

# TIGER Discussion Paper

DP-2015-004

Participatory approach for food security

Michinori Uwasu

2015/3/3

2-3-09 uwasu

**International Workshop on "Environmental Policy-Making  
Instruments Based on Public Participation in a High  
Technological Society — Energy, Chemical Substances and  
Water Management as Central Issues"  
at 7th-8th March 2015**

Organizers: **OSAKA UNIVERSITY, PROJECT TIGER** “Policy decision-making and public participation on energy, chemicals and water management: an international comparative study” (Global Initiative Program), **GREEN ACCESS PROJECT II** “Review of Legal Indicators for the Participation Principle in Environmental Matters - Promotion of an International Cooperation towards Strengthening the Environmental Democracy” (JSPS Grant-in-Aid), and **MITSUI & CO., LTD., ENVIRONMENT FUND** – Project “**Proposing an Asian Version of the Aarhus Convention – Constitution of an International Cooperation for Implementing the Environmental Justice**”

## **Project TIGER**

**“Policy decision-making and public participation on energy, chemicals  
and water management: an international comparative study”  
(Global Initiative Program)**

**Osaka University**

# **Participatory approach for food security**

Michinori Uwasu

Center for Environmental Innovation Design for Sustainability, Osaka University

## **1. Introduction**

Food security is one of the most imperative global challenges in this century. In this report, I will overview the current state of food security using macro data and its analysis. Then I will reconsider the role of participation approach through cases studies around the world. Specifically, I first examine the trends of food supply, showing the food supply has increased due to introduction of modern agriculture rapid enough that it meets the increasing demand in the past decades. Then I discuss three major problems in the current food system exist behind the success; those include hunger and poverty, environmental, and safety problems. In particular, modern agriculture requires substantial industrialized inputs such as chemical fertilizer, pesticide/herbicide, and genetically engineered crops. The problems are in the complex food supply chain, in which these technologies are mainly possessed by large corporates and accessible to only those who have capitals. This means that most farmers particularly in developing countries have no right of choice over those technologies. Moreover, overuse of particular technologies apparently generates substantial burdens to the environment. In particular, there are risk trade-off and uncertainty issues. Scientific communities as well as policy makers have no clear vision of sustainable agriculture to attain global food security. Thus it which technologies we have to promote to use. This report addresses the importance of participatory approach as a promising way to the issue through actual practices around the world, identifying the lessons and challenges of the approach toward achieving global food security in the future.

## **2. World food situation**

This section over-views the current food situations by examining the changes of global cereal production, population and land for food production. Larger population means more demand for food and cereal is by far the most important crops for food. Figure 1 shows that in the past 50 years, world population increased from 3 billion to 7 billion while food production increase has surpassed the population growth from 1961 to 2012, which is welcome news for food security. However, this does not mean that there is no hunger on the planet. According to the United Nations Millennium Development Goals (UN, 2014), there are still billions of people under malnutrition (chronicle hunger) while in the whole food supply is large enough. The

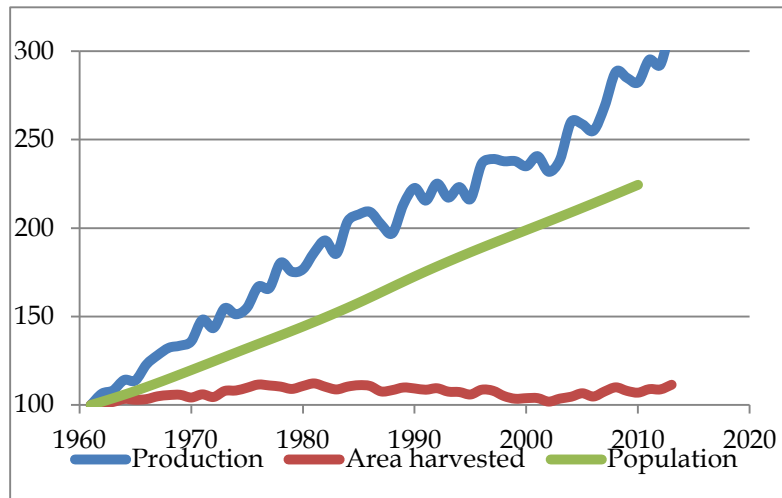


Figure 1. World cereal production, population, and cereal land changes

Source: Data on cereal production and harvested area were obtained from FAO STAT. Population data were based on UN.

famous incident to see this contradictory observation was a famine striking Bangladesh in 1973, by which millions citizens died of hunger (Norton et al. 2010). The famine occurred though food production was increased compared to the previous year, which can be made sure from the food supply data in the FAO data base (FAO, 2014). The major reason was the food price increase due to bad weather in the previous months (which turned out not to affect food production) and lowered cash income for the small farmers in that year. Most of the victims were small farmers who were either unemployed, landless or small farmland owners. One lesson of this incident is the significance to alleviate poverty to increase purchase power and stabilize food production for individual farmers.

