



JRC CONFERENCE AND WORKSHOP REPORTS

Quantitative Methods for Integrated Food and Nutrition Security Measurements

Lessons to be learned!

Nkunzimana, T., Rodríguez Baide, J.M., Custodio Cerezales, E., Rodríguez-Llanes, J.M., Meroni, M., Negre, T. and Gomez Y Paloma, S.

2018



This publication is a Conference and Workshop report by the Joint Research Centre (JRC), the European Commission's science and knowledge service. It aims to provide evidence-based scientific support to the European policymaking process. The scientific output expressed does not imply a policy position of the European Commission. Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use that might be made of this publication.

Contact information

Name: Tharcisse NKUNZIMANA
Address: Directorate for Sustainable Resources
Food Security – D5
Via E. Fermi, 2749 TP 272, Build. 27B/136
I-21027 Ispra (Va) Italy

Email: tharcisse.nkunzimana@ec.europa.eu
Tel.: (39) 0332 789893

JRC Science Hub

<https://ec.europa.eu/jrc>

JRC110327

PDF ISBN 978-92-79-77321-1

doi:10.2760/168627

Luxembourg: Publications Office of the European Union, 2018

© European Union, 2018

The reuse of the document is authorised, provided the source is acknowledged and the original meaning or message of the texts are not distorted. The European Commission shall not be held liable for any consequences stemming from the reuse.

How to cite this report: Nkunzimana, T., Rodríguez Baide, J.M., Custodio Cerezales, E., Rodríguez-Llanes, J.M., Meroni, M., Negre, T. and Gomez Y Paloma, S., Quantitative Methods for Integrated Food and Nutrition Security Measurements. *Lessons to be learned!*, doi:10.2760/168627

All images © European Union 2018.

CONTENTS

Foreword	1
Acknowledgements	2
Abstract	3
1 Introduction	4
2 Conference goal and objectives.....	6
2.1 Goal	6
2.2 Main Objective	6
2.2.1 Specific objectives.....	6
3 Highlighted themes	7
3.1 Nutrition Measurements	7
3.1.1 Outstanding challenges and research questions	7
3.1.2 Advancements	8
3.2 Food Security Measurements	9
3.2.1 Outstanding Challenges and research questions	9
3.2.2 Advancements	9
3.3 Joint Measurement of Food Security and Nutrition	11
3.3.1 Challenges	11
3.3.2 Advancements and new methods	11
3.4 Emerging topics	14
3.4.1 Migration and F&NS	14
3.4.2 Urbanization and F&NS	15
3.4.3 Development and F&NS	16
3.4.4 Conflicts and F&NS	16
3.4.5 Gender aspects on F&NS	17
3.4.6 Resilience and F&NS	17
3.4.7 Impact Assessments accounting for F&NS	18
3.4.8 New digital-Information technologies and F&NS	18
4. Conclusions	20
List of abbreviations.....	21
Annexes: Annex 1. Conference Program	22

Foreword

The conference on “Quantitative Methods for Integrated Food and Nutrition Security Measurements” conference was a joint initiative from the Food Security Unit of the Joint Research Centre (JRC) and the International Food Policy Research Institute (IFPRI). The JRC is a research institution of the European Commission and aims at advancing knowledge and science to inform EU policies. IFPRI is a research institution and member of the CGIAR international research consortium that aims at independent knowledge advancement in agriculture. IFPRI is also member of the Food Security Information Network (FSIN), a global initiative co-sponsored as well by FAO and WFP.

The event was financed with funds from the Directorate General for Development Cooperation, specifically its Unit C1 under the Administrative Arrangement with DG DEVCO on Technical and Scientific Support to Agricultural, Food and Nutrition Security sectors.

Funding was allocated to sponsor participants from developing countries (16 in total) with promising research studies within the theme of the conference. Thirty-three participants were invited and sponsored by the conference organizing committee. In addition, several institutions, research centres, Universities and international organizations contributed with their own participation costs.

Acknowledgements

We acknowledge the contributions of all the professionals and researchers from different universities, research centres and international organizations that responded to the conference call and enriched the program with their oral presentations and discussions.



Thanks to all contributors:
researchers, practitioners, and
professionals who enriched the
event

List of authors:

Tharcisse NKUNZIMANA

Joysee RODRIGUEZ-BAIDE

Estefania CUSTODIO

Jose Manuel RODRIGUEZ-LLANES

Michele MERONI

Thierry NEGRE

Sergio GOMEZ-Y-PALOMA

Abstract

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). It was a great opportunity to identify the main practical challenges, share innovative methods and modelling techniques, and explore 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.

1 Introduction

Food and nutrition security is the foundation of a decent life. However, both remain under stress in many parts of the world due to multiple factors, including erratic rainfall patterns, other forms of climate variability, land degradation, violence and conflict, natural disasters, diseases, price volatility and urbanization, among others.

As adopted by 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 four pillars of food security: availability, accessibility, utilization and stability.



After the World Food Summit, however, the term "nutrition security" became more prominent, in attempting to highlight the way food is actually used by the body, affecting health outcomes. As the broad definition of food security should embody key determinants of good nutrition, the term "food and nutrition security" (F&NS) has been used to combine the two concepts described above. Therefore, food security actions should ensure that food systems provide all households with stable access to sufficient, appropriate 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 adequate nutritional benefit from the food they consume (FSIN TWG, 2014).

