SAJMMR

ISSN: 2249-877X Vol. 11, Issue 10, October 2021, Impact Factor: SJIF 2021= 7.642

South Asian Journal of Marketing &Management Research (SAJMMR)

(Double Blind Refereed & Peer Reviewed International Journal)

DOI: 10.5958/2249-877X.2021.00066.7

FUTURE OF MODERN FARMING: A COMPREHENSIVE REVIEW

Dr. Aniket Kumar*; Rajkishor Singh; Jitendra Kumar Singh Jadon*****

[1, 2 ,3]School of Electronics, Electrical & Mechanical Engineering,
Faculty of Engineering and Technology,
Shobhit Institute of Engineering and Technology,
(Deemed to be University), Meerut, INDIA
Email id: [1]aniket.kumar@shobhituniversity.ac.in, [2]rajkishore@shobhituniversity.ac.in
[3]jitendra@shobhituniversity.ac.in

ABSTRACT

Agricultural production in agricultural systems were dependent on internal resources, organic material cycling, built-in bio - control mechanisms, and rainfall patterns until approximately four decades ago. Agricultural yields were low, though consistent. As insurance against insect outbreaks or extreme weather, producers grew more than one crop or type in the same field at the same time. Accuracy the advantages of this method have been shown in farming, but we may now move on to a new generation of equipment. Instead of dousing a whole apple orchard with chemicals on a regular basis, towing sensors detect illnesses or parasites using infrared multiple sensors, as well as spray just the afflicted trees. Robots may one day work on commercial farms, identifying, spraying, and picking specific bits of food off plants, even if their objectives are grapes, peppers, or apples which are as green as the foliage that surrounding them. A new generation of agricultural automation promises to alter the economics of horticulture in the same way that the mechanical reaper did for cereal production. Because selecting apples differs from picking strawberries, the machines come in a variety of shapes and sizes.

KEYWORDS: *Agriculture, Modern Farming, Robot*

1. INTRODUCTION

Rotating main field crops with legumes provided nitrogen inputs. By successfully interrupting the life cycles of these pests, turn rotations reduced insects, weeds, and illnesses. Corn was alternated with other crops, including soybeans, by a typical Corn Belt farmer, and small grain output was essential to keep animals alive. No specialist equipment or services were bought from off-farm sources, and the majority of the work was done by the family with infrequent hired assistance. The connection between agriculture as well as ecology was very strong in these agricultural systems, and indications of environmental deterioration were rare. The ecology-farming connection was frequently disrupted as agricultural modernization advanced, as ecological principles were disregarded and/or overruled. In reality, a group of agricultural experts has come to the conclusion that contemporary agriculture is facing an environmental catastrophe[1]–[3].

An increasing number of individuals are worried about the current food production systems' long-term viability. Evidence has gathered demonstrating that, although today's capital- or technology-intensive agricultural systems are highly productive and successful, they also carry a slew of economic, environmental, including social issues with them. Agriculture now consumes a lot of energy. It may be found in a variety of forms, ranging from fertilizers and chemicals to tractors and gasoline. To enhance effectiveness, the Phytotechnology method attempts to target the introduced energy. According to the report, switching from conventional trafficked systems (255 MJ/ha) to a non-trafficked system (79 MJ/ha) may save 70% of cultivation energy. This was just for shallow ploughing, not for deep loosening. We may deduce that 80-90 percent of the energy invested in traditional agriculture is used to restore the harm caused by big tractors. It would be preferable to avoid compaction in the first place, which is one of the reasons we're considering utilizing tiny light machines. Harvesting is the most labor-intensive operation for many crops, yet even proponents admit that no machine has yet come close to matching human sensory motor control.

