the nepal ridger

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The Nepal Ridger is a tool designed to improve production conditions for crops grown in rotation with flooded rice. It can be built of simple materials and can be adapted to human, animal or tractor power.

In most traditional areas of flooded rice, other crops are grown in annual rotation. Years of continuous rice culture create unfavorable soil conditions and problems of water management for other crops that follow.

* Tillage practices for flooded rice destroy the normal structure of the surface soil—purposefully—to prevent loss of water through seepage into the soil. Increased soil density and other harmful changes occur in soil structure.

* Excessive water application with no provision for drainage causes prolonged periods of saturation with insufficient soil aeration to supply the needs of roots of most crops. Under this anaerobic condition, nitrogen is lost from the soil through denitrification.

* In addition to poor conditions during the crop growing season, it is often difficult to produce the soil and moisture conditions needed at seeding time to insure a good stand. In many areas, water saturation of the soil after seeding prevents emergence.

The Nepal Ridger offers a way to overcome these problems.

What the Ridger Does

By rearranging the surface soil, the ridger improves conditions for water management and plant growth. The ridger:

1. Forms ridges and firms them by the action of the ridging shoes.
2. Moves surface soil, seed and plant nutrients into ridges where the seed can germinate and the crop can develop free from harmful effects of saturated soil.
3. Redistributes the broadcast seed and fertilizer into a banded seeding pattern, aiding weed control and utilization of plant nutrients.
4. Forms furrows between the ridges for effective application and drainage of irrigation water. Water rises into the ridge tops by capillary action, providing ideal conditions of moisture and aeration for seed germination, emergence and early root development.

Using the Ridger

Land preparation

1. Break the rice stubble and compacted surface soil with a wooden plow or mechanized equipment, as in normal preparation for seeding.
2. Plank or drag to pulverize the soil further and smooth the surface. (An uneven surface results in poor stand establishment due to dry ridge tops in high spots and saturated ridge tops in low spots.)

Fertilization

Broadcast all fertilizer before the final soil preparation so it will be mixed into the surface soil.

Seeding

1. Broadcast seed over the flat surface. (It may be advisable to reduce the seeding rate, because ridging will improve germination and emergence).
2. Since irrigation will be used to provide moisture for germination, time of seeding is not dependent on soil moisture conditions. However, soil preparation and ridging should not be carried out on wet soil. If pre-irrigation is practiced, normal seedbed moisture is satisfactory.

Ridging

1. Carry out ridging as soon as possible after seed is broadcast.
2. Power source may be provided by men, animals, two-wheel walking tractors or small four-wheel tractors. With larger tractors, more ridging units can be used and they should be tractor-mounted.
3. The pulling load, depth of furrows and dragging attitude can be modified by changing the hitch and weighting with soil or sand in bags. The sled should ride level.
4. To increase furrow depth without increasing pulling force required, go over the same set of furrows more than once, or run one or two shoes in the furrows of the preceding pass. (This has the additional advantage of constant ridge spacing, avoiding the variable width of "guess rows" formed between the sets of three furrows of each pass.)

Irrigation

1. The method is basic furrow irrigation. Water is diverted from the source to the furrows by a feeder furrow or ditch. Ponded water in low areas should be drained, if possible. Within a rice paddy with no provision for drainage of excess water, the key principle is to let only the proper amount of water into the paddy.
2. First Irrigation—Make the first application as soon as possible after ridging. Water level and time in furrows should be just sufficient to permit capillary action to moisten—but not to approach saturation of the ridge tops. The best level is one-third to one-half the furrow depth. Water level is not critical in later irrigations.
3. Subsequent Irrigations—Until the soil is partially shaded by the crop, increased irrigation frequency may be needed. If salinity accumulates in the ridge tops, increase the depth of irrigation water to bed-top level or above. Under some conditions, the ridging system may require a greater number of irrigations than flooding of a flat surface.

