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Editorial

Approaches to agricultural innovation and their effectiveness

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According to major organizations such as the World Bank, United Nations and FAO, 11% of people worldwide suffer from chronic hunger. Climate change and natural resource degradation continue to intensify food insecurity across the world, which the World Bank argues may reach crisis proportions by the year 2050, or possibly even as early as 2030. The roles of climate and eco-systems, along with endangered capitals in the realm of politics, economics, infrastructure, and the military, among others, variously impact food security. Each may improve or deeply challenge food production or distribution. For example, rain manifest as water is a vital necessity to the production of food through farming. Yet, in the form of an uncontrolled deluge, rain frequently poses a serious challenge to crop production. But even a deluge and flooding may be turned from challenge to benefit if technology or the farmer's know-how are employed to effectively address the circumstance. However, farmers may lack adaptive capacity when climate presents itself in challenging ways. Or farmers' traditional ways of meeting environmental challenges may be used, but ineffectively in modern circumstances. Human capital may provide the ability to stave off challenges to individual farmers, but consider the fundamentally greater challenge posed when threat is broader and collective social capital is not up to the task of mitigation. This is the case when entire communities are threatened but the lack of adaptive social capital opens the door for true food disasters caused by insurmountable challenges. Rain and flooding are not the only such challenges. Others may include extreme heat, drought, and excessive wind in the form of hurricanes, tornadoes, and tsunamis. The studies in this issue address several of these challenges, some successfully met, while others were not.

As we present a summary and introduction "Elucidating the Specifics of Food Security: Diverse Challenges, Differing Perspectives and Ranges of Solutions": we are pleased to offer research based on nations from the developing and highly developed areas of the world system. Although our introductory paper addresses nations across the entire world system, the remainder of papers represent significantly sized sites in the U.S., Mexico, India, and the Philippines. Furthermore, a range of crops

from varying eco-systems are presented, expanding our knowledge about multiple crops, their responses to differing growing conditions, and the implications of surrounding social dynamics for food security in the analysis of the U.S. and specifically New Orleans—a city well-known for the breadth of its food experiences.

In the introductory paper, Kick, Classen, Bacaltzar and Thompson use a structural equation modeling technique to estimate the effects of world conditions on national results [1]. They offer different theories, sample much of the world, and identify the significant effects on food security of macroscopic factors. Their analysis shows the importance of national eco-systems, and a nation's power relative to that of others, as power too is dependent on the eco-system surrounding them. They also show the importance of the eco-system and national power to various types of national capital such as state strength and internal viability, economic wealth, infrastructural development, and level of militarization. In turn a number of the capital types enhance grain production, which in turn impacts meat production. However, when all nations are taken together food production is unrelated to food security, although production harms the environment. Instead, it appears that beyond a basic and necessary level of food production, a democratic system with the necessary resources provides the distributional requisites that are the keys to national food security.

A linkage between productivity and food security is, nevertheless, restored in a "metafrontier" analysis of the effects of the MasAgro program on rain-fed maize farming in Mexico in the paper by Donnet, Becerril, Black, and Hellin [2]. They analyze data from farmers participating in the Mas Agro program and from other farmers to study productivity effects of the promoted practices and programs in seven delimited rain-fed maize regions. Metafrontier analysis results show variation in technical efficiency from 70–100% and an environment-technology gap of 30–82%. The latter results suggest the need to innovate pro-environment technologies in such production areas. The authors conclude that the differences between MasAgro farmers and non Mas-Agro farmers suggest that scaling the project will increase maize production and Mexico's food self-sufficiency.

Duncan, Dash, and Tompkins provide contradictory evidence for a different locale, eco-system and crop [3]. This study of an Indian rice "agro-socio-ecological" system uses a panel dataset of both Indian crop heat and drought shocks measured at the district level from 1980 to 2009. They find that on average, climate shock has not limited subsequent rice crop sensitivity to annual fluctuations over time. Key here is that there was no clear pattern that farmers who witnessed worsening climate conditions were able to create as an adaptive mechanism to mitigate the effects of climate change. Their ultimate conclusion that there is not a clear signal of adaptive capacity in Indian rice production systems raises alarm about effects of future climate shocks and elevates the need for new research and innovation. Clearly Indian food security as it relates to volatility of rice production in this geographic region, has not been assured by the traditional agro-socio-ecological system.

McKinney and Kato reflect on a free local produce program in a New Orleans food desert [4]. They observe that usage of free services and associated effects on food security depend on a number of factors other than the state of food security in the population. They find that important community context affecting residents' access (and use) of a local and free food market includes: social ties extant in the community, digital and generational divides, continuing infrastructural failures, and the location of the market in the neighborhood. They conclude food justice discourse should incorporate social and cultural contexts when food access and sovereignty are defined and expected in practice. Thus, unlike other treatments, McKinney and Kato introduce the importance of interpersonal ties and definitions of the situation in creating the social capital necessary to ensure food security.

In the final contribution to this special edition, Palis, Lampayan, Flor, and Sibayan analyze multi-stakeholder partnerships for dissemination of alternating wetting and drying water-saving technology for rice farmers in the Philippines [5]. Sustainable, augmented rice farming depends upon water availability and food security. AWD, an alternate wetting and drying system was introduced into the Philippines and evaluated with quantitative and qualitative methods for the years 2002–2012. Multiple stakeholders participated in adaptive research, training, and information sharing. The alliance was used to spread information on AWD operations. The alliance fast-tracked the process, resulting in an increased irrigated rice area. While the program did not result in greater rice production or farmer's incomes, it did reduce consumption of water, labor and fuel, particularly in deep-well irrigation systems, thereby improving resource conservation and sustainability outcomes for this food production system.

The articles presented here show a range of challenges to food security, approaches to those challenges, and the differential successes of those approaches. The samples selected vary from a global sample to several relatively small community samples from larger, transitional countries. The samples selected and methods used permit comparative assessment of successful and less successful approaches to the various challenges to food security. In their global sample Kick et al. show that food production is no guarantee whatsoever of food security [1]. They suggest however that democratic governance that places more power in the hands of the masses helps to guarantee access to food, hence food security. Duncan, Dash and Tompkins similarly show that when communities are unsuccessful in mounting the social capital to guarantee access they will suffer from food insecurity [3]. As well, McKinney and Kato reveal that in a food desert, even in a wealthy country, routine access to food is the gateway to food delivery [4]. And Palis et al.'s study of the Philippines finds that while local social capital and information sharing did not increase rice production, it did reduce water, labor and fuel consumption [5]. They conserved the resources that should aid in the production and distribution of food, thus food security.

Greater optimism is provided by the Mas Agro program in Mexico, where Mas Agro progress through local capital cooperation has led to environment improvements and suggestions that when pro-environmental programs are applied maize production will increase [2]. As Mas Agro is appropriately allied to the right settings, it will generate widespread implementation of production and distribution throughout Mexico.

The presence of a baseline of sufficient levels of food, technical expertise, national or local governments bent on the democratic principles of providing access for many or all, and the presence of locally organized, distributional mechanisms, seem to be keys to successful food security. Environmental circumstances, corrupt governments, and/or disintegrated or disorganized communities will continue to breed challenges to food security.

Conflict of interest

The authors declare no conflict of interest in publishing this paper.

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