In line with the definition above, academics, researchers and other professionals, such as development practitioners, have developed theoretical and empirical methodologies addressing individual, household, national and regional levels of vulnerability to food and nutrition insecurity. 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 evolved into an approach that is unanimously accepted. Consequently, since definitions are not even agreed upon, analysing F&NS is challenging and at least potentially contentious.

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 FAO (1996), plus nutrition outcomes in the same 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 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 combining the variables related to different pillars. Therefore, in some cases, conclusions and findings from research into F&NS may lead to misinterpretations, as one pillar may be considered to the expense of the others.

The 2015 joint report (FAO-IFAD-WFP, 2015) 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 had decreased from 23.3 percent in 1990–92 to 12.9 percent. Though there had been substantial progress, still almost 795 million people were undernourished globally in 2015.

However, the 2017 joint report (FAO-IFAD-WFP-UNICEF-WHO, 2017)¹ on the State of Food Insecurity in the World reported that the number of chronically undernourished people in the world was estimated to have increased to 815 million, up from 795 million in 2015 although still down from about 900 million in 2000.

After a prolonged decline, this recent increase could signal a reversal of trends. The food security situation has worsened in particular in parts of sub-Saharan Africa, South-Eastern Asia and Western Asia. However, the apparent halt to declining hunger numbers has not yet been reflected in the prevalence of stunting that fell from 29.5% to 22.9% between 2005 and 2016, although 155 million children under five years of age across the world still suffer from stunted growth.

Consequently, it is worth noticing 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 affecting large parts of the population.

Today, the evidence based and technical consensus approaches like the Integrated food security Phase Classification (IPC) and the Cadre Harmonise (a French acronym meaning the Harmonized Framework used in West Africa and the Sahel region) are well established to assess the situation of food insecurity in specific countries. In addition, the IPC recently included a tool to measure nutrition insecurity. Those specific tools inform decision makers to take timely decisions to respond to F&NS challenges. Although those methods are useful, they present some limitations due to the nature of the large set of data needed to inform many indicators with well-defined thresholds. On one hand, the final findings depend on the quality of data availability, as the principle behind those approaches is to use the data available on the ground. On the other hand, some components like assessing the livelihood changes and estimation of the population in different phases of food 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 methodological tools, especially of the quantitative type, are urgently needed. They can help to strengthen the qualitative tools (IPC and CH) from the components described above, and contribute to objectively assess and monitor timely the food and nutrition situation for policy support and decision-making.

¹ FAO, IFAD, UNICEF, WFP and WHO, 2017. The State of Food Security and Nutrition in the World 2017. Building resilience for peace and food security. Rome, FAO.

2 Conference goal and objectives

Jointly organized by the Joint Research Centre (JRC) and the International Food Policy Research Institute (IFPRI), the conference on "Quantitative Methods for Integrated Food and Nutrition Security Measurements" was an opportunity to discuss and explore innovative quantitative methods used in Food and Nutrition Security (F&NS) measurements. This international conference was organized under the framework of the Global Network on Food Crises initiated last year by different partners in the humanitarian and development domains and it was a great 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 levels regarding F&NS.

The International Conference on Quantitative Methods for Integrated Food and Nutrition Security Measurements pursued the following goal and objectives:

2.1 Goal

The conference aimed at providing an interdisciplinary forum for researchers, academics, practitioners and professionals to discuss the most recent methodologies for F&NS measurement, as well as trends, gaps in knowledge, limitations, and methods to overcome practical challenges in F&NS measurement.

2.2 Main Objective

The International Conference on Quantitative Methods for Integrated Food and Nutrition Security Measurements aimed to foster increased understanding of the key role that best practices related to assessment methodology should play in improving F&NS, especially in developing countries.

2.2.1 Specific objectives

The specific objectives of this conference were:

1. Highlight new quantitative methodologies and approaches that contribute to F&NS measurements;
2. Identify key challenges and bottlenecks to combining different variables related to the pillars of the F&NS concept in one model;
3. Explore innovative and transdisciplinary approaches and opportunities to increase recognition of the importance of combining variables from different fields of study, in order to improve F&NS measurement;
4. Share experiences in F&NS measurement using both spatial analysis and modern modelling techniques.

The International Conference on Quantitative Methods for Integrated Food and Nutrition Security Measurements brought large diversity topics of current interest to scientist in the field of F&NS measurement. In this section, the topics that are of focus of the conference are highlighted and organized in the themes of interest: Nutrition, Food Security and joint measurements; main advancements, and outstanding challenges and gaps mentioned during the presentations and discussions of the conference.

3 Highlighted themes

3.1 Nutrition Measurements

In the past decades, nutrition scientists and practitioners have managed to increase awareness of nutrition topics at policy levels and into research agendas. Currently, important advancements are made in the nutrition field and its links to food security, agriculture, and socioeconomic development. However, the long disciplinary divide that existed in nutrition and food security has not been easy to bridge and several long-standing challenges remain to be addressed to make findings and methodologies more integrated and applicable in order to advance the overall F&NS knowledge base.



