gap and then asses the cost of diet that can avoid malnutrition.

Other indicator of diet diversity (MDDW) was presented as practical way of assessing nutritional intake measuring changes due to agriculture interventions. Regarding anthropometric indicators, in recent years, the practice of nutrition assessments has proposed using Middle Upper Arm Circumference (MUAC) as rapid and low-cost "wasting" indicator instead of the gold standard Weight for Height indi-cator (WHZ). In this conference evidence on the pitfalls and weaknesses of evidence for supporting this proposal were presented and discussed. Based on these results, the general recommendation is that WHZ is the preferable indicator to assess the severity of malnutrition at population level as global data and evidence from MUAC shows mixed results across countries and specific globally applicable thresholds for classifying severity cannot be established.

One presentation provided evidence of the positive effects of agricultural and food aid investments on reduction of child stunting. Another study presented evidence from West African countries suggesting that greater attention is needed in the slums of urban areas as the levels of under-nutrition are close to those from rural areas, while the levels of obesity are already a more severe problem in urban slums than in rural areas or other urban groups.

In the field of food security, advancements were presented in relation to: new indicators or combina-tion of indicators, methods for identifying determinants, gender sensitive FS research, resilience of food systems, and studies that evaluate the impacts of external shocks currently considered as main driver of food insecurity.

A promising quantitative FS indicator, the "Healthy Eating Index" was proposed as new methods of assessing dietary diversity that can be derived from data available in national surveys and is able to consider food consumption patterns, lifestyle, gender and age aspects to evaluate the adequacy of diet. This indicator is easily computed and can provide comparisons across different households in various settings, allows identifying cut-off points for healthy/unhealthy diets in a country or a specific population group. The index can be used to re-estimate the food poverty line and can reflect how food poverty is higher than when estimated based on calorie based indicators. The presentation showed results of this indicator when applied in the India case.

One presentation showed how the use of combined indicators in food security (MDDW and HHS) with farm productivity explain the positive role of agriculture on FS of female members and households. Other work dealt with the identification of determinants of FS in the rural Africa context, finding that diversity of wild food plants, hunting and local crop varieties are key, as well as the existence of sustainable water sources, and extra-farm employment for FS. Thus, rural areas being environments where households are more likely to be food secure. Another research show how households can optimize the use of available food via storage methods and the impact on better nutritional status.

Recent work presented on gender sensitive measures of food security highlighted the importance of women role in food crises, impacts of a development project on women income, the utility of

gender sensitive nutrition indicators such as MDD-W to inform FNS assessments, as well as the links between farm productivity and diversification and household's and women's nutritional intake diversity.

Many of the advancements in food security presented at the conference are towards addressing emerging research topics such as: climate change impacts on food security, impacts of migration, measurement FNS in urban areas, food systems resilience, and "personal food environment" rather than the external food environments.

RECOMMENDATIONS

Some recommendations highlighted in the different research work included in the conference are summarized here:

There is great technological progress and better tools are available today for improving FNS measurements, however integration of datasets is still needed and building consensus on emerging concepts remain as priorities for advancement. Better methodologies to measure and understand food systems, diets and their determinants in developing countries are key research gaps to be addressed.

Improving measurements of nutritional status in a way that these can be more cost effective can help conducting large scale assessments that combine this information with food security data. For example, the development of field friendly measurement of micronutrient biomarkers could facilitate fieldwork in nutrition. Also, research on nutrition measures, in particular "wasting" have not addressed the seasonality of this indicator potentially leading to underestimation.

More interdisciplinary work is needed to address all the challenges and research gaps in FNS measurement. Some initiatives currently exists, but not to the scale and scope needed in the field. Current research initiatives in this direction are for example: Innovative Methods and Metrics for Agriculture and Nutrition Actions (IMMANA program), the Agriculture, Nutrition and Health (ANH) academy, the IPC initiative, JANFSA, to name a few, however much more in this research domain is needed.

Bringing social and economic equality to the research agenda of FNS is key to combat the current world challenges in FNS in which poverty and inequality are having great effects on FN insecurity.

Greater research emphasis is needed in understanding agricultural systems and their role within the development framework and food systems. In addition, emphasis on understanding the links between food systems and food security and nutrition outcomes is urgently needed.

There is an urgent need to work in the understanding of livelihood systems and their links with nutrition and food security, so that adequate systems for monitoring livelihoods can be developed. As highlighted during the conference and in the most recent report on State of the Food Insecurity by FAO and partners (2018) it is urgent to understand and quantify the effects of multiple stressors in current FN insecurity increasing trends.

