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Review Spotlight on One of Our Human Rights Security–Food Security

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ABSTRACT

Food security has become predominant global affair, in the wake of globalization. It is a leading public health challenge in world today. The burning discussion is how to raise efficient use of the natural resources given ever-increasing population and constrained availability of agricultural land with ensuring food security and social, economic and environmental sustainability. This article examines the concepts of food security and identifies various challenges and issues facing by both developing and developed countries to satisfy the demand of ever increasing population. It proposes both conceptual and practical agenda and efforts to confront the problem of increasing and widespread hunger.

INTRODUCTION

Food security is seen as a fundamental right in accordance with UN in Universal Declaration of Human Rights. It is based significantly on certain fundamental human values aimed at safeguarding humanity from the menace of hunger, famine and also malnutrition. Food security tackles one of humankind's most fundamental needs i.e. access to nutritious, sufficient and healthy diet ^[1,2].

Definition and concepts of food security: ^[3]

According to World Food Summit food security exists when all people, at all the time, have both physical and economic access to safe, sufficient and nutritious food to fulfill their dietary requirements for an active and healthy life.

Four pillars of food security are:

- Food availability: Availability of adequate quantities of food of proper quality, supplied through indigenous production or through imports.
- Food access: Access to sufficient resources to acquire proper foods for a nutritive diet.
- Food utilization: Utilization of food through requisite diet, sanitation, clean water and health care, to outreach a state of nourishing well-being in which all physiological needs are met.

- Food stability: Stability of access to adequate food at all the times, independent of shocks (economic or climate related calamities) or cyclical models.

Demand

A doubling of global food demand anticipated for the next 5 decades poses great challenges for sustainability of food production and of terrestrial and aquatic ecosystems ^[4].

Challenges

Food production to provide adequate supplies for mankind represents the single most challenge of our time. Thomas Malthus view in 1798 that food production and population increase are intently related adds meaning to the present situations ^[5].

A World Bank study indicated that 100 million additional poor will be driven into poverty which further raises food needs, increase pressure on natural resources usage, and also on small farm systems capacity. Scientists from various spheres, including but are not limited to agriculture and biotechnology must put their hands together to confront this challenge ^[6]. The real challenge therefore is to design/adopt strategies depending on sound ecological concepts and blend traditional organic farming systems with scientific knowledge ^[7]. Rising food costs can have major effect on vulnerable population, driving those least further into dangers of poverty and hunger ^[8]. "If we are cautious about what's on our plates, and we care about nourishing other citizens and the planet, then we must care about climate change, because climate change is going to impact our food production," ^[9].

While food shortage remains a big worry in many areas around the world, nearly one third of the total food production is throw out as food loss and waste (FLW) ^[10].

Poverty and food insecurity are intrinsically linked as poor households often lack the resources required to access adequate nutritious food to live an active and healthy life ^[11].

The prognosis is that food supply must become double by 2050 to meet the impact of climate change and population burden on global food systems ^[12].

Social aspects

Women play a very crucial role in household food security in most of developing world. However, they are restrained by different socio-cultural, economic and institutional impediment like their non-involvement in the decision-making process ^[13,14].

Issues

Feeding the world's increasing population in both sustainable and inclusive path with good quality food is one of the important ventures for our time ^[15].

Agricultural land is shrinking because of demographic transition which is causing rapid change in farm sizes, with less land availability per family.

Climate change is the basic threat to sustainable development, global food security ^[16]. There is scientific consensus and also essentially all quantitative assessments show that climate change adversely affect all four dimensions of food security i.e. food availability, food accessibility, stability of food supplies, and food utilization in terms of both quantity and quality. Overall effect of climate change on food security differ across areas and over time and, most significantly, depend on overall socio-economic situation that a country has adjusted as the impact of climate change set in ^[17]. Predictions for the next decade suggest an increasing gap between expected demand and supply under all contexts presented. Climate change increase the dependency of developing countries on

imports and underscore existing focus of food insecurity. Within the developing countries, the adverse effects of climate change fall disproportionately on the poor ^[18].

The battle that results from two contradicting ideologies (traditional versus modern farming practices of biotechnology like genetically modified (GM) crops) can have serious outcomes especially for world's poor. Food security of the rural poor in developing world can be seriously undermined because of global food politics ^[19].

Rapid advancement in the implementation of biotechnological methods and genetically modified (GM) food development has substantially increased public worry about food safety in recent years ^[20].

Continents- Problems and Initiatives

Africa

Climatic conditions are changing in Sub Saharan African countries and are affecting food availability, access to food and utilization. Africa average farm land sizes will continue to fall for many years, presenting distinctive challenges in hinterland and also in commercialized areas ^[21].