Dr. Suneetha Kadiyala in her keynote highlighted current world's nutrition facts, advancements and gaps in nutrition research, while several presentations brought state of the art knowledge in nutrition measurements

At the same time, more pressure to advance in F&NS field comes from the urgency to address malnutrition trends. Several current trends were highlighted by keynote speakers and presenters in the conference, from which is important to highlight that:

- Nowadays, diet factors are the top risk factor for morbidity and mortality globally;
- Diets are changing but the current trends in diets modification are going towards unhealthy foods;
- Some progress has been achieved towards malnutrition reduction worldwide, but still there are 34 countries that concentrate most (90%) of the malnourish people.
- Socio-economic inequalities still play a major role in hindering progress in nutrition and the unequal distribution of wealth has widen making a large difference in malnutrition trends according to socioeconomic groups. It is important that development and economic policies attempting to tackle malnutrition have this into account.

3.1.1 Outstanding challenges and research questions

The measurement of nutrition outcomes remains controversial at some levels. While the use of height for age measure remains uncontested as a proxy for stunting, the anthropometric measures to diagnose acute malnutrition are still under discussion. The weight for height indicator has historically been the gold standard measurement for acute malnutrition, although the Mid-upper arm circumference (MUAC) measure has also been accepted for individual diagnosis or screening programs. In recent times, the MUAC measurement has been proposed as an estimate for acute malnutrition at population level, despite its limitation of not being adjusted not by age nor by sex. A work presented in this conference showed that MUAC could not be used as a population estimate for acute

malnutrition, as results are not consistent across populations. Further work is needed on these indicators before a definitive answer is provided to the scientific community and field practitioners.

In addition, 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 extent food environments are key to determine people's food security and even less about their influence on nutrition in developing countries.

On the other hand, nutrition research has not been closely linked to food security aspects as the two fields of inquiry often worked separately, particularly in developing countries context. Thus, little research exists to understand the seasonality of wasting and malnutrition trends in comparison or in relation with food security seasonality aspects.

Finally, while it is estimated that 2 billion people worldwide present micro-nutrient deficiencies, monitoring interventions and understanding causes is challenging as the issue of assessing micronutrients sufficiency at large scale in developing countries is an outstanding problem due to the lack of field friendly and practical methods or indicators of micronutrient biomarkers.

Because of these and other challenges in nutrition research, science in Nutrition field have not been able to demonstrate the impacts of agriculture interventions on malnutrition reduction. While development agendas have increased the demand for nutrition sensitive interventions and development goals are emphasizing advancement in reduction of malnutrition of any form, food security policies are still largely focused on agriculture and production outcomes. Without the link of impact of agriculture on nutritional status improvements, it remains difficult to continue advocating for increasing support to agriculture in developing countries.

3.1.2 Advancements

Some of the actions to advance in the integration of nutrition measurements in integrated F&NS analyses during the conference were:

- To focus on individual food consumption indicators, which can link the food security information related to food availability and access to the nutrition adequacy interpretation at the individual level, like the Minimum Dietary Diversity for children presented for Rwanda and Burundi or the Minimum Dietary Diversity for Women (MDD-W) presented for Mali during the workshop.
- To apply econometric techniques to the monitoring of nutrition indicators at national level (the "Stunting Gap" example). Discussions on this indicator posed the idea of going beyond monitoring, to the generation of information that can actually inform policy, such as combining the Food Poverty Index and the Stunting Gap indicator to assess the children falling under malnutrition and calculation the cost of the diet to avoid it.
- To include nutrition sensitive price monitoring schemes and develop new indicators based on those data. In this conference, the experience of Ghana was presented as one of the leading countries implementing this type of improvements to the price monitoring system, with some of the indicators developed being: The cost of Nutrient Adequacy (CoNA), Cost of a Recommended Diet (CoRD), Nutritious Food Price Index (NFPI), and Cost of a Diverse Diet (CoDD). The use of this type of data and indicators can inform decision making for fostering more nutritionally balanced food systems.

3.2 Food Security Measurements

The goal of the conference was to provide a platform for researchers, academics, professionals from all regions to present their advancements in innovative metrics for integrated FS&N. Consequently, some scientific papers and studies presented have shown advancements on the measurement of food security that move towards the goal of reaching more integration of various dimensions of food security.



Some presentations addressed advancements in new concepts, and applications for food security measurements that aim at integrating the various dimensions of food security and highlighted key gaps in food security research such as gender aspects, food security in urban areas, resilience, migration,

3.2.1 Outstanding Challenges and research questions

Keynote speakers emphasized the prevailing gender gap in F&NS researches. The gender aspect is still not well addressed, particularly in terms of intra-household food consumption patterns and nutrition outcomes. On this topic, a study entitled “Women’s behavior in the field of food insecurity in the central south region: Bezega province of Burkina Faso” was presented in this conference. This study found out that while women undertakes the load of domestic activities, they also employ several alternative livelihood activities for supplementing households food and also for supplying during scarcity periods; they often prioritize food allocation to male head of household, thus the study found significant differences in the patterns of intra household food allocation, particularly in protein rich foods. Study found that even during lean season the majority of available food goes to the male head of the family.

