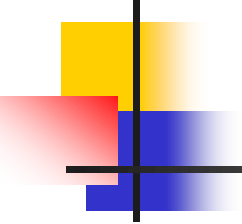


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- Design manual on basic wood harvesting technology
    - FAO Training Series 18 – Rome, 1989.

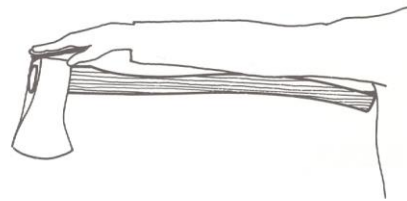
# Opções para pequenos proprietários

## ■ Corte de árvores

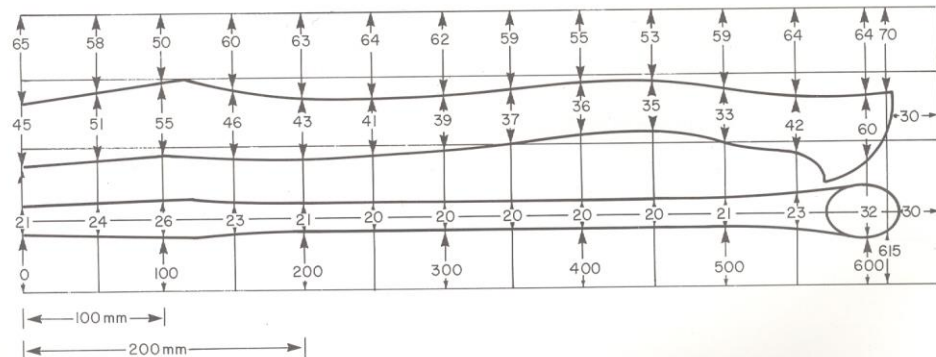
### Instructions

The axe handle should reach from the cutter's armpit to finger tips, and from his hand to the ground (1). If an axe handle is not available as a model, use the pattern (2). Trace the outline of the side of the handle on to the piece of wood (3). Cut away excess wood on the top with a chisel and saw (4). Trace the outline of the top of the handle (5). Cut away excess wood. Finish shaping the handle with a knife. File and sandpaper to the dimensions of the cross sections shown below (6). The finished handle should be comfortable to hold.

1

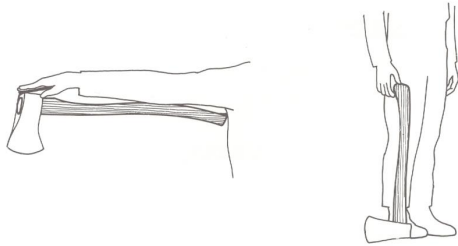


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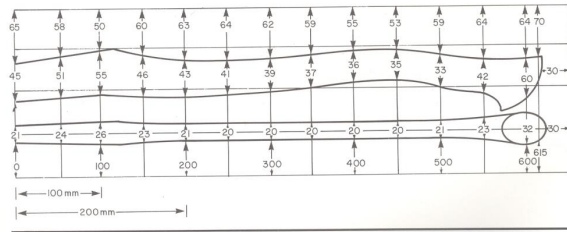




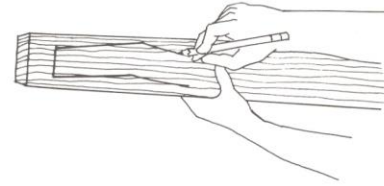
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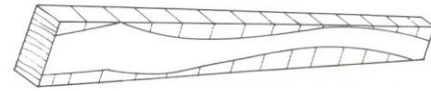
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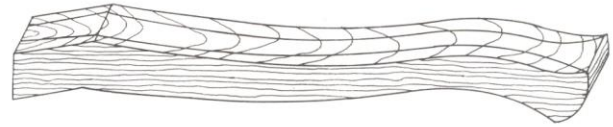
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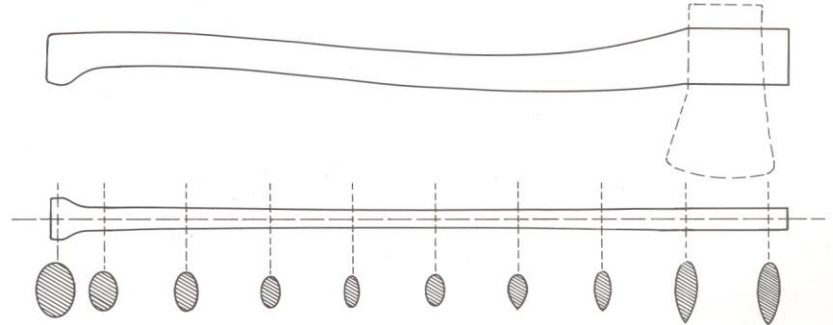
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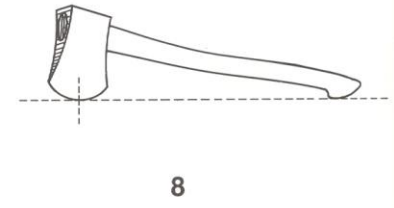
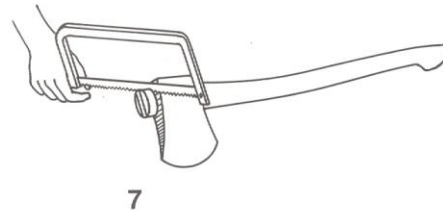
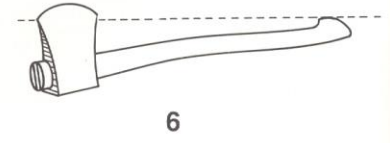
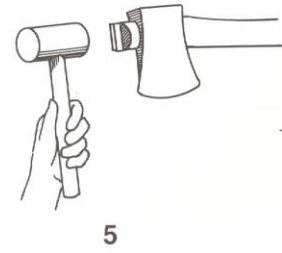
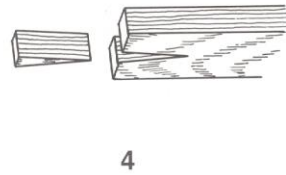
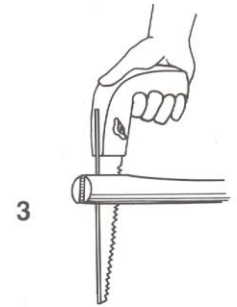
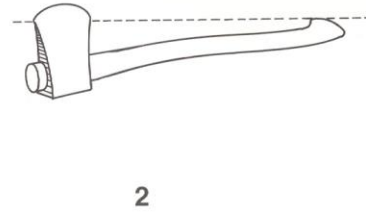
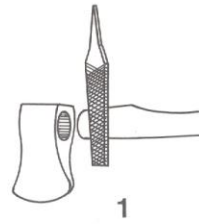
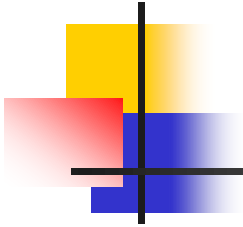


5



6





### Instructions

Using a rasp, shape the end of the handle to fit the eye of the axehead (1). Insert the handle into the head and test for alignment. The line of sight should run through the blade of the axehead and through the knob on the end of the axe handle (2). Remove the handle and saw a slot of approximately 40 mm into the end (3). Cut a hardwood wedge for the slot (4). Insert the handle in the axehead and drive the wedge into the slot (5). Test again for alignment (6). Cut off the excess handle (7). A well-hung axehead will rest on the centre of the blade (8).

