

TOOLS AND EQUIPMENT FOR LAND DEVELOPMENT, TILLAGE AND SEEDBED PREPARATION

Land development is the costliest operation in farming. It involves jungle clearance, soil opening with deep tillage equipment, moving soil from high to low spots, making farm roads, field bunding and levelling etc. These operations require use of self propelled and heavy equipment such as crawler tractors with heavy duty ploughs and dozers, high horsepower tractors with dozing and hoeing attachment, scrapers, ditchers, chisel ploughs, subsoilers, terracers, levellers etc.

The tillage operations, defined as mechanical manipulation of soil, are performed to achieve the desired seedbed to provide optimum environment for seed germination and plant growth. Seedbed preparation for sowing / planting of different crops is done through primary and secondary tillage operations.

Seedbed Preparation for Upland Crops

The optimum seedbed preparation for raising upland crops, involves the following unit operations:

i. Loosening of soil

This is done to achieve a desired granular soil structure for a seedbed and to allow rapid infiltration and good retention of moisture, to provide adequate air exchange capacity within the soil and to minimize resistance to root penetration and shoot growth. Local plough (*Hal*) and blade harrow (*Bakhar*) are traditional implements used for loosening of soil. These are simplest tools designed to break the topsoil and multi-passes are carried out to prepare seedbed. Mould board plough, disc plough, soil stirring plough, ridger plough, tool frames/carriers with mouldboard plough or tillage sweeps, etc. are improved implements designed for breaking soil. Ploughs are used to break soil and invert furrow slice to control weeds, etc.

ii. Clod size reduction

Clod breaking operation is required to produce a granular soil structure in the final seedbed. Tine cultivator and disc harrow are used for breaking of clods. Generally these are operated after one pass of mouldboard plough or ridger plough. Direct harrowing or cultivator operation is also performed when the fields are clean and free from plant residues of previous crop. Clod crushers, *patela* harrow, etc., are very effective for clod crushing under favourable soil moisture conditions but their effect is confined to soil surface only. Power driven implements like rotavators disintegrate the clods over a wide range of soil moisture and provide uniform and fine size clods or aggregates in seedbed.

iii. Clod sorting

Operation of tools with narrow tines such as comb harrow and spike tooth harrow, in loosened soil, produces a sorting effect, bringing larger clods and aggregates on surface. The sorting effect increases with increasing forward inclination of tines and share width and decreasing speed and soil moisture. Large size clods on the surface are recommended because of their stability under rainfall, which helps in reducing soil erosion.

iv. Compaction and consolidation

Wide, backward inclined implements compact soil as well as break clods in top surface of soil. Direct compaction at seed depth can best be achieved using narrow press wheels/discs. Planking is widely used to compact the soil at the surface.

v. Smoothening

Smoothening of seedbed is required for proper operation of sowing machines, better distribution of irrigation water and quick disposal of excess rainwater. Smoothening can be best achieved by using wide backward inclined blades, such as levelling boards, floats and

patela harrow with closely spaced shallow working narrow tines. Wooden plank, *patela* harrow, are recommended for smoothening operation.

Land Preparation for Rice Transplanting

Puddling of soil generally refers to breaking down soil aggregates at near saturation into ultimate soil particles and is one of the common operations in low land rice fields. It is normally done after initial ploughing and allowing about 50 to 100 mm of standing water in the field. However, in low land condition the farmers often flood the field prior to ploughing and puddling to weaken the mechanical strength of the soil. Retention of standing water on the rice field helps weed control and oxidation-reduction. Such conditions help achieving nutrient balance, and a soft soil suitable for transplanting rice seedlings.

Puddling helps retain standing water in the rice field by producing fine soil particles that reduce soil porosity, thus reducing percolation losses of nutrients. Puddling is also beneficial because it controls weeds, levels the soil surface and provides a homogenized puddled tilth. Puddling must be done when there is standing water in the field.

Puddling is done with an animal or tractor drawn implement (puddler) such as ploughs, comb harrow, *patela* puddler, ladder puddler and rotary puddler. The degree of puddling is however, dependent on the type of puddler and on intensity of puddling. Rotary puddlers generally are better than ploughs because their rotary motion continuously changes the direction of the shear stress and therefore matches the weakest fracture plane within a clod. Further the rotary puddlers tend to compact the sub soil, chop and press down organic matter and require relatively low draft as compared to ploughs.

Tillage Requirements under Different Agro-climatic Conditions

Optimum tillage to achieve maximum crop yields with minimum energy consumption should be the aim of seedbed preparation. A good seedbed is generally considered to imply finer particles and greater firmness in the vicinity of seeds. The depth up to which tillage operations disturb the soil can classify the operation as shallow, medium or deep. The depth of tillage depends on the crop and soil characteristics and also on the source of power or energy available.

In arid and semi arid areas with high average soil temperature and dry spells, there is a need to break the soil, which becomes very hard. A pointed tool like chisel or bar point are used on country plough to break soil without inverting or disturbing crop residue, in order to collect and store rain water and reduce wind erosion and evaporation losses. Under such conditions lister plough, rigid tine cultivator, duck foot sweeps and other similar equipment are useful and can be operated for one or two passes.

Under black soil regions (vertisols) of Madhya Pradesh, Maharashtra, Gujarat and Andhra Pradesh, soils dry up and develop deep cracks during hot summer weather, and hence ploughing is not very essential. Mould board ploughing may be done once in 3 to 4 years to destroy weeds. For such soils shallow cultivation by a blade harrow or sweep cultivator is sufficient to prepare a good seedbed, when weeds are under control. Continuous operation of mould board for few years may be required to control the weeds.

In humid areas, it is desirable to have deep tillage accompanied by soil inversion and burying of crop residues. This helps in enhancing nitrogen fixation in soil and incorporation of biomass.

In dryland areas tillage requirements are mainly linked with improved moisture intake and retention, reduced evaporation and checking of weed growth. Studies have indicated that increased infiltration rate and higher crop yields can be achieved under dryland conditions by performing deep tillage by mould board plough.

In brief, the recommendations are to do shallow or medium tillage in most conditions. For weed control and increased storage of rain water deep tillage is recommended. Summer ploughing with mould board plough, once in two to three years, to invert the soil, is also recommended.

BACKHOE DOZER

Features

These are attachments of tractor. The dozer is mounted in front of the tractor and backhoe in the rear. The dozer and backhoe can be easily removed and joined to the tractor. The dozer consists of a thick curved plate and hardened strip. The strip has sharp cutting edge and is joined to the curved plate of the dozer with fasteners. Therefore, the strip can be replaced on wearing or becoming blunt. The dozer plate is joined to the tractor with sturdy arms and can be raised or lowered with hydraulic system of the tractor. Backhoe consists of a bucket with digging fingers, hydraulic cylinder, arms and base for attaching to the rear of the tractor. The bucket position is manipulated by hydraulic system. The digging fingers are hardened and can be replaced on wearing or becoming blunt.



Specifications

Backhoe

Maximum digging depth (mm)	3350
Reach-ground level to rear wheel centre (mm)	5500
Reach-ground level to slew centre (mm)	4100
Maximum working height (mm)	3850
Maximum load over height (mm)	2850
Reach at full height to slew centre(mm)	2450
Bucket rotation (degrees)	180
Side reach to centerline of machine (mm)	4700
King post travel (mm)	1200

Dozer

Blade size (mm)	2400 × 900
Ground clearance (mm)	700
Cutting depth (mm)	up to 190

Uses

Backhoe is used for excavating soil, making foundation for building, making trenches for pipe and cable laying, garbage handling, widening of rural roads and removal of bushes and trees etc. Dozer is used for agricultural land levelling, making bunds in the farms and terracing of farm, road making and site clearance, for trench filling at dam project, after laying cable or pipe etc.

Sources (Appendix)

648, 875

BACKHOE LOADER

Features

These are attachments of tractor. The loader is mounted in front of the tractor and backhoe at the rear. The loader and backhoe can be easily removed and joined to the tractor. Backhoe consists of a bucket with digging fingers, hydraulic cylinder, arms and base for attaching to the rear of the tractor. The bucket position is manipulated by hydraulic system. The digging fingers are hardened and can be replaced on wearing or becoming blunt. Loader consists of

curved frame in the front, which acts as bucket, arms hinged to each other by pins, hydraulic cylinders and hydraulic system. The loader, therefore, can be maneuvered to the required position through hydraulic controls.

Specifications

Loader

Pin height (mm)	3200
Dump height (mm) for 45° bucket	2700
Digging depth (mm)	up to 150
Reach at ground (mm)	1470
Reach at full height (mm) for 45° bucket	700
Bucket return to ground angle (degrees)	45
Bucket unloading angle (degrees)	45
Loader bucket payload capacity (kg)	750
Loader bucket capacity (cu.m)	0.50



Backhoe

Maximum digging depth (mm)	3350
Reach-ground level to rear wheel centre (mm)	5500
Reach-ground level to slew centre (mm)	4100
Maximum working height (mm)	3850
Maximum load over height (mm)	2850
Reach at full height to slew centre (mm)	2450
Bucket rotation (degrees)	180
Side reach to centerline of machine (mm)	4700
King post travel (mm)	1200

Uses

Loader is used for removal of mud and loose soil at canal worksite, for loading of crushed stones into the dumpers and trailers at stone crusher unit, for loading of salt into trucks and trailers, for handling of clay and soil and loading it into the trucks and trailers etc. Backhoe is used for excavating soil, making foundation for building, making trenches for pipe and cable laying, garbage handling, widening of rural roads and removal of bushes and trees etc.

Sources ((Appendix)

648, 875

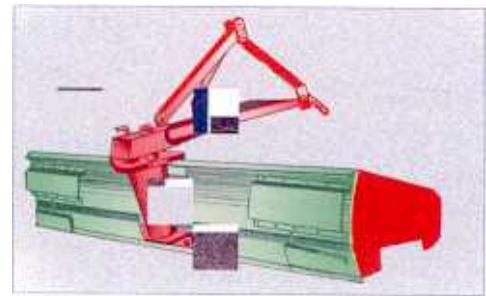
TRACTOR MOUNTED TERRACER BLADE

Features

It is attached to the tractor with the 3-point linkage system and is hydraulically controlled. It consists of replaceable blade attached to curved steel body, side wings and indexing arrangement for tilting and angling of the blade. The cutting blade is made of medium carbon or alloy steel and the cutting edge is hardened and sharpened. The blade with body is also called mould board. The mouldboard can be angled left or right by lifting the spring loaded latch pin and by turning the mouldboard. To tilt the blade for ditching or terracing the



blade is tilted to the desired angle by moving the index pin. The depth of cutting is controlled by hydraulic system of the tractor. The blade can be pitched forward and back or tilted at 15° to 30° left or right. It can be reversed for back filling. For increasing the length of blade, extensions are provided.



