

INNOVATIVE EQUIPMENT FOR SOWING AND TRANSPLANTING: SEEDING SOLUTIONS

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Technological advancements in farm machinery have significantly improved crop production efficiency and precision. Sowing and transplanting machinery, such as drills, planters, and air seeders, are crucial for planting seeds at the optimal depth, spacing, and rate. These machines reduce labor intensity, increase productivity, and improve uniformity of crop establishment, reducing seed wastage and ensuring even distribution, leading to better crop yields. Farmers can choose the best equipment based on crop type, soil conditions, and operation scale. Transplanting machinery is crucial for planting nursery-started seedlings, particularly for crops like rice, tobacco, and vegetables. It ensures a controlled environment and precision in soil placement. Advanced technologies like GPS guidance, automation, and real-time monitoring have enhanced their effectiveness. As global food demand increases, the role of these machines in enhancing agricultural productivity and sustainability becomes increasingly critical. Agriculture, the backbone of human civilization, has evolved dramatically over the millennia, moving from simple hand

tools to sophisticated machinery. Among the critical advancements in modern agriculture are sowing and planting equipment. These machines play a pivotal role in ensuring efficient and effective planting, leading to higher crop yields and sustainable farming practices. Since ancient times, many methods have been used for sowing seeds in agriculture. In traditional methods, more seeds fall, resulting in higher seed rates and costs, and there is a lot of difficulty in removing weeds from the crop. In today's time, there is a need for more production in less time and on less land. To overcome all these drawbacks, advanced devices have been developed that save cost and time. Such machines can be divided into two categories: (1) seed sorting machines and (2) small planting machines. All these machines are available in different sizes, from manual to tractor-driven. The main functions of these devices are as follows:

1. Add the right amount of seeds.
2. Controlling the distance between the seeds and their depth.
3. Cover with soil after the seeds fall.



DIFFERENT SOWING AND TRANSPLANTING MACHINERY

1. Naveen dibbler

This is a manual tool for sowing large or medium seeds in a well-prepared field in a single row or to fill the gap. It is suitable for sowing soybeans, sorghum, and maize in small farms or hilly areas. It has been fitted with a type of seed insertion system, a wooden boulder measuring system, a lever-type operating system for the seed, a seed box-like exit door, etc.

2. Rotary dibbler

It is a hand-pushed device by which large and medium-sized seeds are sown at regular intervals in rows in a well-prepared field. It is suitable for sowing maize, soybean, sorghum, pigeon pea, and gram seeds in black or alluvial soil. It is equipped with a seed hopper, seed exhaust, operating lever, wooden roller, handle, transport, soil pressing wheel, etc.

3. Manual paddy transplanter

It is a six-point manual device for transplanting mat-type paddy plants in a field arranged in rows. It is equipped with a handle, plant catch system, plant tray, indexing system, main/base structure, plant push system, wooden sliding bar, etc.



4. Two-row seed sowing machine

It is a simple, low-load animal-driven machine for sowing wheat, gram, sorghum, soybean, lentil, arhar, sunflower, safflower, etc. in rain-fed black soil areas. The fluted roller measuring system installed in the unit is driven by a 300-mm-diameter operating wheel through a chain and toothed wheel. A shoe-type pot maker in which an unobtrusive boot is fixed puts the seed at the desired depth.



5. Two-row seed and fertilizer sowing machine

It is a bi-directional seed and fertilizer sowing machine that is suitable for small seeds like mustard, sorghum, and millet. This black soil is suitable for all small seeds in the region. It has a main structure: a fertilizer box with a measuring system, a separate seed box with a measuring system, an operating wheel, a power transmission system, etc.

6. Three-row seed sowing machine

It is a simple, light-weight cattle-driven machine for sowing wheat, gram, sorghum, soyabean, lentil, moong, arhar, sunflower, safflower, etc. in rain-fed black soil areas. The measuring system with a fluted roller that is installed in the unit is driven by a 300-mm-diameter operating wheel through a chain and toothed wheel. A shoe-type pot maker in which an unobstructed boot has been put puts the seed to the desired depth.

7. Three-row seed and fertilizer sowing machine

It is an animal-driven, simple, light-weight machine for sowing wheat, gram, sorghum, soyabean, lentil, moong, arhar, sunflower, safflower, etc. in an irrigated black soil area. The measuring system with a fluted roller that is installed in the unit is driven by a 300-mm-diameter operating wheel through a chain and toothed wheel. A shoe-type pot maker in which an unobstructed boot has been put puts the seed to the desired depth.

8. Animal-operated sowing machine (Planter)

It is a three-tier device in which groundnut, maize, arhar, jowar, and other oilseeds and pulses are sown at a suitable distance in a row with a tilted plate measuring system. It is fitted with a seed or fertilizer box, a depth control wheel, a shoe-type cistern maker, and an operating system with a chain and toothed wheel, etc. The measurement of fertilizer is done by an aluminum-fluted roller.



