



Global Food Production: A Primer

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Abstract Understanding the world food situation lies on data on food production, trends in food prices of food, and developments in the agriculture industry. The increasing world population has demanded the need to expand global food production. Food production affects global food security as well as global food supply-demand relationship. Technologies can potentially increase food production, sustainability, and availability, thereby helping the agricultural industry meet the rising demand for food to feed the world's increasing population. This paper provides a brief examination of the development and constraints of food production in several parts of the world.

Keywords food production, global food production, food security

Introduction

Food is essential both for human growth and survival. It provides the body with energy, which is vital for its existence. Food consists of three basic components – proteins, carbohydrates and fats; each component is needed for growth and healthy living. We obtain these components through nutritionally sound diets from a variety of plant and animal foods. Most ingredients in dishes cannot be replaced by mere exclusion, e.g. of tomatoes from salads and increasing the volume of other vegetables. There are four categories of staple food [1]: (1) vegetables or fruits, (2) dairy products, (3) meat, poultry, or fish, (4) breads or cereals.

In a world of rapidly growing population, achieving food security is a basic challenge.

Food security refers to the availability of sufficient food and economic access to food by all people at all times for healthy living. The world's hunger has grown worse in recent times due to rising food prices, especially in the developing world. Rising food prices are causing severe hardship and suffering among the world's poor. Poverty is above 20 percent in many nations. Women and children are hit worst because of women's limited participation in economic activities [2].

Methods of Food Production

Food production can be classified into different types including cultivation, selection, crop management, harvesting, crop production, preserving, baking, pasteurizing, pudding, carving, butchering, fermenting, pickling, drink and candy making, restaurants, etc. Different methods of food production include [3]:

- Chopping or slicing of vegetables.
- Curing food.
- Grinding and marinating.
- Emulsification.
- Food fermentation.
- Fermenting beer at brewing industries.



- Boiling, broiling, frying, grilling, steaming and mixing.
- Pasteurization.
- Fruit juice processing.
- Removing the outer layers either by peeling and skinning.
- Gasification of soft drinks.
- Preserving and packaging of food products by vacuum packs.
- Fast freezing of fruits and berries;
- Production of bread from frozen dough;
- Membrane separation and membrane sterilization of milk.

Agriculture refers to larger-scale cultivation of seed crops in fields, while horticulture or gardening involves small-scale cultivation of a range of food plants in gardens. There are reasons the garden/field and horticulture/agriculture dichotomies are difficult to use in descriptions of past food production. The cultivation of homegrown foods, also known as home gardening, Homestead Food Production (HFP), and Residential Food Production (RFP) played an important role in household and collective food security. The practice of growing food in the home environment provides essential, nutrient-rich foods, and was practiced around the world before industrialization. There are also some initiatives that include food production on institutional sites. Numerous educational institutions now boast community gardens.



Figure 1: World map composed of fruits and vegetables: global food production concept [4]

Global Food Production

This section examines the development and constraints of food production in several part of the world. Figure 1 shows the world map composed of fruits and vegetables and illustrated the global food production concept [4].

- *United States:* The United States plays a major role in the international food system. The industrialization of food production and distribution contributed to the power of the United States to shape economic policy for global trade. In the United States, the federal government's primary strategy to mitigate food insecurity is to provide monetary assistance to individuals. The three largest government operated nutrition assistance programs available to US residents are the Supplemental Nutrition Assistance Program (SNAP) (formerly called the Food Stamp Program), the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and the National School Lunch Program [5]. Across the United States and worldwide, people are calling for a global commitment to agroecology, land reform, food justice, and food sovereignty.



