



## **Popular Article**

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### **Mechanization in different Crops for enhancing Efficiency and Productivity**

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Farm mechanization has become an essential component of modern agriculture, helping farmers improve efficiency, reduce labour dependency, and increase productivity. With the growing scarcity of farm labour and the need for timely operations, the use of appropriate machinery across different crops such as paddy, millets, pulses, oilseeds have gained significant importance. Each crop requires specific tools and equipment for operations like land preparation, sowing, intercultivation, irrigation, and harvesting, making crop-wise mechanization crucial for achieving better yields and reducing production costs. By adopting suitable farm machinery tailored to different cropping systems, farmers can enhance resource use efficiency, ensure timely farm operations, and ultimately improve their income and livelihood.

#### **I. General Advisories for Crops:**

1. **Summer Ploughing for Effective Weed Control:** In order to overcome the weed problem in field and horticultural crops, summer ploughing with Primary Tillage implements like MB Plough & Disc Plough is highly advantageous.
2. **Sub Soiler:** It results in cutting the soil strata upto a depth of 40 to 75 cm and creates more space for rain water entry and storage, in-situ water conservation & to sustain crop in prolonged dry spell. Easily operated by any 35 to 45 hp tractor. It is useful in dryland agricultural crops. Cost of machinery is Rs.15,000/-
3. **MB Plough:** It is useful for preparing field upto 45 cm. It pulverizes soil clods and aids in preparing the friable tilth. It is not suitable for dry, hard and stony soils. Cost of the implement is Rs.40000/-.
4. **Disc Plough:** Deep ploughing the field using a disc plough and exposing the soil to the sun helps in destroying the pests and weed roots such as *Cyperus rotundus* that are brought to the surface.
5. **Secondary Tillage for Uniform Seedbed Preparation:** Implements like cultivators, rotavators, harrows or power tillers to provide soft, friable, timely and uniform seedbed preparation can be used for the Field and Horticultural crops.

6. **Rotovator:** It is effective not only in dryland farming but also in puddling paddy fields. Begin puddling in first gear (very low speed), then gradually increase speed to improve soil quality. Cost upto Rs.1,00,000/-
7. **Trampler:** Used for green manure mixing, it cuts and presses green manure leaves into the soil, helping them to decompose efficiently and enrich the soil.
8. **Tractor operated FYM Pulverizer cum spreader:** Is useful for FYM application in the field without any labour. It covers upto 10 to 12 acres per day. Cost of the implement is Rs. 76000/-
9. **Brush Cutter:** For regular removal of weeds on bunds and in inter row spaces in wide spaced crops. The cost of the equipment ranges from Rs.12000 to Rs.25000/-.
10. **Chaff Cutter:** Manufactured by different companies, useful to cut green plants into small pieces for efficient feeding. Manual (capacity-1.8-2.0q/h & cost around Rs.10, 000), electrical (capacity-25-100q/h & cost around Rs.50, 000) and tractor operated (capacity-52.8- 76.3q/h & cost around Rs.4, 00,000) chaff cutters are commercially available.
11. **Power Sprayer for Plant Protection:** The power sprayer is used for spraying pesticides and fungicides uniformly in crops for effective pest and disease control. It was developed by ICAR institutes and widely adopted across India. Capacity: 1-1.5 ha/day. Saves 50-60% labour and ensures efficient chemical use. Cost of machinery is Rs.5,000 -35,000/-
12. **Drip and Sprinkler Irrigation Systems:** Enhance water-use efficiency. Sprinklers are suitable for light soils to avoid water logging. They help in uniform water distribution, improve crop growth and increase yield while saving water.
13. **Rain Pipe Irrigation System:** Portable, lightweight, and reduces water and energy use by over 50%. Works under low pressure. It ensures uniform water application like rainfall and is highly suitable for closely spaced crops and small fields. Lifespan: 3-5 years.

## II. Paddy:

1. **Self-Propelled Rice Transplanter:** Developed by ICAR-NRRI and it is used for transplanting seedlings. It Eliminates manual transplantation, reduces planting time by upto 80 - 90 % compared to hand transplanting, saves 50-60 % of labour cost. The unit cost of this is Rs. 15,00,000/-. Available on rent basis.
2. **Eight row self-propelled seeder:** Developed by ICAR-NRRI, suitable for sowing of germinated paddy seed in puddled field at row spacing of 20 cm. Reduces transplanting cost by Rs. 1,500 to Rs.2,000/- and can cover 2-3 acres per day. Available in different Agricultural Machinery local shops with a price varying from Rs. 6,000 to 8,000.
3. **Zero till seed cum fertilizer drill:** Popularized by ICAR-CIAE and commercial manufacturers, with a furrow opener and seed metering system, delivers seed and fertilizer in different depths in the furrow. It is used for planting maize in rice-fallows. It works with a 45 HP tractor and have a field capacity of 3.2-4.0 ha/day, costing approximately Rs.75, 000.
4. **Star Cono Weeder:** Developed by ICAR-NRRI is suitable for weeding, churning into soil and mulching in wet land. Its width of cut is 10-15 cm. It covers one row. It reduces labour requirement by 50- 75%. Field capacity is 0.013-0.017 hectare per hour. Its unit cost is Rs. 1,850/-.