Weeding

1. Less weed competition occurs in ridged than in flat seedings. Under the favorable growing conditions in the ridge tops, crop density is about double that of broadcast seedings on flat surfaces. In puddled rice soils, unfavorable plant growth conditions in the furrows tend to suppress weed growth there.
2. If hand weeding is needed, laborers can work from the furrow.

Fitting the Ridger into Local Farming Methods

Ridging is designed to overcome specific soil and water management problems. They are determined, of course, by specific local situations. Development of ridging equipment and practices should be guided by the local situation and needs. The ridger should fit into the system with minimum cost, labor requirements and interference with beneficial local practices.

Design of ridgers is flexible, ranging from two shoes, hand-pulled to a large set of tractor-mounted hydraulically controlled shoes.

The Nepal Ridger was designed to improve yield of wheat grown in rotation with flooded rice. However, it may be useful under other conditions. Many other crops may benefit more than wheat, especially those which are poorly adapted to soil-crusting or soil saturation. This has been the case with mung beans, for example.

Local Manufacture

The purpose of a ridger constructed according to the following plan is to test economic value and ridging practices under local conditions. If results are promising, this ridger can serve as a model for local craftsmen using available construction materials and techniques. For example, shoes could be chopped or sawed from a single block of wood, with or without a metal point and runner, and pegged to the under side of the animal-drawn planks such as used in both rice and other crops. Also, the shoes could be hammered out of sheet metal of 2 to 3 mm thickness for man-animal-or tractor-powered use.

The thin sheet metal surfacing specified for ridging shoes in the following plan is for ease in construction of a prototype for evaluation. Equipment for farmers must be more wear-resistant, especially if the soil is abrasive. Addition of sheet metal 2 to 3 mm thick to the leading vertical surfaces will create a farmers' model of the prototype. Materials used in construction must be able withstand wear, particularly in vulnerable areas which need added reinforcement.

Materials and construction details for a bullock-drawn ridger with three ridging shoes

Materials needed and Purpose	Number	Width cm	Length cm
Sawed lumber, 2.5 cm thickness:			
Shoe center pieces	3	10	45
Shoe side pieces	6	17	45
Platform surface (1 piece or set of planks)		50	112.5
Platform edge cleats	2	5	50
Platform towing cleats	2	10	60
Plywood, 0.6 cm thickness:			
Shoe front V surfaces	6	10	90
Galvanized sheet metal, 22 gauge, approximately 0.7 mm thickness:			
Shoe surfacing and attachment to platform	3	46	50
Strap iron, 3 mm thickness:			
Bottom point and runner	3	2.5	49
Nails for attaching:			
Sheet metal and plywood to shoes and sheet metal to platform	50±		2
Shoe side pieces to center piece	50±		4
Strap iron to center piece, platform cleats to platform and center pieces to platform	50±		6

Steps in Construction

Shoe construction

1. With saw, cut center pieces: 10 x 45 cm.
2. Cut two side pieces: 17 x 45 cm cutting one edge of each piece at 45° to the surface (see figure 1).
3. Nail shoe side pieces to shoe center piece, positioning the 45° angle apex even with the bottom of the shoe center piece at the forward end and bisecting the angled surface with the bottom of the shoe center piece at the rear end (see figures 1 and 2). Do not place nails within the first 3.5 cm of the forward end, as they will interfere with the saw cut in step 5.
4. Plane or saw edges of shoe side pieces level with bottom of the shoe center piece (see figure 1 and photos 1 and 2).
5. Saw the V of the forward end with vertical cuts intersecting at the center of the forward end of the center piece (see figure 2 and photo 2).
6. Saw the side pieces in the plane of the top of the center piece (see figure 3 and photo 1).
7. Nail on the vertical surfaces of plywood or thin sawed lumber. Overlap in front using oversized pieces, then saw off the edges to fit the contours of the shoe (see photos 4 and 5).
8. Bend and nail sheet metal over the exterior surface of the shoes. Overlap at the vertical junction of the V (see photos 6 and 7).
9. Shape a point on the strap iron, drill countersunk nail holes and nail to the bottom of the center piece (see photo 7).
10. Slit the sheet metal above the upper surface of the shoe at the point of the V and at the intersections of the V and ridge-shaping surfaces. Then bend the excess sheet metal to a horizontal position around the top edge of the shoe. The shoe is now ready for mounting under the platform (see photo 6).