Specifications

Blade length (mm)	1950-2458
Height (centre of top pin to ground) (mm)	978
Blade offset (mm)	305
Forward angular adjustment (degrees)	$0^{\circ}, 15^{\circ}, 30^{\circ}$ and 45° RH to LH
Reverse angular adjustment (degrees)	$0^{\circ}, 15^{\circ}, 30^{\circ}$ and 45° RH to LH
Tilt angular adjustment (degrees)	$0^{\circ}, 15^{\circ}$ and 30° RH to LH
Weight (kg)	210-260
Power requirement (hp)	35-50, tractor

Uses

The terracer blade is used for grading, levelling of fields, filling of depressions and smoothening of field for irrigation.

Sources (Appendix)

648, 1405, 1598

HYDRODOZER

Features

This is a tractor front mounted dozer. The dozing blade assembly consists of a curved plate (bucket) to which a cutting blade made of hardened alloy steel is joined with dozer arms, hydraulic cylinders, frame and body. The cutting blade edge is sharp and fastened to the plate with fasteners. The blade is reversible type. The dozer is hydraulically controlled.



Specifications

Blade length (mm)	2000
Blade height (mm)	580-650
Cutting depth control	Two rams
Lifting height (mm)	635-915
Working capacity (cu.m/h)	25-70
Power requirement (hp)	50 and above

Uses

For land shaping, field terracing, construction of roads, contour bunding etc.

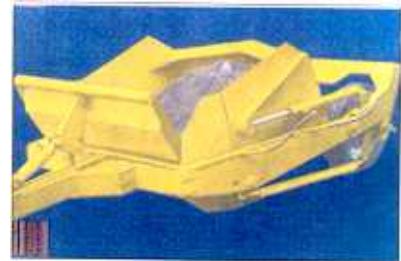
Sources (Appendix)

241, 396, 557, 1343

HYDRAULIC SCRAPER

Features

The hydraulic scraper is towed behind the tractor. The scraper consists of cutting blade, hydraulic system, hitch point, hitch bar, apron, bowl, wheels, apron cylinder, side frame, bucket cylinder, spring, and side arm. The scraper working is controlled by the hydraulic arrangement. The blade is made of alloy steel and has self-sharpening tungsten carbide cutting edge. For operation, the scraper is attached to the tractor, hydraulic system connected and apron is raised. With the forward movement of the tractor, the blade penetrates into the soil and fill bucket bowl gets filled. The apron is closed after the bucket is filled and the scraper is moved to the point of unloading. For unloading, the bucket is tilted hydraulically.



Specifications

Type	: Gated planning scraper, direct hitching and loading
Length (mm)	: 4270
Width (mm)	: 1830 – 2135
Height (mm)	: 1140
Capacity (cu.m)	: 2.5 - 3.5
Number of hydraulic cylinders	: 2
Hitch head	: Triple swivel
Weight (kg)	: 900 – 1000
Cutting blade width (mm)	: 1500 – 2100
Power requirement (hp)	: 50 and above

Uses

It is used for collecting the soil from one place and unloading at the other. It is used for rough leveling, cutting of high spots and filling of depressions.

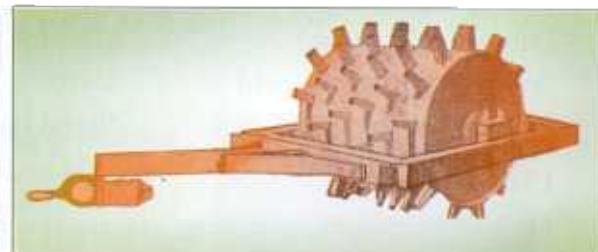
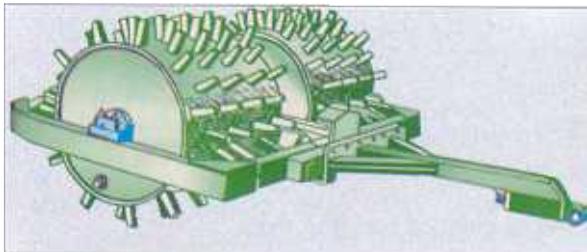
Sources (Appendix)

241, 396, 557, 1343

SHEEP FOOT ROLLER

Features

The sheep foot roller consists of box frame of heavy angles, hard faced solid forged tamping



feet, heavy-duty shaft enclosed in the drum, steel drum on which forged tamping foot are welded, reinforced box section draw bar provided with heavy duty swivel hook, and adjustable cleaner teeth to prevent accumulation of dirt between the teeth. The roller is mounted on heavy-duty frame. The equipment is available in the form of one or two drums

and is attached to the drawbar of the tractor. Independent oscillating frame and oscillation stopper are provided in the double drum sheep foot rollers.

Specifications

Overall length (mm)	3300 – 3670
Overall width (mm)	1430 - 3100
Diameter of drums (mm)	920 – 1020
Number of drums	1 – 2
Width of drums (mm)	1070 – 1220
Number of feet per drum	78 – 90
Length of temper foot (mm)	152 - 178
Area of each foot face (cm ²)	25 – 40
Number of feet per row	2 - 4
Weight (kg)	1100 – 3700
Ground pressure (kg/cm ²)	19 – 22
Power requirement (hp)	50 and above

Uses

For compaction of soil and farm roads.

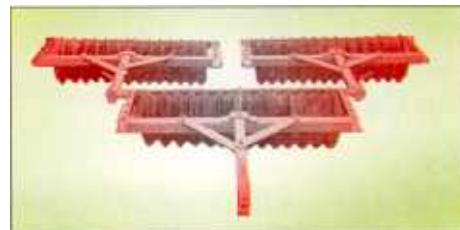
Sources (Appendix)

241, 396, 557,1343

CULTIPACKER

Features

The implement consists of number of cast iron V shaped rollers mounted on three axles. The implement can be operated either with one or 3 gangs. Some times it can be attached behind disc harrow (trailing type) to affect compaction for moisture conservation.



Specifications

Gang span (mm)	1425
Number of gangs	1 – 3
Working width with 3 gangs (mm)	3200 – 4100
Number of rollers in each gang	14
Roller width (mm)	102
Roller diameter (mm)	460
Roller weight (kg)	26
Weight (single gang) (kg)	450
Total weight (kg)	1350

Uses

Breaking of clods and packing of soil thereby conserving moisture.

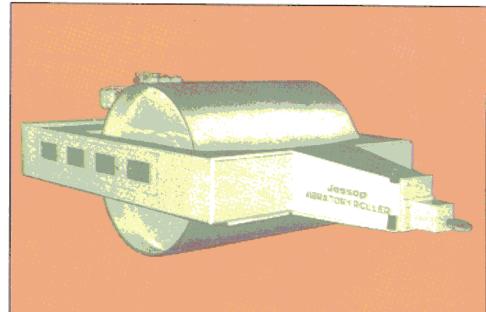
Sources (Appendix)

241, 396, 534,557,1343

VIBRATORY ROLLER

Features

The vibratory roller consists of frame, which is a welded structure and carry the engine at the rear in static balance condition, roller fabricated from steel plate with adjustable scrapers fitted in front and rear, vibratory drive having spring loaded centrifugal clutch directly mounted to the flywheel, vibrating mechanism and towing mechanism. The vibratory roller is towed with the tractor for operation. Vibratory mechanism provided in the roller helps in achieving higher compaction.



Specifications

Length (mm)	4321
Width (mm)	2273
Height (mm)	1619
Roller diameter (mm)	1371
Rolling width (mm)	1828
Ground clearance (mm)	406
Towing height (mm)	552/692
Frequency of vibration (strokes/min)	1400-1800
Centrifugal force (kg)	10170
Working speed (km/h)	2-6
Traveling speed (km/h)	15
Weight (kg)	5500
Power requirement (hp)	70-75 tractor

Uses

It is used for compacting filled-in earthwork such as embankments, sub-grade, sub-bases for farm roads, building foundation etc.

Sources (Appendix)

635

DITCHER

Features

It consists of two curved wings with cutting blades, front cutting point, tie bars for adjusting wingspan, and hitch assembly with 3-point linkages. The cutting blades and cutting point are made of medium carbon or alloy steel, hardened and sharpened. The ditcher is operated by tractor and controlled by hydraulic system. The ditcher penetrates in the soil due to its own weight and suction of the cutting point. Upon drawing the ditcher in the field, it opens the soil in the shape of ditch with either 'V' bottom or flat bottom. The wings enable the ditcher to slice and roll the tough



sod, brush and root sets. The depth and width of the ditch is adjusted from the operators seat. The front cutting point and wings cutting edges are replaceable.

Specifications

Length (mm)	1600
Wing span rear (mm)	1675
Wing height (mm)	470
Wing length from point (mm)	1800
Ditch size top width (mm)	610
Ditch depth (mm)	305-405

Uses

It is used for making ditches for irrigation and drainage.

Sources (Appendix)

241, 396, 557, 1343

ROTARY DITCHER



Features

It consists of a rotary cutter operated by pto shaft of the tractor, gear box, 3-point linkage, hitch system, frame, body, deflector and ditch former. The machine is operated by tractor. Rotary cutter is main component of the ditcher and it consists of drum fitted with cutting knives or cutters. The knives are of different shapes and are made of alloy steel by forging. The knives can be replaced on becoming blunt. The rotary cutter excavates soil, which is uniformly distributed to one side. The deflection of the soil can be adjusted by the deflector. Ditch former, having trapezoidal shape fitted in the rear, form the ditch.

Specifications

Top width of the ditch (mm)	740-915
Depth of the ditch (mm)	460-560
Base width of the ditch (mm)	180-250
Power requirement (hp)	40-70, tractor
Weight (kg)	255-550

Uses

It is used for making ditches for irrigation and drainage.