- *China:* China is already a significant player in world food markets and its role is likely to become increasingly important. China is transitioning from traditional agriculture to modern agriculture. With the increase in urbanization, industrialization, population growth, and people's life quality, China's food production is under severe pressure. The government needs to improve the agricultural infrastructure, especially irrigation facilities, increase farmers' subsidies for purchasing agricultural machinery or fertilizer, and improve modern food production [6].
- *Sub-Saharan Africa:* This includes all countries in Africa with the exception of South Africa and North Africa. North Africa (Algeria, Egypt, Libya, Morocco, and Tunisia) and South Africa are not included here because their economies are more advanced than the rest of Africa. Africa is rich in many ways including virgin land for agriculture and in mineral resources. Africa in general and Sub-Saharan Africa in particular have been severely affected by a prolonged economic, political, and development crisis, causing acute food shortage. The region has witnessed a decline in food production in spite of a rapidly increasing population. Many food-deficit countries in the region now depend yearly on food aid (from donor countries such as the United States, the Soviet Union, Japan, Italy, Germany, and Canada) to meet pressing food needs. Many African nations rely on export revenues to earn foreign exchange and finance purchase food in the international market. Some African policy makers believe that the only way to increase food production is through rapid industrialization [7]. For example, Nigeria has had enough foreign exchange to buy enough foreign food to meet their food demands. In the process, the agricultural sector has been largely neglected and the country has become a major food importer. Today, Nigeria is more of a consumer nation than a producer nation. Reduction in food production, food insecurity, and youth unemployment have characterized the present situation in Nigeria [8].
- *Europe:* The agricultural industry in Europe traditionally relied on local labor to supplement family labor during the harvest period. Local people would respond to employers' changing, unpredictable need for labor at short notice, with low-wages and poor working conditions. International influx of migrant labor (from asylum seekers and refugees) to rural society has helped the food production industry. For example, there have been international migration programs operating in British, French, and German. Migrant workers are often more productive and they generally occupy the least attractive positions in the food production industry. International migration to or in rural areas of Europe has become a new norm [9]. For example, in Greece, the extreme poverty and low productivity of modern Greek agriculture is often attributed to environmental constraints, rural depopulation, poor access to urban markets, and competition from more intensive agricultural regimes. Future food production in Eastern Europe and the former Soviet Union faces a precarious food security situation. This region has great agricultural potential that is as yet underutilized.
- *India:* India is the second most populous country in the world after China. It has witnessed increased political conflicts in many parts of the country (such as the North-East, Jammu and Kashmir) which directly affect those living in these areas. Access to food grains generally depend on the availability of food grains as well as socio-economic determinants, including caste, gender, and affordability. The demand for crop residues as feed is very high. Small-holders have been able to increase the milk production of buffaloes and cows [10].
- *Canada:* Canada was the fifth largest agricultural food exporting nation in 2010. Canadians have reliable access to healthy and affordable food since food production is a major economic driver in Canada. Canada's food production is as varied as its geography and includes fishing, hunting, gardening, and gathering. It depends heavily on seasonal weather for heat, light, and water [11].
- *Papua New Guinea:* People's diets vary across the country, especially between rural and urban residents. For example, rural villagers in PNG grow about 400 plant species for food. Their staple foods include sweet potato, sago, banana, yam, taro, Chinese taro, cassava, sugar cane, coconut, Irish potato, and corn. Some of these staple foods are now believed to be indigenous to and domesticated in PNG. Most of these foods are consumed in small quantities in different places. The domestic pig is the



most popular animal food. Sheep meat, beef, rice, and wheat are the most important imported foods [12].

- *Thailand:* Thailand is an agricultural country. Thailand is confronted with the issue of energy insecurity. Biofuels have been introduced to Thailand as alternative energy sources for transportation. The potential biofuel crops in Thailand that are currently cultivated are sugarcane and cassava for bio-ethanol [13].
- *Bangladesh:* Bangladesh is located in the combined delta of three great rivers (the Ganges, the Brahmaputra, and the Meghna) draining an enormous area of India and China. This country provides an acute illustration of the recent concern over the precarious global balance between food supply and rapid population growth. In Bangladesh, women traditionally contribute significant unpaid and unrecognized labor to post-harvest processing of rice, the main crop produced in Bangladesh. Women's disempowerment and gender inequality are reinforced by social norms that discourage women from seeking outside employment [14].



Figure 2: Global food production [15]

Global Food Constraints

Figure 2 shows global food production [15]. Global food production is increasing but progress may be tampered by the following constraints.

- *Food Production and Climate Change:* Climate change is associated with increasing temperatures and extreme rainfall. It is predicted to warm, deoxygenate, and acidify the ocean. Air pollution and climate change are recognized as major threats to food production. Ozone was long established as the most important pollutant in terms of its effects on crop yield. Climate affects crop productivity, animal production, and water availability, and reduce snow cover during winter. It is also affecting the availability and quality of wild foods such as berries, wild rice, and game animals. The effects of



climate change on food production are evident in many nations. Climate change will affect international trade in foodstuffs. Environmental protection legislation is being introduced minimize air pollution and curb excessive use of animal manure on the land. Global food production will be altered through severe climate change [16].