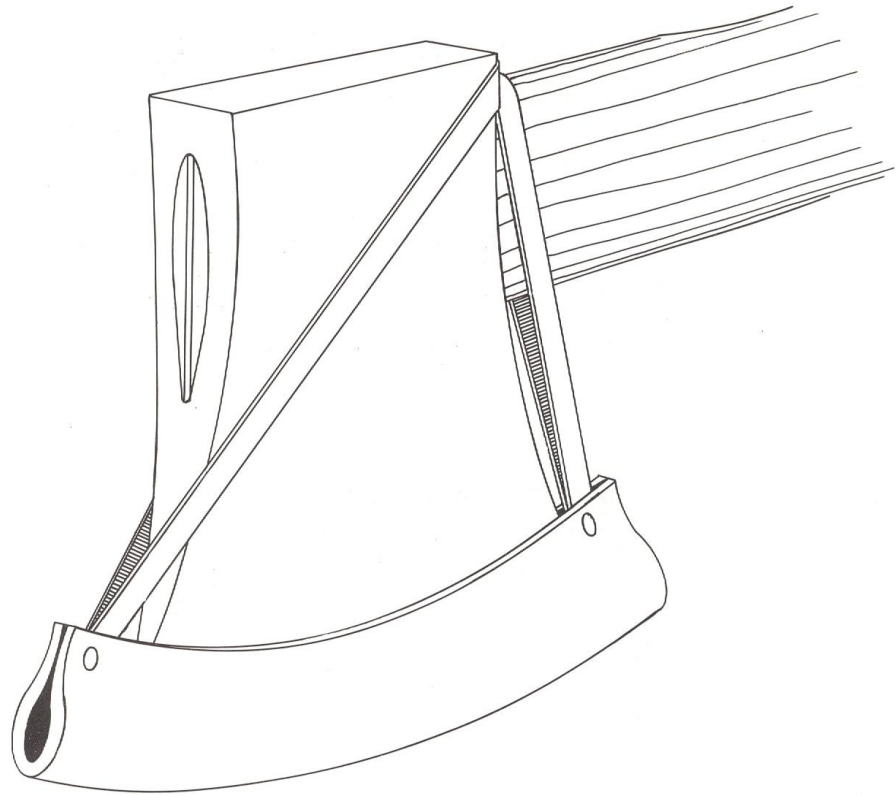


# Aspectos de segurança no manuseio do machado

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## Instructions

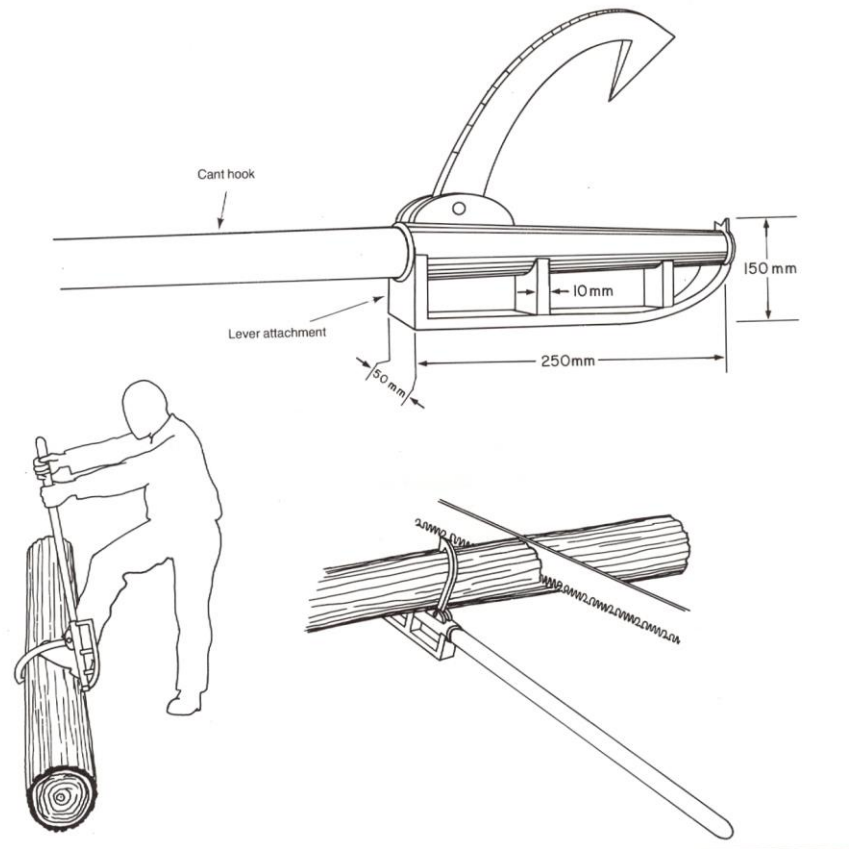
Slit the rubber hose lengthwise. Rivet or bolt two loops of inner tube to each end of the hose. The loops should be long enough to slip over the axehead and hold the rubber hose in place covering the blade.



# Movimentação de toras

## Instructions

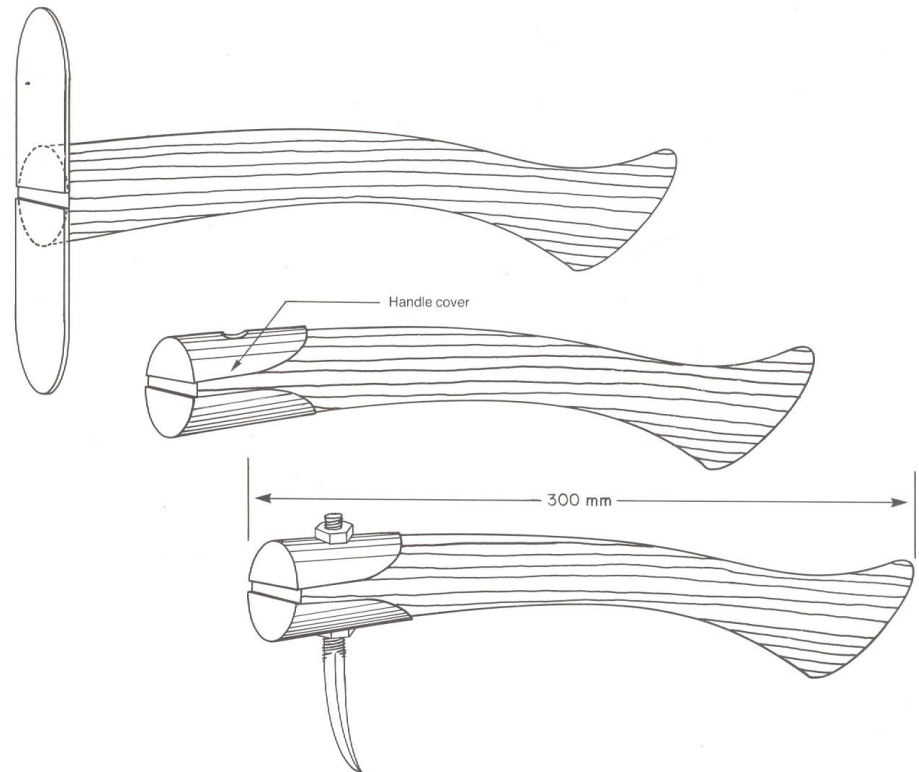
This tool is made by adapting a standard cant hook. Cut two small pieces about 50 x 50 mm from the end of the iron bar. Shape the remaining piece of the bar as shown. Cut a rounded notch in the top of the small pieces and the upright at the back of the bar so that they fit the underside of the cant hook. Weld all of the pieces to the cant hook as shown. The log jack should be strong enough to lift heavy logs and hold them at least 15 cm above the ground.



