

The logo features a large, stylized circular graphic composed of several concentric, overlapping bands in shades of magenta and grey. The text is centered within this graphic.

world
FOOD
RESEARCH &
INNOVATION
forum

Position Paper



world **FOOD**
RESEARCH &
INNOVATION forum

POSITION PAPER DEVELOPED BY THE WORLD FOOD RESEARCH AND INNOVATION FORUM CONSULTATION BOARD

Global Research and Innovation
Agenda for Food Security, Sustainability and Safety
May, 2016

Coordinated by
Professor Fabio Fava and Professor Samuel B. Godefroy

This position paper includes the contributions of those scientists and experts who have joined the 2014-2015 Forum's roadmap and the first World Food Research and Innovation Forum in EXPO Milano 2015. It represents one of the outcomes of the first Forum's edition.

The document has been developed through a global multi-stakeholder approach, with the involvement of representatives of institutions, the science and business community and experts in food and nutrition related issues but also in collaboration with regulators, decision-makers and key-players in the field, coming from different countries and international agencies.

ACKNOWLEDGEMENTS

Thank to the **Steering Committee** of the World Food Research and Innovation Forum who provided insight and expertise for the development of this document.

Thank to keynote speakers, panelists and experts of the World Food Research and Innovation Forum that took place in Expo Milano 2015 for their participation and contributions. Thank to the **International Experts** who took part in the two meetings held on 25-26 March 2015 in Brussels for sharing suggestions and comments that greatly improved the paper. Thank for all the valuable and constructive comments received from the experts of the Climate Change Program Office of the U.S. Department of Agriculture; the Climate KIC; the World Health Organization - WHO and the Federal Institute of Industrial Research - FIRO for sharing their knowledge and providing their contributions. This discussion paper and information about the Steering Committee and the International Experts are available at the World Food Research and Innovation Forum website: www.worldfoodforum.eu

EXECUTIVE SUMMARY

The world's population has increased by almost two billion individuals during the quarter of a century since the first **Rio Conference on Sustainable Development** and is projected to reach over 9 billion people by the year 2050. Today, almost three billion of the world's population live in relative or absolute poverty and suffer from chronic hunger or inadequate nutrition, primarily due to poor diets and lack of access to food. **Food safety** challenges contribute to potential losses in food production and to the burden of disease of the World's population. Conversely, more than two billion people are overweight or obese as a consequence of food over-consumption. The complexity and the inter-relationships of the issues discussed at the first and subsequent Rio Conferences become even more dramatic when placed in the context of a world that, by 2050, will require remarkable increases in food production compared to 2005. **Urgent measures are also required to ensure a drastic reduction in the huge losses and waste of food**, and the sustainable management of agricultural resources including livestock resources, combined with sustainable aquaculture and fisheries.

A number of tailored Research and Innovation (R&I) solutions enable to address such issues, by improving agricultural (incl. livestock) and fisheries' and aquaculture productivity, by reducing the negative environmental impacts of production, by introducing new processing and improved process efficiency and logistics, by reducing waste at all stages in the food production chain and by helping citizens of all countries eat more healthily.

Globalisation has led to increased consumer choice and higher expectations in much of the industrialised world. This was accompanied by contrast with the shrinking of agricultural biodiversity and the emergence and prominence of unhealthy diets. Governments and consumers alike **are also becoming increasingly aware of real and perceived food safety risks**, which impact the availability of the food supply and contribute to acute and chronic human illness.

The World Food Research and Innovation Forum aims to address these multifaceted challenges through the momentum launched by **World Expo Milano 2015 "Feeding the Planet Energy for Life"**. The Forum brings together a broad spectrum of institutional, research, industry and civil society stakeholders with the aim to work collaboratively towards the common goals of sustainable food and nutrition security and safety to feed the planet and simultaneously preserve and restore biodiversity, while giving particular attention to the water food energy nexus. It also aims to create a space for collaboration amongst partners and stakeholders on major R&I needs and opportunities; thus to encourage policy makers to act and to provide compelling business model alternatives for the food and agribusiness intermediaries between the 500 million farmers and the 7 billion consumers of the planet.