Sources (Appendix)

648

IMPROVED BAKHAR

Features

The improved *bakhar* consists of a frame made of mild steel angle section in which a V-shaped blade is attached by means of fasteners. Behind the blade a roller made of 150mm diameter Mild Steel pipe is provided to crush soil clods. The frame also supports a handle by which the operator controls the implement. The unit is suitable for seedbed preparation in black soil. This has a modified V-blade replacing conventional curved blade for reduced draft. A pair of bullocks is used for pulling the implement.



Specifications

Overall Dimensions

Length (mm)	1220
Width (mm)	850
Height (mm)	650
Weight (Kg)	45
Working Width (mm)	500
Working Depth (mm)	60
Operating Speed (km/h)	2.0-3.0
Field Capacity (ha/h)	0.062-0.075
Field Efficiency (%)	70
Draft (N)	450-550
Labour Requirement (Man-h/ha)	15

Uses

It is used for seedbed preparation in black soil.

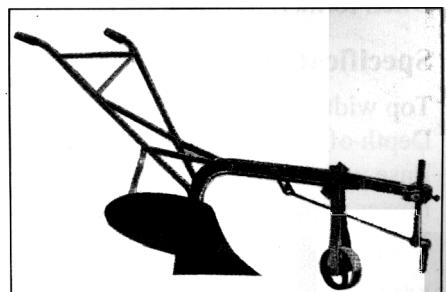
Sources (Appendix)

254

ANIMAL DRAWN MOULDBOARD PLOUGH

Features

The implement consists of a share, mouldboard, landside, handle, depth gauge wheel and wooden beam. The share is made from medium or high carbon steel and hardened to resist wear during operation. The mouldboard that inverts the soil is made of mild steel. The gauge wheel is used to control the depth of operation. It has convenient handles for easy operation. For operation the plough is moved in the soil with the help of a pair of bullock. Share of the plough penetrates into the soil and makes a cut below the soil surface. Mould board lifts, pulverizes and inverts the furrow slice.



Specification

Working width (mm) : 100, 150, 250, 300

Uses

Animal drawn mouldboard plough is used for ploughing and inversion of soil

Sources (Appendix)

12, 57, 62, 84, 538, 202, 210, 213, 221, 324, 450, 532, 590, 617, 698, 747, 815, 851, 873, 905, 956, 996, 999, 1006, 1075, 1108, 1154, 1303, 1419, 1469, 1477, 1503, 1517, 1551, 1566, 1572, 1581, 1592, 1636, 1730, 1750

ANIMAL DRAWN MOULDBOARD PLOUGH

Features

It is an animal drawn small size mouldboard plough used for tillage operations. It is made out of mild steel angle, flat and sheet. It is generally fitted to a long wooden beam hitched to a pair of bullocks. It can also be carried over undulating surfaces easily. The soil working part is removable type and can be replaced when worn out. The width of operation of the plough is about 200 mm.



Specification

Raw materials used	Mild steel angle iron, flat and sheet
Dimension of blade	
Length×Width×Height (mm)	390-400×220-230 × 300-320
Weight (kg)	2.5-3.0

Uses

Primary and secondary tillage operations.

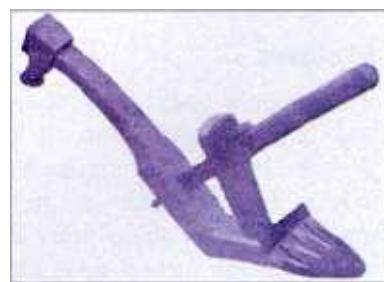
Sources (Appendix)

39, 250, 853, 923, 1224

MELUR PLOUGH

Features

This type of plough is used in Madurai, Ramnad and Tanjore districts of Tamil Nadu. This plough is suitable for ploughing in wetlands for raising rice crop using a pair of bullocks. The depth of cut in black soil is 3.5 cm and the width is 100-130 mm. The shoe is made of single casting with ribbed surface. The pole shaft is made of babul or vengai wood.



Brief Specification

Length of the beam (mm)	701
Beam diameter (mm)	127
Width (mm)	130
Weight (kg)	8
Power requirement	A pair of bullocks and one man
Capacity (acres per day)	0.5

Uses

This type of plough is used for seed bed preparation and puddling in wetlands.

Sources (Appendix)

257, 338, 1537

IMPROVED IRON PLOUGH

Features

The bullock drawn improved iron plough is made of mild steel except the pole shaft and hence it has longer life. As and when the share wears off, it can be pushed forward. Pole shaft angle and height of handle can be adjusted according to field requirements. It is operated with one pair of bullocks. The plough is provided with a mouldboard as an optional attachment for soil inversion.



Specification

Length (mm)	3500
Width (mm)	250
Height (mm)	900
Type	Bullock drawn implement
Weight (kg)	17
Power requirement	A pair of bullocks
Capacity (ha per day)	0.5

Uses

This implement could be used for dry ploughing operations in all types of soil. The plough is provided with a mould board as an optional attachment for soil inversion.

Sources (Appendix)

382, 1187, 1260, 1656, 1671, 1683

ANIMAL DRAWN BOSE PLOUGH

Features

It is a mould board type plough suitable for upland paddy and dryland cultivation. It consists of wooden beam, Wooden handle with a grip, wooden body and a share cum mould board made of mild steel. The share cum mouldboard has sharp point and cutting edge, which cut and invert the furrow slice. Upon becoming dull it can be replaced.



Specifications

Dimensions (l×w×h) (mm)	840×650×190
Weight (kg)	15
Size of bottom (mm)	125

Performance results

Width of cut (mm)	110
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Operating speed (km/h)	2.06
Field capacity (ha/h)	0.01
Field efficiency (per cent)	58
Draft (N)	410
Labour requirement (man-h/ha)	98

Uses

It is suitable for upland paddy and dryland cultivation.

Sources (Appendix)

12, 84, 210, 221, 698, 873, 905, 956, 999, 1006, 1071, 1303, 1469, 1503, 1517, 1551, 1566, 1592, 1636, 1730

IMPROVED PLOUGH

Local Name: Khargaon type hal

Features

The plough consists of mild steel sheet body to which a replaceable share is attached. The body also serve the purpose of frame and the other component like handle, tie bar and hitch assembly is also attached to it. The shape of the share is similar to flat iron section with a tang and is held on the body with fasteners. The share is usually fabricated from used leaf spring steel; tip is forged to a sharp edge and hardened. The share can be replaced after it has worn out and the cutting edge can be sharpened upon becoming dull. The operation of the plough is similar to other bullock drawn ploughs. The hitching point for the beam is a swing type mechanism, which is adjusted by the help of the brackets using the pre-drilled holes and attached to the main body of the plough.



Specifications

Overall dimensions (mm)

Length × Width × Height (mm) 1060 × 190 × 850

Working width (mm) 200

Capacity (ha/day) 0.20-0.25

Power requirement A pair of bullocks

Weight (kg) 26

Uses

It is used for primary tillage.

Source (Appendix)

358, 514, 538, 838, 1572, 1633

IMPROVED PLOUGH

Local Name: Dabra plough

Features

The complete plough is made of steel. It consists of mild steel plate frame to which other parts such as plough sole; handle and soil working components are attached. The share of the plough is fabricated from mild steel sheet having a triangular shape. Another piece of sheet is joined to the share which acts as mouldboard. The share end and mouldboard assembly is

tilted slightly for penetration and inversion of the furrow slice. The share upon becoming dull or after it is worn out can be replaced. The plough is suitable for tillage in light soils.

Specifications

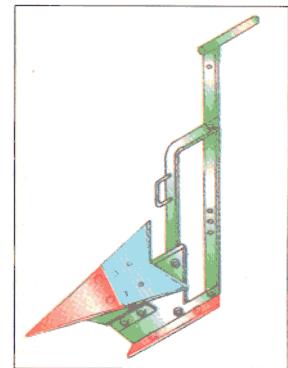
Overall dimensions (mm)

Length × Width × Height 740 × 235 × 830

Working width (mm) 240

Capacity (ha/day) 0.20-0.25

Weight (kg) 8



Uses

It is used for primary tillage in light soils.

Source (Appendix)

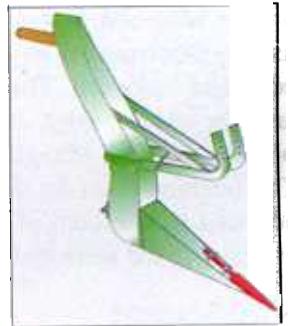
358, 514, 538, 838, 1572, 1633

IMPROVED PLOUGH

Local Name: Rau type hal

Features

The plough consists of triangular shape body made of mild steel sheet, handle body made of mild steel sheet, share made of used leaf spring steel, hitch assembly and tie bars made of mild steel flat iron sections. The share is forged to a screwdriver point shape with tang. The share is held to the triangular body of the plough with the help of U – clamps. The share after becoming dull can be sharpened or replaced. Similar to other ploughs found in the region, it has special brackets having a number of holes to which the beam can be attached. These holes serve the purpose of adjusting the plough suiting to the height of the animals being used. The handle is also placed at a convenient height for the operator. This implement is popular in the Malwa regions of Madhya Pradesh.



Specifications

Overall dimensions (mm)

Length × Width × Height 1480 × 120 × 950

Working width (mm) 130

Capacity (ha/day) 0.25-0.30

Weight (kg) 13

Uses

It is used for primary tillage in *kharif* and *rabi* seasons.

Source (Appendix)

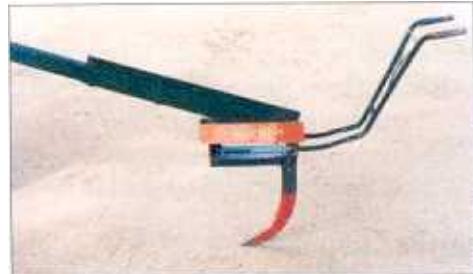
358, 514, 538, 838, 1572, 1633

ANIMAL DRAWN CHISEL PLOUGH

Features

It is a pointed curved bar type implement useful for breaking hard layer of soil below the normal ploughing depth to facilitate infiltration of rainwater. Use of this implement leads to

increase in yield by up to 15 per cent compared to conventional method of field preparation by country plough without any deep ploughing. It is usually operated by a pair of bullocks. The equipment is commercially available.