Limited research in urban food security is an important gap; a study presented in this conference

provided new insights and ideas on the feasibility and importance of conducting such assessments in a disaggregated manner in order to understand patterns of distribution of food insecurity. Additional research that can link this type of results to potential geographic factors of food security in urban areas is needed to inform policy making in FNS. The use of georeferenced data can be a way to overcome the barriers of lack of disaggregated data for FNS research studies.

Rapidly increasing migration trends have already generated research interest and new questions in FNS. Although some research work is already exiting in FNS and migration, in particular in the African context, as seen in this conference, several data challenges impede research at global and regional levels. Census data and population movement's data are not yet adapted for use in FNS for studies with wider scope.

Although it is recognized the importance of women and gender aspects in FNS, several research gaps in this area were highlighted. This include: lack of understanding of intra-households food allocation patterns and dynamics, women's role in FNS, intra-households time allocation for productive and other activities, shifting grounds for women and men as they respond and adapt to new challenges, etc. Despite the great research gaps in this area, little research is conducted to address them.

Several of the studies presented at the conference highlighted the need and importance for collecting and conducting spatially explicit research in FNS as important drivers and factors are spatially defined, in this conference aspects such as access to markets (distance, product diversity, etc.), types of crops cultivated were highlighted as playing important role in nutrition. Thus, for advancing in this direction FSN data need also to be spatially explicit. New remote sensing and weather based early warning tools are available to detect with better spatial precision the risk of production variations (i.e. ASAP) but there is need to have spatially explicitly FNS data to understand actual FNS impacts.

In nutrition, sensitive market price monitoring can help advancing in the measurement of household's economic access to food of high nutritional value and its contrasts with nutritional attainment. This could facilitate the monitoring of diets costs and households' economic access to nutritional diets, its seasonality and spatial variations. Research in this area could help understanding causes and consequences of price variations, which can guide nutrition sensitive interventions in agriculture and other development actions.

In food security, it is imperative to develop quick methods for assuring data reliability. Secondary data is are often used in food security from national or other institutions surveys, quick measures and methods to assess the reliability of the data are needed. This is one of the roadblocks for making joint FNS assessments, often nutrition information is assessed with clear parameters to evaluate the quality of secondary data before using it, but the same is not often possible with food security data as there are no clearly established parameters as for nutrition.

Due to the increasing amount of data and information in FNS, efforts for better organization and publication was proposed. There is great variety of concepts, variables and constructs in FSN which requires generating commonly agreed and standardized storing systems that allow greater use of the data and information available in FNS. In this conference an example of an "Ontology for Nutrition Studies" was presented. Advancing in this direction could motivate researchers and institutions to share data and eventually conduct more integrated and comprehensive research.

Efforts in the compilation and publication of data are also done by some countries' government institutions in Africa; the case of the Kenya Nutrition interactive dashboard (NIWG) is an example presented at the conference.

The joint measurements of FNS are feasible but require multi-partners involvement, well training experts and the close collaboration in interdisciplinary work involving food security and nutritionists. It also requires the understanding of households' constraints for food allocation for consumption a key aspects that need to be addressed for properly interpreting and conducting joint FNS measurements. Recommendations for joint assessments in FNS, such as JANFSA and IPC, were that there is need to allow flexibility and avoid being too prescriptive over what analysis to use, avoid giving over simplistic presentation of results to decision makers as to avoid running into the risk of giving misleading messages and neglecting to communicate the key issues that can emerge from joint assessments. Moreover, lessons from JANFSA and IPC show that much greater interdisciplinary work is needed for properly conducting joint assessments, for example, close work with statisticians and social scientists experts in instruments development could advance the joint quality assessment and analysis and results validation.

LIST OF **ABREVIATIONS**

ASAP	Anomaly hot Spots of Agricultural Production
CH	Harmonised Framework (French acronym: Cadre Harmonise)
CoDD	Cost of a Diverse Diet
CoNA	Cost of Nutrient Adequacy
CoRD	Cost of a Recommended Diet
DG DEVCO	Directorate-General for International Cooperation and Development
FAO	United Nations Food and Agriculture Organization
F&NS	Food and Nutrition Security
FPDS	Farm Production Diversity Score FSIN Food Security Information Network GAM Global Acute Malnutrition
GDP	Gross domestic product
ICRAF	World Agroforestry Centre
IDPs	Internally Displaced Populations
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IMMANA	Innovative Methods and Metrics for Agriculture and Nutrition Actions
IPC	Integrated food security Phase Classification
JANFSA	Joint Approach for Nutrition and Food Security Assessment (WFP- UNICEF)
JRC	Joint Research Centre