Industrialised farming accounts for 30% of output but consumes 70% of the total resources used for the sector. Conversely, small-scale farming accounts for 70% of the output and uses 30% of the resources; it is also the major provider of food in developing countries. Thus, achieving **food security and improved nutrition and promoting sustainable agriculture** is essential for mitigating poverty and reducing critical diseases such as HIV/AIDS and other infectious and chronic conditions. Achieving such a goal is also essential to improving gender equality and access to education for all.

Through its actions, the World Food Research and Innovation Forum aims to be a lasting initiative for dialogue amongst partners and stakeholders to promote the principle of mainstreaming food and nutrition security as well as food safety, into development of policies in an integrated fashion within global and regional development and cooperation approaches.

INTRODUCTION

Feeding the world is a big challenge that entangles all sorts of questions and challenges ranging from how to intensify production in a sustainable way,

how to safeguard food safety and to maintain a suitable diet for people in different parts of the world. All these issues being intertwined makes such a challenge ever more complex.

Three billion of the world's population live in relative or absolute poverty and suffer from chronic hunger or inadequate nutrition primarily due to lack of access to food and poor dietary diversity. Conversely, more than two billion people are overweight or obese as a consequence of food over-consumption. Increased competition for land, water and other natural resources are impacting on biodiversity, contributing to climate change, which in turn threatens agro-food production in many areas.

This situation is further exacerbated by the **exponential growth** in the world's population which is projected to reach over 9 billion by the year 2050; a scenario that will require a 60% increase in food availability relative to 2005 (FAO & UN World Food Programme, 2012). **Urgent measures are also required to ensure a drastic reduction in the huge losses and waste of food**, and the sustainable management of our natural agricultural resources combined with sustainable livestock, aquaculture and fisheries.

Similarly, access to safe food is another necessity. Food safety is in fact a condition for food availability and therefore for food security. Foodborne illnesses impact both health and the economy, in developed and developing nations alike. A number of trends contribute to the complexity of food systems and influence food safety and security. These trends may be inter-dependent. For example, the increase in the globe's population continues to drive food security imperatives and the need for a more efficient, productive and sustainable food sector, which in turn can lead to new food safety hazards: increasing the production of animal-derived proteins through higher livestock production may result in enhanced environmental repercussions and added entry points for pathogens into the food supply. Similarly, when food safety hazards are not addressed, they can contribute to possible food wastage and therefore add to food scarcity. Lack of adequate infrastructure

often results in wasted crops, thereby reducing the potential of supplementary income generation by subsistence farmersⁱ.

In the poorer regions of the world, **food security is often dependent upon women's subsistence production**. Rural women are responsible for half of the world's food production and in developing countries, 60-80% of non-cash crop food production is produced by women. Despite this, women and girls represent 60% of those classified as undernourishedⁱⁱ and own less than 2% of the world's landⁱⁱⁱ.

Limited access to food and inadequate nutrition undermine efforts to assist people with HIV/AIDS, malaria and other diseases. Poor levels of nutrition combined with inadequate environmental hygiene cause, amongst others, stunting in children and morbidity and mortality due to critical diseases. These conditions have inherent economical impacts as people will have no/less capacity to live, work and produce thereby amplifying inequality.

Food insecurity and poor nutrition undermines the potential of countries realizing their *Demographic Dividend*^{iv}. Low levels of food security and under-nutrition result in internal and external migration and in the risks of increasing armed conflict^v.

UN Water notes that **agriculture is currently the largest user of water at the global level**, accounting for 70% of total withdrawal for food production. The food supply chain also accounts for about 30% of total global energy consumption. Intensive farming both in industrialised and emerging countries contributed to desertification. Consumers' interest (typically in industrialised countries) in exotic products or vegetables and fruit out of season has effectively resulted in "water being exported" from countries that are in some cases water stressed. In many cases, such intensive export-driven production denies access to adequate water for domestic small-scale producers and food gardens.

There is a need to develop low-cost and low-maintenance technologies for water harvesting and distribution and at the same time further develop

energy-generating systems that use sanitary waste and safe grey water systems for irrigation.

Food safety, food security and nutrition are not only problems for the world's poor. Globalization has driven the world to become increasingly inter-linked and inter-dependent. Industrialised countries increasingly import fresh and preserved food products from the poorer regions of the world that paradoxically live in conditions of inadequate food security, food safety and nutrition.

