AGRICULTURAL FOOD SYSTEMS AND THEIR ROLE AT INCREASING FOOD SECURITY AND NUTRITION

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Abstract
The submitted scientific paper deals with agricultural food systems and food security and nutrition in the world and European Union. The objective of this paper is to analyse agricultural food systems and their role at increasing food security and nutrition, food supply chain, food losses and land degradation. Data are gained from authors own research and other data were obtained from FAO and OECD. In 2017, 815 million people have been undernourished in the world. Economic growth alone will be not enough to end hunger and malnutrition. Nutrition has to be set as an explicit objective in coherent and cross-sectoral strategies, policies and programmes. The high level of EU food safety and nutrition can be achieved if cross-cutting policy measures are vital for the future EU food safety and nutrition, international food chain governance should be consistently advanced.

Keywords: agriculture, food security, food system, food supply chain, nutrition

JEL Classification: O13, Q18

1 Introduction
Economic growth alone will be not enough to end hunger and malnutrition. Nutrition has to be set as an explicit objective in coherent and cross-sectoral strategies, policies and programmes. In this context the politicians, scientists, NGOs, non-profit organizations have to analyze that how food system influences people’s choices and nutritional status. There is unavoidable radical transformation
and effective policies with programmes, in order to create the potential to shape more sustainable food systems contributing to the progressive realization of the right to adequate food.

Food quality describes the attributes of a food that influence its value and that make it acceptable or desirable for the consumer (FAO/WHO, 2003). This includes: size, shape, colour, texture, flavour, food composition (ingredients and nutrients), as well as the way how food is produced or processed (Floros et al., 2010; Grunert, 2005). This includes negative attributes such as spoilage, contamination with filth, discolouration, off-odours and positive attributes such as the origin, colour, flavour, texture and processing method of the food (Giusti & Bignetti & Cannella, 2008). Food safety describes the impact of food on human health, and refers to “all those hazards, whether chronic or acute, that may make food injurious to the health of the consumer” (FAO/WHO, 2003).

Malnutrition in all its forms (undernutrition, micronutrient deficiencies, overweight and obesity) still affects every country on the planet and is a major impediment to achieving both global food security and adequate nutrition, and sustainable development. Urgent actions are needed, delivered via bold policies, initiatives and investments. According to HLPE (2017) currently around 0.8 billion people are still hungry, more than 2 billion are deficient in essential vitamins or minerals, and around 1.9 billion adults experience overweight and obesity. While hunger have declined over the past decades, overweight and obesity are rapidly increasing all over the world.

Prevalence of undernourishment is an indicator that has been used by FAO since 1974 to measure hunger and food insecurity. Calculated using national-level food balance sheets and information on the distribution of food consumption from surveys, this indicator estimates the number of people whose food consumption is insufficient to meet dietary energy needs for an active and healthy life. While it has been an important metric for tracking national and regional trends in the proportion of people suffering from hunger, it does not offer details on the access to food at the household or individual levels (Ballard & Kepple & Cañiero, 2013). Neither does it provide information about the nutritional value of available food or the quality of diets.

2 Data and Methodology

The main objective of this paper is to analyse agricultural food systems and their role at increasing food security and nutrition.
The data was gathered from own authors’ research and other secondary data taken from FAO. These databases are focused mainly on food systems types, food supply chain, food loses and land degradation.

Scientific methods such as analysis, synthesis, comparison, and scientific compilation were used. The scientific compilation is a creative compilation, and in its use the work brings extended knowledge. The substance of the work consists in gathering, arranging, and interpreting databases of international organizations with own approach to their processing and interpretation.

3 Results

3.1 Challenges of the Agriculture and Food Production

Today, in the world, 1 person in 3 is malnourished and 1 in 2 could be malnourished by 2030, if nothing is done. According to FAO in 2017-815 million people are undernourished.

The current trends and challenges are reflected in 17 sustainable development goals for the next 15 years with aim to balance economic, environmental, and social issues. The sustainable development goals are linked to FAO Strategic Objectives: eliminate hunger, food insecurity and malnutrition, to ensure productive and sustainable agriculture, forestry and fisheries, to reduce rural poverty, and to create inclusive and efficient agricultural and food systems, as well as to increase the resilience of livelihoods to disasters.

3.2 Food System Types and their Food Supply Chains and Food Environments

3.2.1 Food supply chain

The food supply chain consists of the activities and actors that take food from production to consumption and to the disposal of its waste (Hawkes & Ruel, 2012). The steps of the food supply chain include: production; storage and distribution; processing and packaging; retail and markets.

The decisions made by one group of actors at one stage of the chain have implications for the others (HLPE, 2014). These decisions influence the way food is produced and processed along the supply chain (Downs & Fanzo, 2016) and impact the four dimensions of FSN (availability; access, whether physical or economic; utilization; and stability), as well as the nutritional value of the food produced and processed.
Food supply chains can increase the nutritional value of food, by increasing access to macronutrients as well as micronutrients, for instance through biofortification, food fortification or improved storage of perishable foods (such as fruits and vegetables), or by reducing, in food formulation, the levels of substances associated with diet-related non-communicable diseases. However, the nutritional value of food can also diminish along the food supply chain.

