

3D PRINTING IN AGRICULTURE: PRINTING THE REALITY

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INTRODUCTION:

According to Stewart Brand, "Once a new technology rolls over you, if you're not part of the steamroller, you're part of the road," so either you're in the show or you're just watching. Technology has touched all generations and all the fields of industry. 3-D printing is one such emerging technology which has not left any domain untouched and so is agriculture. 3-D printing often regarded as "additive manufacturing" is a process of building a three-dimensional object from a CAD (Computer Aided Design) model or digital 3-D model. The advent of such technologies is the need of the hour to boost output and self-sufficiency and feed the world's growing population. Through the provision of diverse agricultural prototypes, manufacturing parts, etc., 3D printing is supporting the farming industry. These tools facilitate the quick advancement of this industry.

HOW DOES 3-D PRINTING WORKS?

It is a wonder how a machine can create a three-dimensional object from a file on a computer. The answer lies in the layering process that all 3D printers use. Printers operate by depositing layers of material, one on top of the other until the desired object is created. The layers can be made of different materials such as plastics, liquids or powder grains, depending on the type of printer, but they all work together to create a three-dimensional final product.

UTILITY IN AGRICULTURE:

By creating concept models and working prototypes, 3D printing can help in the development of new technology and equipment. These models enable simple component visualisation and bring a new design concept to life. Throughout the development phase, the object's usefulness is evaluated, and any necessary improvements can be performed at a reasonable cost.

Chains, gears, shock absorbers, seeder components, and harvester attachments are just a few of the agricultural items that may be replicated with 3D printing. With the advent of new printing materials, it is now possible to print parts and components from sturdy plastics to metal and alloy combinations. In addition, since 3D printers are widely available, parts can be reused to create new products.

✿ Irrigation systems:

Different sprinkler prototypes can be created, tested, and then used in fields and gardens. A sprinkler with a larger watering capacity can be printed and utilized for crops like paddy (rice), potato, and soybean because different plants typically have varying water requirements.

Additionally, self-designed drip irrigation systems can be printed and used for forest and orchard crops like teakwood and bamboo, as well as fruits and vegetables including grapes, bananas, oranges, and mangoes.



✿ 3D printed Drones:

A 3D-printed drone is intended to perform insect management on various crops. These drones help in successful crop monitoring, in-depth field analysis and long-distance spraying across the field and can carry up to 5kg of insecticide.

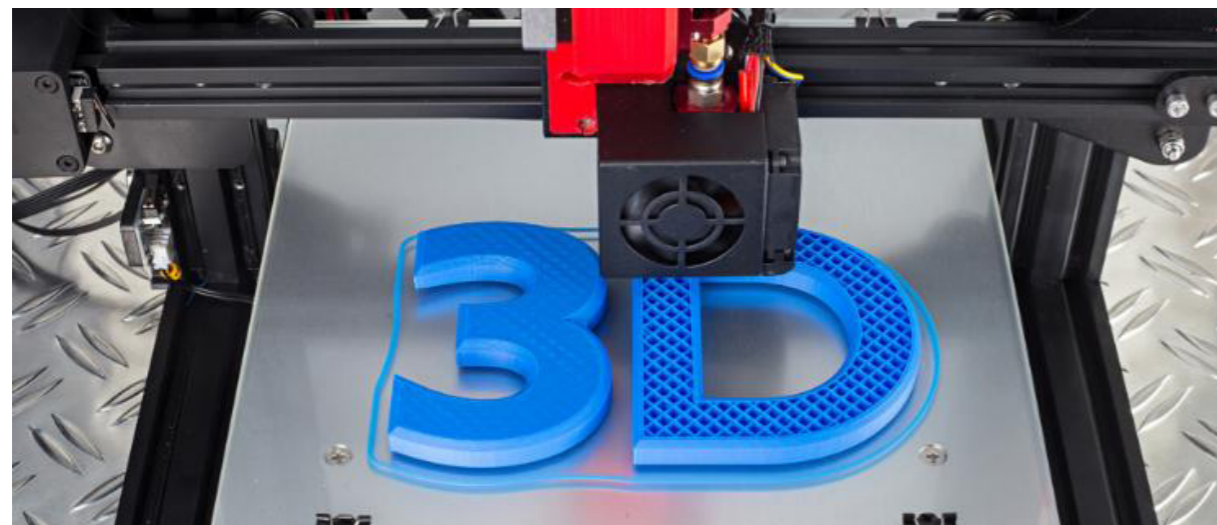
✿ Tri-Claw Fruit picker:

Utilizing this gadget will cut down on the labour and effort involved in climbing tall trees. Fruits can be picked from branches that require the use of ladders, such as those that are too high. Each component of the tool can be printed separately, and it can then be assembled with an appropriate-length grasping stick.



✿ Shovel:

A shovel's parts may be 3D printed and then assembled. To reach whatever depth in the



soil the farmers require, the handle can be made to any desired length. A small shovel is especially helpful in organic farming, which calls for meticulous dirt removal before seeding an area.

NEW POSSIBILITIES WITH NEW TECHNOLOGY:

- More complicated designs can be designed and printed using 3D printing than using conventional production techniques.
- Print-on-demand is another boon as it requires less room to store inventories. Also, as no bulk printing is necessary unless necessary, this saves both space and money.
- As opposed to subtractive manufacturing, which involves cutting big chunks of non-recyclable materials, the manufacture of components only uses the materials required for the part itself, with little to no waste. In addition to conserving resources, the method lowers the price of the materials that are used.

- The speed of 3D printing is substantially faster than that of moulded or machined items, depending on the design and complexity of the part. Not only may 3D printing speed up the manufacturing of the component, but it can also streamline the design phase by producing STL or CAD files that are ready for printing.
- Various materials mostly plastic can be used which offer the advantage of being lightweight, additionally, pieces can be made from customised materials to offer particular qualities like heat resistance, increased strength, or water repellency.

NEW CHALLENGES WITH NEW POSSIBILITIES:

- High equipment and product costs,
- Lack of qualified and skilled professionals to design, perform and run the equipment,
- Fear of adoption of new technology.

CONCLUSION:

The use of technology in agriculture has greatly streamlined many operations, including food production, transportation, and marketing. The way operations and daily tasks are carried out by farmers can be greatly improved by the use of 3D printing in the agricultural sector. Tools that are 3D printed can be customised for particular tasks when planting crops. Additionally, it enables users, like farmers, to make or print immediately, enabling them to quickly create high-quality tools and enhance planting procedures. This is how 3-D printing is going to frame agriculture into a new scenario.