Consumer habits are an important factor impacting food security, safety and sustainability.

Not only do consumers need to be made aware of the need for healthy diets to combat non-communicable diseases and obesity, but also understand the impact of their habits of consuming out-of-season products imported from other areas of the world.

THE CONTRIBUTION OF RESEARCH AND INNOVATION (R&I)

The spectacular increase in crop productivity that has been achieved in the past century has largely come at the cost of high use of natural resources, their depletion and the increase of social and economic inequality. Factors such as climate change, degradation of ecosystems, invasive alien species, loss of genetic diversity, plant and animal diseases, shrinking of agricultural areas, loss of soil fertility, limited access to water and nutrients, natural disasters, population growth, and globally changing and unsustainable dietary patterns, all impact directly or indirectly on **food security, food safety and on the well-being of citizens.**

Research and Innovation (R&I) can contribute to addressing such challenges. However, there are no single or easy solutions to tackle food safety and sustainability as well as food and nutrition security fully. It is necessary to work along the whole value chain with R&I actions targeted to increase agricultural and fisheries' productivity and resource efficiency and to enhance sustainability while reducing environmental footprint, preventing

and mitigating food safety hazards and waste at all stages of the food production chain and providing a healthy diet. R&I can also help to resolve some of the inherent trade-offs (e.g. between intensive production of food and environmental protection) impacting on a societal choice by **providing knowledge and underpinning good policies.**

Enhancing food safety assurance **to protect and promote consumer confidence** has driven the research and innovation agenda by contributing to the development of a number of food safety interventions and process improvements, spanning from the development of chemicals added to food to support product preservation, to inhibit microbial growth or extend product shelf life.

However, some of these innovations have unforeseen consequences and can lead to the introduction of new risks.

In parallel, **some innovations driven by enhancing food safety have been impeded by a vacuum of regulatory oversight or lengthy reviews and approval processes, domestically and internationally.** Additionally, the absence of international guidance and harmonization of the level of oversight for innovative products and processes supporting enhanced food safety has led to trade barriers and can play a role in curbing trends of research, innovation and development in these areas.

The sustainable, safe and resource-efficient production, supply, logistics, infrastructure and consumption systems of food, feed and biobased products are R&I priorities which can provide **improved yields and better resilience to climate change** as well as to other threats in several countries. At the same time, citizens should be well informed and encouraged to choose healthier and more sustainable lifestyle and consumption patterns thereby improving their overall health.

More specifically, the expert consultations conducted to support the establishment of the World Food Research and Innovation Forum have

helped identify major R&I actions that need to be taken to achieve sustainable food security and safety. These initiatives should aim :

- **To improve primary production yields from the existing agricultural land area** (including livestock), fisheries and aquaculture whilst simultaneously reducing the environmental impact and increasing resilience to climate change. This could be achieved by adopting improved cultivars (e.g. via biotechnology), sustainable agricultural models and intensification practices (i.e. integrated crop-livestock and crop-livestock-forest systems), precision farming, geo-technologies and advanced mechanization. In addition, significant yields improvements can be made by increasing soil fertility via organic fertilizers, crop rotation, enhanced CO₂ fixation, etc.) and, the productivity and the protection from abiotic stress and pests of crops (particularly cereals that provide ca. 60% of the calories in our diet) can be improved via smart breeding and management. Optimizing collaboration between the agro-food chain and the bio-based industry (biorefining) would enable reduction of competition for land and natural resources by creating synergies among sectors. Livestock productivity can be improved via the efficient use of locally available feed resources, adequate management practices and breeding programmes for indigenous and upgraded animals, and diagnostic tools and prophylactic measures for the control and prevention of animal and zoonotic diseases.

- **To enhance the investment** in sustainable and environmentally sound aquaculture practices to promote the output of the fisheries sector. This should be accompanied by the strict observance of fisheries protection to enable species renewal and promotion. R&I is critical to providing the scientific underpinnings of these endeavours.

- **To develop agricultural landscapes** via integrated land-use planning decision-making systems and policy incentives that can support food as well as biofuel production, while sustaining resources of clean water and supporting livelihoods.

