Asia-Pacific Journal of Food Safety and Security

OPEN ACCESS

ISSN 2422-9555

Volume 3, Issue 2 (http://apjfss.wix.com/apjfss)

2050SCIENCE PUBLISHERS
Solutions to Global Challenges

April – June 2017

Special Issue: International Workshop on Sustainability of Food Resources and Supply Chain
November 20, 2016, UTM Kuala Lumpur, Malaysia

Theme: *Food Security*

Opinion

Towards era of sustainable food resource

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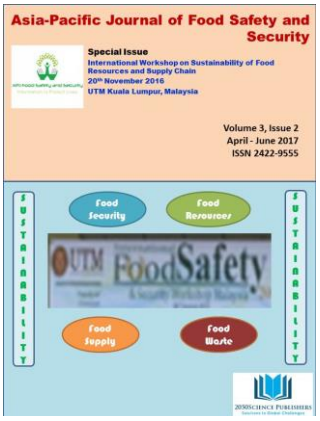

Received: June 2, 2017/ Accepted: June 5, 2017/ Published online: June 7, 2017

Academic Editor: Dayang Norulfairuz Abang Zaidel

To cite this article:
Muhamad, I.I. (2017). Towards era of sustainable food resource. *Asia-Pacific Journal of Food Safety and Security,* 3(2), 7-11.

Highlights

- Global population is increasing consequently the world energy demand also increasing remarkably.
- Food and Agriculture is a solid foundation for sustainability
- Sustainability involving Economic, Environmental and Social aspects - the more sustainable the practice, the more efficient the use of resources (Water, Technology, Soil, Delivery).

About Author

Ida Idayu Muhamad (PhD) is a Professor Lecturer at the University Technology of Malaysia. Her research interests are in food safety, food security, functional food production and nutrition.

Her work in the development of delivery systems and formulation of new compounds in food, agrochemicals, nutraceuticals and biopharmaceuticals is aimed at achieving the best efficiency, bioavailability and safety towards the target sites and thus, the wellbeing of the mankind.

Agriculture and food feature prominently in debates about sustainability. Food and agriculture is a solid foundation for sustainability. Figure 1 shows a diagram of all elements in the foundation of food

sustainability. This "donut" figure, lifted from Raworth (2012) describes the upper and lower boundaries of the safe and just place for humanity. If we focus on the outer circle, the "upper limits" of planetary capacity, agriculture and food systems play critical role – and may be primarily responsible for exceeding ceiling in Nitrogen, Climate Change and Biodiversity Loss. Sustainability and technological innovation in food production are critically needed to ensure worldwide food security and stability of the global economy. It highlights ethical practices and approaches to develop an environmentally harmonized food system for a secure and sustainable global food supply of the current production system that consumes precious resources like freshwater, land, energy, and environments to live and grow food.

Achieving sustainable development means ensuring that all people have the resources needed – such as food, water, health care, and energy - to fulfil their human rights. And it means ensuring that humanity's use of natural resources does not stress critical Earth system processes - by causing climate change or biodiversity loss, for example. If we focus on the inner circle - the "foundation" for sustainable development we also see the heavy presence of food systems which includes food provisioning and health, income, jobs, energy, social equity and gender equality, even "voice" - expression of cultural identity, meaning, and purpose.

Figure 1. Food and agriculture as the foundation of food sustainability (Raworth, 2012)

Planetary crisis refers to how we reconcile these contradictory views of the role of food and agriculture in sustainability. Could it be that the activities in food and agriculture that appear to be producing a solid foundation for sustainability – for example, the pursuit of local food sourcing in many parts of the world be contributing to surpassing environmental ceilings for sustainability at more aggregate scales? For example, that producing locally in some geographic and social contexts (the desert or arable land) can be relatively energy, water and carbon intensive even when resources are priced appropriately, it may make sense to import food from regions where environmental conditions are more conducive to low-input farming.

Sustainability is defined by Leach et al. (2010) as a process and outcome that supports and enhances human well-being, social equity and environmental integrity, and the particular system qualities that sustain these. Every day, farmers and ranchers around the world develop new, innovative strategies to produce and distribute food, fuel, and fibres sustainably. While these strategies vary greatly, they all embrace three broad goals, so called the Three Pillars of Sustainability involving economic (profit over the long term), environmental (stewardship of our nation's land, air and water) and social (quality of life for farmers, breeders and their communities) aspects. Hence, the more sustainable the practice, the more efficient the use of resources. Figure 2 compiles four keys elements of food sustainability.