Hence, international organizations and their expertise including those in UN and the World Bank have addressed the role of modern agriculture to increase farmers' income in developing countries. Green Revolution, which led many Southeast Asian countries to the take-off stage for economic development, is often referred to justify their assertion (e.g., Hayami 1995). In one aspect, the positive effect of modern agriculture is considerable for poverty alleviation particularly in rural areas (I don't say there was no adverse effects of Green Revolution and there are in fact many critiques. For example, it triggered a series of dispute between economists and anthropologists in the 1980's regarding whether it created income and social inequality). To see this, let us turn back to Figure 1. The figure shows that harvested land for cereal production has almost been constant while cereal production increased by 300 %. The exclusive contribution of the production increase was yield raise due to modern agriculture particularly in North America, Europe, and Asian countries.

How about future perspectives of food demand? UN has projected that population will reach to 9 billion in 2050 according to the medium scenario (UN Population Division<sup>2</sup>, 2014). Moreover, world economy will keep expanding, meaning increasing grain demand to produce meat, which in fact has much larger impact on food demand than population growth does. As a result, the food demand in 2050 will be likely to get at least two times larger than that of the present level (Foley et al., 2010). Notice that the condition that aggregated food production meets the demand is necessary for food security (i.e., supply criteria). In the meantime, human being has already exploited most fertile land for food production; it is estimated as 30 million squared kilometer globally, a size of the African continent. Scientists have proposed to increase yield for food production in places where land productivity is still low will attain sufficient food supply for the increased demand in the future (Foley et. al., 2010). The problem is how to achieve it. Modern agriculture may play a crucial role but the next section introduces the negative aspects (besides poverty) of modern agriculture to derive the challenges for food security.

### **3. Modern agriculture and current food systems**

Modern agriculture is often paralleled with economic development, in which individual farmers shift their livelihood of farming from self-consumption food production to agriculture as a source of income. This shift further incurs incentives for farmers to increase their productivity. Thus modern agriculture is often associated with the practice of intensity and specialization for production with engineering technologies being available.

Another significant and irreversible phenomenon is globalization in which goods & services, capitals, people and information go beyond the national boundaries. In a sense, globalization has contributed to the expansion of global economy through trade, knowledge dissemination, and capital investment. Regarding food security, these components of globalization became a driving force of the evolution of global food supply chains.

The problems behind these properties of modern agriculture and complex food systems are that they create considerable environmental burdens and social inequity in the production, logistic, and consumption stages. Environmental problems include soil erosion, desertification, deforestation, poisoning pesticide, nitrogen pollution, and climate change. Specifically, in developed countries such as US, large scale farming requires a large irrigation system, machinery and energy inputs and chemical components. In developing countries on the other hand, population and development pressure is strong, so exploitation of scarce ecosystems often occurs to expand agricultural land while energy and chemical input level is still high to increase yield. Moreover, developed countries including Japan import agricultural products from many of developing countries. Regarding social equity problem, under the current trade

systems, little attention is paid to how and where consumed food was made but local environments may be destroyed because of intense agricultural production with use of chemical substances for input factors. Another equity problem is low price of agricultural commodity in the international market. Sugar, wheat, and dairy products like milk among them are exported from US and European countries for low prices. These countries have large amount of agricultural subsidies, which leads farmers to excessive agricultural production. The adverse effect is that the low priced agricultural imported products lower farmers' income in developing countries.

Now, let me focus on the use of chemical substances used as input factors for food production. The major chemical product for agriculture is pesticides for pest management. Pest management is critical. It is said that more than 40% of all world food production is lost to insect pests, plant pathogen and weeds every year, despite the application of more than 3 million metric tons of pesticides annually (Norton et al., ). The world pesticide consumption has been constantly increased. Since 1945, the amount of pesticides applied to crops in the USA has increased 10-fold (Pimentel, 2005) and Japanese agriculture faces similar situations where pesticide application is also inevitable to produce food. In China the amount has increased even higher rate in the past decades.

However, misuse of chemical pesticide and fertilizer contaminate land and water runoff through surface and ground water. Needless to say, application of pesticide causes health damages for both producers and consumers. The soil and water degradation and health problem due to pesticide has become one of the biggest environmental problems in China (Huan et. Al., 2000). It is just recently reported that pesticide toxicity (particularly, neonicotinoids) is the possible contributor of the disappearance of honey bees, called colony collapsed disorder (Lu et. Al., 2012) while peer reviewed literature possess several hypothetical mechanisms of the incidents. Little is known about the potential long-term effects on health and ecosystems. Heavy use of chemical fertilizer and pesticides tends not to hurt agricultural production in the short-term, but future production potentials can be jeopardized.