Similarly, another study presented investigated the relationship between indicators of women food security (Minimum Dietary Diversity for Women - MDD-W), farm production diversity score (FPDS) and household’s food security. The findings provided evidence that there is a relationship between women’s dietary diversity, household food security situation and farm production diversity. Independently of the “household’s food security situation” and wealth level, a large proportion of women (above 70%) are at risk of not reaching an acceptable MDD-W, particularly in households facing moderate and severe levels of hunger in which 80% or more don’t reach an acceptable MDD-W. In contrast, women living in households with greater farm production diversity were associated with higher odds of reaching acceptable MDD-W, particularly when farm production diversity score (FPDS) is above four and five. A high percentage of women (above 60%) still do not attain acceptable MDD-W.

3.2.2 Advancements

There have been some advancements in the development of frameworks for understanding the agricultural systems and their linkages to food systems, food security and nutrition. Some efforts in this direction, such as the ICRAF Climate-Agriculture-Nutrition Framework are already in place. However, these are still at early stages in becoming more

comprehensive framework, and more research and interdisciplinary work are needed for advancing in the development of a holistic framework.

A study from Burkina Faso, presented evidence on the importance of “gender” sensitive food security measurements, as women often are less food secure than the other members of households. Studies like this allowed providing recommendations of strategies at household level that could likely improve women food security.

Better conceptualization of “food environment” and great advancements in these topics are happening in recent years. However, most studies were conducted in high-income countries. Thus, in developing regions, a paucity of food environment measures exists and the methods and concepts so far developed do not apply well, as more complex value chains characterize them. The methods and techniques for measuring food environments were improved to conduct an evaluation of a development program: the “Market place for Nutritious Food” (MNF) in Kenya, Rwanda and Mozambique. This program provides support to small and medium enterprises to produce nutritious food, to improve availability and affordability of nutritious foods. Study found the proposed market food environment framework was effective at guiding data collection, but also identify remaining challenges: spatial and modeling approaches to measure food environments need more development, the fact that measuring impacts of interventions at market level requires longitudinal data and not only cross-sectional information is sufficient to estimate impacts. The study proposes several metrics for consumer, vendor, market and mapping and concludes that using these three levels measurements resulted in a very informative way of collecting data and offered opportunity to triangulate information.

A compendium of methods and metric to measure “market level food environment” was presented at the conference. This paper highlighted that “market level food environment” matters for nutrition, and may shape diets in the rural populations. The food environment is a new concept that aims to capture the links between different value chains as well as the desirability and convenience dimensions that are not captured in the value chains analysis.

Some proposals for improving “price monitoring” to enable food and nutrition market environment were highlighted:

- Methods for analyzing market prices;
- Going beyond market food environment (FE) and addressing the “personal” FE in research;
- Linkages between individual food security indicators, households food security and farming;
- The role and application of Bayesian models.

Despite progress observed in many countries, where agricultural technologies and access to them have been improving, still other basic technologies important for assuring the role of agriculture in food security are lagging behind. For example, lack of food storage still an important limiting factor for food security. A paper presented at the conference, assessed the impact of cereal banks on food security during a drought year in a region where seasonal hunger is of concern. Drawing data from 41 villages with no previous intervention history, a quasi-experimental design was implemented with pre and post evaluations and control groups. Findings suggest that the intervention (use of storage structures) decreased the price of cereals at village level. Study could not show that households consume more or better food, but showed better nutritional outcomes. These findings highlight the relevance of better food availability to improve food security. The study also found that remote areas are the ones that benefit the most from interventions such as cereal banks.

3.3 Joint Measurement of Food Security and Nutrition

3.3.1 Challenges

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



Current effort, projects and examples of joint measurements of F&NS were presented, highlighting the challenges and early advancements

Methods and Metrics for Agriculture and Nutrition Actions (IMMANA program). This program is led by London School of Hygiene & Tropical Medicine and aims to accelerate the development of a robust scientific evidence base needed to guide changes in global agriculture and food systems to feed the World's population in a way that is both healthy and sustainable.

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 showing this link is still challenging and research presented in the conference suggest that there are also inconsistent results. However, making the link of positive impacts of agriculture interventions on nutrition is a much more under research topic. One study presented at the conference highlighted this gap and showed initial results of agriculture and food aid influence on reduction of children stunting. This study look at agricultural and food aid statistics from 90 developing countries between 2002-2014, and their potential effects on general child stunting prevalence. Results show the relationship between increase agriculture aid and reduction on child stunting prevalence. Around 10% increase on agriculture aid is related to 0.5% decrease of stunting prevalence, while the same increase in food aid is linked to a reduction of 2.1% of stunting prevalence.

3.3.2 Advancements and new methods

One of the advancements in joint efforts of assessments that integrate food and nutrition security is the Joint Approach in Nutrition and Food Security Assessment (JANFSA), an initiative between two major humanitarian agencies WFP and UNICEF that is a first step in the efforts to pilot a guidance for joint assessment. After several years of work, a basic and practical guidance from current practice in both fields (FS&N) is put together into a manual for practitioners that can guide the preparation of joint assessments. Addressing research aspects from a practical perspective, this document includes key aspects of the process from sampling design, data collection preparation, choice of indicators, practical aspects of implementation, database organization, data analysis, results presentation and dissemination.

