



October – December 2018

Special Issue: International Symposium on Food Security, Quality and Safety 2018
November 27-28, 2018, UCP Lahore, Pakistan

Theme: Food Security

Opinion

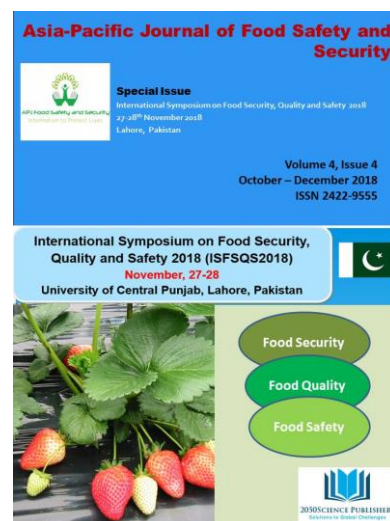
Food Sustainability and Security: 2050 Global Food Challenge

Ida Idayu Muhamad

Food and Biomaterial Eng. Research Group, School of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia and Executive Committee Member, Asia-Pacific Institute of Food Professionals (APIFP)

***Corresponding author's email address:**

idaidayu@utm.my



Received: November 19, 2018/ Accepted: November 30, 2018/ Published online: March 28, 2019

Academic Editor: William Riley

To cite this article:

Muhammad, I.I. (2018). Food sustainability and security: 2050 global food challenge. *Asia-Pacific Journal of Food Safety and Security*, 4(4), 10-15.

Highlights

- By 2050, there will be a challenge to deliver ~70% more food to ensure food availability and safe agricultural effects on health.
- The Global Food Security Index (GFSI) provides a measure of food security at the country level, as influenced by culture, environment and geographic location.
- A circular economy approach and more environment-friendly agriculture landscape are crucial in facing this 2050 global food challenge.

About Authors

Ida Idayu Muhamad (PhD) is a Professor Lecturer at the University Technology of Malaysia (UTM), a chartered scientist (C.Sci. UK), and Fellow of the Institute of Food Science Technology UK (FIFST). She has been teaching and conducting workshops in a variety of aspects of food sustainability. Her research interests are in the formulation of new compounds and delivery systems in food nutrition, nutraceuticals and biopharmaceuticals is aimed at achieving the better efficiency, bioavailability and safety performance.

Abstract

Food security is a concern in Malaysia as it is everywhere. It is ranked second among the 17 Sustainable Development Goals in the United Nations 2030 Development Agenda, which proclaims - “End hunger, achieve food security and improve nutrition, and promote sustainable agriculture”. Globally, 800 million out of 7.6 billion people suffer from hunger. Although the number has decreased in recent decades, many of these people come from developing countries. By 2050, there will be approximately 9–10 billion people in the world— meaning an additional 1.6 billion people to feed, with the need to provide about 60–70% more food than is now being produced, to ensure food availability for everyone. An existing agricultural production system which provides an abundant, affordable, and safe food supply and many industrial and consumer products, while faced with decreasing agricultural land, less water for irrigation, rising energy and labour costs, and major grain crops that have already reached a yield plateau. Natural disasters, along with climate change-related extreme weather events, transboundary plant pests and diseases, and other emerging threats continue to provoke crises in agricultural and food systems and impact productivity and human health. Hence, it will indeed be a daunting task. The Global Food Security Index (GFSI) provides a measure of food security at the country level, as influenced by culture, environment and geographic location. The GFSI informs food systems around the world with a common framework for understanding the root causes and risks of food insecurity, at the core of which are affordability, availability, quality and safety. Indisputably, a circular economy implementation and more environment-friendly agriculture landscape would enhance our score on the global food security index.

Keywords: Food Security; Global Food Security Index; Circular Economy; Sustainable Agriculture

Introduction

The Food and Agriculture Organization (FAO) defined food security as a time “when all people at all times have physical, social and economic access to sufficient safe and nutritious food preferences for an active and healthy life”. Meanwhile, the International Conference on Food Security in 2013 deemed food security to be a multifaceted issue with four dimensions: availability, access, utilization and stability. With the world’s population expected to reach 9.7 billion people by 2050, farmers will need to produce more food to feed the world over the next 35 years than in has during the last 2000 years! According to the World Economic Forum (WEF), a quarter of all food, measured by caloric content, is wasted from “farm to fork”, and 8% of this loss occurs in the upstream value chain. As the primary source of food, agriculture contributes significantly to arable land depletion and environmental degradation as a result of the prolific use of water, fertilizers, pesticides and other chemical inputs. The International Food Policy Research Institute indicates that 5 to 10 million hectares of cropland are lost annually due to severe degradation, and that crop yields are continually decreasing over a much larger area.