Europe

The lack of appropriate knowledge about European food insecurity is especially distressing in these times. More empirical, relative and longitudinal research is needed to monitor and survey the extent of food security issues across European countries over time. There is also a requirement to identify groups at risk of food insecurity as well as legal, social, economic and psychological constraints constraining access to proper and adequate food ^[22,23].

Countries- Problems and Initiatives

Developed

USA

Most U.S. households are food secure. But a minority of American households experience food insecurity some times during the year, indicating that their access to adequate food is constrained by lack of money and other resources. USDA's food and nutrition assistance programs raise food security by giving low-income households access to food, a nutritious diet and education about nutrition. Genuine monitoring of food security contributes to the fruitful operation of the food assistance schemes and other government initiatives which are aimed at reducing food insecurity ^[24].

Canada

Comprehensive approaches including action at public policy is needed to achieve food security in Canada ^[25].

Developing

India

The National Food Security Act (NFSA) of India aims to provide subsidized food grains to approximately two-thirds of India's 1.25 billion populations. The introduction of this Act in 2013, marks a major paradigm shift from a welfare based to a rights based approach to address food insecurity. Local food systems have undergone significant transitions over the past two decades. Current dynamics are generally characterized by livelihood diversification with increased off-farm income opportunities and an expansion of external development interventions. A case study from Ladakh (Indian Himalayas) illustrates how changes of the political and socio-economic conditions have affected food security strategies of mountain households. Despite economic growth and self-sufficiency in food grains production, high levels of poverty, food insecurity and malnutrition persist in India (WFP 2015) ^[26-28].

China

The problems facing agriculture in China are likely more grave than ever before. After an extraordinary 86% rise in cereal production (from 1980 to 2005), recent crop yield increase in China has been slow. Many parts of the

farming systems are now more prone to stagnation with rice, wheat, and maize. Land and water limitation, climate change, and other environmental affects undermine increased crop and agricultural productivity and threatening future food security [29,30].

Pakistan- Vegetable cultivation is the most crucial strategy to decrease poverty and also to overcome food security concerns due to small landholdings/farm sizes in the rural areas of countries like Pakistan [31].

Nigeria

National programme on Food Security (NPFS) on agricultural activities started to increase food production in the Nigeria. Agricultural cooperative societies are powerful means of obtaining agricultural services under NPFS. Proper publicity and awareness creation, adequate funds and the active involvement of youth to embrace agriculture as a means of employment make the NPFS programme successful [32].

Bangladesh

There is temperature rise, irregular rainfalls and growing frequency of natural disaster which directly, influenced the food security of Kalapara Upazila. Climate change happening in Upazila has resulted in substantial reduction in agricultural production. It is observed that people are aware of climate change and its effects on food security. But lack of proper knowledge is the main reason to adapt to these alterations [33].

Implications

Food security, nutritional status and psychological health are closely connected. Researchers hypothesize that food insecurity leads to changes in dietary practices, including purchase of low-cost, unhealthy and substandard foods when resources are hindered which can be associated with more levels of psychological distress, mental disorders and poor child development [34,35].

Alternatives

Agricultural land is diminishing because of ever rising population especially in the developing world. Decreasing farm land necessitates alternative antidotes to food security problems which are explained below.

Diversification of staple crops makes agriculture sustainable, resilient and suitable for local habitats and soils.

Because of increasing demand for meat and shrinking of agricultural land alternative protein rich sources like edible insects need to be produced with less environmental influence than livestock. Edible insects have sufficient protein quantity and quality and also high amount of unsaturated fatty acids and minerals like iron and zinc. Precautions like proper labeling may be required for people allergic to seafood and also house dust mites. Psychological and emotional obstacles to acceptance need to be tackled [36].

Alternate sources rich in nutrients like *Macrotermes nigeriensis*-gregarious termite rich in proteins, carbohydrates, vitamins, lipids and minerals could help in combating against protein energy associated disease conditions, facing in developing countries [37].

Aquaculture has great prospects and benefits that range from its nutritional values to economic advantages, food security, employment and also income generation. More scrutiny needs to be paid in aquaculture in terms of funds, innovative technologies, and human resources to reach its maximum potential [38].

Biofortification, the method of breeding nutrients into food crops using both conventional and transgenic breeding methods, gives a sustainable, long-term approach for supplying micronutrients to rural dwellers especially in developing countries.

Poultry birds rearing at both captive and commercial levels provide food, energy, fertilizer and a renewable asset to many rural households [39].