5. **Power weeder:** Is useful for Inter-cultivation and weeding in puddled or dry conditions. It reduces weeding drudgery, 50-55% time savings over hand weeding, cost-effective by 40-45%. Available in different Agricultural Machinery shops with a price varying from Rs. 30,000 to 40,000.
6. **Combine harvester:** Developed by Kubota and other companies in paddy crop is used for harvesting, threshing and cleaning the grains. It is ideal for muddy fields. The minimal grain loss is <1% breakage, saves almost 90% labour compared to manual harvest. The cost of it varies from Rs.12,00,000/- to 24,00,000/-. Available on rental basis @ Rs. 2500 to 3000 per hour. It takes 1.5 hour to 3.0 hour per acre.
7. **Paddy Reaper:** Developed by different manufacturing companies is a self-propelled harvesting machine, especially for the harvest in muddy land. It can harvest 3 acres per day. The price varies from Rs. 90,000 to 1, 65,000 and available in different Machinery shops and through online
8. **Straw Baling Machine:** Is developed by Punjab Agricultural University, Ludhiana which is used to bundle paddy straw into either round or square/rectangular shapes for easy handling and transport. Price of this machine varies from 3.48 Lakh to 3.5 Lakh and it is available on rental basis.
9. **Mini Paddy Parboiling Unit:** Developed by different state Agricultural Universities and companies is a small size parboiling unit to produce quality parboiled rice by employing improved process. The process involves soaking the paddy at 75 degrees Celsius for 3.5 hours followed by open steaming for 30-45 minutes. The process ensures uniform parboiling, without any bad smell and produces light coloured rice with better consumer preference. It takes 5-6 hours to parboil 75 kg of paddy in one batch.

### III. Maize:

1. **Multi crop Combine Harvester with Maize Header:** Developed by different manufacturing companies used for harvesting cobs, shelling and cleaning. It reduces labour cost upto 60-70% (saves Rs.7000/ha). The price varies from 11, 30,000/- to Rs 24,60,000/-.

### IV. Millets:

1. **Tractor drawn six-row planter with Fertilizer drill:** It is utilized for sowing of millets. Developed by: ICAR-CIAE, Bhopal. It Saves 60-70% of cost and time. Capacity: 0.42-0.52 ha/hr. Cost of machinery Rs.45,000/-.
2. **Power tiller drawn six-row planter with Fertilizer drill for millet multi crops:** The same Tractor drawn six-row planter with Ferti drill suitable for small millets and multi crop seeds can be used with power tiller by changing the hitch system. It was developed by ICAR-CIAE, Bhopal. Capacity: 0.32 ha/hr. Saves 60-70% of cost and time. Cost of machinery is Rs.50,000/-
3. **Small Seed Planter used for sowing of millets.** The metering mechanism of these machines is precise enough to pick single seed from the seed box without any damage to the seed. The field capacity of machine is 0.5-0.6 ha/h. Use of these planters can save upto 90% seeds as compared to broadcasting and 70% seeds as compared to drilling by traditional methods in case of millets.
4. **Broad Bed Furrow Planter for Rainfed Intercropping Systems:** This Planter's planting mechanism allowed to sow Redgram / castor and Bajra in a 1:2 ratio with a spacing of 45 cm.

Improves intercropping system and reduces cost of cultivation. The intercropping with BBF system also improves crop yield by 10 %. Developed by: ANGRAU, Guntur. Field capacity of 1.5 acre per hour