Platform construction, (surface area 112.5 cm by 50 cm.)

1. Assemble a set of planks 112.5 cm long by the proper width, or use a single plank or piece of plywood 112.5 cm by 50 cm.
2. Nail narrow cleats to the side edges (see figure 4 and photo 7). This step is not needed for a single plank or plywood.
3. In each 10-cm cleat drill a 1.5-cm diameter hole 5 cm from one end and nail to the platform at cleat center 27 cm in from the edge. The end with the hole should extend 10 cm beyond the front edge (see figure 4 and photos 6 and 7).

Fastening shoes to the platform

1. Place shoes 37.5 cm apart at centers, with the middle shoe at the center of the platform. Be sure that the center line of each shoe is parallel to the others (see figure 4).
2. Nail through the platform into the center piece of each shoe.
3. Turn the ridger upside down and nail the excess sheet metal around the shoes to the underside of the platform. At the trailing edge, the sheet metal should be formed into a smooth arc for proper shaping of bed tops (see photos 7 and 8).

Figure 1. Joining shoe side pieces to center piece

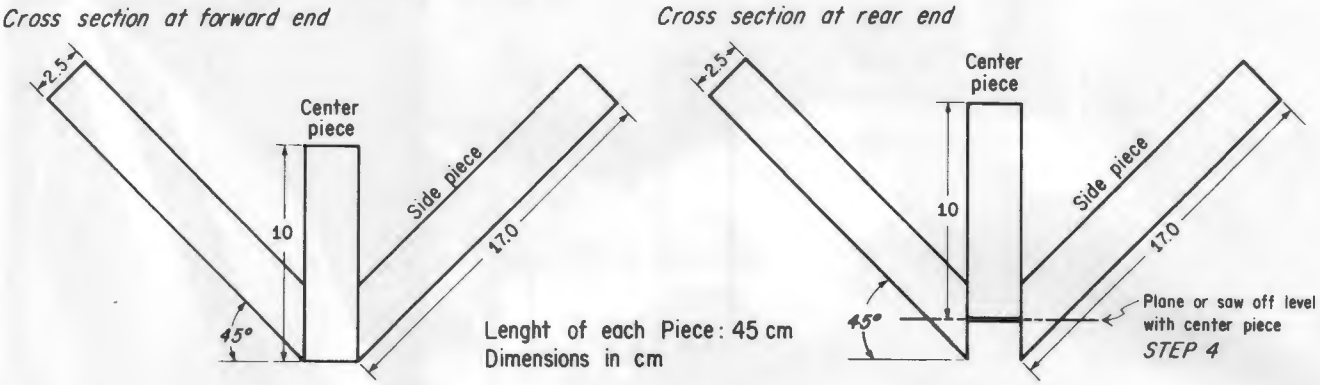


Figure 2. Cutting the "V" at the forward end, STEP 5

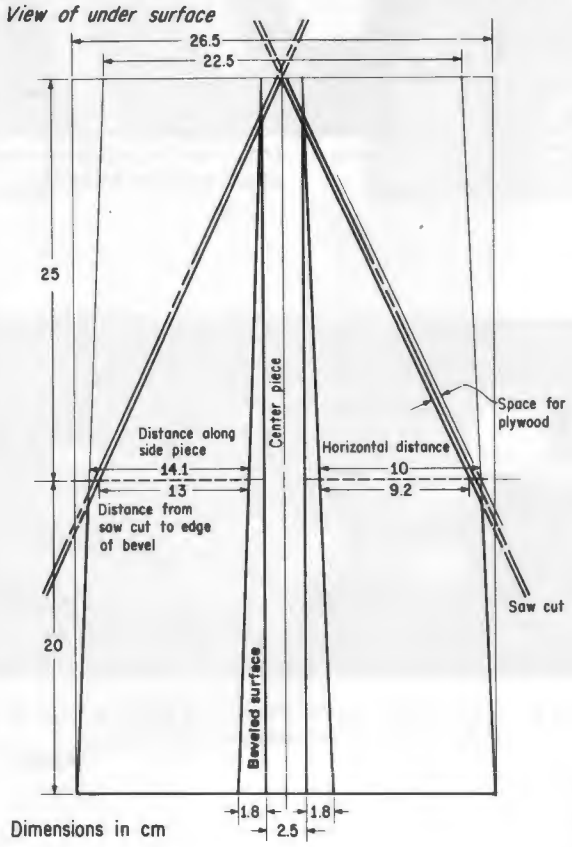


Figure 3. Cutting top edge of side pieces, STEP 6

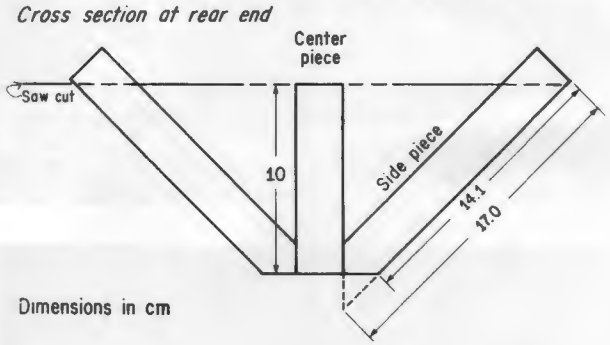


Photo 1. Rear view, after side pieces planed at bottom and sawed at top.

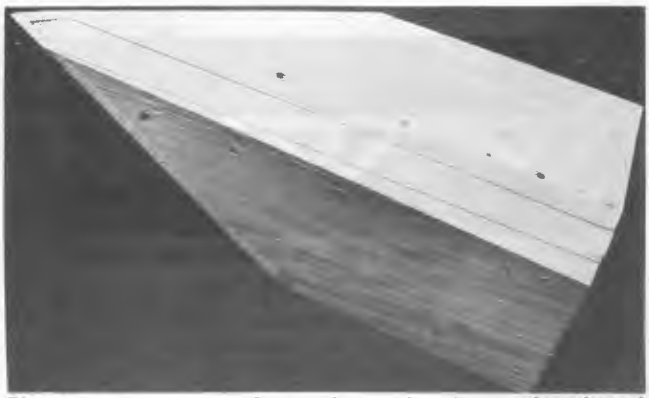


Photo 2. Bottom surface, after side pieces planed and front V cut.