#### **4. Participation approach is key**

Food industry including super market and first food chain stores has constructed so complex food supply chains that no one can see the whole picture of them. Likewise, technologies are advancing too fast and becoming too complicated. Individual experts only have profound knowledge and skills within a closed boundary and so they often reach no scientific and objective answers for questions as to what agriculture and food systems are ideal. Speaking of everyday life, it is extremely difficult for consumers to identify the ingredients and food; what

are used, where they come from, how they were produced, and what are the health impacts.

Another point is lack of voice of consumers and small farmers. Imbalance of bargaining power exists between those who have political power and capitals such as the governments and multinational corporates, small farmers. For example, introduction of a modern crop variety often requires the use of chemical fertilizer and pesticide; otherwise, the crop will not grow as it is expected. The problem is that most farmers in developing virtually have no choice but to accept the offered input factors like seeds and chemical products from the governments and/or large cooperates. In developed countries' context, power imbalance also can be seen between consumers and super markets.

What are the potential solutions? I believe more opportunity of participation for farmers and consumers in the food system is a key. On the farmer's side, extension services in the agricultural sector have played a crucial role in knowledge dissemination and empowerment of small farmers. Extension services for farmers originated in the US University but the activities alike have spread out in developing countries too. Government-sponsored research and education, often NPOs and NGOs involved, can develop new natural-resource conserving practices and facilitates their adoption. While they deliver the necessary knowledge and information for new technologies, farmers can also directly tell the stuff about what they need. combination of it with traditional practices are often introduced; those including integrated pest management techniques and cropping techniques (e.g., windbreaks, contour plowing, and legume fallow crops) to prevent from soil erosion, silting, and desertification and reduce use of chemical substances.

Regarding the consumers aspect, farmers market is a good practice to bridge food producers (farmers) and consumers is one attempt. Farmers market is just a new form of a traditional way of food market, but farmers come together to one place in a city and sell directly their products to the consumers. The merit of farmers market is farmers can appeal the quality of their products (tastiness, freshness, safety, etc.) to consumers, which thus creates incentives for farmers to produce food products in a more sustainable manner. Also, consumers can know more about the food they eat, who and how make their foods. Local production for local consumption lowers the energy consumption for transport, as well. In the US, the number of farmers markets has been considerably increased (Payne, 2002; USDA 2013) and they are now seen around the world including Japan. These attempts have potentials to achieve both increase in food production and reduction in environmental burden.

## **5. Concluding remarks**

Food security requires to meet the supply criterion while making the balance between safety,

social equity, and the environment. Sustainable agriculture addressing environmental sustainability at the local level is possible. Even in such a place, however, it incurs many practical issues under the built environment where trade system and food supply chains dominate. Also just looking at environmental sustainability at the local level can possibly be compatible with regional and global food security. Global poverty cannot be ignored in the discourse of sustainable agriculture and food systems. Advancement of basic science and development of technologies alone may not solve the problem. Designing the vision of regional/country level sustainable agriculture in which many stakeholders are involved is essential. How to institutionalize it at the local, regional and global level is a big challenge we face.

## References

- Food and Agriculture Organization (FAO) (2014) FAOSTAT <http://faostat3.fao.org/home/E>
- Foley et. al. (2011) Solutions for a cultivated planet, *Nature*, Vol. 478, pp. 337-342.
- Hayami Y. (1995) *Development Economics*, Sobunsha.
- Huang, J.K., Hu, R.F., Zhang, L.X., Rozelle, S., (2000). *The Economy of Agricultural R&D Investment in China*. Agricultural S&T Press, Beijing.
- Lu, A., et al (2012) In situ replication of honey bee colony collapse disorder, *Bulletin of Insectology*, Vol. 65.
- Norton et al. (2010) *Economics of Agricultural Development*, Routledge.
- Payne, T. (2002) U.S. Farmers' Market 2000: A Study of Emerging Trends, *Journal of Food Distribution Research*, Vol. 33, pp. 173-175.
- Pimentel, D. (2005) "Environmental and Economic Costs of the Application of Pesticides Primarily in the United States" *Environment, Development and Sustainability*, Vol. 7, pp. 229-252.
- United Nations (UN) (2014) *UN Millennium Development Goals Report 2014*
- UN Population Division (2014) <http://esa.un.org/wpp/>
- US Department of Agriculture (2013) *National Farmers Market Directory*.
- Zhang W., Jiang F., Ou J. (2012) Global pesticide consumption and pollution: with China as a focus, *Proceedings of the International Academy of Ecology and Environmental Sciences*, 2011, Vol. 1, pp. 125-144.