5. **Manually operated pull type three row planter:** It is light weight, low cost machine used for sowing. It can be used by small farmers of the country. Developed by: ICAR-CIAE, Bhopal. Capacity: 0.10 ha/hr. Cost of machinery: Rs. 12,000/-.
6. **Multi millet thresher:** Used for threshing and dehulling of small millets. Developed by: ICAR-CIAE, Bhopal. Output capacity: 80-120kg/hr. Saving about 30 man-h/ha of operation time. Threshing efficiency: 96% and Broken grain: less than 2%. Cost of Machinery is Rs.45,000/-.
7. **Finger millet thresher cum pearler:** Is a multi-purpose post-harvest machine that integrates threshing, grain pearling and cleaning into a single continuous process. Threshing capacity: 30-35 kg/hr and pearling capacity : 60-65 kg grain/hr.
8. **Multi millet crop thresher:** Can be used for threshing and dehulling of different types of millets like sorghum, pearl millet and finger millet etc., and also small millets. Capacity of the machine: 1500-2500 kg/hr. Cost of the machinery: Rs.45,000/-.
9. **Victor Single Chamber CF Dehuller:** Is used for dehulling of all small millets; but more suitable for little, Foxtail and Proso millet. Developed by: TNAU, Coimbatore. Capacity- 40 to 50 kg/ hour. Cost of machinery: Rs.52,000/-.
10. **Millet mill:** Efficient in dehulling of all small millets like foxtail millet, Kodo millet, little millet etc. in a single machine. Capacity- 100 kg/ hour. Dehulling efficiency is more than 90%.

### III. Pulses:

1. **Seed-cum-Fertilizer Drill for Pulse Crops:** The seed-cum-fertilizer drill is used for line sowing of pulse crops with simultaneous fertilizer application ensuring uniform spacing and depth. It was developed by ICAR-Central Institute of Agricultural Engineering. Capacity: 0.4 - 0.6 ha/hr. Saves 50-60% of labour, time and seed rate. Cost of machinery is Rs.35,000 - 85,000/-
2. **Power Weeder for Pulse Crops:** The power weeder is used for inter cultivation and weed management in row-sown pulse crops, reducing weed competition and improving soil aeration. It was developed and popularized by Agricultural Universities including Acharya N.G. Ranga Agricultural University. Capacity: 0.3-0.4 ha/hr. Saves 60-70% labour. Cost of machinery is Rs.25,000 -75,000/-.
3. **Cycle Weeder (Manual) for Pulses:** The cycle weeder is a manually operated implement suitable for small farms and women farmers for inter cultivation in green gram and Black gram. It was developed by Acharya N.G. Ranga Agricultural University. Capacity: 0.05-0.1 ha/hr. Saves 60-70% labour. Cost of machinery is Rs.3,000-10,000/-.
4. **Reaper for Pulse Crops:** The reaper is used for harvesting pulse crops like Green gram, Blackgram and Bengalgram efficiently with minimum shattering losses. It was developed by ICAR-Central Institute of Agricultural Engineering. Capacity: 0.4-0.6 ha/hr. Saves 70-80% labour. Cost of machinery is Rs.1.5-3.0 lakh/-.

5. **Combine Harvester for Pulses:** The combine harvester are used for harvesting pulse crops like Bengalgram, Greengram and Blackgram with minimum shattering losses and high efficiency. Popularized by ICAR-Central Institute of Agricultural Engineering. Capacity: 1-2 ha/hr. Saves 70-90% labour and ensures timely harvesting. Cost of machinery is Rs.15-28 lakh.
6. **Multi-crop Thresher:** The multi-crop thresher is used for threshing pulse crops efficiently by separating grains from pods with high efficiency. It was developed by ICAR-Central Institute of Agricultural Engineering. Capacity: 300-500 kg/hr. Saves 60-70% labour. Cost of machinery is Rs.80,000-2.5 lakh/-
7. **Pedal Operated / Motorized Thresher for Pulses:** The pedal operated or motorized thresher is used for threshing small quantities of pulse crops at farm level, suitable for small and marginal farmers. It was developed by Agricultural Universities and ICAR institutes. Capacity: 100-300 kg/hr. Saves 50-60% labour. Cost of machinery is Rs.20,000 - 1,20,000/-.
8. **Mini Dal Mill for Pulse Processing:** The mini dal mill is used for processing pulses into dal at village level, enabling value addition and income generation for farmers and FPOs. It was developed by ICAR-Indian Institute of Pulses Research. Capacity: 100-500 kg/hr. Enhances income through value addition. Cost of machinery is Rs.1.5 - 10 lakh/-.
9. **Seed Cleaner-cum-Grader for Pulses:** The seed cleaner-cum-grader is used for cleaning and grading pulse seeds to improve seed quality and market value. It was developed by ICAR institutes. Capacity: 200-500 kg/hr. Improves seed quality and fetches higher price. Cost of machinery is Rs.50,000 - 2,00,000/-.

