

Advanced Agriculture Machinery

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ARTICLE ID: 017

Introduction:

Agricultural machinery is machinery used in farming or other agriculture. There are many types of such equipment from hand tools and power tools to tractors and the countless kind of farm implements that they tow or operate. Diverse arrays of equipment are used in both organic and non-organic farming. Especially since the advent of mechanized agriculture, agricultural machinery is an indispensable part of how the world is fed. The normal life expectancy of a farm machine is about 2000 hours of use. Many machines are used only for a few hours in a year i.e. sowing/planting machinery. The designer should aim at lowest cost of construction of the machine. Farm machine comes of work rather work coming to machines. Most of farm machines perform various functions in motion mostly on uneven or bumpy grounds. e.g. rotavators, combine harvester, vertical conveyer reapers, root crop harvesters etc.

Safety:

- Proper engineering design of agricultural machines can reduce the number of accidents on the farm.
- Majority of agricultural machinery manufacturers have volume of production less than 5000 units per year that makes economic design different from the other machines.
- Human factors in farm machinery design: Several environmental variables and machine parameters can materially affect a person's performance while operating a machine in actual field conditions.

Draft and Power Requirements: The draft and power requirements of farm machinery vary from one farm to another farm and on the same farm from location to location, season to season and from year of year. However, common ranges available from literature can be used.

Design of Frames of Farm Machines: The frame of farm machines must be as light as possible to reduce cost, soil compaction and propelling power but strong enough to resist the shocks due to rough fields or obstacles.

Definition:

A farm machinery and/or implement can be defined as any type of machinery or implement that can be used in the process of agricultural production. It can be for crop production or animal production.

The need for Farm Mechanization

Among the most compelling importance of farm mechanization the followings are can be mentioned:

- Reducing human drudgery
- Increasing productivity
- Improving timeliness of agricultural operations such as planting and harvesting
- Reducing peak labor demands etc.

Concept of farm mechanization:

- The main concept of farm mechanization is to apply the principles of engineering and technology to do the agricultural operations in a better way to increase crop yield.
- This includes the development, application and management of all mechanical aids for field operation, water control, material handling, storage and processing.
- Mechanical aids include hand tools, animal drawn implements, power tillers, tractors, engines, electric motors, grain processing and hauling equipments.

Most Advanced Agricultural Technologies:

In the next few decades, farming is expected to be revolutionized by the use of fatigue-free self-driving tractors or robots that perform the time-consuming tasks that are being done by humans.

Invention, innovation and sales of the major farm machinery have been rising rapidly amid stable prices for some key crops like corn and soybeans. However, the ever-present need of controlling farm input costs and increasing output has eventually driven farmers to

adopt modern farming technologies. It is predicted that farm technologies is going to be market opportunity worth more than \$200 billion for agricultural suppliers, with driverless tractors worth \$45 billion market on its own.

Automation in the agricultural industry is growing exponentially with almost all fields of farming requiring minimum physical human intervention. Some dairies are already using robotic milking machines. Using a technology known as lettuce bot, farmers could thin lettuce automatically. All these were achieved due to scarce labor resulting to high cost. Moreover, the equipment does a better job than the human labor. These agricultural robots are facilitating what autonomous steering trend that is limited to large farm machinery could not serve. Some of these robots could work in groups or swarm-like action. The key advantage of smaller and lighter machinery is that they reduce soil erosion while enhancing soil compactness. This highly increases yields per acre of a farm.

Tractors on Autopilot

GPS tractors, combines, sprayers can more accurately drive themselves through the field, the user has to hold the onboard computer system and the equipment will cover the distance by setting A & B points and then the GPS system will have a track to follow and it extrapolates that line into parallel lines set apart by the width of the tool in use.

Swath Control and Variable Rate Technology

Building on GPS technology are swath control and VRT. This is where guidance really begins to show a return on investment. Swath control is just what it sounds like. The farmer is controlling the size of the swath, a given piece of equipment takes through the field.

Telemetric

Telemetric is being touted as the next big thing in agriculture. This technology allows equipment to talk to farmers, equipment dealers, and even other equipment. Imagine you have a problem in the field and have to stop working. With telemetric your dealer can access the onboard diagnostic system of your tractor. Depending on the problem they might be able to fix your equipment right from dealer. No waiting on a mechanic to drive out to wherever you might be. You're back to work, and the dealer saved a trip too. Farmers will be able to keep track of what field equipment is in, fuel consumption, operating hours, and much more.

Personally I've noticed on our farm as we become more technologically advanced our downtime is often caused by electrical, software, or hardware problems as opposed to mechanical.