During the conference, the discussions highlighted the need to avoid being too prescriptive regarding what analysis are relevant when analysing data and to encourage researchers joint creativity and interdisciplinary thinking in this largely unexplored aspect. The idea of offering over simplistic presentation of results for policy makers is a widespread idea but the F&NS field have to be very careful on the transmission of misleading messages that can be assumed from such presentations by layout stakeholders.

The concept of food poverty was brought up by various presenters as a new way of looking at the linkage between food security and nutrition.

In relation to that one index that takes into account how typical diets meet or fail to meet nutritional requirements was presented and proposed as an indicator that can serve to monitor and evaluate how healthy are local diets and as a measure of food poverty that focus on quality. The Healthy Food Diversity Index for India was proposed, to aid identifying the cut-off points of a healthy diet in specific context, examine how typical diet of certain "groups" meets or not the requirements for each food group with regards of a healthy diet standards. Researchers used the example of Indian diets to illustrate how the index can better reflect food poverty line as compared to other food security indicators based on caloric requirements goals. Findings suggested that Indian diets are exceeding the caloric intake and reflects on the connection with the country's food security policy that focuses on subsidizing cereals for achieving food security based on caloric requirements, thus promoting increase in caloric intake. Thus, the index can allow working in urban context on diet evaluation. It can also be used to re-estimate the food poverty line; and finally it can reflect how food poverty is higher than when estimation is based on calorie-based indicators.

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.

Besides new indicators or methods and technologies, some of the advancements in F&NS are the combination of methods effective at distinct levels of analysis. As the study of nutrition and food security can involve metrics and measurements at distinct levels of analysis (individual, households, regional, national) combining methods from these levels is another way to conduct joint assessments. A study presented in this direction as a Multi-level analysis from Rwanda and Ethiopia were presented as own ways of conducting joint F&NS assessments. Application of multilevel analysis methods for identification of spatial patterns of diet diversity and nutrition were presented.

A study from two African countries showed that an important part of the variation in the children's diet in Rwanda and Burundi is determined by the residential community. Similarly, a study from Ethiopia showed how multi-level analysis could be used for combined assessments. An application "A Multidimensional Food and Nutrition Security Measurement" from Rwanda, highlighting that the use of this methodologies as an effective ways of combining F&NS information. The added value of this kind of methodology is that you come up with some hidden population in severe condition in need for assistance.

A case from of South Sudan showed that integrating nutrition and food security measurements broadens the picture and saves costs but quality checks for the food security indicators are needed (the same way that they exist for the nutrition indicators).

Key lessons learnt with recent joint F&NS analysis were highlighted during the conference. There is relatively less quality checks for food security measurements in comparison with nutrition data and metrics. This is an important barrier to effective joint assessments as

the results discrepancies and disagreements between food security and nutrition indicators are then not well understood and eliminating methodological problems and shortcomings of indicators is imperative before attempting to interpret results from Food Security and Nutrition joint assessments.

There is a great need to use well developed and validated indicators for both Food Security (FS) and Nutrition (N), an imperative step for advancing in the joint assessments. There are many methods and indicators available for both FS and N but many of them have limited testing and validation conducted before they are widely used. This is a barrier that has to be overcome and taken into account when planning joint assessments. The strengths, weaknesses and limitations of each indicator have to be well studied and known for selecting the best option or proposing improvements to current indicators.

The need for conducting more comprehensive data collection that can allow for different types of analysis to make joint assessments. Partnerships between governments and development or humanitarian agencies is essential to advance in this regard, so that shared databases can be constructed with capacity of data aggregation and disaggregation to any level of analysis.

There is a great need for the generation of clear guidelines for compatible sampling methods, data analysis and results reporting as key components that could advance joint assessments.

As the ultimate goal of advancing scientific knowledge in F&SN should be for supporting intervention and monitoring activities, the development of tools that can be used for both targeting and monitoring would be ideal when developing joint measurements.

The most advancements in F&NS currently come from developed countries and there is great need for more cross-cultural application or advancing in methods that can be widely applied.

Some of the work presented in this conference shows that in FS research, there is a need to move away from the calorie measures and focusing more on the nutrient density of consumed foods, which is key for allowing assessments that are more integrated.

3.4 Emerging topics



Several topics that have gained focus in the fields of F&NS were highlighted by keynote speakers and presentations: migration, urbanization, gender, conflicts, impacts assessments, resilience and new digital technologies in the fields of F&NS

Due to the wide variety of participants, several emerging topics were highlighted during presentations and keynotes. Many of these have been subject of research in other fields of inquiry, but their importance and recognition as topics that are having more attention from F&SN researchers and practitioners was evident during the conference as many debates were raised around these topics including their relevance to FSN field.

3.4.1 Migration and F&NS

Highlights

- Great data gaps for studies addressing effects on FNS
- Challenging research due to long causal chain of effects
- Uncertainty about pattern and causal factors
- African countries experiencing migrations conducting research

Due to the recent high migration from many developing countries, this one topic has emerged with great importance for F&NS. In fact, migration has several implications for food and nutrition security of the populations affected and the hosted areas.