Specifications

Dimensions (l×w×h) (mm)	1150 × 380 × 1050
Weight (kg)	50
Radius of curvature of tyne (mm)	370
No. of tynes	One
Power source	Pair of heavy bullocks

Performance results

Width of cut (mm)	40
Space between successive pass (mm)	900
Depth of cut (mm)	300
Operating speed (km/h)	2.1
Field capacity (ha/h)	0.2
Draft (N)	1200
Labour requirement (man-h/ha)	5

Uses

It is a pointed curved bar type implement useful for breaking hard layer of soil below the normal ploughing depth to facilitate infiltration of rainwater.

Sources (Appendix)

185, 1287, 1589, 1656

MP IRON WEDGE PLOUGH

Features

The plough is similar to the indigenous plough in shape. It consists of mild steel box section frame, a shank attached to the frame, plough body made of mild steel sheet attached to the shank, share attached to the body of the plough, hitch assembly and handle. The share point is fabricated from used leaf spring steel and forged to the required shape. The share can be replaced upon becoming dull. It requires a pair of bullocks to pull; the share cuts a slice, which is inverted on both sides by the body of the plough. It has several holes on the brackets meant for attaching the beam such that the implement can be easily adjusted for varying heights of animals. The handle provided at a convenient height enables the operator to guide it with ease when pulled by the animals.



Specifications

Overall dimensions (mm)	
Length × Width × Height	: 850 × 305 × 820
Working width (mm)	: 305
Capacity (ha/day)	: 0.20-0.25

Power requirement	A pair of bullocks
Weight (kg)	

Uses

It is used for primary tillage and in *biasi* cultivation.

Source (Appendix)

358, 514, 538, 838, 1572, 1633

BIRSA ANIMAL DRAWN RIDGER PLOUGH

Features

It is a ridger plough to perform all functions of country plough with added efficiency and advantages. It is suitable for hilly region of Chota Nagpur region. It saves 9 per cent labour and operation time and 5 per cent cost of operation compared to the conventional method of using country plough. The Birsa ridger plough was found to be better than the country plough in its performance.



Specifications

Dimensions (l×w×h) (mm)	250×150×80
Weight (kg)	5 (without beam)

Performance results

Width of cut (mm)	156
Depth of cut (mm)	108
Operating speed (km/h)	2.68
Field capacity (ha/h)	0.022
Field efficiency (per cent)	63
Draft (N)	450
Labour requirement (man-h/ha)	46

Uses

It performs all functions of country plough with added efficiency and advantages.

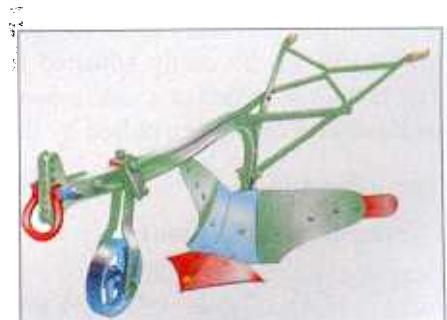
Sources (Appendix)

220

ANIMAL DRAWN KAPAS RIDGER

Features

The ridger is more popular in the cultivation of cotton, therefore has been named as *kapas* ridger. The ridger consists of a sturdy frame, share, two mouldboards with tail, head wheel, double handle and hitch assembly. The share of the ridger is made from medium carbon steel or alloy steel and hardened to resist wear in the soil. The mouldboards are adjustable and the wingspan can be adjusted according to row width. Tailpieces are provided for increasing the furrow width. The head wheel regulates the depth of the furrow. For operation, the implement is drawn by a pair of bullocks, the depth of furrow is



adjusted by the head wheel, width of the furrow is adjusted by the wingspan of mouldboard and tail pieces. The ridger has two handles, which helps in keeping the implement stable during operation. The furrow is formed in a single pass and the ridge in the return pass.

Specifications

Length (mm)	:	1300
Width (mm)	:	720
Height (mm)	:	400
Weight (kg)	:	44

Uses

It is used for making ridges and furrows for cultivation in maize, sorghum, cotton, millets, cowpea, groundnut and other arable crops.

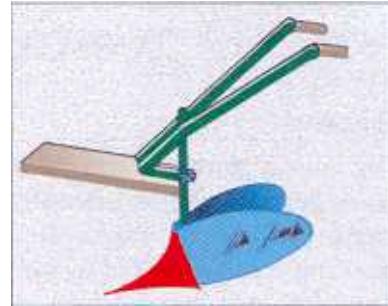
Source (Appendix)

283

BULLOCK DRAWN RIDGER

Features

The ridger plough consists of single share and double mould board attached to a short (steel) or long beam (wooden). Two handles are provided to balance the ridger during operation. During operation the share cuts furrow slice and pulverises the soil, which moves on to the mouldboard and is inverted. During the onward movement, a furrow is formed and ridges get formed in its return pass. The point of the ridger can be replaced after it is worn out. In certain designs, the width of ridges can also be adjusted.



Specifications

Wing width (mm)	690
Length (from share point to wing) (mm)	780
Weight (kg)	25

Uses

It is used for making ridges and furrows for potato and sugarcane planting and making field channels for irrigation.

Source (Appendix)

117, 220, 283, 293, 464, 358, 514, 538, 825, 838, 938, 1084, 1087, 136, 1291, 1387, 1572, 1631, 1633, 1665

BULLOCK DRAWN DISC HARROW

Features

The harrow consists of a frame and shafts on which discs are mounted. The shafts are held in bearings for smooth rotation of discs. The shafts are called gangs on which discs are arranged and equally spaced with the help of spools. Single gang and double gang disc harrows are equally popular and operated using a pair of animals. The discs are fabricated from carbon steels and the cutting edges are hardened. The harrow is provided with an operator's seat and

also has a transport wheel which aids in easy transportation. The operator's seat enables the operator to ride instead of walking, which helps in deeper penetration and reduces drudgery.



Specifications

Number of discs	:	4-6-8
Disc diameter (mm)	:	400-450
Number of gangs	:	1-2
Width of cut (mm)	:	800-1200
Depth of cut (mm)	:	50-120
Capacity (ha/day)	:	1.5-1.75 (8 hrs)
Weight (kg)	:	80-120
Power requirement	:	Pair of bullock

Uses

It is used for seedbed preparation, cutting and burying of grass and weeds.

Source (Appendix)

204, 213, 283, 332, 617, 697, 747, 850, 851, 996, 1419, 1520, 1581, 1750

ANIMAL DRAWN PATELA HARROW

Features

The animal drawn patela harrow consists of a heavy batten made of Sal wood having 1500mm length and 100mm thickness on which a Mild Steel angle frame is fixed by means of screws. The frame carries a bar to which curved and pointed hooks are attached. The bar can be raised or lowered by means of the lever having a slotted sector to lock its position. Some models may be up to 2000mm in length. It is secondary tillage equipment for clod crushing, stubble or trash collection, levelling and smoothing of land surface before seeding.



Specifications

Overall Dimensions,

Length (mm)	1500
Width (mm)	230
Height (mm)	100
Weight	65
Working width (mm)	1500/2000
Working depth (mm)	60
Draft (N)	600
Operating speed (km/h)	2.5
Field capacity (ha/h)	0.3
Field efficiency (%)	70
Labour requirement (man-h/ha)	3-4

Uses

It is a secondary tillage equipment and used for breaking of clods, collection of stubble or trash and levelling of the field surface before the application of seedlings

Sources (Appendix)

254, 1288

ANIMAL DRAWN DISC HARROW

Features

It is a single acting double gang type disc harrow suitable for secondary tillage operation. The harrow is provided with an operator's seat and a transport wheel which aids in easy transportation. The operator's seat enables the operator to ride instead of walking, which helps in deeper penetration and reduces drudgery. Also the disc angle can be adjusted easily with the help of the slotted bracket and the depth and width of operation can be controlled. It saves 89 per cent labour and operating time and also results in 80 per cent saving in cost of operation compared to conventional method of ploughing by bullock drawn country plough. The equipment is commercially available.



Specifications

Dimensions (l×w×h) (m)	1.20×1.00×0.68
Weight (kg)	80
Disc diameter (mm)	400
No. of gangs	2
No. of discs per gang	3

Performance results

Width of cut (mm)	750
Operating speed (km/h)	2.3
Field capacity (ha/h)	0.13
Field efficiency (per cent)	75
Draft (N)	430
Labour requirement (man-h/ha)	8

Uses

It is used for secondary tillage operation

Sources (Appendix)

204, 213, 283, 332, 617, 697, 747, 850, 851, 996, 1419, 1520, 1581, 1750

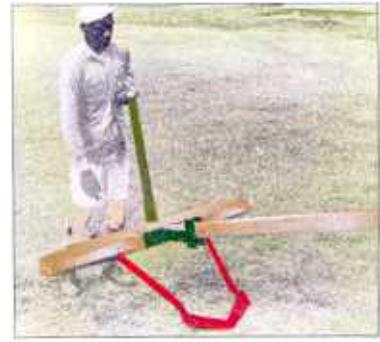
BLADE HARROW

Local Name: Bakhar

Features

The implement consists of a blade, blade holding prongs, wooden body and a wooden beam. The blade is attached to the *bakhar* frame prongs with the help of rings, which are hammered

into place. It cuts a thin slice of soil and removes the weeds etc and requires a pair of bullocks to pull the implement. The V-shape of the blade has a self-cleaning advantage, which prevents adherence of weeds and its roots, thus enabling speedier operation and improving the uniformity of cut as compared to the straight bladed version.



Specifications

Cutting width of blade (mm)	500-600
Shape of blade	Straight or V shape
Weight of blade (kg)	4-5
Weight of the implement (kg)	25-30
Working capacity (ha/day)	0.5-0.6

Uses

It is used for the primary tillage operations.

Source (Appendix)

29, 358, 464, 514, 538, 825, 838, 861, 1249, 1477, 1572, 1633

BLADE HARROW

Local Name: MP Single Dora

Features

The implement consists of mild steel box type frame, a weeding blade, blade holding prongs, hitching arrangement, handle and a steel beam. All the parts of the *dora* are made of steel. The blade is attached to the *dora* prongs with the help of rings. The bracket for fixing the beam has multiple holes so that the height of the beam can easily be adjusted according to the height of the animals being used. The implement is pulled by a pair of bullocks and scraps the soil. The shape of the blade is slightly concave. This implement has multiple utilities and can also be used for exposing potato tubers and digging out groundnut vines from the soil. Once its soil-working component gets worn out it can be reshaped and fitted again to improve its performance.