Irrigate via Smartphone

Mobile tech is playing a big role in monitoring and controlling crop irrigation systems. With the right equipment a farmer can control his irrigation systems from a phone or computer instead of driving to each field. Moisture sensors in the ground are able to communicate information about the level of moisture present at certain depths in the soil. This increased flexibility allows for more precise control of water and other inputs like fertilizer that are applied by irrigation pivots. Farmers can also combine this with other tech like VRT mentioned earlier to control the rate of water applied. It's all about more effective and efficient use of resources.

Biotechnology

Biotech or genetic engineering (GE) isn't new tech, but it is a very important tool with much more potential yet to be unleashed. The form of GE most people have probably heard of is herbicide resistance. The other would likely be insect resistant traits. Crops can be made to express toxins that control particular pests. Many employ Bt toxin that is the same toxin found in some organic pesticides. That means a farmer won't have to make a pass through his fields to apply pesticide, which not only saves on pesticide, but fuel, labor, and wear on equipment too.

Crop Sensors

This is taking variable rate technology to the next level. Instead of making a prescription fertilizer map for a field before you go out to apply it, crop sensors tell application equipment how much to apply in real time. Optical sensors are able to see how much fertilizer a plant may need based on the amount of light reflected back to the sensor.

Machines That Make Modern Farming More Productive

Farming is perhaps one of the world's oldest and most necessary trades and up until recently, it has continued on with the same tools. Modern engineering along with tractors and new machinery has shifted the farming industry to one of efficiency and mass production.

Farming is no longer a small scale production, but rather one that takes place with massive machines over thousands of hectares. This efficiency boost means that the world has access to any food it wants at any time. Let's take a look at 6 modern machines that dramatically increased the efficiency and production of farming operations across the globe.

- 1. Automatic in Row Weeder:** As farmers know, weeding is an essential part of making sure you maintain a good crop. Letting your fields get overgrown can allow weeds and invasive species to choke out your cash crop and leave the farmer with pennies. Pesticides and weedicides are common, but many take issue with the possibly harmful chemicals hidden within. As a result, the Robo crop In Row Weeder was designed to quickly and effectively tear up weeds without worrying about hurting the original crops.
- 2. Olive Harvester:** Olives are incredibly hard to harvest as its small oily fruits were picked by hand in a painstaking process by many workers. Now, farmers use an olive harvesting machine which shakes the tree, releasing the olives, and collecting them in one centralized location.
- 3. Automatic Cow Milking Machine:** Cows are the most abundantly used livestock on the planet, from meat to milk, cow products help make the world go round. For large-scale milking operations, it simply isn't feasible to have hundreds of workers milking cows from morning until night. Even still, having workers attach automatic pumps to the utters is still in need of efficiency improvements. For this reason, this automated cow milking machine was invented which takes humans completely out of the process.
- 4. Small-scale Potato Harvester:** Potatoes harvesting requires a lot of digging. The machine above tills the dirt around the potatoes and brings them up out of the ground. Even though the video depicts a small-scale machine, the same technology is used in tractor-towed rigs to harvest potatoes at an even greater scale.
- 5. Robotic Lettuce Harvester:** lettuce is a very hard leafy green to harvest, and it often required hundreds of workers spending their days bending over and standing up. This repetitive motion opened up the industry to a wide array of back problems and the farmers saw that something needed to be done. The above video gives an inside look

into the lettuce harvesting industry and how, in this case, automation is actually creating better jobs.

- 6. Carrot Harvester and Separator:** Potatoes and carrots are hard to harvest as these crops were deep in the soil. The tow-behind carrot harvesting machine above is perhaps the most mesmerizing of machines we have listed here, and its scale is just astounding. Think about the same process being done by hundreds of workers digging up carrots. Only then can the increase in efficiency in this process truly be grasped.

Advantages of Advanced Agriculture Technology

A distinct advantage of mechanized farming is that it allows one man, on one piece of machinery, harvest hundreds of acres a day for the cost of a tank of diesel fuel. A very little of our current population farms i.e. about 1% in fact and that 1% has to feed the rest of the population, and their only help is from machinery.

Another advantage of modern equipment is that it can do things that humans can't. A modern tractor is equipped with all kinds of wonderful technology that allows the farmer to use GPS coordinates from space to accurately apply chemicals to within a square inch.

Conclusion:

Agriculture advancement is very important nowadays to fulfill the needs of people for healthy and nutritional food. It also helps farmer to maintain their family needs as well as earn more and more profit.