As sensors and software grow cheaper and more sophisticated, this is likely to change. Experts believe the effort has a variety of potential advantages as scientists in Israel and Europe come closer to achieving this objective. Human workers may be protected from the dangers of handling chemicals by autonomous agricultural robots. Robots may also decrease pesticide usage by up to 80% on a farm using a highly selective spraying method. In many areas, where there aren't enough nomadic laborers accessible at the appropriate times in the harvesting cycle, robots might provide a timely supply of labor. Meanwhile, efforts to build robots that can see, grip, and learn may have far-reaching consequences. The aim is to educate computers to perceive in the same way that people do, and to improve their skills as they work and learn. Agrirobots, in whatever form they take, have many fundamental technical advancements that have their roots in factories. Farms, on the other hand, are much more difficult to automate since the weather is always changing, the light varies, the terrain may shift from grass to mud, and there are animals and humans roaming about.

Fruit, unlike automobile components, does not come in conventional sizes. It floats about in the wind on branches, changing form and color, and may be covered by leaves. However, advances in vision and other sensor systems, along with increased processing power, have made robots smarter, safer, and more dexterous. Farmers, like industrial owners, will, nevertheless, want to see a return on their investment. “It is not difficult to choose an orange, but it is very difficult to select an orange efficiently,” explains Tony Stentz of Carnegie Mellon University's Robotics Institute. One benefit that robots have over physical labor is that they can operate nonstop all day. However, their ability to collect correct information is proving to be an equally valuable skill. Farmers may be compelled to alter some of their practices and the types they produce as a result of increased automation. Crop-tending robots can create a database of information on each plant by using machine vision, laser sensors, satellites positioning, and devices to detect things like humidity[4].

1.1. Agricultural Robotics in Action:

1.1.1. Scouting for crops

The capacity to gather timely and reliable information is one of the most important aspects of effective management. Quantified data has a reputation for being expensive, and the expenses of sampling may rapidly exceed the advantages of spatially varied management. To transport instruments above the crop canopy and use GPS, a high clearance platform is required.

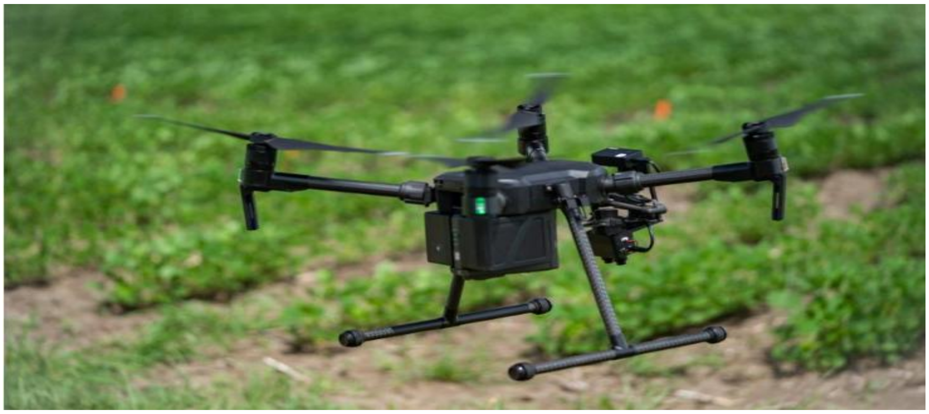

Figure 1: Drone scouting solutions are a revolutionary way that growers and their advisers are redefining field scouting[5]**.**

1.1.2. Robotic weeding

Managed biodiversity is a possibility that robotic mowing could bring to fruition. When non-competitive weeds are kept at a safe distance from the crop, they can be allowed to grow. This is one of the design parameters for the KVL-developed Autonomous Christmas Tree Weedier.