Specifications

Overall dimensions (mm)	
Length × Width × Height	500 × 300 × 500
Working width (mm)	300
Cutting width of blade (mm)	350
Shape of blade	Concave
Weight (kg)	12
Capacity (ha/day)	0.5-0.6
Power requirement	A pair of bullocks

Uses

It is used for the weeding of crops sown in line such as cotton, maize, sorghum and similar crops and also for digging out potato and groundnut.

Source (Appendix)

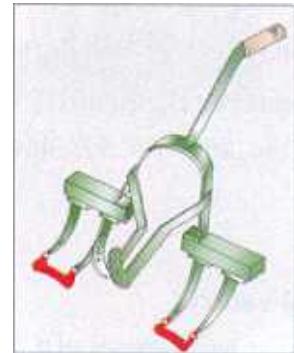
358, 514, 538, 838, 1572, 1633

BLADE HARROW

Local Name: MP Double Dora

Features

The implement consists of two mild steel box type frame, two weeding blades, blade holding prongs for each blade, common hitching arrangement, flat iron curved part to join the box frames, handle and a steel beam. All the parts of the *dora* are made of steel. The blade is attached to the *dora* prongs with the help of rings. . The bracket for fixing the beam has multiple holes so that the height of the beam can easily be adjusted according to the height of the animals being used. The implement is pulled by a pair of bullocks and scraps the soil. The shape of the blade is slightly concave. With the *dora*, two rows can be weeded in a single pass, thus improving its field capacity but requires a heavier pair of animals.



Specifications

Overall dimensions (mm)	
Length × Width × Height	700 × 700 × 840
Working width (mm)	700
Cutting width of blade (mm)	350
Shape of blade	Concave
Weight (kg)	18.5
Capacity (ha/day)	0.8-1
Power requirement	A pair of bullocks

Uses

It is used for the weeding of crops sown in line such as cotton, maize, sorghum and similar crops.

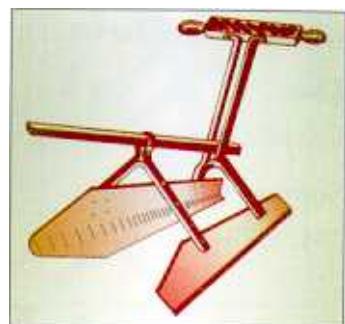
Source (Appendix)

358, 514, 538, 838, 1572, 1633

BULLOCK DRAWN BUND FORMER

Features

The implement consists of two blades, flat iron frame bent at an angle a handle attached to the frame with tie bars and wooden beam. The operator's handle is made of wood for providing better grip and convenience in operation and attached to the frame with the help of suitable brackets. The frame is bent at an angle and has holes for adjusting the space between the blades. The profile of blades is made to a shape so that bund formed is trapezoidal and remains stable. The blades are attached to the frame with fasteners. For operation, a pair of bullock pulls the implement, the blades gather the loose soil and accumulate it in the form of bund.



Specifications

Size (mm)	750-1050
Size of bunds	Adjustable

Capacity (ha/day)	3-4
Power requirement	A pair of bullocks
Weight (kg)	25-30

s

It is used for making bunds for irrigation purpose.

Source (Appendix)

116, 283, 293, 358, 464, 697, 700, 825, 861, 961, 36, 1633

PATELA PUDDLER

Features

The unit consists of a frame made of mild steel frame, a wooden plank, a gang consisting of pegs for turning the soil, and sliding type pegs (10 nos.), handle and hitch system. The operator can stand on the plank while in operation to provide additional depth. A pair of bullocks is used for the operation of the implement to prepare homogenized puddled tilth for mechanised paddy transplanting. It breaks the soil clods to obtain a smooth puddle. Soil moisture is maintained near the saturation level at the time of operation. It is suitable for shallow puddling with high mechanical dispersion of soil particles.



Specifications

Overall Dimensions

Length (mm)	1500
Width (mm)	700
Height (mm)	780
Weight (kg)	40
Working width (mm)	1500
Working depth (mm)	100
Draft (N)	600
Operating speed (km/h)	1.4
Field capacity (ha/h)	0.15
Field efficiency (%)	71
Labour requirement (man-h/ha)	

Uses :

Used for shallow puddling of the field surface and higher mechanical dispersion of soil.

Sources (Appendix)

254, 1288

BULLOCK DRAWN PUDDLER

Features

Various designs of puddler are available and their shape, size and other features differ from region to region. Basically, the unit consists of frame, steel blades mounted on a shaft in a staggered fashion either on straight or inclined position, and operator's handle and hitch

arrangement. The shaft carrying blades rotate in the bushes mounted on the frame. A pair of bullocks pulls the puddler. The blades on the implement rotate and impart a lateral and turning action on the soil particles, thus achieving a good puddle.



Specification

Working width (mm)	600-700
Number of blades	12
Capacity (ha/day)	1-3
Power requirement	A pair of bullock:
Weight (kg)	35

Uses

It is used for puddling of soil for paddy cultivation.

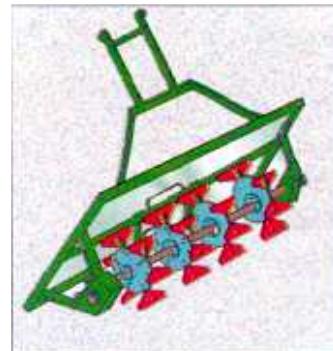
Source (Appendix)

117, 282, 283, 701, 825, 861, 54, 183, 1249, 1589, 1665

BULLOCK DRAWN PUDDLER

Features

The unit basically consists of mild steel angle iron frame, steel blades mounted on a shaft in a staggered fashion in straight position, handle and hitch arrangement. A mild steel sheet is provided on the frame so that the puddled splashes are not thrown on the operator during operation of the implement. The shaft carrying blades rotate in the bushes mounted on the frame. The blades on the implement rotate and impart a lateral and turning action on the soil particles, thus achieving a good puddle.



Specifications

Overall dimensions (mm)	
Length × Width × Height	945 × 700 × 1060
Working width (mm)	700 - 800
Number of blades	20
Capacity (ha/day)	2-3
Power requirement	A pair of bullocks
Weight (kg)	40

Uses

It is used for puddling of soil for paddy cultivation.

Source (Appendix)

358, 514, 538, 838, 1572, 1633

ANIMAL DRAWN PUDDLER

Features

It is a rectangular blade type puddler suitable for puddling operation under wetland conditions. It has a wooden frame on which bushes are mounted using mild steel flats. The

shaft carrying the blades fixed in a staggered fashion rotates in the bushes. The blades are fixed at an angle to the direction of motion. The blades on the implement rotate and impart a lateral and turning action on the soil particles, thus achieving a good puddle. It has an operator's seat, which helps in continuous operation and reduces drudgery. It saves 66 to 88 per cent labour and operating time and 66 to 82 per cent on cost of operation compared to conventional method by using bullock drawn country plough. The implement is very popular among the farmers of Andhra Pradesh.



Specifications

Dimensions (l×w×h) (mm)	900× 650× 580
Weight (kg)	40
No. of rows	3
No. of blades in one row	5
Size of blade (mm)	190×105
Effective dia (mm)	405
Power source	A pair of bullocks

Performance results

Centre	APAU, Rajendranagar	IIT, Kharagpur
Width of cut (mm)	750	700
Depth of cut (mm)	100	NA
Operating speed (km/h)	1.5	2.4
Field capacity (ha/h)	0.07	0.11
Field efficiency (per cent)	60	70
Draft (N)	600	480
Labour requirement (man-h/ha)	15	9

Uses

It is used for puddling operation under wet land condition.

Source (Appendix)

89, 116, 446, 700, 1181, 1732

ANIMAL DRAWN PUDDLER

The animal drawn puddler consists of tubular steel section main frame on which other components are mounted, mild steel sheet leveller for levelling the puddled soil simultaneously, operator's seat which helps in increasing the depth of puddling to the required depth by operator's weight, a steel beam for pulling the puddler by a pair of animals, three number of concentric circular wheels used for transporting and also help in puddling the soil. The wheels are mounted on the axle, which is connected to the hitching frame. Mild steel angle sections in the particular geometry are welded to the wheels for carrying out puddling operation. For operation, the puddler is transported to the



field, which has been flooded with water. As the animals move forward, the wheels start revolving and angles mounted on the wheels cut the soil and weeds and puddling takes place. For transplanting of paddy with rice transplanters, field should be properly levelled. A leveller mounted behind the puddler accomplishes task of levelling. The beam of the puddler is hitched to the yoke of the animals and adjusted according to their size. The puddler is suitable for shallow puddling. With the puddler a higher field capacity and better puddling index can be achieved over the traditional puddling methods, and results in reduced cost of operation in addition to quality output.

Specifications

Overall dimensions

Length (mm)	1020
Width (mm)	1304
Height (mm)	1101

Performance

Working width (mm)	1140
Working depth (mm)	100
Pull (N)	650
Speed (km/hr)	1.35
Field capacity (ha/hr)	0.10
Field efficiency (%)	65

Uses

The animal drawn puddler is used for shallow puddling and levelling of puddled soil and also to uproot the weeds.

Sources (Appendix)

254

ANIMAL DRAWN HELICAL BLADE PUDDLER

Features

It is a helical blade type of puddler suitable for puddling in wetland conditions and also for cutting and mixing of green manure crop. The implement consists of two angle iron brackets carrying a bush. A shaft carrying specially shaped slots accommodates the blades. These blades are imparted a twist along their length to form a helix, thus its nomenclature. The blades on the implement rotate and impart a lateral and turning action on the soil particles, thus achieving a good puddle. The handle for the operator is made of wood and helps in comfortable operation. It saves 30 per cent labour, 46 per cent operating time and 30 per cent on cost of operation compared to conventional method of using country plough or tractor with cage wheels for puddling.