# Movimentação de toras

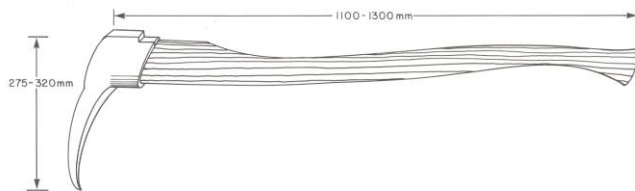
## Instructions

Shape the two pieces of soft iron over the end of the handle to form handle covers as shown. Drill a hole through both covers and the handle and draw them tightly together with the bolt. Grind or file the end of the bolt to a point and bend it slightly to form a hook. Harden the point of the hook.



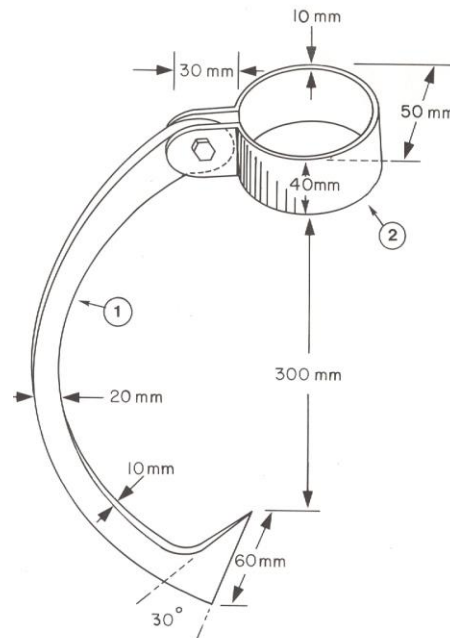
# Movimentação de toras

## Sapie



### Instructions

Shape the hook using the longer iron bar (1). The point should have an angle of  $30^\circ$  and be about 60 mm long. Sharpen and harden the point. Shape the ring to attach the hook to the handle using the shorter iron bar (2). Drill a hole in the hook and the ring as shown. Bolt the hook and the ring together. The hook must be free to move. Cut a pole for the handle and shape one end to fit the ring.

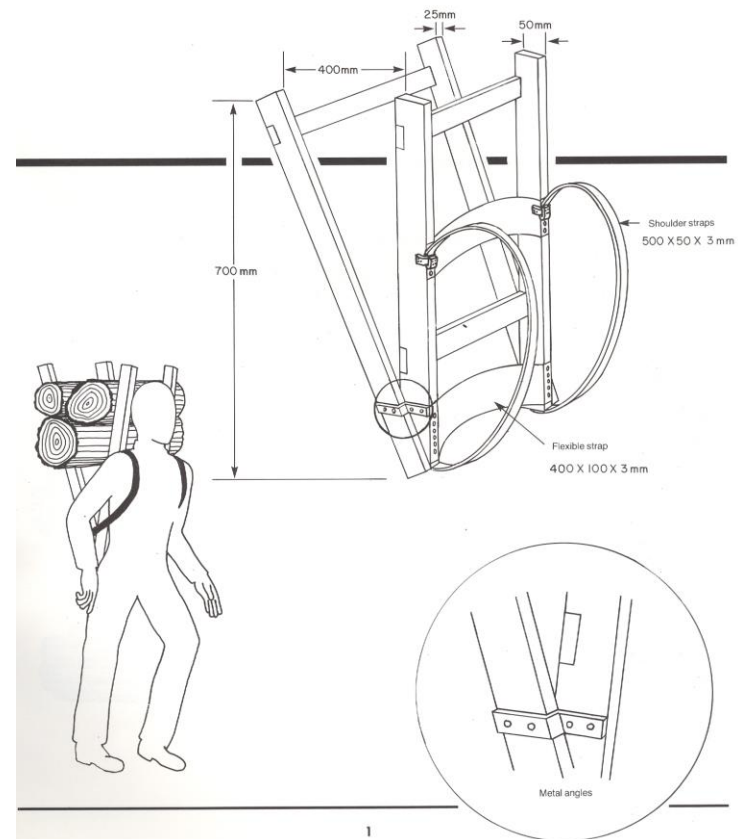




# Movimentação de toras

## Instructions

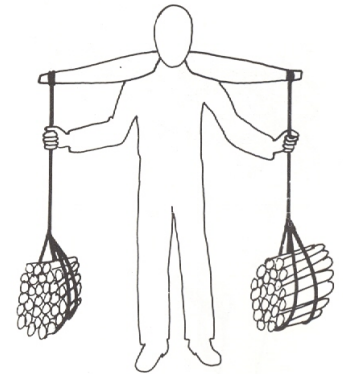
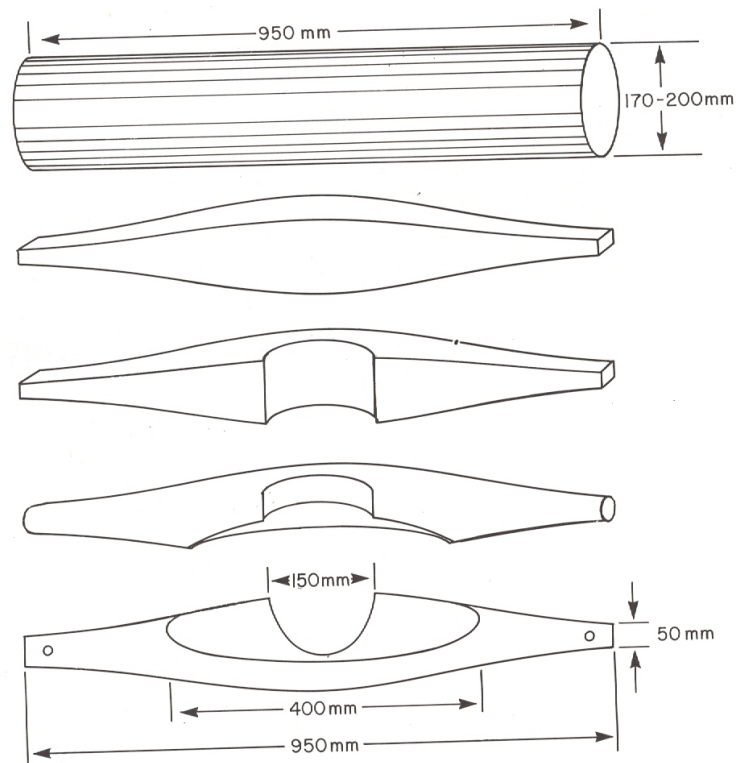
Assemble the two wooden frames of the backrack. Attach the front to the back, leaving an opening of 400 mm at the top, using the metal angles as shown in the detail. Nail the leather bands and straps to the frame so that loads are comfortable to carry.



