Computerized Farming

Karthigainathan.M

Department of computer science and Engineering
Srm university Ramapuram campus

Abstract

Computerized farming is an agricultural technique involving large-scale, stacked, indoor agriculture in urban areas. Computerized farming is the urban farming of fruits, vegetables, and grains, inside a building in a city or urban centre, in which each floors are designed to accommodate certain crops. While many people fantasize about the construction of towering "farm scrapers" spiking up in the centre of our cities' financial districts, economic factors such as high real-estate, construction, energy, and employment costs make computerized farming more practical in underutilized or vacant commercial structures in suburban areas on the outskirts of our major cities. Computer technology during the last decade has numerous changes in the many fields. The evolution of the computer, in the early ages, the mainframe computers was made a big evolution in which only expert accessed the computer. But today, the popular devices as laptops, tablets and Smartphone are owned and accessed by all ages. Computers and their applications changed the face of most traditional occupations including agriculture. Using of mobile technologies as a tool of intervention in agriculture is increasingly popular. Smartphone penetrations enhance the multi-dimensional positive impact on sustainable poverty reduction and identify accessibility in agricultural space. Reach of smart phone even in rural areas extended the ICT services beyond simple voice or text messages. A few Smartphone apps are available for agriculture, horticulture, animal husbandry and farm machinery. The purpose of this investigation was to determine ways to supply food to cities in an energy efficient and sustainable manner from both a significant and sufficient approach.

INTRODUCTION

Due to the population increasing, 80% of the world's population will live in urban centres by 2050 and 80% of the world's farmable land is already in use..Food is the primary essential thing for human beings, without food we cannot able to survive in this world. This change will cause changing climate, Earth's resources, specifically the ability to supply food. Computerized farming will be helpful for the farmers to reduce their work load and monitor their crops in regular interval of time without their presence. A valuable investigation would be to determine other ways to supply food to cities alongside current agricultural practices in a sustainable manner. Computerized farming is a relatively new concept, which could help raise production without occupying space. Inside the building, plants grow in vertical stacks without natural soil or sunlight. The crops can grow in 15 days than which usually takes 30 days in a field and they can do it using 95% less water, and 50% less fertilizer. The entire system is fully automated with less human behaviour .The new farming technique envisages production of crops nutrient-enriched water or nutrient-enriched air, without using soil or compost. The plants can get the required sunlight through glass windows. Computerized farming is considered as one of the modern agricultural technique in the future urban area, in where most of the people are expected to live. There are many developments taking place today that apply the concept of urban agriculture, and the concept of computerized farming is a large scale extension of urban agriculture. A computerized farming system has developed intelligent systems to provide a practical solution for global food production.

LITERATURE SURVEY

- Computerized farming is not new to the world, but fairly modern to urban environments.

- Computerized farms build on the idea of rooftop farming by capitalizing on space vertically and utilizing natural light to produce energy.

- Computerized farms create urban communities in which individuals can both live and work in a sustainable environment.

- The Computer farm acts as a mini eco-system.

- With the population increasing and the supplies decreasing, it is necessary to think a innovative and creative ways to feed and nourish everyone.

EXISTING MODEL

Computerized farming system, called A-Go-Grow technology, grows vegetables in shaped towers, each of six meters tall. These modular A-frames are quick to install and easy to maintain. Each tower consists of 22 to 26 tiers of growing troughs, which are rotated around the aluminum tower frame at a rate of 1mm

per second to ensure uniform distribution of sunlight, good air flow and irrigation for all the plants. The plants don't get overstressed under the sun at the same time they can get nutrients and water equally. The rotation system does not need an electrical generator It gets powered by a unique gravity aided water-pulley system that uses only one liter of water, which is collected in rain water fed overhead reservoir. This method also boasts a very low carbon footprint as the energy needed to power one A-frame is the equivalent of illuminating just one 60-watt light bulb. The water powering the frames is recycled and filtered before returning to the plants. The organic waste on the farm is composted and reused. This farming system is housed in a protected environment of PVC roofing and netted walls to enable cultivation of tropical leafy vegetables under natural sunlight, all year round. Operational costs include raw materials like soil and seed and electricity to pump the water driving the structures. The electricity cost alone covers $3.00 per month per structure. A total of 120 such towers have been erected in Kranji, which is situated 14 miles from Singapore's central business district, with plans for 300 more, which would allow the farm to produce two tons of vegetables per day. The vegetables are harvested everyday and delivered almost immediately to retail outlets. Although sky greens vegetables cost about ten percent more than the imported vegetables. As one of the consumer mentions, the prices are still reasonable and the vegetables are very fresh and very crispy.

WORKING

1) Fully integrated technology
Profitability in commercial horticulture requires the ability to cost-effectively and consistently provide plants with optimum growing conditions from germination through to harvest. A computerized farming system monitor and controls the levels of air, water and nutrition to provide optimum growing requirements with a fully integrated computer management system.

2) Optimum air quality
Temperature and humidity levels are closely monitored and maintained in an optimum range for each crop being grown. In warehouse installations the addition of CO_2 is an optional addition that further increases crop growth and yield rates.

3) Optimum water quality
All fresh water into Computerized Farm System installations has particulate, fluoride and heavy metal contaminants removed and is sterilised before entering the system.

4) Optimum light quality
High-intensity low-energy LED lighting has been specifically developed and is used for maximum growth rates, high reliability and cost-effective operation. The system is fully pre-programmed into the computer management system with wavelength adjustment according to each plant variety and stage of growth.