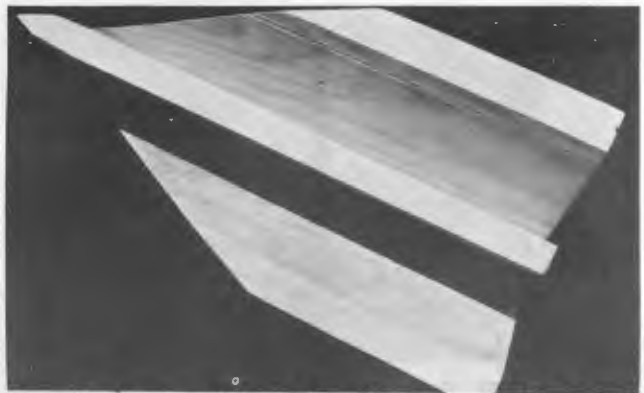
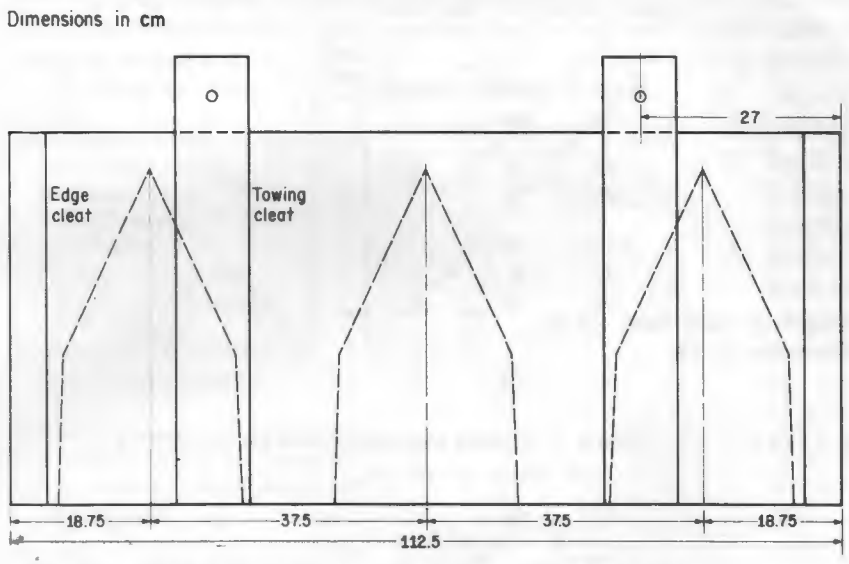


Photo 3. Upper surface after front V and side pieces sawed.

Figure 4. Placement of cleats and shoes on the platform



Note: Edge cleats can be eliminated by placing towing cleats at the edge

Photo 4. Upper surface after addition of plywood to front V.

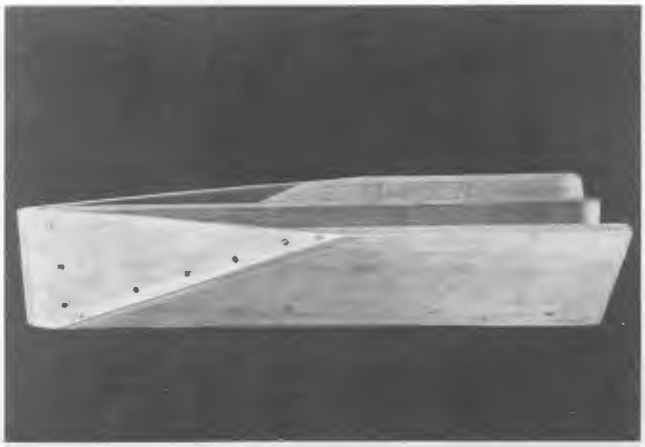


Photo 5. Side view of front V surface.

Photo 6. Note sheet metal overlap at leading edge of V and nailing to front edge of platform.

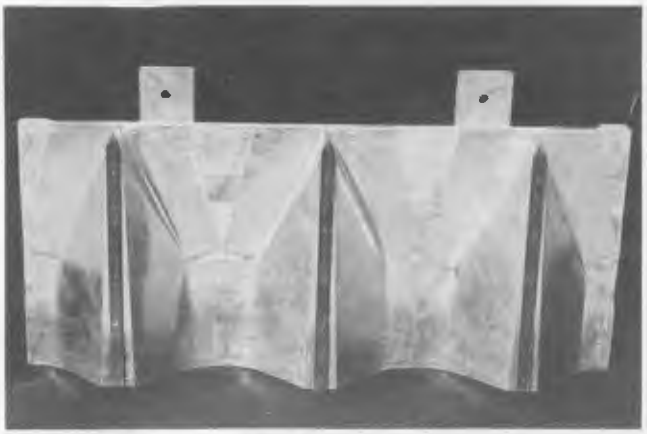


Photo 7. Note strap iron attachment and sheet metal attachment to under surface of platform.

Photo 8. Note trailing edge of sheet metal shaped in an arc to form rounded ridge tops.

Photo 9. **Amount of weight added in bags of soil depends on power available and hardness of soil.**

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