#### **IV. Oilseeds:**

1. **Seed-cum-Fertilizer Drill:** Ensures uniform seed placement and proper depth in crops like groundnut and redgram. Calibration before use helps in maintaining correct seed rate and spacing.
2. **Tractor-Drawn Ananta Groundnut Planter (8-Row):** Used for sowing groundnut and intercrops like redgram or castor. Covers 6-7 ha/day efficiently.
3. **Small Tractor-Drawn Ananta Planter (4-Row):** Suitable for small farms and mini tractors & effective sowing for small holdings. Field capacity: 0.35 ha/h; fuel consumption: 2 l/h; cost saving: ₹1500/ha.
4. **Motor-Operated Groundnut Sheller:** It reduces labour requirement, increases output and ensures faster processing with minimal kernel damage. Capacity: 25-250 kg/hour. Powered by 1-2 HP motor.
5. **Seed Treatment Drum:** Ensures uniform coating of chemicals on seeds. Improves germination and protects against seed/soil-borne diseases. It reduces chemical wastage and ensures safe, efficient and timely seed treatment.
6. **Solar Fencing System:** Protects crops from wild animals like boars. Covers ~5 acres. Cost: ₹15,000 - ₹25,000. It is eco-friendly, operates on solar power and provides continuous protection with low maintenance.
7. **Acoustic Animal Repellent Devices:** Sound-emitting devices to deter birds, monkeys and wild animals. They provide non-lethal, eco-friendly protection and help to reduce crop damage effectively.

8. **Bird Scarer:** Wind-driven rotating device producing sound to repel birds. Cost: ₹800. It is low-cost, easy to install and works without electricity, making it suitable for small farms.
9. **ANGRAU Blade Guntaka (Groundnut Digger):** Digs upto 30 cm depth with 90-95% efficiency. Covers 1 acre/hour. It reduces labour requirement, minimizes pod losses and ensures timely harvesting.
10. **Tractor-Drawn Groundnut Digger Shaker cum Windrower:** Harvests 4 rows at a time. It reduces harvesting time and labour, ensures clean windrowing and minimizes pod losses. Efficiency: 95-96%; capacity: 0.6-0.8 ha/h. Cost: ₹1,68,000.
11. **Dry Groundnut Pod Thresher:** Used after field drying. Capacity: upto 500 kg/hour. Requires only 3 labourers. It ensures faster threshing, reduces labour cost and minimizes losses during post-harvest operations.
12. **Fresh Groundnut Pod Thresher:** For freshly harvested bundles. Capacity: 250-300 kg/hour. Cost: ₹1,68,000. It enables timely threshing, reduces drying time and helps minimize post-harvest losses.
13. **Multi-Crop Thresher:** Required for oilseeds like groundnut, sunflower & sesame for threshing. It increases efficiency, reduces labour cost and enables faster processing of multiple crops with a single machine.
14. **Groundnut Stripper:** Separates pods using a 1-3 HP motor. It reduces labour requirement, speeds up pod separation and ensures efficient post-harvest processing. Capacity: 100-125 kg/hour.
15. **Tractor-Mounted Stem Cutter:** Used for cutting castor stalks after harvest. It enables quick field clearance, reduces labour requirement and helps in timely land preparation for the next crop. Capacity: 0.25-0.5 ha/h.
16. **Castor Capsule Shelling Machine:** It ensures efficient seed separation with minimal damage, reduces labour and improves post-harvest productivity. Processes 200-300 kg/hour. Operated with 3-5 HP motor. Cost: ₹23,640-₹40,880.
17. **Sunflower Seed Sheller:** Removes husk and separates kernels. It improves processing efficiency, reduces labour requirement and ensures clean, high-quality kernels for better market value. Capacity: 125 kg/hour. Powered by 3 HP motor. Cost: ₹50,000.

## VI. COMMERCIAL CROPS:

1. **Tractor operated pit digger for sugarcane planting:** Will dig pits 250 to 300 holes per hour with a diameter of 90 cm. Cost is Rs.1,20,000/-.
2. **Cutting sugarcane sett with single bud by Sugarcane sett cutter:** Capacity about 1500 setts per hour and Cost of the implement is Rs.5000/-. Damage is less when compared to manual cutting.
3. **Sugarcane Detrasher:** can be used for detrashing. Easy for handling and detrashing, reduces the labour requirement and Cost of the implement is Rs.1200/-.
4. **Cotton Picker:** mechanically plucks open cotton bolls from the plant without damaging the fiber. Used in large-scale operations.

**VII. Drone Technology:**

1. Spraying of pesticides through Drones reduces time and cost of application and it is the Measure against labour scarcity.
2. In Paddy, Maize, Jowar, Groundnut, Bengalgram, Chilli crops, this technology is already proved effective.
3. An Acre can be sprayed with 10 litres capacity of Drone in 6-10 minutes.
4. When compared to conventional sprayers, crop coverage by the spray fluid will be uniform with finest droplet size.