



Food Production: A Gentle Introduction

Matthew N. O. Sadiku¹, Tolulope J. Ashaolu², Sarhan M. Musa¹

¹Roy G. Perry College of Engineering, Prairie View A & M University

²College of Food Science, Southwest University, Tiansheng Road Beibei District, Chongqing, 400715, P.R. China

Email: sadiku@ieee.org; ashaolut@gmail.com; smmusa@pvamu.edu

Abstract Agriculture refers to larger-scale cultivation of seed crops in field. It is significant part of the food industry, which plays a crucial role in the economy of any nation. Today food production, processing, and marketing represent the dominant components of the food industry in many countries. Food production from agriculture embraces all businesses that are involved in converting raw materials into ready-made food products. Some emerging world eco-socialist movements increasingly pay attention to the role of food production. This paper provides a brief introduction to food production.

Keywords food production, food manufacturing

Introduction

The world has witnessed rapid advancements in technology, medicine, science, and international cooperation. On average we live longer than our predecessors and enjoy more widespread availability of energy and food [1]. However, man faces many challenges including energy, rapid population growth, and food production. The problems are complex and interrelated. In the United States, food production, harvest, and transportation of food consume significant amount of energy. Agriculture has become more energy-intensive. As demand increases, agriculture consumes proportionally more indirect energy. In food production, energy is used in many forms [2]. The crucial roles of agriculture in sustaining human lives through production of foods and fibers have long been recognized. Agriculture, which is the cultivation of food through farming, produces the lion share of the global food supply. Early farmers usually worked land in ways that depleted its fertility. For decades, farmers grew the same crops year after year, using enormous amounts of chemical pesticides and fertilizers that damage soils, water, air, and climate. The environmental damage of food production from conventional farming includes deforestation and pollutants. An increasing number of innovative farmers and scientists are taking a different approach, which is more sustainable—environmentally, economically, and socially. Today, most foods in the US are produced using modern or contemporary farming practices. Also, consumers demand enough information about food attributes, country of origin, and method of production should be provided by the food supply chain, from the production to the consumption stage. The food production chain is illustrated in Figure 1 [3].

The Concept of Food Production

Food production is the process of transforming raw ingredients into food products. It includes industries that take raw food products and convert them into marketable food items for use by consumers. It is significantly influenced by many factors such as the physical environment temperature, altitude, rainfall distribution, soil moisture, and total land mass. The physical environment plays a critical role in determining both where crops can be grown and how productive they are. For example, higher energy expenses hit food producers hard after



hurricanes. Temperature conditions often set the absolute limits to growth. Cloud cover can reduce the amount of sunshine, which is necessary for optimum plant growth [4]. Increased food production depends on the cultivation of the soil more intensively. There are large numbers of plant and animal products which provide us with food such grains, spices, honey, nuts, cereals, milk, vegetables, fruits, egg, meat, chicken, etc. A typical food production is shown in Figure 2 [5].

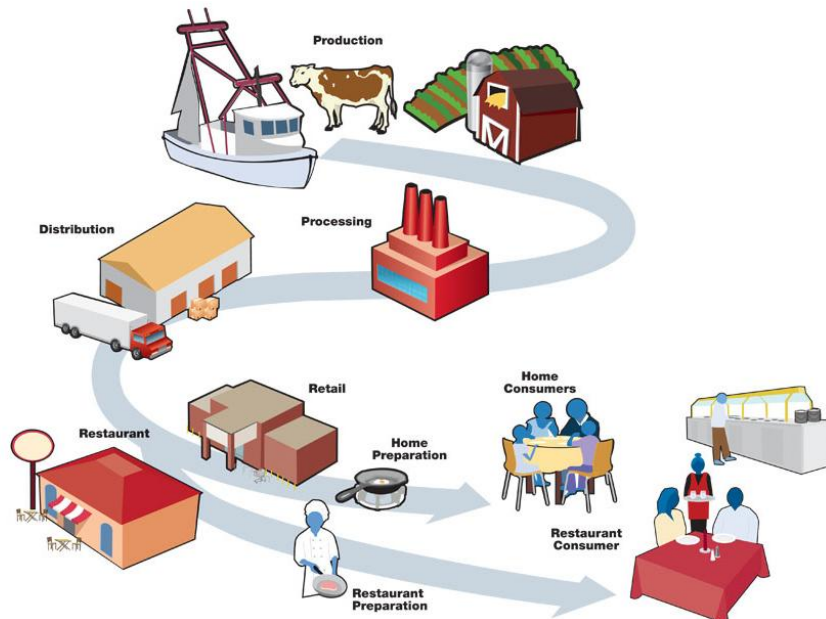


Figure 1: The food production chain [3]



Figure 2: A typical food production [5]

Food Production Methods

Food production takes many forms, which are alternatives for increasing food consumption. Food is produced and sourced through industry-based production of agricultural and fisheries products, as well as through manufacturing, local and household production.

- *Food Manufacturing:* The food production process can be automated using different technologies such as the programmable logic controller (PLC). Automation offers solutions for improving future food production. Manufacturers are not always required to provide information on the label detailing the type of production method or aids used to produce food.
- *Organic Food Production:* “Organic” simply refers to one type of food production method. By regulation, organic food is produced without the use of synthetic pesticides and fertilizers made with



synthetic ingredients or sewage sludge. Organic ingredients must meet requirements that are consistent across the US.