- *Food Production and Population Growth:* Humanity's future is at a critical juncture as the population continues to grow at a high rate in the most food-deficit regions of the world. The world's population is projected to reach 7.67 billion by 2020. This may put pressure on the world's food production. The imbalance between the growing food demand due to increasing world population and global food production is alarming. Faced with population growth and climate change, small-holder farmers should be the first target for policies to intensify production and feed to minimize waste and environmental impact [17].
- *Food Production and Energy/Water:* The modern food production depends heavily on fossil fuels. High energy prices and availability affect the US and global economies. The continuous increase in energy prices has inevitably raised production costs. Some experts believe that the food industry's reliance on cheap fossil fuels could eventually cripple the system. Rising energy prices trickle down to the food consumers [18]. In addition to energy, water availability is important for food production. Water availability is tightly linked to land use. Water scarcity is a major challenge for farmers in Africa, Asia, and the Near East [19].
- *Sustainable Food Production:* Food production entails extensive amount of raw materials, energy, and water, thereby releasing a significant amount of waste to the environment. This food production challenge has become a global issue. Sustainable food production has the benefits of satisfying human needs for food, protecting natural resources, and ensuring environmental quality. There has been a great demand in Europe and North America to integrate environmental concerns in to agriculture and food production. Sustainability in food production at global scale is vital to limit global carbon emissions stocks. The goal is to reduce global food waste at retailers, consumers, production, and supply chains. Sustainable food production includes economic and environmental factors such as sustainable investment in agriculture production system, land use change, dietary change, affordable food prices, environmental products labeling, global bioenergy demand, mineral resource rents tax, forest biodiversity, financial liberalization, and population density [20].
- *Food Aids:* The global food production is not keeping pace with some developing nations in Africa and Asia. Despite the massive assistance and the massive virgin land, Africa still produces little food. This may be due to some problems such as weather, political instability, lack of foreign exchange to purchase fertilizers, and inability to participate in the Green Revolution. Some of these nations depend on foreign aid. The aid has become a serious economic and political hinderance to progress and growth [21]. This has caused some to argue that food aid should be reduced to nothing. Inefficiencies in the transfer and distribution of food aid lead to wasted time and money. Delivery modes include direct transfer, local purchase, and triangular purchase [22].

Addressing this problems and producing enough food to better feed the poor will be a tremendous challenge. The environmental impacts can lead to additional economic and health challenges, particularly for the poor individuals.

Benefits and Challenges

Food was central to the emergence and expansion of capitalism, European colonialism, and industrialization. Animals act as insurance against hard times, and supply farmers with a source of regular income from sales of milk, eggs, and other products. Food production has significantly increased over the year due in part to productivity-enhancing Green Revolution technologies and a significant expansion in the use of land, water and other natural resources for agricultural purposes. Food donors help in alleviating hunger in developing nations. Hunger is essentially exclusion from the land, income, jobs, wages, life and citizenship. One way is to increase food production for consumption and exports.



Since the food crisis of the early 1970s, food production and distribution around the world has dominated by large multinational companies, thereby controlling the availability and cost of food worldwide. Market factors reinforce the exploitation in food production. Individuals may not be able to participate in homegrown food practices if they are excluded from access the resources. This “food-system divide” is one of the major hindrances to achieving a healthy population and sustainable agricultural systems in developing countries. Trust is a decisive factor for market success in modern consumer societies. Energy costs will stay high for the foreseeable future in most countries. Most developing nations have opted for cheap food, accepting food aids and easy credit. In some of those nations, modern technology has been introduced only to a small segment of the agricultural sector [23].

Conclusion

Food is a basic necessity of life. Food production is an important component of food security. It covers a broad spectrum of activities involving agriculture, fisheries, and non-commercial food supply. The production of safe food is important for the food businesses, governments, and consumers worldwide. Globalizing food production has grown.

Current global food production is sufficient to meet human nutritional needs in 2050 provided there is radical societal adaptation [24]. There will be enough food to meet the demand of people who can afford to buy it. As part of improving human welfare and increasing the quality of life, food self sufficiency should become a priority for developing nations. Education for the generation of new technologies in food production is the responsibility of policymakers, researchers, and others. More information on global food production can be found in the books in [25-27] and related journals such as *Journal of Food Science* and *British Food Journal*.

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