Through the presentations and discussions on the topic in the conference, several issues were highlighted about conducting research on migration and its links to F&NS. Some of the challenges cited were:

- *Scarcity of data*: there is scarce data on migration in general, coming either from research studies or from population census. Migration census are not accurate in terms of migrant's place of origin, activity at place of origin, etc. Furthermore, as this is a recently an emerged topic in F&SN, in general there is lack of migration data linked to F& SN eligible to conduct research on potential linkages between the two dimensions.
- The *long causal chain of migration* makes it especially challenging to assess the association with F&SN through research. Effect of remittances on food security and nutrition and in agriculture in general are worth studied.
- *Lack of understanding of the migration patterns* and their *causal factors* is an important limitation to understand the links with F&SN. Without sufficient understanding on the patterns of migration and their causes, the implementation

of policy interventions that alter regular patterns of migration can actually harm people's capacity to address shocks, as migration is often identified as a risk management strategy.

- Need of clarity on the *differences between seasonal versus permanent-long term migration*. In a review on the topic by IFPRI, they looked at all kinds of migration but better distinction of these migration types could yield some additional insights.


Despite challenges in some areas in the world, like West Africa, the issue is being explored, suggesting that migration may have a negative impact on agriculture, as most migrants are the young, leaving farming to elders and children.

Overall, national level data also show that there is a clear economic incentive for migration, as the agriculture vs non-agriculture productivity gap is high, meaning that salaries in urban areas can be up to three times higher than agricultural salaries.

However, even if macro-level economic incentive for migration exists, should policies encourage people to leave rural areas? Many pros and cons can be argued against such conclusion: loss of rural labour and its effects on farming, the possibilities of getting extra income from remittances, labour patterns changes at household levels can lead to shifting crops, more investments in durable housing and improving leaving conditions. Research on these topics is urgently needed.

3.4.2 Urbanization and F&NS

Highlights



- Urban areas increasingly affected by stunting and overweight
- Methods for large scale assessment of nutrition in urban population were presented

Global trends of nutrition indicators in rural and urban populations showed the known disparity with rural areas presenting higher stunting prevalence as compared to urban ones in most developing countries, although it was also shown that a new trend is evolving to see increasing stunting prevalence (above 20%) in many urban areas of the developing world. In addition, the increasing trends in overweight and obesity concentrate in the urban areas, making the double burden challenge more specific to urban areas.

A study presented in the conference highlighted the need to stratify urban populations by subgroupings according to community endowment conditions. They had gathered data from 2,000 urban areas in Africa, and had developed a novel method for filtering populations belonging to three groupings: slums, severe slums and non-slum. They concluded that urban slums need urgent attention in terms of F&SN as the levels of undernutrition are close to those found in rural areas while overweight and obesity were also at alarming levels on those populations.

These findings also highlight the fact that the indicators and methods for studying malnutrition in urban areas have also to be adapted as different manifestations of malnutrition are expected in urban areas.

The impacts of urbanization on food security were also discussed with the presentation of a study on household food security in the Delta Region of Nigeria, which showed that urbanization has a negative effect on food security and highlighted some of the factors

influencing food security in urban areas: education, distance to market, income, and credit access.

3.4.3 Development and F&NS

The topic of development and food security has been subject of debate and research for many years. Current trends on this topic were presented at the conference, such as: the labour share of agriculture being low in countries with high GDP and declining in developing countries that is more labour is moving out of agriculture in these countries, while slight economic (GDP) growth is observed.

On the other hand, in relation to nutrition outcomes, current evidence shows that there is correlation between economic growth and the reduction of stunting, but it also a that economic growth is associated with increases in overweight in a faster rate than the reduction of stunting.

As mentioned earlier, the large socioeconomic inequalities are persistent and increasing in developing countries. The FS&N indicators show that although nutritional problems are mainly found in the lowest wealth quintile of the populations, in developing countries they can also be found in the highest wealth quartiles.

The relationship between roads and transportation aspects in food systems were also topics presented at the conference with a specific case from Nigeria.

3.4.4 Conflicts and F&NS

Recent trends in protracted and numerous armed conflicts occurring in the world have led to considerable food and nutrition crisis as it has been stated in the two recent Global Food Crisis reports. In this conference, couple of studies have represented the topic of conflicts and food security. One study that looked at relationship between food insecurity and income shocks and conflict, assessing several potential causes, concluded that the impacts of droughts is evident on the excluded groups (in heterogeneous societies like most African countries). In addition, the study found that commodity price shocks are always closely linked to social unrest and conflict areas, in particular where ethnic fragmentation is high and its impacts are quantitatively large.

Another study on Cameroon presented the effects of internally displaced populations (IDPs) on local food and nutrition security. Although evidence presented in this topic was still preliminary, it is clear that research in the aspects of conflict and FNS are an imperative as to contribute to better response to conflict situations.

3.4.5 Gender aspects on F&NS



Highlights

- Increasingly recognition of women key role in FNS
- Methods for gender sensitive food security assessments are greatly lacking
- MDDW as a recently developed indicators addressing women's nutrition

Despite the recognition that considering gender aspects in F&NS research is extremely important, methodologies for gender sensitive F&NS research are scant. Thus, there is great need to develop methodologies for more gender sensitive studies in F&NS.

With the increased focus on nutrition and the long-standing recognition that women's role on household's food security makes them key to the assurance of nutrition of households members it is imperative to foster the advancement of scientific research in this aspect of F&NS.