# Movimentação de toras

## Instructions

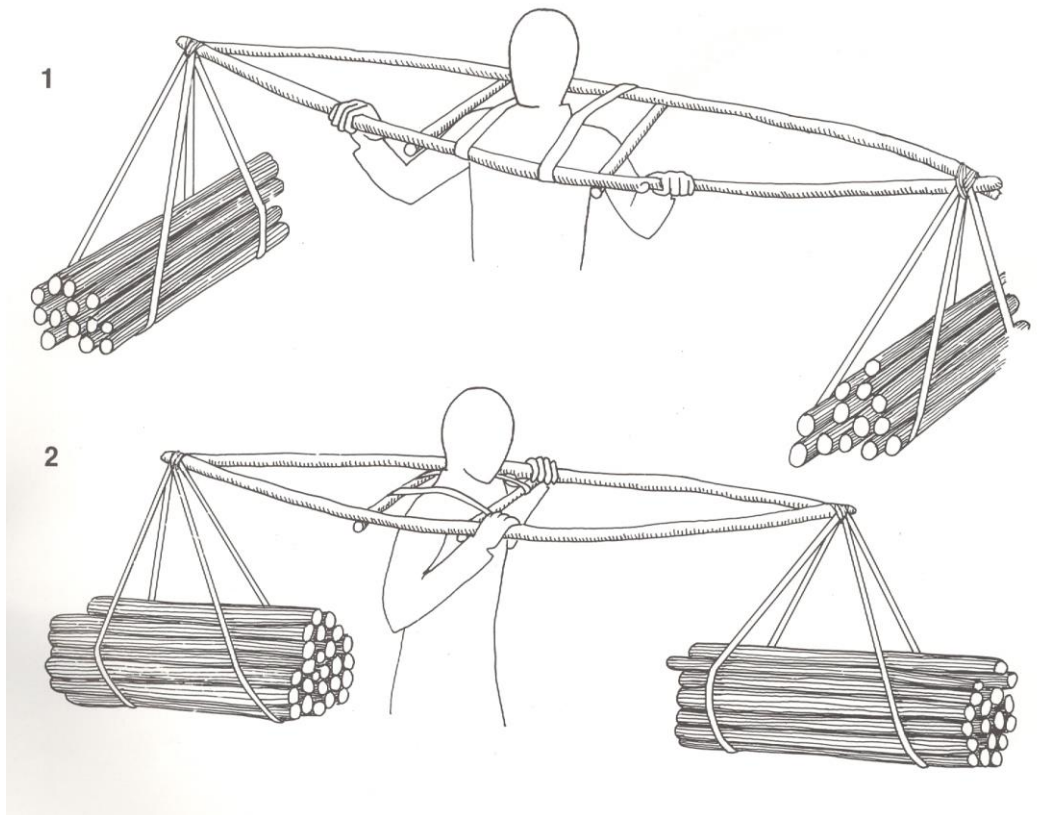
Shape the yoke following the diagram. First saw the basic shape and then carve with a knife. Drill a hole in each end of the yoke. Thread a rope, wire or chain through each hole, adjust the length according to the height of the user and attach a hook to the bottom of each. The wood to be carried is stacked in loose loops of rope and hung from the hooks.



# Movimentação de toras

## Instructions

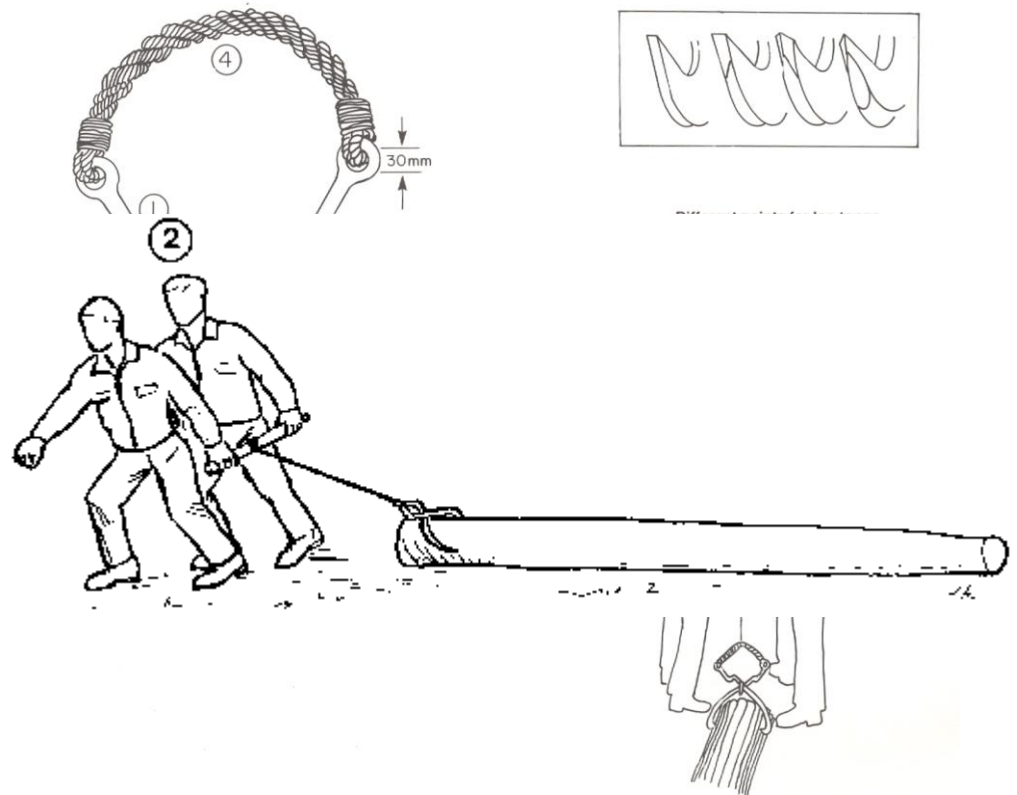
Lash the long poles together at the ends using heavy cord. Pull these poles apart at the middle and lash the short poles in place as shown. Attach the shoulder straps to the long poles (1) or the short poles (2) according to the way the yoke is to be used. The wood to be carried is stacked in loose loops of rope hanging from the ends of the yoke.



# Movimentação de toras

## Instructions

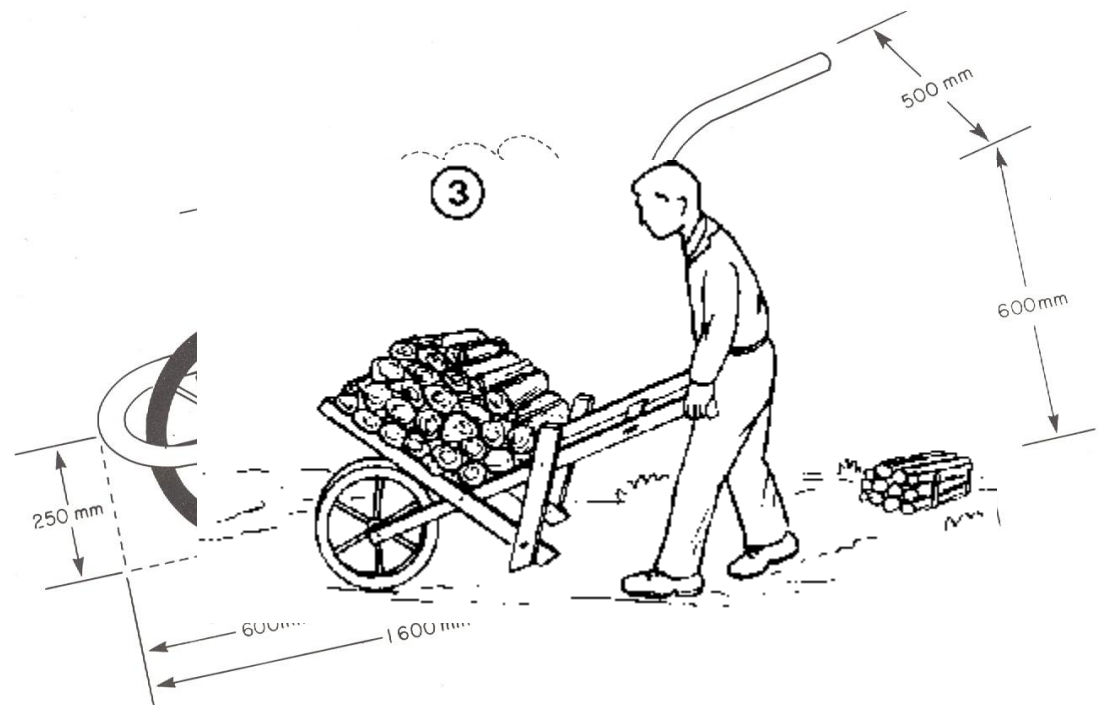
Heat and bend the long iron bars to form the tong arms (1). Each arm should have an eye at one end and a point at the other. Various kinds of points are shown below. Sharpen and harden the points. Heat and bend the short bar into a U-shape (2). Drill a hole through both arms and both sides of the U-shape and rivet them together (3). Attach the length of rope to the eyes in both tong arms (4). With these tongs one person can drag a log. An additional length of rope and a handle will allow two people to drag a log (5).