### 3.2.2 Food system types

States should, in collaboration with affected stakeholders, recognize the diversity of food systems (traditional, mixed, modern) and design context-specific policies and programmes that support the co-existence of diverse food systems and diets, integrate a nutrition-focused food system approach into national development, health and economic plans and facilitate an inclusive dialogue and develop nutrition strategies at national and local levels, which focus on improving food environments.

Also is necessary to improve food and nutrition literacy throughout society through popular education programmes and other appropriate schemes, improve capacity by investing in a workforce of nutrition practitioners, and by educating a new generation of food system professionals on nutrition (HLPE, 2017).

Food supply chains consist of production (availability), storage and distribution, processing and packaging, retail and markets.

**Production** in traditional food systems - food is mainly produced by smallholders in the area and most of the foods available are local and seasonal. In mixed food systems, food production takes place at both local smallholder farms and larger farms that are farther away. There is greater access to foods outside their typical season. In modern food systems a wide array of foods is produced at farms ranging from small to industrial in size. Production is global, so foods are available from anywhere and at any time.

**Storage and distribution** in traditional food systems - lack of adequate roads makes transporting food difficult and slow, leading to food waste. Poor storage facilities and lack of cold storage makes storing food, especially perishables, difficult and leads to food safety concerns and waste. In mixed food systems, there are improvements in infrastructure with better roads, storage facilities and increased access to cold storage; however, these are usually not equally accessible, especially for the rural poor. In modern food systems, modern roads, storage facilities and cold storage make it easy to transport food on long distances and store it safely for long periods of time.

**Processing and packaging** in traditional food systems - basic processing is available such as drying fruit, milling flour or processing dairy, little or
limited packaging occurs. In mixed food systems, highly-processed packaged foods emerge and are more accessible. These extend the shelf life of foods. In modern food systems, many processed packaged foods are easily available, often cheap and convenient to eat, but sometimes “unhealthy”.

Retail and markets in traditional food systems - low diversity and density of food retail options leads to a heavy reliance on informal kiosks and wet markets. In mixed food systems are greater diversity of both informal and formal bodegas, corner stores and markets. More access to meals eaten outside the home including street food and fast food. In modern food systems, high diversity and density of “food entry points” including all of the options in the other systems as well as larger super and hypermarkets, fast casual food and fine dining restaurants.

3.3 Outcomes of diets

Food systems, through diets, give rise to a variety of outcomes. These relate not only to nutrition and health, but also to all the dimensions of sustainability, which in turn link back to the food system drivers.

3.3.1 Nutrition and health outcomes

Healthy diets are essential to prevent malnutrition in all its forms (undernutrition, micronutrient deficiencies, overweight and obesity). These multiple burdens of malnutrition lead to health problems such as underweight and stunting and to diet-related NCDs such as diabetes, coronary heart disease, cancer and stroke (WCRF/AICR, 2007; Hawkesworth & Dangour & Johnston & Lock & Poole & Rushton & Uauy & Waage, 2010).

3.3.2 Economic outcomes

Agriculture and food production provide income and employment for millions of people, particularly smallholders and poor people in rural areas (HLPE, 2013). Agriculture alone is estimated to provide employment to 1.3 billion people worldwide, 97 percent of them living in developing countries (IBRD/World Bank, 2007). However, unhealthy diets and malnutrition hamper economic growth and perpetuate poverty via three main routes: direct losses in productivity from poor physical status; indirect losses from poor cognitive function and deficits in schooling; and losses owing to increased health care costs. Consumption patterns can also have positive economic impacts, for instance through the reduction in food losses and waste (HLPE, 2014).
3.4 Land degradation

Despite the fact that the ECA region is well-endowed with land resources, many countries are experiencing an increase in degradation, depletion and overexploitation, which is undermining the sustainability of their production systems (FAO, 2016). Recent, rapid changes in land cover and land use have created major challenges to traditional landscapes and land use systems, magnifying land degradation processes and impacts. This trend is especially important for achieving SDG2 targets centred on sustainable agriculture. Land degradation not only reduces productive capacity of land, but also decreases ecosystem functions, thereby reducing resilience and limiting ability to adapt to future extreme weather events that may occur as a result of climate change. Land degradation constitutes a major development challenge for countries, negatively impacting their food security, ecosystem services and rural livelihoods.

According to FAO (2017), overall, in the EU-28, EFTA and European CIS countries (except the Russian Federation), water erosion is threatening approximately 16 percent of total land, while wind erosion is impacting 6 percent. It is also estimated that 45 percent of soil in the EU-28 countries has low organic content. Soil sealing has a negative impact on approximately half of the land under agriculture within the EU-28 countries. It is predicted that climate change will further exacerbate these issues, worsening soil degradation and leading to further desertification.