MDD-W	Minimum Dietary Diversity–Women
MUAC	Mid-Upper Arm Circumference
mVAM	mobile Vulnerability Analysis and Mapping
NFPI	Nutritious Food Price Index
NDVI	Normalized Difference Vegetation Index SDGs Sustainable Development Goals UNICEF United Nations Children's Fund
WFP	United Nations World Food Programme
WHO	World Health Organization

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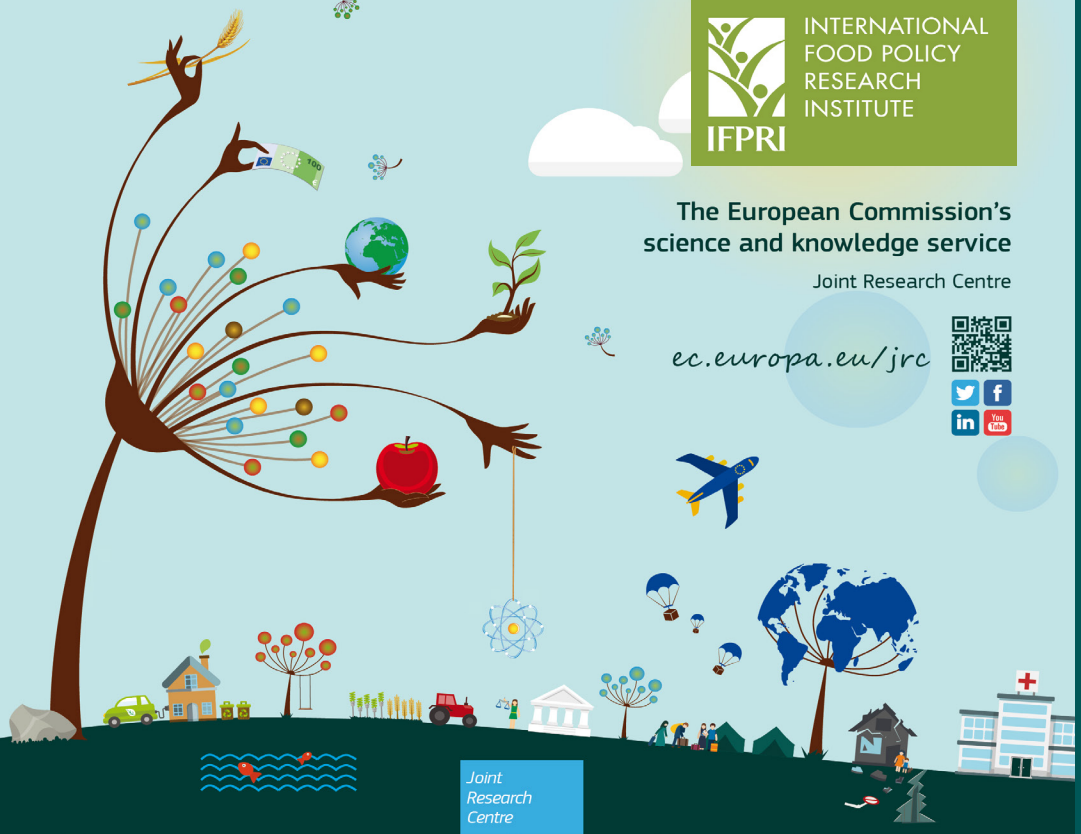
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Wednesday 15 November 2017, *Brussels, Thon Hôtel, rue de la Loi 75 - 1040 Brussels*

13.00 - 14.00 Registration.
14.00 - 15.15 Plenary session 1. Food and Nutrition Security Measurements: Methods & Tools.

Chair: **Neil Hubbard**, Head of Unit, Food Security, Directorate-General Joint Research Centre, European Commission.

Introductory remarks: **Thierry Negre**, Team leader, Food Security, Directorate-General Joint Research Centre, European Commission.

Keynote speaker 1: **Leonard Mizzi**, Head of Unit, Rural development, food security, nutrition Directorate-General International Cooperation and Development, European Commission Improve F&NS measurements for better decision making.

Keynote speaker 2: **Arif Husain**, Chief Economist, Director of the Food Security Analysis United Nations World Food Programme Policy support and F&NS measurements. A field experience.

Conference background and organisation: **Tharcisse Nkunzimana,** Scientific officer, Food Security unit, Directorate-General Joint Research Centre, European Commission.

Alan de Brauw, Senior research fellow, Cluster Leader A4NH and PIM research programs of the CGIAR International Food Policy Research Institute.

