AGRI-ROBOTICS FOR SUSTAINABLE AGRICULTURE

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INTRODUCTION

A boom in global population, over-farming, and over-utilization of resources impose a major threat to one of humanity's most basic needs – food. The agriculture sector has been witnessing a drastic shift in itself – climatic conditions are no longer the way they used to be, pests and diseases are getting more common, resistant, and fatal for the crops, and the demand for food is skyrocketing. Proper usage of machinery is the key for efficient farming systems. This useful disposal of machinery, known as mechanization, include agricultural tools and equipment for land preparation, cultivation, harvest and post-harvest, and all activities included in the production chain. Appropriate disposal of agricultural machinery also pushes forward sustainability.

There is a fallacy that mechanization replaces farm labor,but the opposite is true: mechanization improves well-being and increases employment prospects.Mechanization has evolved rapidly in the past few decades, with radical improvements. Digital innovations in mechanizations can make agriculture more striking to both – rural as well as urban youth. Digital mechanization, on a large scale, will give birth to training services that will engage the rural youth in productive things and shape their future in a positive way, with appealing careers.

Agri-robots in Agriculture

Agriculture progresses with science and technology, and it is only a matter of time until the Internet of things (IoT) reaches the mainstream farmlands. Technical improvements in new agricultural technologies should:

- Enhance production efficiency,
- Enhancequality,
- Reduce environmental impact, and
- Curtail production-associated risks.

The term *"agrobot"* is unquestionably a valuable description for independent machines that can carry out different recurring agricultural tasks on the farm – from land preparation to harvesting – without direct human intermediation. In vigorous and amorphous environments, agricultural robots can often produce unsatisfactory results due to the intrinsic uncertainties, unknown operational settings and fickleness of events and environmental conditions. An agrobot can perform a massive range of tasks. The first commercially available agrobots cover three main tasks: eradicating weeds, examining pests and diseases, and harvesting specific crops (fruits or vegetables). An agrobot offers cost-saving prospects as it reduces labour constraints, limits the use of inputs (pesticides, insecticides, fungicides, etc.) and reduces yield shortfalls resulting from the late detection of pests and diseases.This is a fantastic measure to grow crops in a sustainable way.

A popular example of agrobot is "Dino" – an agrobot developed in France that weeds crops. This robot is specific in mechanical weeding of vegetable crops; it identifies the weeds in the crop rows and can distinguish between the commercial plant and the weed with artificial intelligence (AI) applied to image recognition.

Drought, flooding and the emergence of new pests and diseases are, however, now a menace on all continents. Even a developed continent like Europe faces a challenge right across its farming techniques. This is especially true of countries such as Italy, which faced a 57% dip in its 2018 olive produce – the worst in about three decades – because of climate change, bestowing to scientifical data.

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For a robot to comprehend something and interrelate with it, the robot not only needs to be able to identify things in the setting, but it also needs to then comprehend how those objects in the setting relate to one another substantially, the way they attribute to one another, like a fruit or vegetable on a climber. Then the system needs to comprehend how that liaison informs the robot how to grasp and remove the object from its environment. Grasp planning is an indispensable factor that promotes sustainable agriculture.

Root works diligently with a set of cultivators that grant the start-up access to their resources to operate product tests. The cultivatorsgive feedback on experiments and the types of attributes they will need for the robotic gathering system to provide greater benefit.

If cultivators can pick it one day and have it on the grocery shop shelf the next day, that is the pinnacle of nutritional importance and flavour. That is where consumer movements are headed. Citizens want garden-fresh produce in their food intake. But to deliver fresh produce that is steadily high in quality, nutritional importance, and taste, means cultivators need to start generating closer to where food is consumed. Right now, the logistics trade lines for fruits and vegetables are quite long and can eat into the shelf life of the product, reducing the end customer's familiarity.

With risks high for the world's food fabricators, adaptablemechanization helps the industry meet the encounters of a food supply chain that is always up for a battle. Fresh, rapid, and affordable leave little room for inadequacies. Robots help cultivatorsdevour the voracious demand.

Faith and belief in a secure, trustworthy food supply is an essential human necessity. But escalating populations, labour scarcities and land deprivation jeopardize sustainability. The agriculture industry will need to do extra with less. Robotics and AI are up for the fight as farms learn to function like slender workshops. High-tech, tidy, and data-efficient for a more balanced future.

I am bamboozled with aspiring and unbelievable ideas when I ask myself the question: "How will agriculture look in 20 or 30 years from now?"

Will the traditional methods such as tractors and ploughs be out of the image?

Will AI control and manage a significant portion of manual labour?

Will the urban youth population be intrigued by the technological manifestation in agriculture and ergo, incline towards it?

By looking at the growth curve of Agri-robotics, it is predictable that most of these questions, if not all, will be answered as "YES." Agri-robotics will completely change the agricultural space and make it sustainable to a significant extent. Let us keep our scientific minds ignited and join hands to make agriculture more sustainable and our plant a better place to live in.