In this conference, a study on Burkina-Faso emphasized the key and determinant role of women in the nutritional status of the family, and in particular during food security crisis when women search for possible coping strategies to help households overcome food insecurity periods. With so many ongoing food crises in the world, this suggest there is a greater need now than ever before to give more importance to gender issues in the long run fight against food insecurity.

A study conducted in Mali showed the relevance of measuring the adequacy of women's diets with the new indicator on Minimum Dietary Diversity for Women, to monitor and evaluate nutrition-sensitive agriculture interventions.

3.4.6 Resilience and F&NS

In spite of the recent advancements achieved with the application of the "resilience" concept into other scientific fields, in food security the concept has still many conceptual challenges hindering its measurement. In this conference, some presentations in this topic highlighted such gaps; in particular, the construct of resilience capacity of food systems was seen as not yet properly defined and lacking proper metrics and indicators.

A study presented from Kenya used Household Hunger Score indicator to assess food security impacts of the biodiversity at farm level, finding that crop diversity was associated to lower levels of food insecurity, and that increased crop diversity allowed for withstanding climate variations. The conclusion was the need for countries to guide the monitoring of agrobiodiversity, as a process of climate change adaptation.

Another study from Senegal assessed the resilience aspect of the food system to climate shocks such as declining rainfall, high temperatures, and poor temporal distribution of precipitation. This study used Food Expenditure Ratio indicator, and Food Consumption Score as food security measurements against many socio-economic factors that can be taken as determinants of resilience. The results showed that in Senegal access to basic services is a key for households' food security resilience. In addition, the study found that the "resilience capacity index" showed significance for climate shocks and not for other shocks like death in the household, job loss, main production tool loss and decreases in income.

However, one of the largest challenges in resilience research in social systems is the measurement of adaptive capacity as resilience construct. In the Senegal study proxies of

the adaptive capacity used were dependency ratio, welfare perception, household head education level, adaptation strategies index, community priorities. This selection of proxies included are limiting in the study's ability to capture "adaptive capacity" construct

Discussions in the conference highlighted the fact that many limitations still prevail in resilience studies, one of which is the lack of longitudinal data that would be needed to demonstrate how systems are changing in their state when a shock occurs. Most of the existing studies in resilience of social systems use only cross sectional data to understand the fluctuation in the state of the system, which hinders the interpretation.

3.4.7 Impact Assessments accounting for F&NS

Progress achieved by the Global Panel for Agriculture and Food Systems for Nutrition was also presented. Now agriculture is seen as fundamental to structural transformation of economies and to poverty reduction. However, the pathways to improved nutrition are diverse and interconnected. In addition, gender aspects and women role in agriculture have been highlighted as essential.

Nutrition-sensitive agriculture projects and the methods have also been the focus of research studies in F&NS presented at the conference. This is a case of the utilization of micro-economic modelling optimization techniques to assess the potential impacts of agricultural technologies on food and nutrition security at the household level. In addition, the use of the minimum dietary diversity for women indicator (MDD-W) as a nutrition proxy to assess the impact of farm production diversity has been presented. This last indicator is suggested as an indicator for monitoring nutrition sensitive interventions in agriculture.

On the other hand, agriculture and food systems sustainability under multiple stressors are also a focus of current research as several interrelated challenges are having concomitant effects in F&NS in many areas of the world. A keynote speaker highlighted the fact that rapid changes are affecting the underlying and basic determinants of nutritional status (food security-agriculture and food systems, feeding and care practices health services access and hygienic environment). These rapid changes include climate change-environmental fragility, conflict and migration, rapid urbanization and rural transformation, changing food systems governance, production and distribution.

One study presented at the conference tackle the question of impacts of farm agrobiodiversity on food security in rural households in selected sites of Eastern Kenya representatives of lower midland zones and upper midland zones. Results showed that high crop richness, diversity was predominant in the lower midland zone, and this was a determinant factor in preventing food insecurity related to climate change. Diversification of farming through livestock and indigenous crops can improve diets and income to smallholder households.

3.4.8 New digital-Information technologies and F&NS

Mobile phone technology as a data collection tool is one of the cutting-edge methods currently under testing and development by agencies like WFP. They tested its reliability using test/retest design and comparing phone interviews on food consumption with face-to-face surveys, finding somehow contrasting results for different variables being scrutinized.

Improvements of data collection and organization for food security datasets was presented by the project 'Ontology for food security and nutrition dataset's which has elaborated a prototype for food security datasets organization, naming conventions and centralized storage, in order to facilitate analysis, timing and reutilization of the data.

As examples of the use of remote sensing technologies, the ASAP early warning decision support system developed by JRC, which can support FS analysis, was shown. Remote sensing was also shown to be useful in scrutinizing the biophysical success of restoration interventions, a fundamental information to evaluate the impact on FS of such type of rural interventions. In addition, the use of GIS technologies in relation to malnutrition assessment was presented with a study mapping malnourished children with GIS in Ethiopia.

4. Conclusions

Some progress in the development of food and nutrition security metrics has been achieved in recent years. Large humanitarian agencies are investing resources into this route and generating new technologies and methods for assessing jointly food security and nutrition. Although these efforts are still at a preliminary stage, they offer some basic principles and a point of departure to continue in the advancement of F&NS measurement and assessment.