AGENDA

Development of an organized framework to handle global food security has become prime concern for the global community. The exercise of securing food and nutrition is multidisciplinary. Food accessibility, food production and food distribution cannot succeed independently. They are closely intertwined to other developments, like socio-cultural influences (such as religion, gender and family), environmental issues (land, water, temperature, climate, biodiversity), economic forces (value chains, prices, finance capital), and political forces (regulations, subsidies, policies and laws) ^[40]. Farmers need to get required training and support from the government and other agencies to effectively adapt to the environmental vulnerability and avert any adverse events on their socioeconomic sustainability and food security. The Food and Agriculture Organization (FAO) suggests that agricultural biotechnology has a chief role in meeting the challenge of food security. Biotechnological interventions that utilize different OMICs approaches (like genomics, proteomics, metabolomics, transcriptomics etc.) have primary role to play along with traditional agricultural approaches.

Appropriate policies and infrastructure helps in higher agricultural prices which lead to raise in farmers' incomes and rural wages that stimulate improvement in rural economies and stimulate investment for longer-term economic growth ^[41].

Our future food supply challenges must involve everyone across the food system including food producers, processors, retailers, consumers and lastly civil society to respond and tackle the problems facing the food system through appropriate policy development (nationally, regionally and locally). Food system as a whole i.e. from inputs- primary production-processing-food manufacturing-distribution, logistics and retail- has to be kept in context and meticulously studied along with its outer influences and after effects ^[42]. It is crucial to take more aggressive yet scientifically and well organized- actions along with raising awareness to reduce food loss and waste, which need everyone's participation throughout the food supply chain.

Panacea to food insecurity must include poverty removal through different approaches like integrating irrigation farming in government poverty alleviation programmes which ensure food security, self-reliance, rise in employment opportunity and better quality of life, especially for the rural habitants ^[43].

There should be stringent laws defining strict barriers to check the entry of dangerous and substandard food commodities, both in the form of raw materials and final products ^[44].

Advocating sustainable and locally produced food, promoting community gardening, home gardening, and urban farming improve community food security and increase participant uptake of fruits and vegetables ^[45].

Shifting funding from food relief programmes to training and skills development schemes, effective public-private partnerships, promoting innovative initiatives like gender equity in agriculture and food security sectors, supporting design and execution of educational programmes linked to community development, supporting the use of technology and rise in investment in R & D projects helps in combating the problem of food security ^[46].

CONCLUSION

Food production methods in the coming decades need to adapt, not only to increase production to meet the higher population demand and modifications in diets utilizing less land, water and nutrients, but also to decrease their carbon footprint on warmer temperatures and changed precipitation patterns arising from climate change.

REFERENCES

1. Das S. Food Insecurity among Dalit Communities in India: Searching the Root Causes and Dimensions. J Pol Sci Pub Aff. 2016;4:190.

2. SciDevNet. Food security: Facts and figures. 2013.
3. Derbie M. Impact of Akaki Small-scale Irrigation Scheme on Household Food Security. *J Account Mark.* 2015;4:140.
4. Gebrehiwot NT, et al. Small-scale Irrigation: The Driver for Promoting Agricultural Production and Food Security (The Case of Tigray Regional State, Northern Ethiopia). *Irrigat Drainage Sys Eng.* 2015;4:141.
5. Devendra C. Intensification of Integrated Natural Resources Use and Agricultural Systems in the Developing World. *Agrotechnol.* 2012;1:e101.
6. Kumar A, et al. Metabolomics: A Novel Tool to Bridge Phenome to Genome under Changing Climate to Ensure Food Security. *Med Aromat Plants.* 2014;3:e154.
7. Bhatt KN. System of Rice Intensification for Increased Productivity and Ecological Security: A Report. 2015;3:147.
8. Gustafson DJ. Rising food costs & global food security: Key issues & relevance for India. *Indian J Med Res.* 2013;138:398-410.
9. Paige B. Can small communities tackle global food security?
10. Shafiee-Jood M and Cai X. Reducing Food Loss and Waste to Enhance Food Security and Environmental Sustainability. *Environ Sci Technol.* 2016.
11. Hjelm L, et al. Measuring Poverty for Food Security Analysis: Consumption- Versus Asset-Based Approaches. *Food Nutr Bull,* 2016.
12. Massawe F, et al. Crop Diversity: An Unexploited Treasure Trove for Food Security. *Trends Plant Sci.* 2016;21:365-368.
13. Maurice MB, et al. Assessing The Socio-Cultural Factors That Affect Women's Contribution To Food Security In The Kasena Nankana Municipality, Upper-East Region, Ghana. *Int J Pl An and Env Sci.* 2014;4.
14. Sharma MC and Sharma KS. Food Security and Ecological Degradation: Challenges and Opportunities for Inclusive Growth. *Int J Econ and Manage Sci.* 2014;3:200.
15. Josef S and Francesco NT. Global food security under climate change. *PNAS.* 2007;104:19703–19708.
16. Sticklen M. Studies of the Negative Effects of Climate Change on Crop Productivity and Global Food Security. *Adv Crop Sci Tech.* 2015;3:e129.
17. Kumar M. Impact of climate change on crop yield and role of model for achieving food security. *Environ Monit Assess.* 2016;188:465.
18. Failler P. Climate Variability and Food Security in Africa: The Case of Small Pelagic Fish in West Africa. *J Fisheries Livest Prod.* 2014;2:122.
19. Mahmudul A, et al. Climate Change Adaptability Of Farmers: Malaysian Case Study. *Int J Pl An and Env Sci.* 2013.
20. Anouti FA. Concerns Regarding Food Biotechnology: An Ongoing Debate. *J Biodivers Biopros Dev.* 2014;1:106.
21. Zewdie A. Impacts of Climate Change on Food Security: A Literature Review in Sub Saharan Africa. *J Earth Sci Clim Change.* 2014;5:225.
22. Knox O, et al. Improved Sustainability and Ecosystem Services from Seaweed Additions to an Old Agricultural Production System. *J of Ecol and Envi Scie.* 2015.
23. Borch A and Kjærnes U. Food security and food insecurity in Europe: An analysis of the academic discourse (1975-2013). *Appetite.* 2016;103:137-147.

