Food and Agriculture

Student's Name

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The scientific foundations established during the agricultural practices of the twentieth century played an important role in the current technological advancements experienced in the sector. Starting with the breakthroughs that began in the second half of the twentieth century, the modernization of agriculture in the U.S has led to high crop yields (Jain, 2012). As the country continues to experience a steady increase in technological advancements, scientists are also discovering new ways of increasing the efficiency and sustainability of agriculture by developing means such as aquaponics and genetically modified crops. Nonetheless, these advancements increase crop productivity, but also affect food safety and the environment.

Aquaponics involves cultivating crops in a non-soil medium, by feeding the crops with water that is rich in nutrients from aquatic organisms that are intensively cultured (Rizal et al., 2018). The benefits of aquaponics include a reduction in plant pathogens, a higher rate of plant growth, a decrease in the production footprint as compared to soil, and a decrease in water resource inputs (Rizal et al., 2018). Aquaponics is environmentally friendly because plants can be grown at any time of the year and the water from the system can be recycled. Compared to the traditional practice of planting crops in soil, aquaponics uses less amount of water and does not require fertilizer. Nonetheless, aquaponics poses a threat to food safety in that aquaponics systems have a higher amount of pathogens, which can prove to be harmful. The aquaponics system is more likely to result in the transmission of bacterial contamination into the fish and the crops as well. The pathogens are more likely to be found in both water and the plants.

Genetically modified (GM) crops are also a good way of increasing crop productivity, thus increasing the availability of food. Genetically modified crops are plants whose DNA has been genetically modified using genetic methods of engineering (Qaim & Kouser, 2013). The

system of genetic modification results in high crop production while reducing the inputs of machinery, chemical pesticides, and fuel. The high crop production results in high yields, which leads to increased employment as more workers are needed to cultivate the crops. Genetic modification is also beneficial since crops can be modified to be more resistant to pests, thus leading to high yields while reducing the cost of buying pesticides. The GM crops can also be modified to control certain diseases from occurring in the crops (Bawa & Anilakumar, 2013).

Nonetheless, the GM crops present both food safety and environmental issues. During the process of cross-pollination, the crops that are genetically modified can prove harmful to other plants in the environment (Bawa & Anilakumar, 2013). Additionally, since the crops are genetically modified to resist pests and diseases, the long-term effect could result in the evolution of the pests and diseases in that area, which could lead to devastating effects (Bawa & Anilakumar, 2013). The evolution might also occur in the weeds as well, which can be more resistance. Also, genetic modification of crops can result in food safety issues. For processes that involve gene integration, the effects of the gene product can result in the production of new proteins in the crops, which can produce unpredictable allergenic effects. More so, the existing genes of the host plants that are genetically modified can be disrupted when inserted with foreign genes. Once inserted, the natural genes can be inactivated leading to mutant plants (Bawa & Anilakumar, 2013). Such alterations can be harmful to the plant itself as well as the consumers. Therefore, it would be more appropriate to conduct proper research on the effects of the advancements in agricultural technology before they can be practiced.

References

Bawa, A. S., & Anilakumar, K. R. (2012). Genetically modified foods: safety, risks and public concerns—a review. *Journal of Food Science and Technology*, *50*(6), 1035-1046.

Jain, H. K. (2012). Transition to Twenty-First Century Agriculture: Change of Direction. *Agricultural Research*, *1*(1), 12-17.

Qaim, M., & Kouser, S. (2013). Genetically Modified Crops and Food Security. *PLoS ONE*, *8*(6), e64879.

Rizal, A., Dhahiyat, Y., Zahidah, Andriani, Y., Handaka, A. A., & Sahidin, A. (2018). The economic and social benefits of an aquaponic system for the integrated production of fish and water plants. *IOP Conference Series: Earth and Environmental Science*, *137*, 1-7.