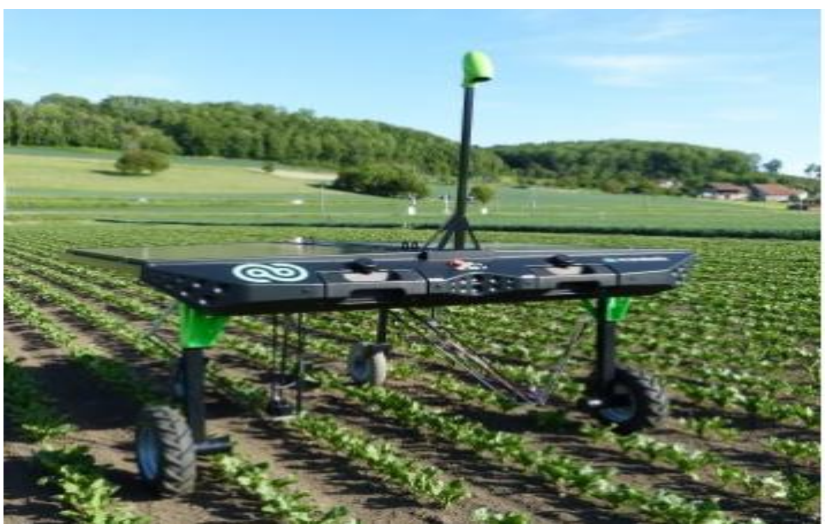

Figure 1: illustrate the Solar-powered robot from ecoRobotix[6]**.**

1.1.3. Smart Gardeners:

Autonomous gardener, developed for an MIT robotics class, employ equipment installed to the base of a Roomba. Sensors in the soil alarm the robot, which water crops or may select any fruit it sees with an articulated arm. The MIT team has no immediate intentions to commercialize the bots, and they are working to give them more autonomy. Future systems could compare earlier images of the same plants over time to detect diseases or parasites.

Figure 1: Illustrate the Smart Irrigation Tips for Gardeners and Growers.

1.1.4. Inspecting a tomato plants:

IN THE early 1830s, spurred on by his hatred of sweaty field work, Cyrus McCormick took an idea his father had been working on at the family farm in Virginia and produced a mechanical reaper. Others devised similar machines. Despite initial skepticism, farmers eventually bought them in droves. With one person riding the horse that pulled the reaper, and another raking the cut stalks off the back, the machines could harvest as much grain in a day as a dozen men breaking their backs with reaping hooks

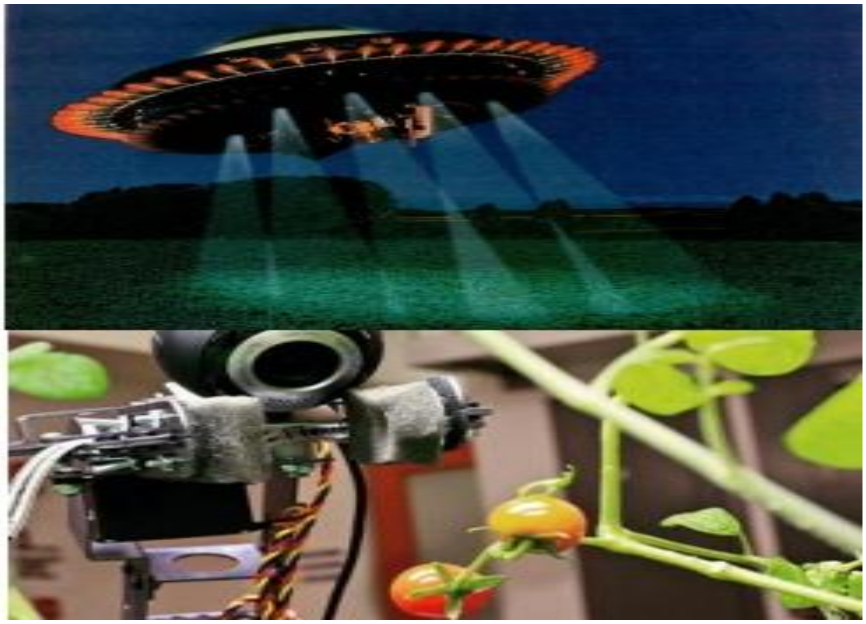

Figure 3: Illustrate the Inspecting a tomato plant at MITJason Dorfman[7]**.**

From drought-stricken California to Australia's record-breaking heat, we're rapidly discovering that water is the most valuable resource on the planet. Water is the essence of life, and Smart Irrigation Month reminds us that it is our responsibility to manage it wisely.Since we began shipping out of a ramshackle basement warehouse 25 years ago, smart irrigation techniques have been the basis of DripWorks. Although water is plentiful, the ground and surface water that we use for municipal and industrial purposes makes up less than 1% of the total water on the planet.