This will ensure that agriculture, rural and marginal land development, and wider eco-system service provision as well as nature & biodiversity on its own are boosted and maintained. Alternative sources of proteins (like insects) should be also identified, assessed and exploited. Urban farming concepts such as vertical farms and horticulture should be intensified and more widely exploited.

- **To minimise losses and wastage of food** throughout the entire supply chain by: longer-range weather forecasting for agricultural planning and demand forecasting, the adoption of cultivars with enhanced resistance to abiotic stresses and pests/diseases and smarter processing (based on advanced and non-thermal technologies), and smarter and more sustainable preservation processes, packaging and supply chain logistics. Focus should also be out on recycling of phosphate and nitrate, organic matter from effluents and exploitation of inherent by-products and expired food for the production of food ingredients and novel food products.

- **To improve food safety and quality** by:

- a. Reducing risks associated with chemical and microbial contamination of raw materials, products and ingredients also via the integration of Hazard Analysis and Critical Control Point (HACCP)-based practices and enhanced traceability systems in the overall production cycle;

- b. A more hygienic and optimised processing, advanced/smart packaging and more efficient and integrated food safety monitoring. The latter may also contribute in preventing food adulteration issues;

- c. Mitigating of the spread of antimicrobial resistance and managing emerging food safety hazards such as the allergenic potential of some food ingredients, foodborne viruses as well the occurrence of some known pathogens in new food vehicles;

- d. Adopting the «One Health» approach in preventing and mitigating emerging food-borne infectious diseases, by integrating animal and environmental health with food safety considerations.

e. Management of potential of food fraud across the entire supply chain through enhancing efforts of prevention and early detection.

- To improve **scientific knowledge, information and understanding** by all partners and stakeholders, including consumers, about traditional food and recipes in order to promote their safe/sustainable consumption.

- To introduce **improvements** in production technologies, packaging, supply chain efficiency and overall sustainability of the food production chain, also considering the key role of many of these products, often identified with Geographical Indication (GI), in providing safe and affordable food to local communities as well as products of great commercial value that can assure economic and social resilience for local production systems and communities.

- To improve **access to and stimulate consumption of healthy**, more nutritional and sustainable food and diet. The nutrient profile of foods and local habits of consumers as well as their taste and “gut feeling” are key elements in consumers’ decisions. A better knowledge of the relationship between diet and lifestyle are essential to promote culturally acceptable sustainable diets.

Other actions useful to promote sustainable food security and healthy and sustainable food consumption could also aim:

- To improve/standardise the definition of **“healthy”** and **“sustainable food”** and develop simple, cheap and common tools for measuring them.

- To improve **regulations and industrial protocols** for the integrated valorisation of food by-products and waste in the context of the food industry.

- To develop **legislative and regulatory levers** permitting the industrialisation of novel processes and technologies developed.

- To enhance the **development** of food safety culture amongst food safety operators.

- To promote systematic **ethical reflection** of the consequences and promises of different technologies, policies and potential solutions to support decision-making and strengthen research focus and local implementation through bi-lateral and multilateral R&I collaboration.

- To improve the **communication** and awareness among the wider public (public opinion/engagement) as well as training, capacity building, and education.

- To integrate **risk-benefit** assessment and analysis of food and nutrition in order to support well-informed choices and policy decisions.

- To **educate consumers** (and journalists, policy makers alike) about the real risks associated with food (wrong dietary habits, microbiological food safety) versus perceived but well-managed and non-real food safety issues (safe use of additives, development of approved GMO, etc).

FOOD SECURITY AND NUTRITION IN DEVELOPING COUNTRIES: MATCHING INDIGENOUS PRACTICES AND TRADITIONAL FOOD WITH INNOVATION

Several of the R&I priorities mentioned above are suitable for promoting food security and safety in several of the emerging/developing Countries but they should be specifically tailored for the specific local needs, based on the local socio-economical, environmental and climate conditions. Agriculture is the core sector, but the focus should be on the entire food chain.

The adoption of high-yielding cultivars, the sharing and optimisation of existing local technologies/scientific and technological background as well as conservative practices, including no-till, biological nitrogen fixation, integrated crop-livestock and crop-livestock-forest systems, would contribute to increasing local production yields, conservation and food security. Insects, which form part of the

traditional diet in many countries, can be a potential source for future nutritional purposes.