Specifications

Dimensions (l×w×h) (mm)	1200× 1100× 800
Weight (kg)	52
Width of blade (mm)	220

No. of blades	8
Power source	A pair of bullocks

Performance results

Width of cut (mm)	700
Depth of operation (mm)	60-120
Operating speed (km/h)	2.2
Field capacity (ha/h)	0.12
Field efficiency (per cent)	75
Draft (N)	520-600
Labour requirement (man-h/ha)	8.5

Uses

It is suitable for puddling wetland and also for cutting and mixing of green manure crops.

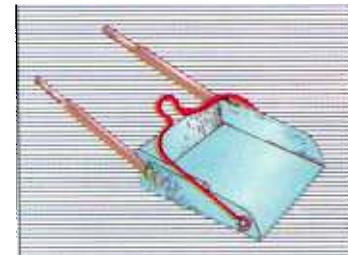
Source (Appendix)

1589, 1656, 1683

BULLOCK DRAWN LAND LEVELLER

Features

The bullock drawn land leveller is fabricated from steel sheets and two handles are fixed to it with the help of fasteners. Mild steel round bar is bent to a suitable shape with holes at its extremities for fixing to the scraper. This steel round has a semi-circular loop to which the rope from the yoke of the animal can be attached for towing. One pair of animals is required to operate the implement. The levellers are of different design and shape, but the scoop type and terracer blade type are most common. The leveller is used for filling minor depression and levelling minor irregularities in the field. Scoop type has got a bucket of 0.15-0.2 cu.m (approx.) and is operated by a person walking behind it. The terracer blade type has got sitting arrangement and is provided with pneumatic wheels. Initial ploughing and loosening of the soil is necessary before the leveller could be put to use.



Specifications

Volumetric capacity (m ³)	0.15 to 0.20
No. of scoops	1
Power source	One pair of bullocks

Uses

It is used to fill minor depressions and to remove minor irregularities of the field.

Source (Appendix)

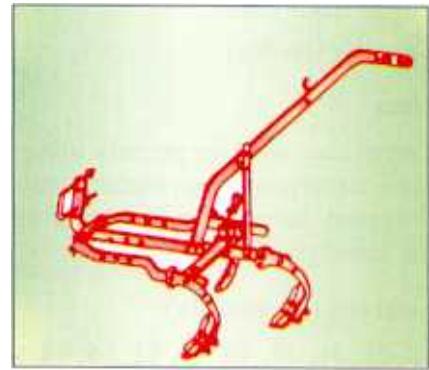
23, 117, 283, 293, 358, 514, 538, 838, 861, 966, 1572, 1633, 1665, 1775

BULLOCK DRAWN CULTIVATOR

Features

The bullock drawn cultivators are available in fixed or expandable frame designs. The unit consists of reversible tines, frame, handle and a wooden beam. The working width of the

cultivator can be adjusted by varying the spacing between the tines or expanding the frame. For operation, the implement is attached to a pair of bullock by beam and moved in the soil. The beam is attached to the unit with the help of U-bolts and can be adjusted as per the height of the animal pair. The operator's handle can also be adjusted by varying the position of the supporting bracket. The tines dig into the soil and cut a small furrow slice. During weeding operation, the tines also uproot weeds and create soil mulch. Seeding attachment can also be provided on the frame, increasing the versatility of the unit.



Specifications

Number of tines	:	3-5
Shovel type	:	Reversible
Working width	:	Adjustable
Capacity (ha/day)	:	0.6-0.7 (8 hrs)
Weight (kg)	:	20 (approx.)
Power requirement	:	A pair of bullocks

Uses

It is used for shallow ploughing, weeding and intercultural operations.

Source (Appendix)

117, 187, 220, 283, 297, 464, 825, 861, 938, 1109, 1136, 1164, 1249, 1477, 1509, 1635, 1665, 1673, 1775, 1777

TRACTOR MOUNTED MOULDBOARD PLOUGH

Features

It is a tractor-operated implement and consists of share point, share, mouldboard, landslide, frog, shank, frame and hitch system. The share point is of bar type and is

made from high carbon steel or low alloy steel. The share is also made from high carbon steel or low alloy steel. Both are hardened and tempered to suitable hardness (about 45 HRC). The working of the plough is controlled by hydraulic system lever and three-point linkage. Its bar point makes it suitable to break hardpan of the soil.



Specifications

	2-bottom	3-bottom
Length (mm)	1778	2392
Width (mm)	889	1194
Height (mm)	1092	1092
Weight (kg)	253	386

Power requirement	30-40 hp	40-50 hp
Capacity (ha/day)	1.5	2.0

Uses

Ploughs are used for primary tillage operations. It cuts trash and buries it completely. It is also used for turning green manure crop for decaying under the soil, which adds humus to the soil. Compost, farmyard manure or lime when spread in the field, the mould board plough is used for turning and mixing these materials in the soil.

Sources (Appendix)

13, 21, 36, 47, 49, 55, 85, 86, 94, 99, 106, 110, 112, 115, 116, 120, 123, 130, 155, 168, 172, 203, 204, 206, 209, 211, 218, 224, 256, 257, 266, 269, 272, 276, 307, 318, 338, 349, 382, 384, 385, 387, 394, 396, 419, 420, 421, 424, 463, 475, 500, 519, 522, 533, 540, 543, 557, 569, 598, 628, 633, 634, 648, 654, 658, 661, 681, 700, 701, 713, 750, 754, 783, 787, 807, 814, 815, 818, 826, 831, 840, 841, 857, 858, 859, 862, 870, 875, 877, 884, 890, 917, 920, 926, 928, 938, 944, 959, 963, 997, 1005, 1009, 1010, 1039, 1052, 1054, 1057, 1059, 1060, 1077, 1079, 1085, 1116, 1128, 1135, 1146, 1147, 1149, 1161, 1165, 1167, 1190, 1197, 1203, 1204, 1229, 1231, 1260, 1261, 1272, 1282, 1291, 1304, 1342, 1343, 1355, 1370, 1385, 1389, 1391, 1396, 1402, 1405, 1408, 1412, 1413, 1427, 1435, 1508, 1509, 1513, 1519, 1520, 1521, 1528, 1530, 1536, 1556, 1563, 1566, 1574, 1576, 1598, 1600, 1604, 1606, 1612, 1631, 1664, 1665, 1673, 1684, 1686, 1689, 1692, 1703, 1709, 1711, 1717, 1720, 1732, 1736, 1764, 1771

TRACTOR DRAWN DISC PLOUGH

Features



The plough consists of common mainframe, disc beam assemblies, rockshaft category -1 or category -2, a heavy spring loaded furrow wheel and a gauge wheel. In some models disc plough is designed to operate as 2, 3 or 4 bottom, by adding or removing the sub beam assemblies according to requirement.

The disc angle ranges from 40 to 45° to obtain the desired width of cut and the tilt angle ranges from 15 to 25° for penetration. The discs of the plough are made of high carbon steel or alloy steel and the edges are hardened and sharpened. The discs are mounted on tapered roller bearings. Scrapers prevent soil build up on the discs in sticky soils. The furrow slice rides along the curvature and is pulverized to some extent before being thrown.



Specifications

Number of furrows	2-4
Disc size (mm)	600-800
Length (mm)	1180-2362
Width (mm)	889-1194
Height (mm)	1092-1118
Width of cut per disc (mm)	200-300
Adjustable working width (mm)	600-1200

Working depth (mm)	up to 300
Power requirement (hp)	25-50, tractor
Weight (kg)	236-376

Uses

Disc plough is used for primary tillage and is especially useful in hard and dry, trashy, stony or stumpy land conditions and in soil where scouring is a major problem.

Sources (Appendix)

86, 92, 94, 97, 168, 192, 203, 256, 272, 303, 307, 318, 328, 384, 446, 448, 452, 453, 459, 540, 610, 647, 648, 679, 748, 755, 765, 798, 875, 920, 939, 975, 1044, 1047, 1076, 1121, 1246, 1260, 1261, 1335, 1386, 1405, 1429, 1430, 1453, 1509, 1598, 1612, 1665, 1673, 1710

TRACTOR MOUNTED DISC HARROW

Features

The tractor mounted disc harrow consists of two gangs of discs mounted one behind the other. The discs on the front gang throw soil outward and the rear gang inward. Therefore, no soil remains uncut by the offset disc harrow. The harrow consists of a sturdy frame, discs arranged in two gangs, and three-point linkage. Discs are important component of the harrow and are made from high carbon steel or alloy

steel; the cutting edges are hardened and tempered to suitable hardness. The gangs can be moved in either direction on the hitch frame. The rear gang can be moved the same amount as the front gang. When operating in orchards or plantations, the harrow can be offset to the right or left, thus



enabling soil to be thrown towards or away from the trees. The offset feature makes it possible to work under low-hanging branches. Discs with notches on the outer rim are also available for operation in weed-infested fields. Three point hydraulic linkage and hydraulic control makes it highly manoeuvrable.



Specification

Length (mm)	:	1980-2260
Width (mm)	:	1150-1900
Height (mm)	:	1143-1350
Number of discs	:	10-16
Diameter of discs (mm)	:	457-660
Pitch of discs	:	228-280
Weight (kg)	:	330-490
Power requirement (hp)	:	20-60, tractor
Capacity (ha/day)	:	2.5

BAR POINT CULTIVATOR

Features

The cultivator consists of rectangular frame made of mild steel angle or channel section. Rigid tynes of heavy flat section are mounted on the frame with the help of clamps. Bar point shares are joined to the end of tynes. Bar points shares are made of medium carbon or low alloy steel, hardened and tempered to suitable hardness. Bar points can be replaced on wearing or becoming dull. In place of bar points, duckfoot shovels can be attached to the cultivator.



The cultivator is mounted type and is operated by tractor. The tynes of cultivator can be adjusted vertically by moving in the clamp.

Specifications

Number of tynes	7-11
Cutting width (mm)	1950
Cutting depth (mm)	200-250
Earth clearance (mm)	375-525
Weight (kg)	225-255
Power requirement (hp)	25-50, tractor

Uses

The cultivator is used for inter cultivation in light and heavy soils for loosening and aerating the soil, preparing of seedbeds, and subsoil cultivation. The duck foot shovel version is ideal for shallow cultivation and interculture.