The most accessible and cost-effective freshwater sources, particularly in water-scarce regions, have already been created. New solutions are more important than ever as demand increases and climates change. We're offering some of our greatest water-saving ideas for gardeners and farmers in celebration of Smart Irrigation Month. You'll save both water and money if you implement these suggestions.

1.2.Plant Plants That Are Appropriate for Your Environment:

The typical American household consumes 320 gallons of water each day, according to the EPA. Thirty percent to sixty percent of the water is utilized to cultivate lawns and landscapes, with as much as half of that water being wasted owing to inadequate irrigation methods.Some cities are enacting rules to reduce outdoor water use, but that doesn't mean you have to forego aesthetics. Some homeowners are replacing their well-kept, water-guzzling front lawns with drought-tolerant plants. For suggestions on how to choose plants that save up to 75 percent of water and need less care, go to earth simple and Google the phrase "xeriscape". When planning your landscaping, arrange plants according to how much water they need and minimize evaporation by layering mulch over bare ground between plantings and rows.

2. LITERATURE REVIEW

Most agricultural areas of California, according to Miguel A. Altieri et al, have lengthy growing seasons, rich soils, and irrigation, all of which promote a highly varied cropping. Furthermore, the vast range of vegetables, field and tree crops dictated the agricultural businesses' great diversity and adaptability. Despite these considerations, monoculture cropping systems dominate California's agro ecosystems. These systems are productive, but they lack the ecological characteristics that guarantee effective nutrient cycling, water or soil conservation, or biotic control. Chemical inputs including such pesticides and fertilizers, some of which are harmful to the environment and public health, are used to boost productivity. Large-scale monocultures are particularly vulnerable to wind erosion and rely on ground water for irrigation, resulting in a significant ‘overdraft' in certain places. In some areas, inadequate field drainage and increasing water levels have resulted in unsustainable levels of soil salt. In conclusion, Californian agriculture is very efficient, but the environmental costs of that productivity are jeopardizing the industry's long-term viability[8].

A robotic system for mapping weed concentrations in fields was utilized by Thomas Bak et al to show intelligent ideas for autonomous vehicles in agriculture, which may ultimately lead to a new sustainable paradigm for developed agriculture. The vehicle on display is designed to work in 0 25 and 0 5 m row crops and is fitted with cameras for weed identification and row guiding. The platform is designed in a modular fashion, with four similar wheel modules allowing for four-wheel steering and propulsion. As a consequence, the vehicle's mobility is enhanced, allowing parallel displacement during turns by decoupling positional changes from orientation modifications. A vehicle electronics and control system based on integrated controllers as well as standard communication protocols controls the platform. The program uses a hybrid intentional software architecture to decompose the operation in a hierarchical manner. The lowest level provides a reactive feedback control system based on a four-wheel case extension of basic control for car-like vehicles. The controller's architecture compels the vehicle's front and rear wheels to follow a preset route while allowing it to retain a fixed normative to the path. The controller's reasoning is given, as well as findings from field trials[9].

N. S. Naiket al. conducted research on any production or planning system's primary objective is to achieve long-term, fair development. More food production will be required during the next

50 years to keep up with the growing human population and accessible arable land. Agriculture and its related industries rely on both the exploitation and protection of natural resources at the same time. Their environmental effects must be minimized in order to continue developing sustainable manufacturing methods. This is, however, an uncommon occurrence. Rapid population expansion, severe poverty, loss of biodiversity, pollution of air and water, and soil toxicity threaten the resources necessary to these industries in most hilly regions of emerging nations. The use of robots technology has already begun in Western nations. In the agricultural production scenario, this innovative and cutting-edge technology is expected to unlock the door to new farming systems that will improve yields and create revenue while also increasing sustainability. Swarms of robots have the qualities of being simple and low-cost, allowing them to be mass-produced and deployed without having to worry about their survival. It's a burgeoning industry that's being put to innovative uses. The idea has been around for decades, but small groups of robots working together to accomplish tasks have proven useful in conservation, sustainability, and agriculture[10].