New promising technologies for large-scale assessments are starting to appear such as mobile-phone-based surveys and remote sensing with high resolution imagery.

The need to conduct more joint work between the two fields FS and N, has brought about the identification of several remaining challenges in both fields, which have to be addressed before any advancement in joint measurement can occur.

Some of the most salient topics that have emerged in recent years in the field of FNS are: migration and its linkage to F&NS, gender aspects of F&NS, urbanization and the challenges of assessing F&NS in urban areas, conflicts and their interlink with natural hazards when looking at F&NS.

List of abbreviations

ASAP	Anomaly hot Spots of Agricultural Production
CH	Harmonised Framework (<i>French acronym: Cadre Harmonise</i>)
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

Annexes: Annex 1. Conference Program

"Quantitative Methods for Integrated Food and Nutrition Security Measurements – Lessons to be learned!"

Brussels, Belgium, November 15 – 17, 2017. Draft Agenda/Program Overview (Thon Hotel,
Rue de la Loi, 75. 1040 Brussels)

Wednesday, 15 Nov. 2017	
13:00-14:00	Registration
14:00-15:15	<p>Plenary session 1. Food and Nutrition Security Measurements: Methods & Tools Chair: Neil HUBBARD (JRC)</p> <p>Introductory remarks: Thierry NEGRE (JRC) <i>Key Note Speaker1.</i> Improve F&NS measurements for better decision making, by Leonard MIZZI (DG DEVCO) <i>Key Note Speaker2.</i> Policy support and F&NS measurements. A field experience, by Arif HUSAIN (WFP) Conference background and organization: Tharcisse NKUNZIMANA (JRC), Alan de BRAUW (IFPRI)</p>
15:15-15:30	Health break
15:30-16:30	<p>Oral session 1 (Room 1) Moderator: Leonard MIZZI (DEVCO)</p>
LAMBED TATAH	The Effect of Refugee Influx on Nutrition Security in the Hosting Community in Cameroon: A Difference-in-Differences Approach
ILBOUDO MAIMOUNA	Women's behavior in the field of food security in the central south region: Bazega province/Burkina Faso
15:30-16:30	<p>Oral session 2 (Room 2) Moderator: Neil HUBBARD (JRC)</p>
DANIEL B. 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	<p>Plenary session 1a. Wrap-up/Day1 Alan DE BRAUW (IFPRI)</p>
18:30-21:30	Welcome reception
Thursday, 16 Nov. 2017	
08:30-09:00	Early coffee
09:00-10:00	<p>Plenary session 2. Food & Nutrition Security Indicators/tools & new challenges Chair: Arif HUSAIN (WFP)</p> <p><i>Keynote Speaker2.</i> Methods and metrics in agriculture-nutrition research: Issues and Challenges by <i>Prof. Suneetha Kadiyala, Prof. LSHTM</i></p>
10:00-10:30	Health break
10:30-12:00	<p>Oral session 3 (Room 1) Moderator: Arif HUSAIN (WFP)</p>
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 (JRC)
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 (JRC) <i>Keynote Speaker3 Migration, Agriculture, and Implications for Food and Nutrition Security by Alan De Brauw, IFPRI</i>
14:00-15:30	Oral session 5 (Room 1) Moderator: Sergio G. Y Paloma (JRC)
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 (JRC)
NSIKAK-ABASI A. ETIM	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 (JRC)
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 G. Y Paloma (JRC)
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 (JRC)

Friday, 17 Nov. 2017	
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 (IFPRI) <i>Keynote Speaker4. Digitally enabled food security and livelihood research system by Prof. Luc D'HAESE University of Stellenbosch, VECTOR FS)</i>
10-10:30	Health break
10:30-12:00	Oral session 9 (Room 1) Moderator: Suneetha KADIYALA (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 (IFPRI)
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 (LSHTM)
JACKSON MACKAY	Utilizing GIS data to assess spatial determinants of dietary diversity: Evidence from Malawi during the El Niño 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: Evidences from EDHS 2011 data using the application of Geographical Information System
13:00-14:30	Oral session 12 (Room 2) Moderator: Luc D'HAESE (University of Stellenbosch, VECTOR FS)
LUCIE MAINA G.	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 (JRC), Alan de BRAUW (IFPRI) and Thierry NEGRE (JRC)

Europe Direct is a service to help you find answers to your questions about the European Union
Free phone number (*): 00 800 6 7 8 9 10 11
(*) Certain mobile telephone operators do not allow access to 00 800 numbers or these calls may be billed.

A great deal of additional information on the European Union is available on the Internet.
It can be accessed through the Europa server <http://europa.eu>

How to obtain EU publications

Our publications are available from EU Bookshop (<http://bookshop.europa.eu>),
where you can place an order with the sales agent of your choice.

The Publications Office has a worldwide network of sales agents.
You can obtain their contact details by sending a fax to (352) 29 29-42758.

JRC Mission

As the science and knowledge service of the European Commission, the Joint Research Centre's mission is to support EU policies with independent evidence throughout the whole policy cycle.



EU Science Hub

ec.europa.eu/jrc



@EU_ScienceHub



EU Science Hub - Joint Research Centre



Joint Research Centre



EU Science Hub