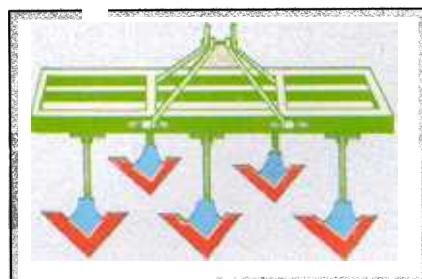
Sources (Appendix)

211

DUCKFOOT CULTIVATOR

Features

The duckfoot cultivator consists of a box type steel rectangular frame, rigid tines and sweeps. The sweeps are triangular in shape similar to foot of duck, hence called duckfoot cultivator. The sweeps are made from old leaf spring steel and joined to tines with fasteners, which makes them replaceable after being worn out or becoming dull. The tines are made of mild steel flat and forged to shape. It is a tractor-mounted implement and depth of operation is controlled by hydraulic system. The cultivator is popular in black cotton soils. Sweeps are attached to these tines. Three-point linkage of the tractor is attached to the implement. The implement is mostly used for shallow ploughing and in hard soils.



Specification

Number of sweeps	5, 7
Length (mm)	1980-2310
Width (mm)	830-1150
Height (mm)	1000-1050
Power requirement (hp)	25-50, tractor

Weight (kg) 200-300

Uses

Used for primary tillage operation, destruction of weeds and retention of soil moisture.

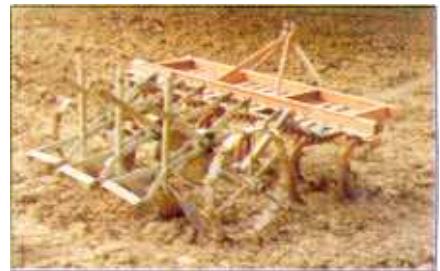
Sources (Appendix)

10, 35, 60, 68, 69, 94, 105, 108, 113, 161, 175, 199, 349, 386, 424, 514, 515, 542, 627, 688, 707, 814, 822, 823, 830, 844, 881, 885, 907, 935, 944, 990, 1016, 1045, 1052, 1058, 1081, 1131, 1132, 1152, 1161, 1165, 1174, 1228, 1230, 1240, 1334, 1342, 1343, 1357, 1380, 1393, 1404, 1412, 1433, 1443, 1444, 1445, 1445, 1448, 1482, 1483, 1513, 1549, 1554, 1561, 1572, 1607, 1678, 1708, 1718, 1724, 1737, 1738, 1740

TRACTOR DRAWN BASIN LISTER

Features

It is an attachment fitted behind 9-tine tractor mounted cultivator. It is used for water harvesting and conservation of soil and moisture. The lister attachment consists of mild steel framework, ground wheels with lugs, lister bottoms (trencher), roller follower, cam, hitch bracket and reversible shovel. The cultivator tills the soil and the lister bottoms form the trenches.



Specifications

Dimensions (l×w×h) (m)	:	.55×1.07×0.98
Weight (kg)	:	18
Number of trenchers	:	
Width of trencher (mm)	:	290
Spacing (mm)	:	400
Power transmission	:	Trenchers are operated by a cam driven by groundwheel
Power source (hp)	:	30, tractor
Width of cut (mm)	:	1600
Depth of operation (mm)	:	160
Operating speed (km/h)	:	3.78
Field capacity (ha/h)	:	0.60
Field efficiency (per cent)	:	80
Fuel consumption (l/h)	:	2.88
Labour requirement (man-h/ha)	:	2

Uses

It is used for water harvesting and conservation of soil and moisture.

Sources (Appendix)

TRACTOR DRAWN SPIKED CLOD CRUSHER

Features

It is used as a combination tillage tool with tractor drawn harrow or cultivator. The clod crusher consists of a mild steel sheet drum and pegs are welded on its surface, a rectangular

frame made from mild steel angle section, hitch frame and a shaft for carrying the drum. The shaft is mounted on bearing pedestals. The soil clods are pierced and broken by the pegs of the crusher.



Specifications

Dimensions (l×w×h) (m)	1.76×0.83×0.35
Weight (kg)	150
Length of roller (mm)	1500
Diameter of roller (mm)	350
Power source (hp)	Tractor, 25 or more

Performance results

Soil moisture, per cent (db)	: 9.73-11.5
Width of coverage (mm)	: 1500
Initial clod size (mm)	: 160-180
Operating speed (km/h)	: 4.00-4.25
Field capacity (ha/h)	: 0.4-0.60
Draft (N)	: 750
Labour requirement (man-h/ha)	: 1.69-2.5

Uses

It is used as a combination tillage tool with tractor drawn harrow or cultivator. It is suitable for breaking and segregation of clods for seedbed preparation after paddy harvest

Sources (Appendix)

1177

PEG TYPE PUDDLER

Features

The peg type puddler is a tractor-mounted implement using the three-point linkage of a tractor of 35 hp or more. It consists of a frame made of mild steel angle sections on which the three cross bars and the cleats for the three-point linkage are welded in place. It is operated when the soil moisture is near the saturation level to obtain a fine tilth and good puddle to facilitate mechanical transplanting. For achieving better performance, the tractor is fitted with cage wheels to improve traction and achieve higher field capacity.



Specifications

Overall Dimensions

Length (mm)	: 2000
Width (mm)	: 630
Height (mm)	: 680
Weight (kg)	: 90
Working width (mm)	: 2000
Working depth (mm)	: 110

Draft (N)	1000
Operating speed (km/h)	2.40
Field capacity (ha/h)	0.40
Field efficiency (%)	78
Labour requirement (man-h/ha)	2.5

Uses

Used to break the soil clods and puddle the soil for rice transplanting.

Sources (Appendix)

254

ROTAVATOR

Features

It consists of a steel frame, a rotary shaft on which blades are mounted, power transmission system, and gearbox. The blades are of L-type, made from medium carbon steel or alloy steel, hardened and tempered to suitable hardness. The PTO of tractor drives the rotavator. Rotary motion of the PTO is transmitted to the shaft carrying the blades through gearbox and transmission system. A good seedbed and pulverization of the soil is achieved in a single pass of the rotavator.



Specifications

Power source (hp)	:	35 or above, Tractor
Length (mm)	:	1760-2080
Width (mm)	:	950-1050
Height (mm)	:	935-1110
Working width of rotavator (mm)	:	1000-2000
Shape of blade	:	L-Shape
Orientation of blade (degrees)	:	45 -47
Length of blade along the flange (mm)	:	160-170
Length of blade along the rotor shaft (mm)	:	115-130
Thickness of blade (mm)	:	7-10
Distance between consecutive flanges (mm)	:	213-220
Total number of flanges	:	6-8
Number of blades per flange	:	6
Diameter of rotor shaft (mm)	:	70-90
Rotor diameter (mm)	:	420-435
Revolution of rotor shaft (rpm)	:	210-237
Weight (kg)	:	280-415

Uses

It is suitable for preparing seedbed in a single pass both in dry and wetland conditions. It is also suitable for incorporating straw and green manure in the field.

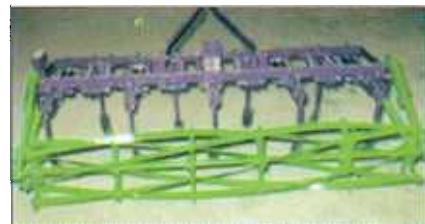
Sources (Appendix)

4, 124, 128, 291, 307, 396, 451, 458, 463, 500, 584, 592, 700, 712, 721, 841, 864, 865, 875, 915, 1085, 1102, 1233, 1374, 1405, 1413, 1490, 1599, 1673

PULVERISING ROLLER

Features

Pulverising roller is an attachment to commercially available cultivator. The pulverizing roller consists of star wheels, central shaft, pulverizing members, mounting link and depth controlling tee. The pulverizing members are similar to lawn mower blades and are inserted in the cast star wheels in such a way that it forms helical shape and progressively come in contact with soil. The roller is attached to the cultivator with the help of two mounting links having bearing housing on one side and tensile springs on other side.



Specifications

Length (mm)	950
Width (mm)	2340-2760
Height (mm)	390
Working width (mm)	2010-2385
Number of star wheels	6
Distance between star wheels (mm)	400-475
Material of star wheel	Cast iron
Shaft diameter (mm)	35
Number of pulverizing members	6
Number of springs	2
Weight of the machine (kg)	115 –125
Power source (hp)	35, tractor or above

Uses

Pulverising rollers are used for puddling as well as dry seedbed preparation in two runs, and creates good puddle. It saves 20-35 % fuel consumption and 20-30 % water requirement in comparison to traditional method.

Sources (Appendix)

326, 480, 600, 939, 1194, 1302

TRACTOR DRAWN COMBINED TILLAGE TOOL

Features

It is a tillage tool having cutting blade with rotary slicer making it suitable for seedbed preparation in one pass under irrigated soil conditions. It consists of a frame, hitching bracket, gearbox, chain drive system, cutting blades, rotary slicer and cover. The blade mounted in front loosens the soil. The rotary slicer operated with tractor pto pulverises the loosened soil. The tractor drawn combine tillage tool can serve the purpose of mouldboard plough and cultivator.



Specifications

Dimensions (l×w×h) (m)	1.93×0.92×0.62
Weight (kg)	180
Primary share blade angle (degrees)	23°, with horizontal
Speed of rotor (rev/min)	110
Number of blades on rotor	35
Blade type	'L' shaped
Power source (hp)	35 or higher, Tractor

Performance results

Width of coverage (mm)	1850
Depth of cut (mm)	150-190
Operating speed (km/h)	1.70
Field capacity (ha/h)	0.22
Field efficiency (per cent)	71
Fuel consumption (l/h)	2.3
Labour requirement (man-h/ha)	9

Uses

It is suitable for seedbed preparation in one pass under irrigated soil conditions.

Sources (Appendix)

47

LAND LEVELLER

Features

It is a tractor-mounted implement controlled by tractor hydraulics and three-point linkage. It consists of hitch system, replaceable cutting blade with sharp edge, and a curved plate with side wings, which form a bucket. The blade is made from medium carbon steel or low alloy steel, hardened and tempered to suitable hardness. During operation, the blade digs into the soil and extra soil is collected in the bucket, which is released in the depressions of the field. The angle and pitch of leveller is adjustable. The leveller can also angled left or right, or reversed for back filling.