Sustainable preservation processes tailored for the local environmental conditions should be developed. In addition, the adoption of cultivars that show resistance to the attack of the pests/diseases would remarkably contribute to the reduction of the large portion of the lost/wasted food.

However, the sustainable food security in developing countries requires the access of small-scale food producers, indigenous people, family farmers, livestock farmers and fishermen to resources (i.e. knowledge, local investments and infrastructure, land, seeds, water, fertilizers, genetic resources, etc.) to generate both economic growth and equity. The distribution of the value-added should be implemented **through policy, social and communication actions based on science and R&I** outputs. Greater efforts should be made for the empowerment of women who do not have the same rights and opportunities in the access to such resources as well as to education and training, and social and health protection. This implies the development of specific programmes for the inclusion and valorisation of women and the change of legal and social norms in many developing countries. Efforts should be made for establishing seed banks of indigenous crops; then governments should be encouraged to share species and germplasm of varieties and between the private sector and the sources of exploited traits.

Tailored international R&I funding programmes/initiatives that promote **local knowledge transfer and cooperation between developed and developing countries** (e.g. Horizon2020, cooperation programs from UNEP, World Bank, FAO, WHO, Codex, etc.), can contribute to the development of site-specific local food security as well as employment and economic growth.

The establishment of local Clusters/Public Private Partnerships - foreign and local companies together and also between local universities/research centres, social entrepreneurs and SMEs is also warranted.

Shared-value business models nested with frugal innovation promote a local cluster approach also with respect to R&I and R&I spillovers. Targeting both sustainability and social inclusiveness, shared-value business model and frugal innovation represent a rising topic in multinational corporations, universities and in the policy agenda of governments of developing countries.

Existing observatories on food security and safety in developing countries should be exploited for the development of broader strategies for improving/managing food security at regional and sub-regional levels.

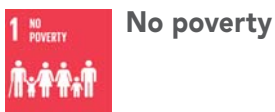
Finally, existing successful examples of cooperation with **developing countries** should be duplicated and used as models for further actions. Donor actions and local needs should therefore be better matched.

MAINSTREAMING FOOD SECURITY, FOOD SAFETY AND NUTRITION IN NATIONAL/REGIONAL POLICIES AND DEVELOPMENT COOPERATION

Given the critical global challenges, there is an urgent need to take **appropriate measures to mainstream food safety & security and nutrition into national and regional trading block policies** (e.g. EU, ALA, NAFTA, APEC, etc.). Moreover, these issues should be included in Economic Partnership Agreements/Trade Agreements, Country Strategy Documents and Poverty Reduction Strategy Plans. Mainstreaming of Food Safety & Security and Nutrition recognises priority consideration of these factors are critical to the achievement of many of the proposed post **2015 Sustainable Development Goals (SDGs)**; conversely, the successful implementation of other SDGs (in particular related to the water, energy climate change nexus) will impact upon food safety, security and nutrition. The mainstreaming will also contribute to the Rio+20 commitments to achieving a Green economy in the context of sustainable development and poverty eradication. The proposed mainstreaming should make adequate provisions for institutional development and capacity building;

acknowledgement of the important role of small-scale farming and food gardens in the food supply chain; the promotion of collaboration in the broad technological spheres that address the Water, Food, Energy (and Environment) Nexus; the promotion of private sector collaboration (including cooperatives), especially SMEs; and collaboration in developing organisational systems to support small-scale farmers to jointly access resources, technologies and markets.

The World Food Research and Innovation Forum - WFR&IF - will contribute to the **United Nations Sustainable Development Goals** through its strategic platforms of global stakeholders on food research and innovation. Particularly, the WFR&IF strategic platforms will contribute to the following Goals:



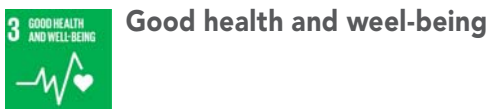
No poverty

End poverty in all its forms everywhere



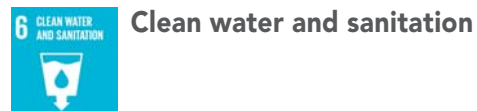
Zero hunger

End hunger, achieve food security and improved nutrition and promote sustainable agriculture