1. Water use efficiency and conservation are essential for sustainable food production

The slightest water deficits can impact crop yield and quality. Excessive irrigation is wasteful, run-off, nutrient leaching, disease susceptibility, and resource costs. We need to achieve uniformity and balance. Efficiency is achieved when crop actually uses most of the water applied by irrigation systems. It is dependent on water being applied as uniformly as possible and water being applied in proper amounts at appropriate time intervals.

2. Innovate and Integrate Mechanical, Chemical, Biological ways to improve food sustainability

Example of integrated ways are in introducing stress-tolerant crops, controlling biological pests, managing Abiotic plant stress, and advancing mechanical delivery systems. A comprehensive understanding and technological desire to reduce food wastage would assist to save 30% of current losses in the supply chain.

3. Value soils and healthy roots

Technologies focused on soil and roots can help us achieve sustainable and food security. Prolong usage of chemical supplementary nutrient to the land should be prevented due to negative impacts to our environmental system such as deterioration of soil fertility, acidification and eutrophication (Camargo and Alonso, 2006). Under-valuation of soils is a major issue facing modern agriculture. Soils are living ecosystems directly impacting the movement and delivery of water and agrichemicals in the environment.

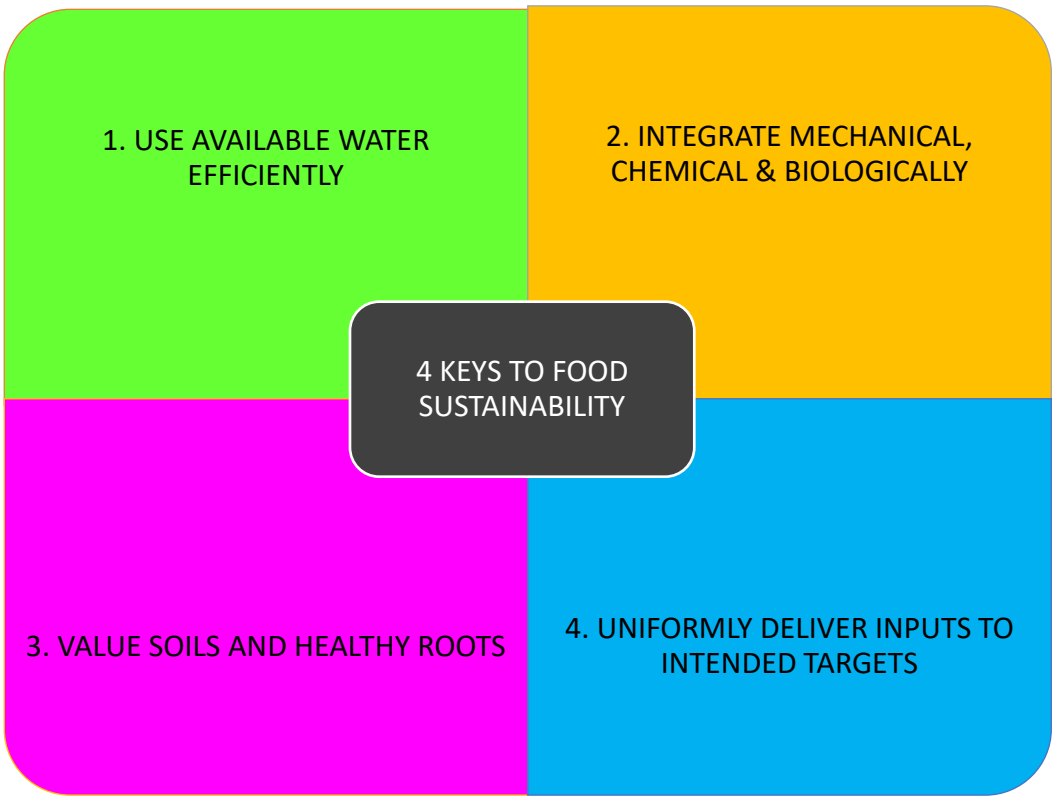

Figure 2. Four keys elements of practical food sustainability

4. Uniformly deliver inputs to intended targets

We need to uphold technology to characterize soil variabilities as it relates to crops growth and yield. This affects fruit yields, producer profits and consumer. Areas with poorer-than-average soil may end up deprived of nutrients or irrigation, reducing potential yield. This is due to four variabilities: i. Soil variability, ii. Preferential flow of agrichemicals, iii. Soil and root zone variability and iv. Depth of water penetration.

Sustainability and technological innovation in food production are critically needed to ensure world-wide food security and stability of the global economy. It highlights ethical practices and approaches to develop an environmentally harmonized food system for a secure and sustainable global food supply of the current production system that consumes precious resources like freshwater, land, energy, and environments towards era of sustainable food resource.

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