9. Power tiller-operated seed and fertilizer sowing machine

This machine has been specially developed for power tillers of 8–10 potency that sow seeds and fertilizer in a row. It is suitable for sowing wheat, sorghum, gram, etc. in medium and heavy soil. It has a main structure: a seed and fertilizer box, a measuring system, a transport wheel, a pot maker, a machine pull system, etc.

10. Power tiller-operated tilling and sowing machine (till plant machine)

It has been specially developed for 10–12 Ashva shakti power tillers for field preparation as well as for sowing seeds and fertilizers. It is suitable for sowing in medium and heavy soils for wheat, gram, soyabean, etc. It has a standard traction system with a main structure, a seed or fertilizer box, a transport wheel, an operating wheel, etc.



11. Seed sowing, planting, and transplantation technologies

For the sowing of groundnut, arhar, soyabean, maize, peas, gram, mustard, etc., a six-cutter low-plate tractor-driven planter is suitable, in which an independent plate metering system has been installed with six seed hoppers. In this machine, the distance between the rows can be controlled, and it is also possible to sow different seeds in different rows. The effective efficiency of the machine is 0.45 to 0.65 hectares per hour.

12. Multi-millet planter

A multi-millet planter is appropriate for the transplantation of kudo millet, little millet, puros millet, foxtail millet, barnyard millet, finger millet, mustard, and jute. The machine is equipped with a seed and fertilizer box, a pair of ground wheels, a seed and fertilizer insertion tube, a shoe-type kund opener, a three-point linkage attachment and chain, and a sprocket-type power transmission system. The working capacity of the machine is 0.52 to 0.62 hectares per hour.



13. Pneumatic precision planter

A tractor-driven pneumatic precision planter is suitable for precision sowing of single seeds at pre-determined locations of toria, cotton, saffron, sunflower, soyabean, gram, okara (Bhindi), mustard, and groundnut. Air is drawn through a perforated rotating plate. The seeds coming into contact with it also get stuck in the holes by pulling, and as soon as the contact with the air is stopped, these seeds fall to the ground at the nearest places. The efficiency of the machine is 0.5 to 0.6 hectares per hour.



14. Vegetable transplanter

Tractor-driven two- and three-qatari vegetable transplants are suitable for transplanting crops of tomato, chilli, cabbage, cauliflower, and brinjal. During operation, workers lift the plant from the teah and place it in finger pockets designed for this purpose. The flappers of the pocket open at the starting point of the tunnel where the plant is placed. They close automatically as soon as the plant moves down the tunnel. The efficiency of the machine is 0.08 to 0.10 hectares per hour.

15. Tractor-driven turmeric transplanter

The developed a machine to plant turmeric bales attached to the back of the tractor. In this reserve planter, three riser bottoms and a transplanting machine system have been installed to transplant one side of the ram at a time. The effective efficiency of the unit is 0.15 hectares per hour, and the cost is around Rs. 45,000.



16. Paddy harvester manufacturer and seed sowing machine

The machine is fitted with rolling dumbbell type carry shaping parts to give uniform shape to the carry. A rotavator is mounted at the front to continuously supply sufficient soil to the mouldboard to form the mould and give it a solid shape. The roper is used as a ground wheel to generate power to operate the filling shaft of the seed and fertilizer control unit. There is no adverse effect due to adverse weather on the wheat sown through machines in the paddy fields. Rapid draining

of excess rainwater leads to good growth of organic matter in the stem and roots, which benefits the crop by allowing air and sun rays to penetrate the soil surface between the roots.

17. Tractor driven small seed sowing machine

On Ludhiana center has developed six Qatari tractor driven small seed sowing machine unit which is suitable for transplantation of small seed (onion) at a distance of 150 mm adjustable plant to plant distance. The equipment has been developed in collaboration with National Agro Industries Ludhiana. The unit price is around Rs. 60,000. Compared to the conventional method, a saving of 50% in the cost of operation and 81% in the labour requirement was observed.

18. Tractor driven fertilizer dibbler for sugarcane

A tractor driven fertilizer dibbler for sugarcane (ratoon) has been developed by Coimbatore centre on which sprays the fertilizer through the crop residue without disturbing the soil much. The cost of the unit is around Rs. 45,000/- and the efficiency is 0.2 hectare per hour.



19. Zero till drill

Zero till drill are made up of seed box, manure box, seed and manure measuring system, manure pipe, potted fruits, seed and manure controller lever, chain, sprocket and power transferring wheel. The structure is

made of mild steel box. The inverted T letter is attached to the nut bolt on the claw / tine. Adjustments can be made according to the distance from the rows to the rows. The main difference between the non-ploughing and shallow cud machine and the old method cud machine is that it is fitted with a T type cud-opener. It penetrates into the soil at low power and easily and only opens the soil as the seed falls. It is used for sowing wheat in unprepared farm after harvesting paddy. The unit cost is around Rs. 35,000.