# Movimentação de toretes

## Instructions

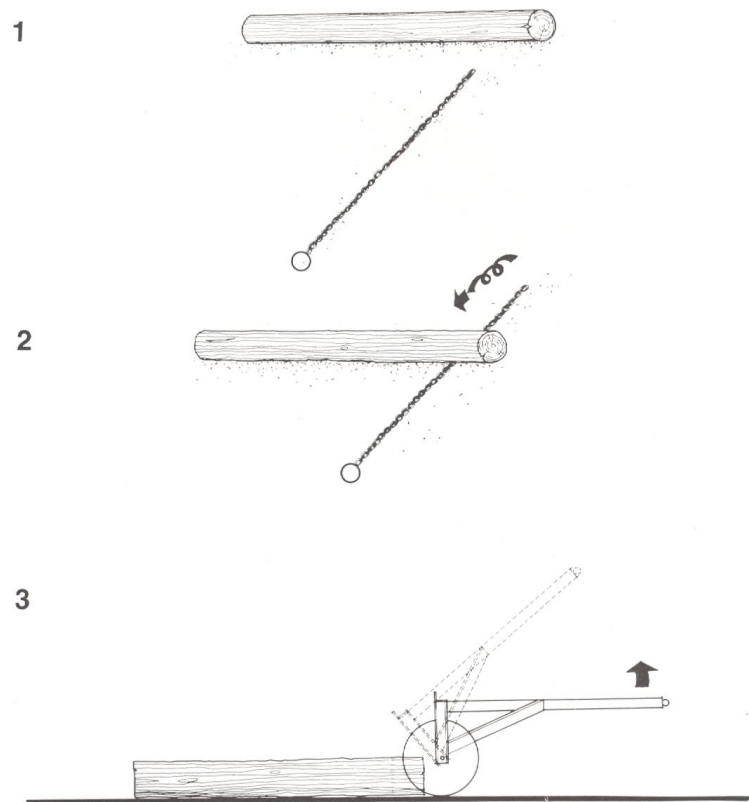
Bend the long piece of pipe at the centre to form the frame. Weld the 450-mm pipe between the sides of the frame. The handles of the wheelbarrow should then be about 500 mm apart. For the legs weld on two of the 400-mm pipes below the curve of the handle. Weld on the remaining two 400-mm pipes to make the posts to hold the load. Cut the two small iron squares diagonally and weld them to the frame as shown to strengthen the connections. Fit the wheel and axle in place using hardwood blocks or metal bearings.



# Movimentação de toras

## Instructions

Stretch out the choker chain on the ground next to the log to be moved (1). Roll the end of the log over the chain (2). Back up the sulky so that the slotted angle is over the end of the log and the chain and tip the sulky up (3). Slip the end of the chain through the ring and pull tight. Then fit a link of the chain into the slots in the angle and tip the sulky down (4). One end of the log will be lifted off the ground so that you can drag it (5). You can also chain the log at the centre, if it is not too long, and lift it clear off the ground (6). If the logs are not too big, you can attach two or more to the sulky (7).

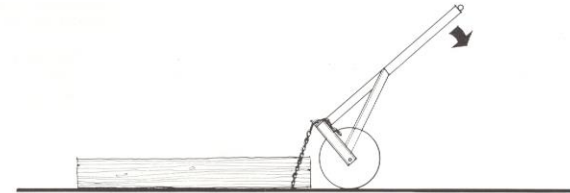


# Movimentação de toras

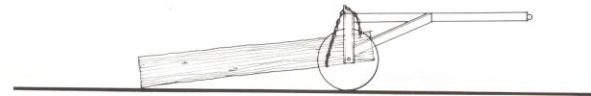
## Instructions

Stretch out the choker chain on the ground next to the log to be moved (1). Roll the end of the log over the chain (2). Back up the sulky so that the slotted angle is over the end of the log and the chain and tip the sulky up (3). Slip the end of the chain through the ring and pull tight. Then fit a link of the chain into the slots in the angle and tip the sulky down (4). One end of the log will be lifted off the ground so that you can drag it (5). You can also chain the log at the centre, if it is not too long, and lift it clear off the ground (6). If the logs are not too big, you can attach two or more to the sulky (7).

4



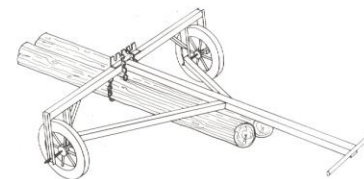
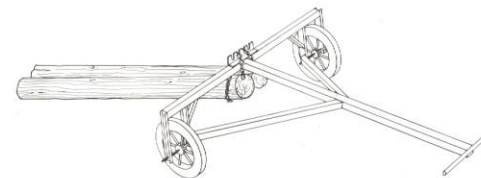
5