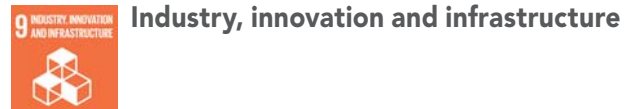
Good health and well-being

Ensure healthy lives and promote well-being for all at all ages



Clean water and sanitation

Ensure availability and sustainable management of water and sanitation for all



Industry, innovation and infrastructure

Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation



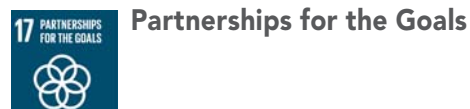
Responsible consumption and production

Ensure sustainable consumption and production patterns



Life on land

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss



Partnerships for the Goals

Strengthen the means of implementation and revitalize the global partnership for sustainable development

Source:
Preamble - Resolution adopted by the General Assembly on 25 September 2015 70/1. Transforming our world: the 2030 Agenda for Sustainable Development

WORLD FOOD RESEARCH AND INNOVATION FORUM FUTURE ACTION

The aim of the World Food Research and Innovation Forum is to create a **worldwide permanent platform and a biennial international event for providing answers to the challenges of feeding the planet.** The World Food Research and Innovation Forum aspires to bring onto the world scene an **innovative model for working out and discussing issues of great European and international interest** together with national and international global food policy makers, people in charge of regulatory policies, international development organizations, global food companies and small and medium businesses, leaders in the food sector, international consumer groups, the world of finance, science and research, and communities of innovation.

The Forum aims to attract global players in the **food research** and sectors and to create a platform of stakeholders and experts in order to design global strategies for the **development of the agri-food sector**, strategies in favour of **research**, and policies contributing to **sustainability, security and quality in the agri-food field**, working in support of business competitiveness, governments, the scientific community and international institutions.

Its objectives are:

- **activating and stimulating strategic commitment, political debate and dialogue** about the challenges and opportunities of the local and global food sector, drawing on the legacy of Expo Milano 2015 “Feeding the Planet, Energy for Life”;

- **sharing knowledge, best practices and lessons learned** from research and innovation partnership initiatives in the rural and agri-food sectors, food security, and sustainability;

- promoting the development of **new partnerships between companies**, the international institutional system and research and innovation systems.

Considering the prominence of food and nutrition in the **2030 Sustainable Development Goals** as promulgated by the United Nations General Assembly in September 2015, advocacy in favour of these topics may no longer be required. However, prioritization of action, coordination of efforts, stimulating collaboration and mobilizing resources will still need to occur.

This is what the World Food Research and Innovation Forum will contribute in making happen as a lasting initiative stemming from the World Expo Milano 2015, themed about “Feeding the planet, Energy for life”.

This Forum is hosted by the Emilia-Romagna Region in Italy. The **work plan** of the World Food Research and Innovation Forum platform will include:

- a permanent biennial Forum
- an annual strategic event (odd-numbered years)
- multi stakeholders platforms and dedicated international working groups
- communication and web sharing platforms.

¹ DANIDA/SADC Regional IWRM Programme identification – mission report August 2005

¹¹ FAO Gender Equality and Food Security – Women’s Empowerment as a tool against hunger. <http://www.fao.org/wairdocs/ar259e/ar259e.pdf>

¹¹¹ International Food Policy Research Institute Gender Inequalities in Ownership and Control of Land in Africa Myths versus Reality IFPRI Discussion Paper 01308 December 2013 <http://www.ifpri.org/sites/default/files/publications/ifpridp01308.pdf>

¹¹² UNFPA State of World Population 2014. Demographic Dividend is achieved when

a) “Young people are healthy and educated and equipped to seize opportunities

b) When more resources are available for productive investment

c) when per capita incomes and standards of living rise and

d) When poverty is reduced” http://www.unfpa.org/sites/default/files/resource-pdf/EN-SWOP%20EX%20SUM-Final-web_0.pdf

^v ILO Fragile-to-Fragile Cooperation and decent work:

An ILO Perspective http://www.ilo.org/wcmsp5/groups/public/---dgreports/---exrel/documents/publication/wcms_356557.pdf

^v <https://sustainabledevelopment.un.org/index.php?menu=1225>

www.worldfoodforum.eu

info@worldfoodforum.eu

PROMOTED BY