- *Local Food Production:* Local food production is one produced in the proximity of where it is purchased. This is becoming important as a growing number of people worldwide grow their own food. Growing and consuming food locally helps increase food security. Consumers, traders, and food-processing companies have shown increasing interest in local food production. Local food is regarded as alternative food supply, originating from the dissatisfaction with conventional food systems [6].
- *Home Food Production:* This is also known as family food production. Food production in and around the household is the most ancient form of cultivation. Home food production involves household garden, which is a subsystem within larger food procurement systems. Such food production enables the planting of a wide range of fruits and vegetables. It also involves converting raw food product into forms for long-term storage. It is different from field production [7]. Growing food in home gardens allows daily physical activity and improves mental health. House wives can contribute to the nation wide food-producing and food-conserving movement.

Benefits and Challenges

Food production and its related operations are integral parts of hospitality management, hotel management, and restaurant businesses. It has become indispensable requisites for modern living. Household food production addresses the causes of hunger and malnutrition. Modern food production allows us to preserve food products for a long period of time. Food production pays off very quick. Since people always want to eat, food production has become a lucrative business.

Some factors contribute to the short- and long-term impact on food production. Food production is facing grand challenges. Major threats to food production include air pollution, climate change, rising population, degrading bio-productivity of agricultural land, over-fishing, literacy, incomes, and types of government. Assessing the impact of these threats is a major challenge. It is challenging to evaluate food production efficiencies. Although price, mass, volume, and calorie are common tools, they have proved to be unsatisfactory as measures of efficiencies. Land resources for agriculture have decreased due to increasing population, urbanization, diminishing water supply, and continuing climate change.

Water supply is the chief limiting factor in food production in some countries. It is a challenge for growing biofuel crops. Agriculture, whether rainfed or irrigated, is the largest consumer of water, which is a limited resource. Someone has said that most of the water humans consume is for agriculture [8]. Contemporary world hunger is also an immense problem, closely linked to poverty. The agricultural workforce in some developing economies is made up of women, who are merely seen but not heard [9]. Large companies dominate the food sector. In some cases, high productivity can lead to the problem of possible overproduction. Other challenges faced by food production include war, drought, and famine. More challenges, problems, and uncertainties lie ahead.

Conclusion

Agriculture and food production are becoming more innovative. Food production needs to grow yearly in order to have enough food for everyone in rapidly increasing population. The solution to maintaining the global food supply lies in the wide adoption of new technologies, which may involve a thorough understanding of recent advancements in agriculture and food production. Wise and timely interventions should be made at all levels to ensure that farmers achieve a satisfactory level of food production. Several nations are attempting to boost agricultural output and food production to meet the demands of increasing populations and ensure food security [10]. Development economists realize that the government must play a critical role in facilitating food production. Business-as-usual mentality in agriculture will not deliver sustainable solutions. More information on food production can be found in the books in [11-15] and related journals such as *Journal of Food Science* and *British Food Journal*.



References

- [1]. A. Gvakharia, "The atmospheric impact of energy and food production," *Doctoral Dissertation*, The University of Michigan, 2019
- [2]. D. F. Rychel, "The economic impact of energy on food production," *Doctoral Dissertation*, Florida State University, Tallahassee, Florida, 1972.
- [3]. "Foodborne Outbreaks," https://www.cdc.gov/foodsafety/outbreaks/investigating-outbreaks/figure_food_production.html
- [4]. R. M. Bourke, "Environment and food production in Papua New Guinea," in J. Golson et al. (eds.), *Ten Thousand Years of Cultivation at Kuk Swamp in the Highlands of Papua New Guinea*. ANU Press, 2017, pp. 51-64.
- [5]. "The importance of nature stability," <https://greaterthamesmarshes.com/>
- [6]. K. Korhonen, "Accessibility of local food production to regional markets – Case of berry production in Northern Ostrobothnia, Finland," *European Countryside*, vol. 9, no. 4, 2017, pp. 709-728.
- [7]. V. Niñez, "Household-level food production," *Food and Nutrition Bulletin*, vol. 7, no. 3, 1985.
- [8]. C. Dalin, M. Taniguchi, and T. R. Green, "Unsustainable groundwater use for global food production and related international trade," *Global Sustainability*, vol. 2, 2019, pp. 1–11.
- [9]. U. C. Amalu, "Food security: Sustainable food production in Sub-Saharan Africa," *Outlook on Agriculture*, vol 31, no 3, 2002, pp 177 –185.
- [10]. B. J. McMahon et al., "Targets to increase food production: *One Health* implications," *Infection Ecology & Epidemiology*, vol. 5, no. 1, 2015.
- [11]. Z. Y. Blech, *Kosher Food Production*, Wiley-Blackwell, 2nd ed., 2008
- [12]. M. N. Riaz and M. M. Chaudry, *Halal Food Production*. Boca Raton, FL: CRC Press, 2004.
- [13]. H. M. Resh, *Hydroponic Food Production. A Definitive Guidebook of Soilless Food-Growing Methods*. Santa Barbara, CA: Woodbridge Press Publishing Company, 1995.
- [14]. P. S. Bali, *Food Production Operations*. Oxford University Press, 2nd ed., 2020.
- [15]. P. Christou et al., (eds.), *Sustainable Food Production*. Springer, 2013.

Authors

Matthew N.O. Sadiku is a professor in the Department of Electrical and Computer Engineering at Prairie View A&M University, Prairie View, Texas. He is the author of several books and papers. His areas of research interests include computational electromagnetics and computer networks. He is a fellow of IEEE.

Tolulope J. Ashaolu is a research fellow at Southwest University, Chongqing, China. He is the author of several papers and a book. His research interests include functional foods and food microbiology.

Sarhan M. Musa is a professor in the Department of Electrical and Computer Engineering at Prairie View A&M University, Texas. He has been the director of Prairie View Networking Academy, Texas, since 2004. He is an LTD Sprint and Boeing Welliver Fellow. His areas of research interests include computational electromagnetics and computer networks.