6



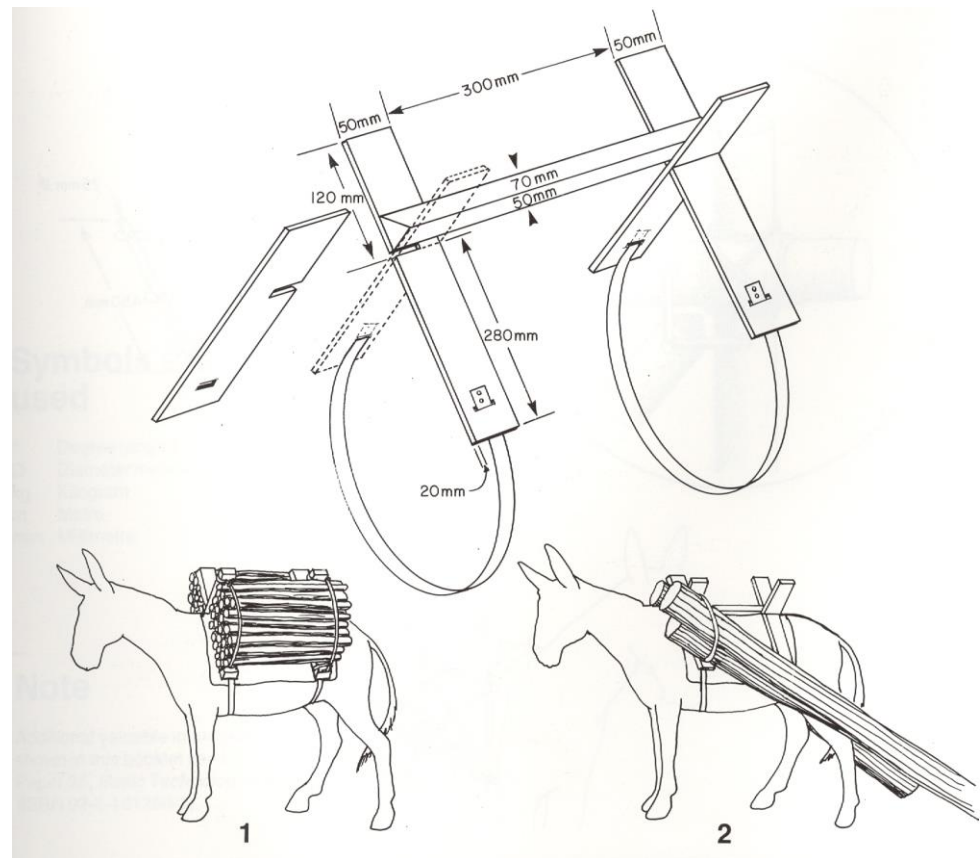
7



# Extração de toras com animais

## Instructions

Cut a notch 20 mm wide x 25 mm deep at a point 120 mm from the upper end of each of the four boards. Assemble the four notched boards to form two cross-pieces. Cut the remaining piece of wood in half lengthwise on the diagonal and nail one cross to each end as shown. Drill a hole near the bottom of each cross and attach the straps to hold the rack in place on the animal's back. Short lengths of wood in equal amounts can be tied to each side of the rack (1) or one or more logs can be tied to each side of the front (2) and dragged beside the animal. To tie the rope to the rack, notches can be cut in the ends of the cross-pieces.

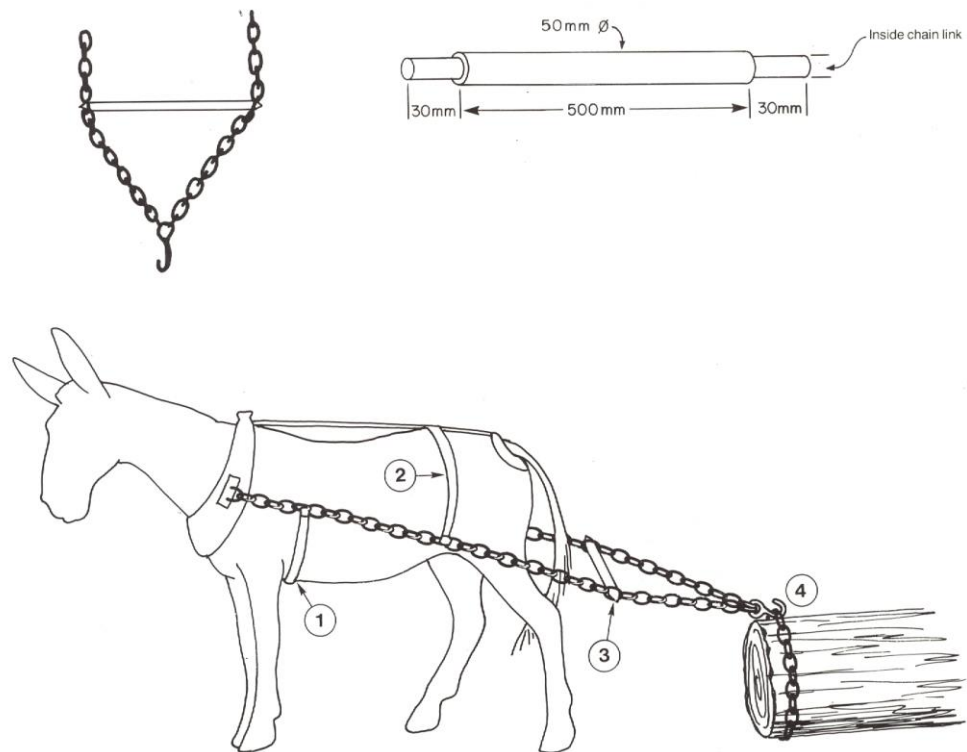




# Extração de toras com animais

## Instructions

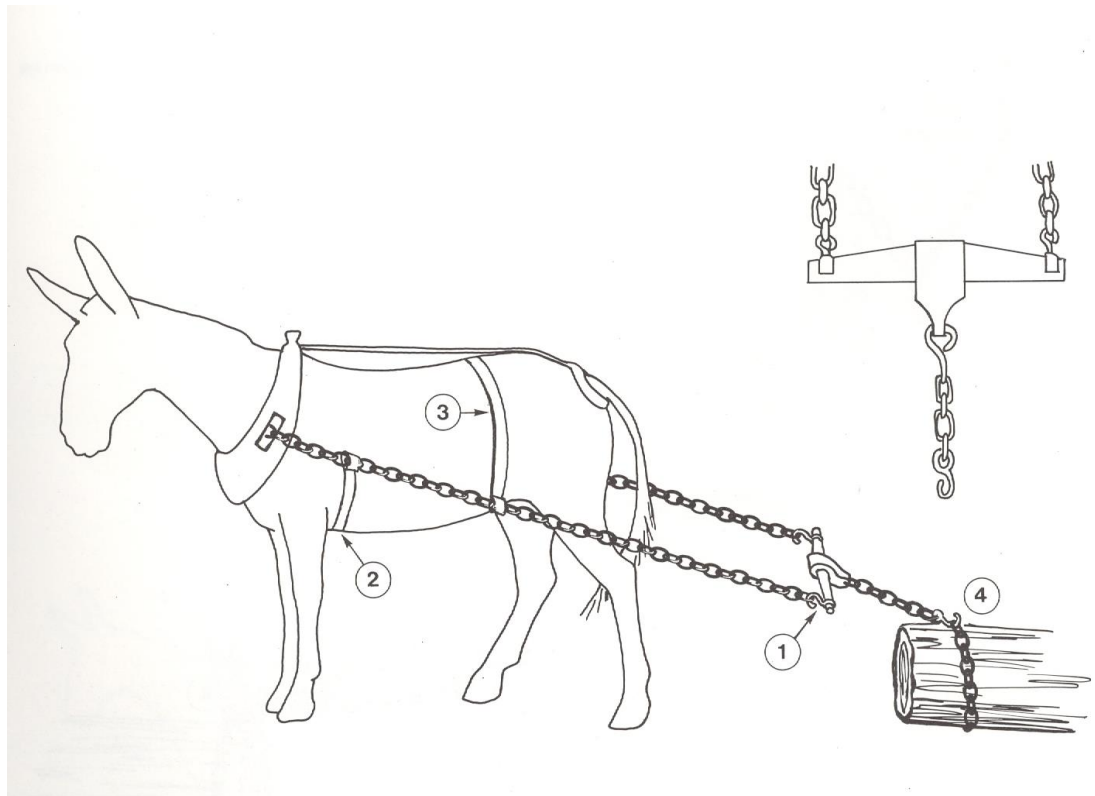
Shape the round piece of wood as shown. Attach the two long pieces of chain to the sides of the collar. Join the ends of the chains with the hook and eye. Pass one of the straps under the animal (1) and one of the straps over the animal (2) and attach them to the chains on both sides. Insert the round piece of wood in the chains (3) to hold them apart behind the animal. Pass the short piece of chain around the log to be pulled and attach it to the hook (4).