Figure 1 Population living on degraded land, % of total population in 2010

Soil erosion rates for arable land in the EU-28 countries indicate that the issue is most acute in the Southern and Central EU countries, with Italy being the worst
affected, followed by Croatia, Greece, Portugal, Slovakia, Slovenia and Spain. In
the North and North-East of Europe, the soil loss rate is still relatively low, espe-
cially in countries such as Estonia, Finland, Ireland, Latvia, Lithuania, the Neth-
erlands, Sweden and the United Kingdom of Great Britain and Northern Ireland.
In larger EU countries, including Germany, France, Poland and Romania, the
southern territories are typically more exposed to soil losses than the northern
ones. From V4 countries the best situation is in Czech Republic, where only 4
% of population living on degraded land. In Slovakia, 9 % population was living
on degraded land in 2010. The worst situation is in Hungary- 17 % population
(figure 1).

For example, in the EU-28, a framework of objectives related to land take and
land degradation has been established via a series of policy documents. Their key
elements include: (1) progress towards the target of ‘no net land take by 2050; (2)
reducing soil erosion; (3) increasing soil organic matter; (4) remediating contam-
inated sites; and (5) integrating land use into all levels of government, including
via the adoption of targets on soil and land as a resource (FAO, 2017).

In addition, the EU countries have issued several strategic documents to re-
duce land take, soil sealing and land degradation. Within the Common Agricul-
tural Policy, ‘greening’ measures are intended to address land degradation issues,
for example through the protection of permanent grasslands and ecologically val-
uable farmland as well as crop diversification. Overarching frameworks are also
deﬁned within the EU directives on the Environmental Impact Assessment and
Strategic Environmental Assessment.

3.5 Food losses

Environmental (and economic) sustainability of agricultural and food systems
can be adversely affected by the occurrence of food losses and waste in these sys-
tems, as they lead to wasted natural and economic resources. It is estimated that
in Europe, 31 percent of the food produced for human consumption is not eaten
by people and is largely spoilt and discarded. Eleven percent of this is discarded
by consumers (FAO, 2011). Food losses and waste also undermines the adaptive
capacities and resilience measures of vulnerable populations to cope with climate
change, through decreased food availability and reduced income. In addition,
food loses and waste is a major contributor to climate change. At the global level
it accounts for about 8 percent of anthropogenic GHG emissions (FAO, 2015).
Efforts to reduce food losses and waste in the ECA region are driven by SDG 12.3:
“By 2030, halve per capita global food waste at the retail and consumer levels and
reduce food losses along production and supply chains, including postharvest
losses”.
The share of food losses for various categories of food differ across the ECA (European and Central Asian region, figure 2). More affluent countries of the Balkan region tend to have the highest share of food losses in vegetables, cereals and fruits. The Balkan countries are followed by the European CIS ones, where the highest levels of losses occur in fruits and pulses.

The underlying causes for food losses and waste differ across European and Central Asia countries and often depend on the level of economic development in the countries in question (FAO, 2014). The bulk of losses in middle and low-income countries of the region are seen at the agricultural production and post-harvest handling and storage stages of food supply chains. These losses are largely due to inadequate harvest, post-harvest and storage equipment and technologies. Absence of investment in equipment and technology is compounded by the overall investment climate, the difficulty of doing business in many South-eastern European and former Soviet states and the discouragingly high rates of interest (often over 20 percent per annum) charged by commercial lenders to value chain actors.

Management, marketing and product development are also major underlying causes of losses, with country studies pointing to poorly qualified management and labour as being responsible for high levels of losses. In addition, the fragmented nature of agrifood production, caused by the breakup of public vertically-integrated production systems during the 1990s and the slow pace of consolidation into commercial farms have led to major challenges in value chain coordination owing to the large numbers of small producers.
The most recent estimates on European Union (EU) food waste levels indicate that 70 percent of EU food waste takes place at the household level, and in the food service and retail sectors, while 30 percent per cent takes place at the production and processing levels (FAO, 2017).

4 Conclusion

Ending hunger remains critically important but other forms of malnutrition have become widespread and must also be tackled. The challenge is to provide enough food for all without relying on a strategy of producing overabundant energy-dense and nutrient-poor foods in unsustainable food systems.

Food systems face big challenges to improving diets and nutrition around the world but also represent many opportunities: they contain large resource flows, they encompass many action points, and they embrace many potential agents of change. The key to identifying and seizing the opportunities will be a sense of urgency, an appreciation of the landscape in which action can and must occur, the connections between actions and outcomes and an ability to be bold in ambition and imaginative in partnership (HLPE, 2017).

A better knowledge of food systems, and of the interactions between food supply chains, food environments and consumer behaviour, is critical to understand why and how diets are changing and influencing people’s nutritional status around the globe. Such understanding is needed to identify ways of intervening and applying a rights-based approach to improve FSN for all, especially the most vulnerable.

Current food systems have dramatic effects on human and planetary health and, if current trends continue, the current development process will not “self-correct” this problem neither in the short nor even in the medium term.

The effects of climate change are already being felt in many ECA countries and pose considerable challenges to agriculture production, as it will alter production conditions and increase the frequency of extreme weather events. As a result, in order to meet the interlinked challenges of food security and climate change, production systems must undergo significant transformations. As future production needs must occur largely on existing agricultural land, sustainable intensification practices must be adopted in the ECA region, not only to increase productivity and incomes, but also to safeguard the natural resources on which production depends (FAO, 2017).
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