Understanding the Global Food Security Index (GFSI)

In 2013, the International Conference on Food Security deemed food security to be a multifaceted issue with four dimensions: availability, access, utilization and stability. This led to the establishment of the Global Food Security Index (GFSI), developed by the Economist Intelligence Unit and sponsored by Corteva Agriscience, the Agriculture Division of DowDuPont, which considers three core pillars of food security—Affordability, Availability, and Quality & Safety—across 113 countries. The index is a dynamic quantitative and qualitative benchmarking model, constructed from 28 unique indicators, that measures these drivers of food security across both developing and developed countries. It provides an objective framework for evaluating food security across a wide range of countries worldwide. By creating a standardized metric around food security, we seek to empower users to explore the issues surrounding food security—including the rankings and results—and draw conclusions for policy, business operations and future research. This index is the first to examine food security comprehensively across the three internationally established dimensions. Moreover, the study looks beyond hunger to the underlying factors affecting food insecurity. The GFSI now includes an adjustment factor for natural resources and resilience. This category assesses a country's exposure to the impacts of a changing climate; its susceptibility to natural resource risks; and how the country is adapting to these risks.

A Circular Economy and More Environment-Friendly Agriculture Landscape

The high focus of the circular economy (Fig. 1), particularly in Europe (EC, 2014a,b), is expected to be to promote economic growth by creating new businesses and job opportunities, saving material costs, dampening price volatility, and improving security of supply while at the same time reducing environmental pressures and impacts. It has been estimated that eco-design, waste prevention and reuse can bring net savings for EU businesses of up to EUR 600 billion, while at the same time reducing greenhouse gas emissions. Moreover, the additional measures to increase resource productivity by 30% by 2030 could boost GDP by nearly 1% and also create 2 million additional jobs.

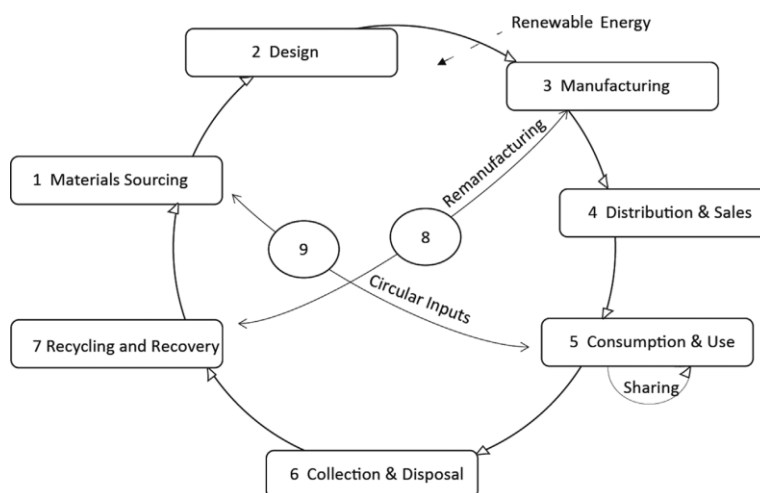


Figure 1. Resource flows through a value chain in a circular economy (Yuliya et al., 2018).