# Extração de toras com animais

## Instructions

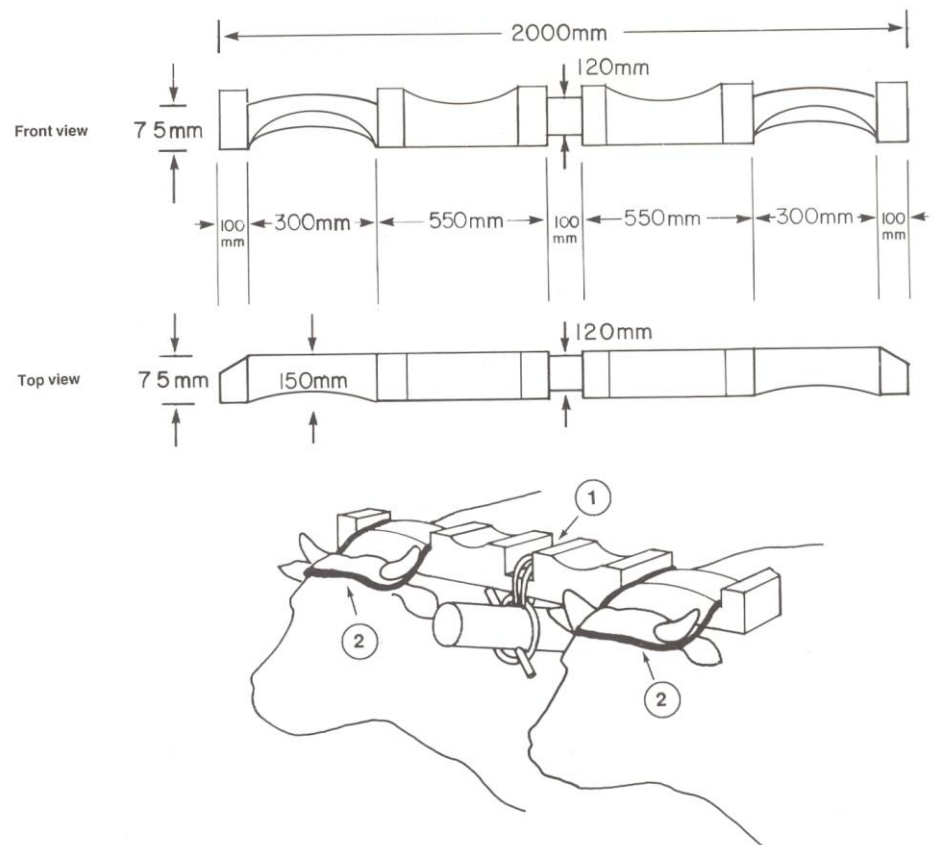
Attach the two long pieces of chain to the sides of the collar. Attach the singletree to the ends of the chains (1). Pass one of the straps under the animal (2) and one of the straps over the animal (3) and attach them to the chains on both sides. Pass the short chain around the log to be pulled and attach it to the hook (4).



# Extração de toras com animais

## Instructions

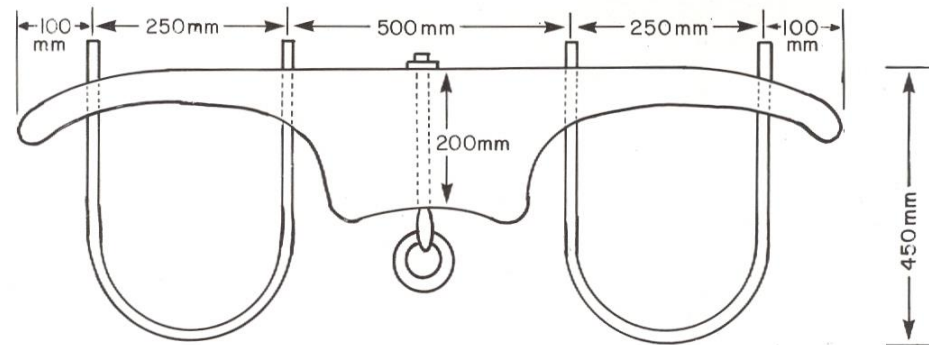
Shape the piece of wood to form the yoke as shown below. The final shape will depend on the size of the oxen. When the yoke is finished it should fit the head of both animals just behind the horns. Lash the ring to the centre of the yoke (1) using one of the rawhide strips. Put a piece of thick cloth on the head of each animal to keep the yoke from rubbing. Lash the yoke tightly to the horns (2) with the two remaining rawhide strips. The load to be pulled is attached to the ring. The pole of a cart can be pushed through the ring and held in place with a pin.



# Extração de toras com animais

## Instructions

Shape the piece of wood to form the yoke as shown below. The final shape will depend on the size of the oxen. When the yoke is finished it should fit the necks of both animals just in front of the shoulders. Drill four holes in the yoke for the neck hoops using the dimensions shown. Drill a hole in the centre of the yoke for the bolt, eye and ring. Place the yoke on the oxen and slip in the neck hoops. Wooden hoops may have to be wet or steamed to bend them into shape. The load to be pulled is attached to the ring. The pole of a cart can be pushed through the ring and held in place with a pin. The weight of a load being pulled holds the yoke firmly in place against the shoulders.



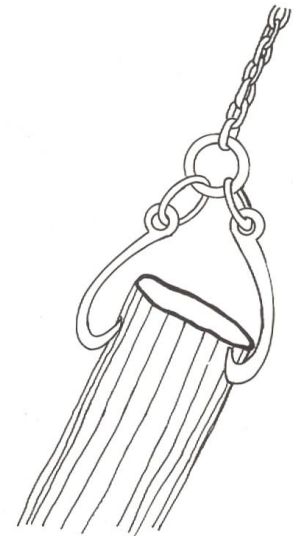
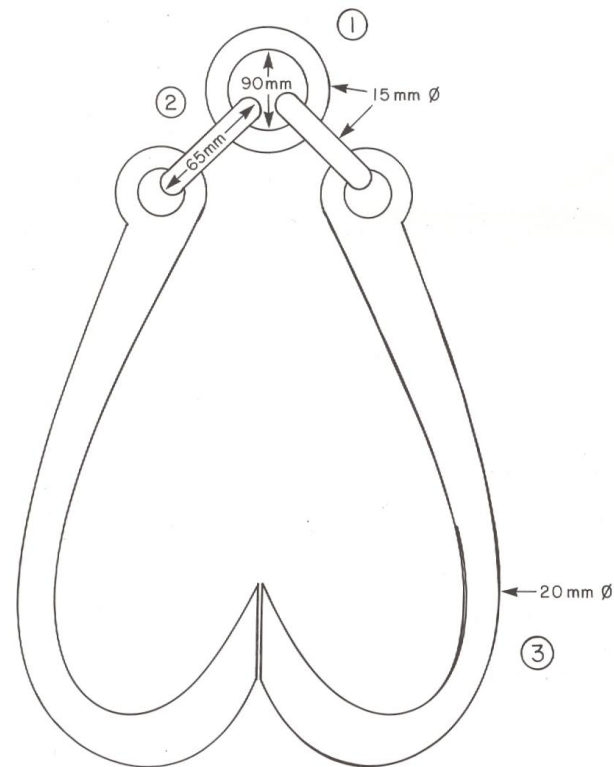
# Extração de toras com animais