5) Optimum nutrient and mineral quality
For maximum plant growth and the nutritional wellbeing of consumers, computerized farming systems use specially formulated and biologically active nutrients in all the crop cycles. Levels of nutrition available to the plants is constantly managed and adjusted to optimum levels relative to the growth stage of each crop. The system uses biologically active organic plant nutrients, so that it can produce several crops within 21 days. Bionomics is a proven farming technique originally developed in the USA where luxury levels of essential organic minerals and enzymes are provided to plants in combination with a select range of living microbes and bacteria that are normally found in only the healthiest of farming soils. The result is plants having truly optimum growing conditions and in return producing harvests that have the maximum nutritional and flavour potential for our natural health and wellbeing.

6) Testing unit
The XA2 yield test unit is a computer controlled vertical farming system designed for teaching & training, laboratory research as well as for testing seed, nutrient and growing cycle regimes for commercial replication in larger XA Series Warehouse systems.

The main concept of computerized farm is to produce maximum amount of crop production with optimal condition, even in the middle of the urban area. Hence the farm scrapers have much number of floors with variety of crops in it. As each crop is distinct, each needs a different environmental condition. Therefore, keeping a track of the crop and its location is much more important. The environmental parameter of the corresponding sector should be maintained properly so as to control the equipment of the above required sector. Each floor will have its own watering and nutrient monitoring systems. Sensors will be placed for every single plant that tracks how much and what kinds of nutrients the plant has absorbed. Computerized farming even has systems to monitor plant diseases by using DNA chip technologies that detect the presence of plant pathogens and bacterial infections. The sensed data are updated in the monitoring client on a regular time interval. Both the time-based and event-based readings are graphed for the comparison. The readings are taken from a single port ID, or from a particular sector of the vertical farm. Each sector has different crop, which is mapped well to compare and monitor the crop's optimal growth environment. The farming chambers are computerized. Sensors monitor every aspect of the environment and deliver data to a

cloud-based central processor that analyzes the information and quickly makes adjustments using the robotic apparatus in each sector. The system collects data during each harvest is compiled and analyzed to identify opportunities for improvement to increase grow times and yields for each type of seed. The entire controlling service is performed automatically without any human intervention. The collected data from the sensor such as temperature sensor, humidity sensor or light sensor are sent to the mobile device through the wireless communication protocol. Otherwise the optional GSM alarm system can be used which automatically sends pre-programmed text messages to nominated cell phone numbers that either sends water, power or pH levels have problems. The GSM alarm system requires a SIM card with text messaging account.

Fig 1 Working Channel

Fig 2 Robotic Machine Apparatus

Fig 3 Indoor computerized farming

Fig 4 Testing Unit

Fig 5 Monitoring Values

Plants Grown in this Farming

- Loose Leaf Lettuce
- Baby Spinach
- Wild Rocket
- Tutsi
- Herbs
- Pak Choir
- Salad Mistune
- Beet Chard
- Mustard Greens

ADVANTAGES

- One indoor acre is equivalent to 4-6 outdoor acres or more, depending upon the crop.
- Food is grown organically
- Converts black and gray water into potable water by collecting the water of evaportranspiration.
- Low total energy use
- Low water use
- Low operator skills
- Fully automated operation
- Expandable to suit any market size
- LED Lighting – Programmed wavelength control
- CO^2 enrichment option for maximum crop performance

DISADVANTAGES

- Limited varieties of fruits and vegetables can be grown in this farm. The reason is that there are only a few varieties of vegetables and fruits that can be produced well in this controlled environment of farm.

- One of the main disadvantages of computerized farming is the high cost associated with this idea, that the price of urban land is higher than that of farmland.
  .

CONCLUSION

Today, researchers are willing to make computing services smarter. The basic concepts proposed can be reused and extended for the agricultural based smart environments. The cost factors being the major drawback, once cheaper solutions can be found in the construction of these farm scrapers, traditional farming may one day be revolutionized. Technological advances have brought some drastic changes in farming and animal husbandry resulting in a tremendous increase in production capacity even the support functions for farming such as delivery of machinery, fertilizers and production of raw products has been successfully automated. The motivation of this farming technique to bring some vast changes in the agriculture field using computer technology in today's world and to deploy all available technologies computers, mobile computing, satellite systems, smart cards for the empowerment of farmers and strengthening of partnerships across the food value chain. With the gained experience from the technology and the concept will be more refined according to the domain specific environment. By doing this, it may serve as a very helpful to develop agricultural service automation and smart service application in the agricultural environment.

REFERENCES

[1] https://en.wikipedia.org/wiki/Vertical_farming
[2] http://permaculturenews.org/2014/07/25/vertical-Farming-Singapore's-solution-feed-local-urban-population / by Ravindra Krishnamurthy
[3] http://okaywhatever.com/wordpress/the-pros-and-cons-of- vertical-farming//by D.S.Deboer
[4] http://www.hindawi.com/journals/ijdsn/2013/161495/
[5] http://verticalfarms.com.au/warehouse-systems
[6] https://www.theguardian.com/science/2014/feb/06/vertical-farming - explained-erik-murchie by NicolaksDavis
[7] http://www.verticalfarms.com.au/test-units
[8] http://10milefarms.com
[9] https://lifeboat.com/blog/2016/02/vertical-farming by Shallesh Prasad
[10] https://en.wikipedia.org/wiki/ICT_in_agriculture#Smartphone_mobile_apps_in_Agriculture
[11] http://www.buzzle.com/articles/uses-of-computers -In- agriculture.html