24. Coleman-Jensen A, et al. Household Food Security in the United States in 2014. United States Department of Agriculture Economic Research Report No. (ERR-194). 2015;43.
25. Atkey KM, et al. A Public Policy Advocacy Project to Promote Food Security: Exploring Stakeholders' Experiences. Health Promot Pract, 2016.
26. Sandhu A. National Food Security Act, 2013 and Food Security Outcomes in India. The Journal of Business Perspective. 2014;18:365-370.
27. Desai S and Vanneman R. Enhancing Nutrition Security via India's National Food Security Act: Using an Axe instead of a Scalpel? India Policy Forum. 2015;11:67-113.
28. Dame J and Nusser M. Food security in high mountain regions: agricultural production and the impact of food subsidies in Ladakh, Northern India. Food Secur. 2011;3:179-194.
29. Li X, et al. Patterns of Cereal Yield Growth across China from 1980 to 2010 and Their Implications for Food Production and Food Security. PLoS One. 2016;11.
30. He L, et al. Calculation on ecological security baseline based on the ecosystem services value and the food security. Ying Yong Sheng Tai Xue Bao. 2016;27:215-224.
31. Noonari S, et al. Price Flexibility and Seasonal Variations of Major Vegetables in Sindh Pakistan. J Food Process Technol. 2015;6:524.
32. Onugu CU. The Performance of Agricultural Cooperative Societies under the National Programme on Food Security in Enugu State, Nigeria. Review of Public Administration & Management.
33. Amir KI and Ahmed T. Climate Change and Its Impact on Food Security in Bangladesh: A Case Study on Kalapara, Patuakhali, Bangladesh. J Earth Sci Clim Change. 2013;4:155.
34. Sharon F, et al. The impact of drought on the association between food security and mental health in a nationally representative Australian sample. BMC Public Health. 2014.
35. Jamie AF. The Impact Of Nutrition Education On Food Security Status And Food-Related Behaviors. Masters Theses 1896 - February 2014. University of Massachusetts-Amherst. 2013; Paper 1036.
36. Van HA. Edible insects contributing to food security? Agr Food Secur. 2015;4:20.
37. Pisoschi AM. Studies on Biochemical Processes for Elucidation of Disease Mechanisms and Ensuring Food Security. Biochem Anal Biochem. 2013;2:131.
38. Adelodun OB. Participation of Youth in Aquaculture. J Aquac Res Development. 2015; 6: 386.
39. Khan MS and Khan IA. Biopharming: A Biosecurity Measure to Combat Newcastle Disease for Household Food Security. Biosafety. 2015;4:e156.
40. Evert-jan Q. Evert-jan Q From local to global: prioritizing food security Conclusion and recommendations. The Broker. 2013.
41. Smyth SJ, et al. EU Failing FAO Challenge to Improve Global Food Security. Trends Biotechnol. 2016;34:521-523.
42. Impact Report. Impacts from the Global Food Security Programme. 2015.
43. Oruonye ED. Reducing Rural Poverty And Developing Livelihood Opportunity Through Irrigation Farming In Taraba State, Nigeria. Int J Pl An and Env Sci. 2011;1.
44. Aigarinova GT. Legal Backing of Food Security as a Major Component of the National Security of the Republic of Kazakhstan. J Civil Legal Sci. 2013;2:106.
45. GRACE Communications Foundation Communications Foundation. Food Security & Food Access.
46. Ngopulse. Food Security: Not Simply a Matter of Access to Food.