15.15 - 15.30 Health break.
15.30 – 16.30 Oral session 1 (Room 1).

Moderator: **Leonard Mizzi**, Head of Unit, Rural development, food security, nutrition Directorate-General International Cooperation and Development, European Commission.

Lambed Tatah, The Effect of Refugee Influx on Nutrition Security in the Hosting Community in Cameroon: A Difference-in-Differences Approach Maimouna Ilboudo, Women's behavior in the field of food security in the central south region: Bazega province.

15.30 – 16.30 Oral session 2 (Room 2).

Moderator: **Neil Hubbard,** Head of Unit, Food Security, Directorate-General Joint Research Centre, European Commission.
Daniel Bruce Sarpong, Affordability of Nutritious Diets in Africa: Monitoring and Analysis of Market Price Data in Ghana.
Singbo Alphonse, Improving Women Purchasing Power Through Land-Enhancing Technologies: The Case of Bio-Reclamation of Degraded Lands In Niger.

Olorunfemi Samuel O., Road Transportation Challenges to Food Security in Ikere Ekiti Local Government Area of Ekiti State, Nigeria.

16.30 - 17.00 Health break.
17.00 – 18.30 Plenary session 1a. Wrap-up/Day1

Alan de Brauw, Senior research fellow, Cluster Leader A4NH and PIM research programs of the CGIAR International Food Policy Research Institute.

18.30 – 21.30 Welcome reception and social dinner.

Thursday 16 November 2017, *Brussels, Thon Hôtel, rue de la Loi 75 - 1040 Brussels*

08.30 - 09.00 Early coffee.
09.00 - 10.00 Plenary session 2. Food & Nutrition Security Indicators/tools & new challenges.

Chair: **Arif Husain**, Chief Economist, Director of the Food Security Analysis, United Nations World Food Programme.
Keynote speaker: **Suneetha Kadiyala**, Associate Professor in Nutrition-Sensitive Development, London School of Hygiene and Tropical Medicine/LSHTM Methods and metrics in agriculture-nutrition research: Issues and Challenges.

10.00 - 10.30 Health break.
10.30 – 12.00 Oral session 3 (Room 1).

Moderator: **Arif Husain**, Chief Economist, Director of the Food Security Analysis, United Nations World Food Programme.
Estefania Custodio, Multilevel analysis applied to dietary diversity in Rwanda and Burundi
Laura Adubra, The 'Minimum Dietary Diversity for Women' (MDD-W) indicator is related to household food insecurity and farm.
Juan Feng, Malnutrition Gap as a New Measure of Child Malnutrition: A Global Application.

10.30 – 12.00 Oral session 4 (Room 2)

Moderator: **Tharcisse Nkunzimana**, Scientific officer, Food Security unit, Directorate-General Joint Research Centre, European Commission
Oleg Bilukha, Poor concordance between the estimates of wasting measured by weight for height and by mid-upper arm circumference
Mousumi Das, A new approach to measuring Indian Diet Diversity: Healthy Eating Index
Elliot Vhurumuku, Technical Guidance for the Joint Approach to Nutrition and Food Security Assessment (JANFSA).

12.00 - 13.00 Lunch.
13.00 – 14.00 Plenary session 3. New challenges/ Food & Nutrition Security: Resilience, Migration, Urbanization Climate change.

Chair: **Thierry Negre**, Team leader, Food Security, Directorate-General Joint Research Centre, European Commission.
Keynote speaker: **Alan de Brauw**, Senior research fellow, Cluster Leader A4NH and PIM research programs of the CGIAR International Food Policy Research Institute,
Migration, Agriculture, and Implications for Food and Nutrition Security.

14.00 – 15.30 Oral session 5 (Room 1).

Moderator: **Sergio Gomez Y Paloma**, Economics of Agriculture Unit, Directorate-General Joint Research Centre, European Commission.
Tharcisse Nkunzimana, A Multidimensional Food and Nutrition Security Measurement: Evidence from a Household Survey in Rwanda
Djeinam Toure, Towards a Compendium of Methods and Metrics to Measure the Market Level Food Environment: a Conceptual Framework.

14.00 – 15.30 Oral session 6 (Room 2).

Moderator: **Thierry Negre**, Food Security, Directorate-General Joint Research Centre, European Commission. **Etim Nsikak-Abasi**, Modelling the Impact of Urbanization on Households' Food and Nutrition Security Status in Niger. Delta Region of Nigeria. **Pascal Tillie**, Modelling the ex-ante policy impacts on Food and Nutrition Security indicators: the case of small irrigation programme in Niger. **Simon W. Mburu**, Unlocking the potential of agrobiodiversity conservation for food security and mitigating the effects of climate change.