Specification

Length (mm)	1156
Height (mm)	978
Type	Mounted type
Weight (kg)	251
Forward angular adjustment (degrees)	0°, 15°, 30° and 45° to RH or LH
Reverse angular adjustment (degrees)	0°, 15°, 30° and 45° to RH or LH
Tilt angular adjustment (degrees)	0°, 15°, 30° to RH or LH
Power requirement (hp)	35 – 45, tractor
Capacity (ha/day)	3

Uses

It is suitable for land preparation operations such as scraping, grading, levelling and back filling. It is also used for irrigation, terrace work and general cleaning of field.

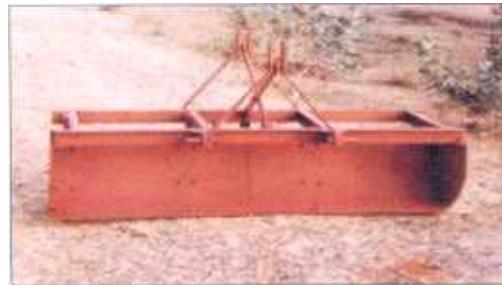
Sources (Appendix)

9, 16, 18, 24, 27, 50, 51, 62, 97, 140, 165, 167, 168, 172, 174, 178, 196, 203, 203, 204, 205, 218, 221, 256, 267, 269, 317, 318, 339, 343, 349, 361, 369, 388, 396, 419, 421, 424, 457, 466, 475, 480, 488, 497, 513, 514, 519, 537, 540, 543, 585, 592, 595, 598, 618, 654, 681, 687, 693, 695, 697, 732, 738, 740, 742, 749, 815, 840, 862, 877, 890, 939, 959, 1001, 1025, 1039, 1055, 1129, 1147, 1185, 1204, 1244, 1260, 1261, 1283, 1304, 1305, 1324, 1326, 1335, 1342, 1350, 1356, 1361, 1364, 1370, 1386, 1389, 1398, 1413, 1424, 1427, 1464, 1468, 1480, 1508, 1509, 1554, 1556, 1563, 1567, 1574, 1598, 1600, 1604, 1630, 1665, 1673, 1690, 1719, 1720, 1771

TRACTOR DRAWN LEVELLER

Features

The leveller consists of frame, 3-point linkage, cutting or scraping blade, and thick curved sheet closed from sides to form a bucket. The scraping blade is made from medium carbon steel or low alloy steel, hardened and tempered to about 42 HRC. The blade is joined to the curved sheet with fasteners and can be replaced after being worn out or becoming dull. The working depth of the implement is controlled by hydraulic system of the tractor.



Specifications

Length (mm)	1840
Width (mm)	700
Height (mm)	700
Size of Blade	
Length (mm)	1830
Width (mm)	75
Thickness (mm)	8
Power requirement (hp)	35, tractor
Weight (kg)	90

Uses

Levelling of fields and pulling or pushing loosened soil from one place to other.

Sources (Appendix)

9, 16, 18, 24, 27, 50, 51, 62, 97, 140, 165, 167, 168, 172, 174, 178, 196, 203, 203, 204, 205, 218, 221, 256, 267, 269, 317, 318, 339, 343, 349, 361, 369, 388, 396, 419, 421, 424, 457, 466, 475, 480, 488, 497, 513, 514, 519, 537, 540, 543, 585, 592, 595, 598, 618, 654, 681, 687, 693, 695, 697, 732, 738, 740, 742, 749, 815, 840, 862, 877, 890, 939, 959, 1001, 1025, 1039, 1055, 1129, 1147, 1185, 1204, 1244, 1260, 1261, 1283, 1304, 1305, 1324, 1326, 1335, 1342, 1350, 1356, 1361, 1364, 1370, 1386, 1389, 1398, 1413, 1424, 1427, 1464, 1468, 1480, 1508, 1509, 1554, 1556, 1563, 1567, 1574, 1598, 1600, 1604, 1630, 1665, 1673, 1690, 1719, 1720, 1771

CHANNEL FORMER

Features

The channel former consists of two inner blades, two outer blades, hitch frame, mainframe and shovel. The front portions of the two inner blades are joined together and form an angle of 30° in between them. At the junction of these two inner blades a cultivator shovel is fixed to penetrate into the soil. The inner blades can be mounted 50 to 100 mm lower than the outer blades and form a furrow at a lower depth than the surface of the bed for the flow of irrigation water. The two outer blades are placed one on each side of the inner blades and at an angle of 60° to the direction of the travel. The soil collected from the furrow is formed as bund on both the sides of the irrigation furrow.



Specification

Length (mm)	2200
Width (mm)	1126
Height (mm)	900
Size of inner blades (mm)	1000 × 250
Size of outer blades (mm)	1300 × 250
Weight (kg)	90
Power requirement (hp)	35-45
Capacity (ha/day)	1.2 - 1.5

Uses

It is used for making channels and beds at regular intervals for irrigation.

Sources (Appendix)

203, 241, 388, 396, 592, 1187, 1260, 1598

TRACTOR BUND FORMER

Features

The bund former consists of mild steel angle iron frame; hitch system, and two blades (wings). The blades are made by mounting mild steel sheet on an angle iron frame. The blades are adjusted in converging manner and has wider opening in the front in comparison at the rear end. The distance between blades can be adjusted according to size of bund required. The implement is mounted type and operated in tilled soil.



Specifications

Length (mm)	:	1200
Width (mm)	:	810
Height (mm)	:	1000
Number of bunds	:	One at a time

Capacity (ha/h)	0.3-0.4
Weight (kg)	53

Uses

Making of bunds in the field.

Sources (Appendix)

18, 27, 192, 513, 610, 687, 695, 740, 749, 862, 931, 993, 1107, 1191, 1325, 1630, 1719

TRACTOR DRAWN CHANNEL CUM BUND FORMER

Features

It is a tractor-mounted implement and consists of inner wing, adjustable handle, frame, hitch pin and outer wing. The wings are reinforced or tensioned at the bottom edge and are made from thick mild steel sheet. It is operated under well-prepared and pulverised soil condition and can be used under all types of soil and crop conditions. The distance between wings can be adjusted according to the size of bund.



Specifications

Dimensions (l×w×h) (m)	1.82×1.21×1.15
Weight (kg)	55
Size of soil working components (mm)	Adjustable - from 500 to 1300
Power source (hp)	20, Tractor

Performance results

Width of coverage (mm)	500-1000 for bund, 1000-1300 for channel
Depth of cut (mm)	10-50
Operating speed (km/h)	2.5
Spacing (m)	10 crosswise
Field capacity (ha/h)	4 when spacing is 10 m crosswise
Field efficiency (per cent)	70
Range of bund size (mm)	250-1000 base width and 120-350 height
Range of channel size (mm)	100-450 width and up to 1000 height
Labour requirement (man-h/ha)	0.25

Uses

It is used for making field channels to manage the irrigation water effectively and making small bunds across the slope for inter-plot rainwater harvesting under rainfed areas.

Sources (Appendix)

1353, 1701

TRACTOR DRAWN RIDGER

Features

The ridger is used in sugarcane growing area of the country. It consists of rectangular frame made of mild steel angle or channel section, 3-point hitch assembly, shanks and ridger body.

The ridger body consists of two mouldboards, share point and tie bars to vary the wingspan of ridgers. The share point is made from medium carbon steel or low alloy steel, hardened and tempered to about 42 HRC. Upon wearing or becoming dull the share point can be replaced. The ridger is operated in tilled soil by a tractor, the share point penetrates in the soil, ridger body displaces the soil to both sides and a furrow is created. The soil mass between furrows forms a ridge. The depth of operation is controlled by hydraulic system of the tractor.



Specifications

Length (mm)	:	1000-2000
Width (mm)	:	600-2000
Height (mm)	:	1000-1100
Wingspan adjustment (mm)	:	350-500
Number of base	:	2-5
Row spacing (mm)	:	Adjustable 610 to 860
Weight (kg)	:	150-230
Power requirement (hp)	:	30-50, tractor
Capacity (ha/day)	:	2

Uses

It is used for making furrows and ridges for sugarcane, cotton, potato and other row crops.

Sources (Appendix)

27, 37, 131, 147, 184, 192, 194, 197, 203, 211, 274, 388, 396, 541, 592, 607, 610, 618, 670, 689, 738, 740, 993, 1191, 1208, 1260, 1268, 1324, 1325, 1567, 1568, 1598 1630, 1700, 1704

TRACTOR DRAWN BED-FURROW FORMER

Features

The tractor drawn bed-furrow former consists of mild steel angle iron frame; three point linkage, lifting pin, furrow former, bed former and stiffeners. The bed and furrow formers are made of mild steel sheet and bent in required shape. The stiffeners are used to strengthen the formers. The implement is operated in the tilled soil.



Specifications

Dimensions (l×w×h) (mm)	2240×900×1000
Weight (kg)	115
Formers (mm)	Three 'V' shaped, depth 150 and top width 450
Power source (hp)	35, tractor

Performance results

Width of coverage (mm)	2250 (3-furrows at 750 mm centre distance)
Depth of cut (mm)	140
Operating speed (km/h)	3.2

Field capacity (ha/h)	:	0.75-1.00
Field efficiency (per cent)	:	43.6
Labour requirement (man-h/ha)	:	8

Uses

It is used for forming alternate beds and channels. The beds are suitable for planting crops like sorghum, maize, cotton. This bed and furrow system is ideal for efficient irrigation management.

Sources (Appendix)

195, 1287, 1589, 1656

TRACTOR MOUNTED SUBSOILER

Features

It consists of beam made of high carbon steel, beam supports which are flanged at upper and lower edges for rigidity, hollow steel adaptor welded to bottom end of the beam to accommodate share base, share base having square section, share plate made from high carbon steel and shank drilled and counter bored for set board which secures the base in the adaptor. Share plate is made from high carbon steel, hardened and tempered to suitable hardness. Two symmetrically located bolt holes allow reversibility of share. The working depth of the subsoiler is controlled by hydraulic system and linkage of tractor.



Specifications

Length (mm)	600
Width (mm)	490
Height (mm)	1325
Maximum working depth (mm)	535
Weight (kg)	62

Uses

It is used to break hardpan of the soil, loosening of the soil and helps the water to seep into the soil for improving drainage. A mole ball can be attached to create a small tunnel in the soil, which serves as drainage channel for water.

Sources (Appendix)

211, 1598