3. DISCUSSION

Precision the advantages of this method have been shown in farming, but we may now move on to a new generation of equipment. Instead of dousing a whole apple tree with chemicals on a regular basis, towing sensors detect illnesses or parasites using infrared sensors and cameras, and spray just the afflicted trees. According to the variables identified as influencing biodiversity, agriculture as well as its related industries are one of the major causes of deforestation or biodiversity loss since they use and preserve resources at the same time. Increased agricultural yields will decrease the demand for land expansion, which can only be accomplished via innovative technology. A mix of traditional and sustainable technologies, as well as novel application models, may be used to create robotics for sustainability. Farmers and others in related occupations will soon live in a world of mostly autonomous, self-maintaining, and self-healing equipment, as agricultural robotics advances, and farming will get simpler in the coming years. More generally, advanced control of swarm and robotic technologies provides tremendous promise for fast, time-saving, low-cost chemical application, low-input food production, and crop management construction and maintenance. Today, once the advantages of new techniques and technologies are recognized by the general public, they may quickly spread across the world. Agriculture robotics research has numerous difficulties in the future, and the strategic goals should be to make agricultural robots more flexible, efficient, and robust.

4.CONCLUSION

The loss of biological variety is caused by the vast and increasing population, widespread nature of agriculture, acceptance of monoculture cash agriculture, excessive use of pesticides and fertilizers, soil erosion and land degradation, overgrazing of pastures, or excessive pressure on natural forests. According to the variables identified as influencing biodiversity, agriculture as well as its related industries are one of the major causes of deforestation or biodiversity loss since they use and preserve resources at the same time. Increased agricultural yields will decrease the demand for land expansion, which can only be accomplished via innovative technology. As a result, research is required to develop suitable technologies, with robotics use in future farming and sustainability being the most recent example. A mix of traditional and sustainable technologies, as well as novel application models, may be used to create robotics for sustainability. Farmers and others in related occupations will soon live in a world of mostly autonomous, self-maintaining, and self-healing equipment, as agricultural robotics advances, and farming will get simpler in the coming years. More generally, advanced control of swarm and robotic technologies provides tremendous promise for fast, time-saving, low-cost chemical application, low-input food production, and crop management construction and maintenance. Today, once the advantages of new techniques and technologies are recognized by the general public, they may quickly spread across the world. Agriculture robotics research has numerous difficulties in the future,

REFERENCES

1. B. Sani, “The Role of Robotics at the Future of Modern Farming,” *Int. Conf. Control Cybern.*, vol. 43, no. Iccrc, 2012.

2. A. Singh, A. Gupta, A. Bhosale, and S. Poddar, “Agribot:- An Agriculture Robot,” *IJARCCE*, 2015, doi: 10.17148/ijarcce.2015.4173.

3. K. Jensen, M. Larsen, S. H. Nielsen, L. B. Larsen, K. S. Olsen, and R. N. Jørgensen, “Towards an open software platform for field robots in precision agriculture,” *Robotics*, 2014, doi: 10.3390/robotics3020207.

4. R. Ebel and J. Castillo Cocom, “X-Pichil: From traditional to ‘modern’ farming in a Maya community. XIII Conference on Sustainable Agriculture, Environment and Forestry,” 2012.

5. “A ShiLng Equation Links Modern ~ a h i n and g Forests,” vol. 286, no. November, p. 1999, 1999.

6. “Smart Irrigation Tips for Gardeners and Growers,” 2018.

7. “THE FUTURE OF ROBOTIC WEEDERS,” 2018.

8. M. A. A. A.Altieri, “Agroecological foundations of alternative agriculture in California,” 1992.

9. T. Bak and H. Jakobsen, “Agricultural Robotic Platform with Four Wheel Steering for Weed Detection,” *Biosyst. Eng.*, vol. 87, no. 2, pp. 125–136, 2004, doi: 10.1016/j.biosystemseng.2003.10.009.

10. N. S. Naik, V. V. Shete, and S. R. Danve, “Precision agriculture robot for seeding function,” 2016, doi: 10.1109/INVENTIVE.2016.7824880.