15.30 - 15.45 Health break.
15.45 – 17.15 Oral session 7 (Room 1).

Moderator: **Thierry Negre**, Team leader, Food Security, Directorate-General Joint Research Centre, European Commission.
Kiross Tefera Abebe, Harmonized food security and nutrition assessment in emergency situation; a case of South Sudan.
Sebastien Mary, Does Agricultural And Food Aid Reduce Child Stunting?.

15.45 – 17.15 Oral session 8 (Room 2).

Moderator: **Sergio Gomez Y Paloma**, Economics of Agriculture Unit, Directorate-General Joint Research Centre, European Commission.
Ahmadou Ly, Households resilience to food insecurity in Senegal: Climate shocks vs Non-climate shocks effects.
Beatriz M. Hidalgo, Food Security and Income Shocks: The role of social conflict and ethnic cleavage in Africa.
Cornelia F.A., Mapping urban food security in West Africa.

17.15 - 17.30 Plenary session 3a. Wrap-up/Day2.

Tharcisse Nkunzimana, Scientific officer, Food Security unit, Directorate-General Joint Research Centre, European Commission.

08.30 - 09.00 Early coffee.
09.00 - 10.00 Plenary session 4. Data collection, new taught and tools: TIC and Remote Sensing.

Chair: **Alan de Brauw**, Senior research fellow, Cluster Leader A4NH and PIM research programs of the CGIAR International Food Policy Research Institute+.
Keynote speaker: **Luc D'Haese**, Extra Ordinary Professor University of Stellenbosch, South Africa, VECTOR FS.
Digitally enabled food security and livelihood research system.

10.00 - 10.30 Health break.
10.30 – 12.00 Oral session 9 (Room 1).

Moderator: **Suneetha Kadiyala**, Associate Professor in Nutrition-Sensitive Development, London School of Hygiene and Tropical Medicine/LSHTM. **Kusum Hachhethu**, Feasibility and Accuracy of using Innovative Mobile Methodology to collect Nutrition data remotely.
Sognigbe N'Danikou, Exploring linkages between livelihood assets and smallholders' food security in rural Mali, West Africa
Simon Renk, Can Social Network Analysis Inform African Development Policies? An Application To Food Security, Market Analysis And Gender.

10.30 – 12.00 Oral session 10 (Room 2).

Moderator: **Alan de Brauw**, Senior research fellow, Cluster Leader A4NH and PIM research programs of the CGIAR International Food Policy Research Institute+. **Jeremie Gross,** Buy As You Need: Nutrition and Food Storage Imperfections.
Mohammadou Nourou, Food System metrics off resilient nutrition security in Africa. **Vongai G.Murugani**, Identifying the essential components of a proposed food and nutrition security tool: Lessons learnt from existing metrics.

12.00 - 13.00 Lunch.
13.00 – 14.30 Oral session 11 (Room 1).

Moderator: **Suneetha Kadiyala**, Associate Professor in Nutrition-Sensitive Development, London School of Hygiene and Tropical Medicine/LSHTM.
Jackson Mackay: Utilizing GIS data to assess spatial determinants of dietary diversity: Evidence from Malawi during the El Nino Crisis
Michele Meroni, Remotely sensed information for food security early warning and project impact monitoring.
Zewdie A. Alemu, Spatial epidemiology of child undernutrition in Ethiopia: µevidences fromEDHS 2011 data using the application of Geographical Information System.

13.00 – 14.30 Oral session 12 (Room 2).

Moderator: **Luc D'Haese,** Extra Ordinary Professor University of Stellenbosch, South Africa, VECTOR FS.
Lucie G. Maina, Interactive Spatial Database for key Nutrition and Food Security Parts of Kenya
Ajala O.N, Enhancing Food Security Measurement through Improved Cassava Varieties, Resilient to Climate Change in Nigeria using GIS
Chen Yang, Ontology for food and nutrition: a solution for multiple level measurement, data integration and analysis.

14.30 - 15.30 Plenary session 4a. Wrap-up day 3 & Final Wrap-up days ½; 2; 3: Take home messages!.
Tharcisse Nkunzimana, Food Security, Directorate-General Joint Research Centre, European Commission. **Alan de Brauw,** Senior research fellow, Cluster Leader A4NH and PIM research programs of the CGIAR International Food Policy Research Institute+. **Thierry Negre**, Team leader, Food Security, Directorate-General Joint Research Centre, European Commission.

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