20. Raised bed planter

It is made up of seed box, manure box, seed and manure measuring system (mechanism) 3 sheep making fruits, chain, sprocket, power transfer wheel, seed and manure controller lever and roller to press the layer. This sowing machine makes a flat layer on which the seeds are sown. Since seeds are sown in layers, good growth of roots and good yield are obtained. Irrigation is done from the wells made of it. This machine is also suitable for sowing seeds of wheat, maize, peas etc. and vegetables. By sowing wheat in layers in light and medium land, there is economical saving of irrigation water and manure. The unit cost is around Rs. 45,000.

21. Inclined plate planter

Tractor Based Six Line Inclined Plate Planter Thick and small grain seeds, which cannot be sown by traditional seed drill or old method, can be sown satisfactorily by this machine. It is made of planter frame, tool bar including modular design seed box, inclined plate type seed metering method. Seeds, plates can be selected and changed according to the seeds. The unit cost of coarse grains like groundnut, maize, cabbage etc. or very fine seeds like mustard, sorghum etc. from this planter is about Rs. 50,000.

22. Strip till seed drill

It is used for sowing wheat without ploughing after harvesting paddy. This results in 50-60 percent fuel saving and 65-75 percent

time saving as compared to seed drill. This increases the yield when sown on time. On the front side of which rotavator is fixed. This rotavator has I type blades which cut a line in front of the opening plate for the seed. It is used for sowing wheat in uncultivated fields after paddy harvesting. The unit cost is around Rs. 45,000.

23.Sugarcane cutting and sowing machine

This machine has a cud opening unit, cane slice composting unit, fall the unit consists of a chemical drop unit, a cane crumb box and a crumb covering unit its structure consists of two opening slabs that go down the drain

to dig a well. This machine has two units for cutting sugarcane pieces. Each unit consists of a package to run it, two workers sit on the machine and lift the guns kept in the iron box one by one and put them in the harvesting unit. Cutting pieces of sugarcane with rotating blades, they automatically fall into the drainage well. Before falling into the drainage pit, along with the sugarcane pieces, manure chemicals also fall. It is used in the sowing of sugarcane by cutting the sugarcane according to the length as per the requirement, making a tube well and putting the pieces in it, dropping manure and chemicals in it before covering the tube well. The unit cost is around Rs. 60,000.



IMPORTANCE OF SOWING AND PLANTING EQUIPMENT

- 1. Efficiency and speed:** Modern sowing and planting equipment drastically reduce the time and labour required to plant seeds. This allows farmers to cover larger areas quickly, optimizing the planting window and improving productivity.
- 2. Precision:** These machines are designed to plant seeds at precise depths and spacing, ensuring uniformity in crop growth. This precision leads to better resource utilization, including water, nutrients, and sunlight, which is essential for maximizing yields.

- 3. Versatility:** Sowing and planting equipment can handle a wide variety of seeds and soil types. Whether it's small grains like wheat and rice or larger seeds like corn and soybeans, modern equipment can be adjusted to meet different agricultural needs.
- 4. Cost-effectiveness:** By reducing manual labour and minimizing seed wastage, sowing and planting equipment contribute to cost savings for farmers. Over time, the investment in such machinery pays off through increased efficiency and higher crop returns.

TYPES OF SOWING AND PLANTING EQUIPMENT

- 1. Seed drills:** These machines are designed to plant seeds in rows at a uniform depth and spacing. Seed drills are ideal for cereals and other small-seed crops, ensuring even germination and growth.
- 2. Planters:** Planters are used for larger seeds and are capable of planting at precise intervals and depths. They are commonly used for crops like corn, sunflower, and cotton.
- 3. Transplanters:** Transplanters are used for crops that are initially grown in nurseries and then transplanted to the field. This equipment ensures minimal root disturbance, promoting better establishment and growth of the transplanted crops.
- 4. Broadcast seeders:** These machines scatter seeds across the soil surface, suitable for crops like grasses and legumes. While less precise than drills and planters, broadcast seeders are useful for cover cropping and pasture seeding.

ADVANCEMENTS IN SOWING AND PLANTING TECHNOLOGY

Recent advancements in technology have further enhanced the capabilities of sowing and planting equipment. Innovations such as GPS-guided precision farming, automated seed delivery systems, and variable rate technology (VRT) allow for even greater accuracy and efficiency in planting operations. These technologies enable farmers to optimize input use, reduce environmental impact, and increase overall farm profitability.

CONCLUSION

Sowing and planting equipment are indispensable tools in modern agriculture. They not only improve the efficiency and effectiveness of planting operations but also contribute to sustainable farming practices by ensuring precise seed placement and optimal resource use. As technology continues to advance, the future of sowing and planting equipment promises even greater innovations, further revolutionizing the agricultural landscape.