Currently there are many initiatives underway to implement a circular economy (CE). The main actors driving this development are the legislative and governmental bodies, NGOs and consultancy firms. The existing CE approaches have been analyzed by identifying the common main ideas, such as stock optimization, eco-efficiency and eco-effectiveness, waste reduction and the 4Rs. These are the main strategies to achieve the CE. In addition, two tools have been developed and presented in order to facilitate the circular economy design (i) the CE Strategies Database featuring 45 strategies that are suitable for application in different parts of the value chain; (ii) the CE Implementation Database, containing over 100 implementation cases for 35 of the strategies. This classification enables a search for examples of suitable strategies for CE implementation by parts of the value chain and by scope in interest, and it is useful for looking up which strategies are application-ready. A country may be able to grow or produce food locally at high self-sufficiency levels, but that does not mean it has attained the desired food security status (Roberto et al., 2014). It is timely to review all approaches to sustainable agriculture using science and modern technologies in addition to considering the role of traditional knowledge. The system must function within the space of climate change; minimum (zero) negative impacts on the environment; reduced (zero) greenhouse gas emissions (GHG); reduced water usage; concern for availability and cost of energy; increased application of conservation tillage; worldwide adoption of biotechnology and nanotechnology; increased organic food production; major adoption of information technologies at all phases of the agricultural, food, and natural resources systems; and significant advancements in machine innovations. Also, a country needs to learn and apply valuable lessons from many case studies worldwide of efficacious efforts to stem and reverse land degradation and biodiversity loss. Indisputably, a more environment-friendly agriculture landscape would enhance each score on the GFSI.

The challenge of measuring the effects of agriculture on health

The global agricultural system is primarily concerned with ensuring that sufficient food (in terms of calories) will be produced to feed the projected global population of nine billion in 2050 (FAO 2009). However, to tackle global public health problems associated with both under- and over-nutrition, healthy diets must be sufficient not just in calories but also in the balance of macronutrients, vitamins and minerals. Our increasingly advanced understanding of the association between diet and health should now prioritize health as a key driver of future agricultural production and put in the effort to link agricultural production with health (Sophie et al., 2010). As the food system becomes more complex and global in nature, it is clear that food availability statistics provide information that should not be used as an estimate of individual dietary consumption. Hence, actual food consumption data will be needed to assess the impact on health of future developments in the agricultural and food systems. The enormous challenge of global food security is likely to motivate considerable investment and innovation in agriculture and food science in the coming decades, which will hopefully contribute to improving the food supply at a global level. However, too narrow a focus on cereal improvements and calorie supply alone will not eliminate under-nutrition or address the health challenges arising from the

nutrition transition. An integration of agricultural innovation and population health planning is necessary, based on matrices that will allow us to better understand the impact of the agriculture and food systems on population health.

Conclusion

The GFSI provides a measure of food security at a country level, as influenced by culture, environment and geographic location. Therefore, the GFSI is useful in informing food systems around the world with a common framework for understanding the root causes and risks of food insecurity, at the core of which are affordability, availability, quality and safety. A circular economy corroborates how agricultural production, food systems and population health are intimately linked. While there is a strong evidence base to inform our knowledge of what constitutes a healthy human diet, we know little about actual food production or consumption in many populations and how developments in the food and agricultural systems will affect dietary intake patterns and health. A clearer understanding of the links between the agriculture and food system and population health will ensure that health becomes a critical driver of agricultural change. Feeding the world in 2050 will require about a 70% increase in overall food production because of population growth and changes in consumption driven by an expanding middle class. All aspects of industry during the Fourth Industrial Revolution must revolve around not only increasing output but minimizing the impact on the environment – a fact that has not been taken into consideration during previous industrial revolutions and yet is key to human evolution and survival.

References

EC (2014a). Sustainable Food - Environment - European Commission Impact Assessment On Measures Addressing Food Waste To Complete SWD (2014) 207. Brussels.

EC (2014b). Towards a Circular Economy: A Zero Waste Programme for Europe. Available online: <http://ec.europa.eu/environment/circular-economy/pdf/circular-economy-communication.pdf>.

FAO (2009). How to feed the world in 2050. Rome, Italy: Food and Agriculture Organization.

Capone, R., El Bilali, H., Debs, P., Cardone, G. and Driouech, N. (2014). Food System Sustainability and Food Security: Connecting the Dots. *Journal Food Security*, 2(1), 13-22.

Hawkesworth, S., Dangour, A.D., Johnston, D., Lock, K., Poole, N., Rushton, J., Uauy, R. and Waage, J. (2010). Feeding the world healthily: the challenge of measuring the effects of agriculture on health. *Philosophical Transactions of the Royal Society B*, 365, 3083–3097.

Kalmykova, Y., Sadagopan, M. and Rosado, L. (2018). Circular economy – From review of theories and practices to development of implementation tools. *Resources, Conservation & Re-*

cycling, 135, 190–201.

© 2018 by the author; licensee 2050Science Publishers, Christchurch, New Zealand. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.