# Arraste de toras com ganchos

## Instructions

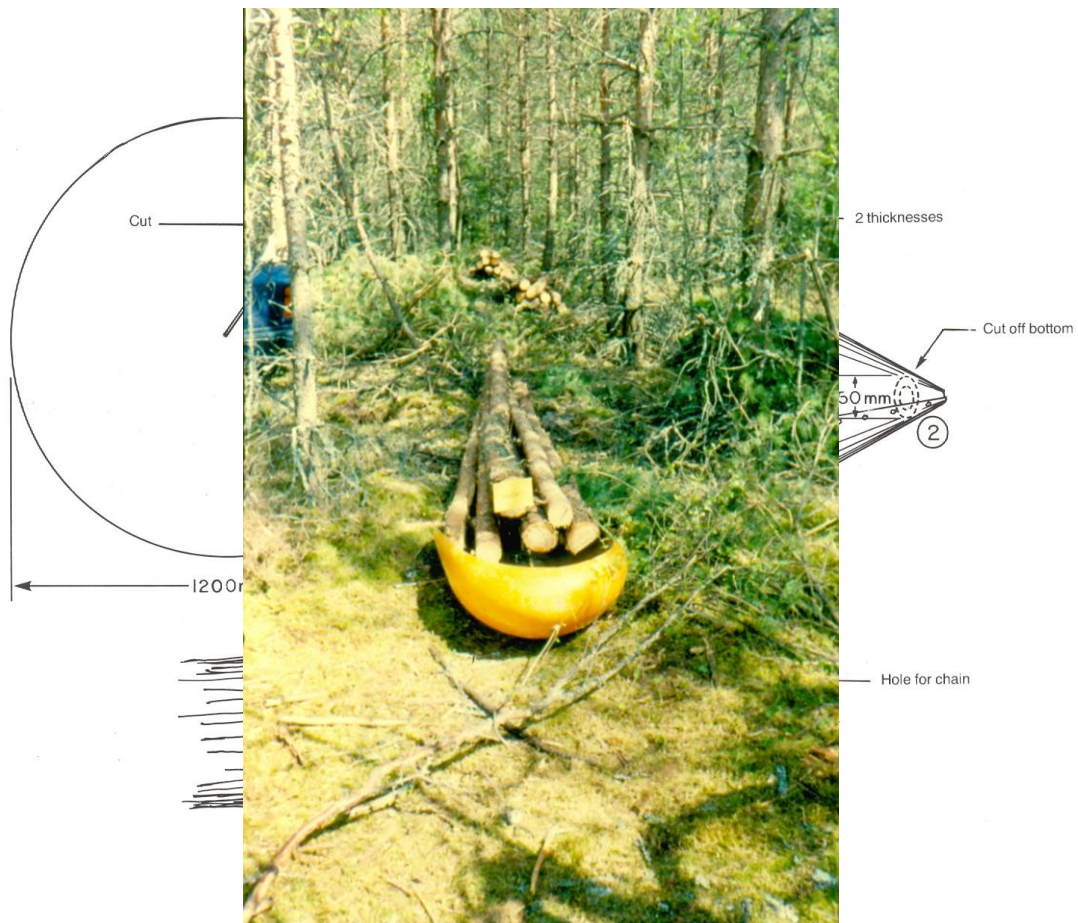
Heat and bend the steel rods to form two hooks with eyes (3). Sharpen and harden the points. Form the two small rings through the eyes of each hook (2). Form the large ring through the smaller rings (1). Attach the length of chain to the large ring. Place one hook on each side of a log. When the chain is pulled tight the hooks are forced into the log.



# Arraste de toras – cone de proteção

## Instructions

Cut a circle 1 200 mm in diameter from the sheet of metal. Make a cut from the edge of the circle to the centre. Role the circle into a cone so that one half has two thicknesses of sheet metal and the other half has three thicknesses. The diameter of the base of the finished cone will be about 500 mm. Rivet or weld the loose edges of the cone. Cut off the end of the cone to make a hole for the chain. Bend the short iron rod into a ring 50 mm in diameter and weld it into the hole. Attach the chain to the log, thread the chain through the hole in the cone and pull. When using the skidding cone the part with the three thicknesses should be down.

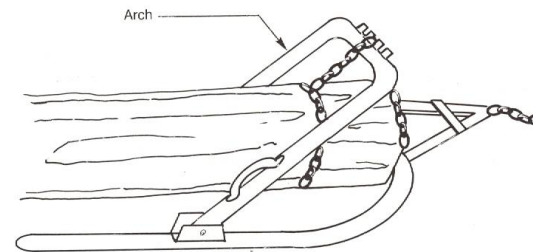


# Arraste de toras com base suspensa - trenó

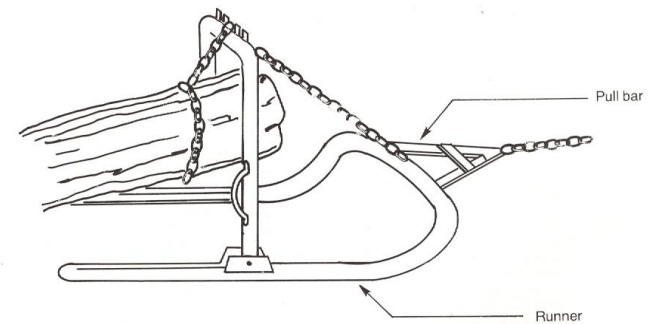
## Instructions

Shape the long piece of pipe to form the sled runner. Weld the short pieces of flat iron to the front of the runner to form a pull bar. Weld the two pieces of channel iron to each side of the runner about halfway between the front and the back. Shape the shorter piece of pipe to form an arch. Drill holes through the base of the arch and the channel iron and bolt the arch in place. Weld several iron squares to the top of the arch. Attach the chain to the log to be pulled. Hook the chain through the squares, over the arch and fasten it to the front of the runner (1). The forward movement of the sled will cause the arch to move into the vertical position, lifting the front end of the log off the ground (2).

1



2

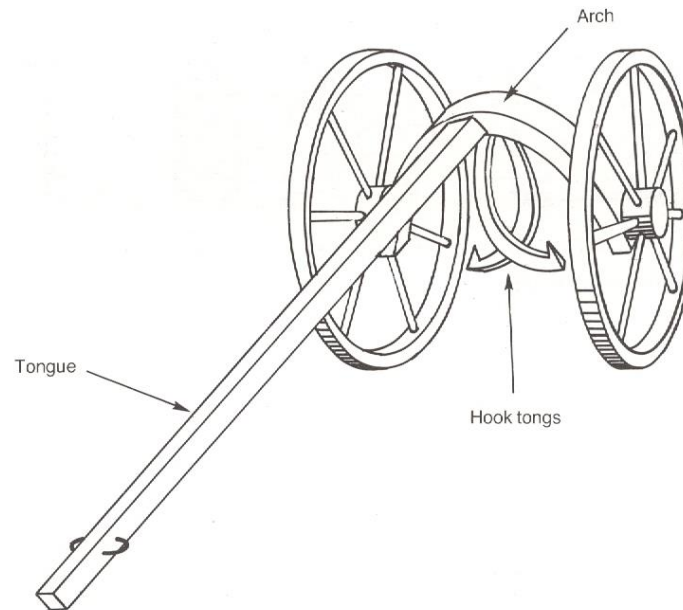




# Arraste de toras com base suspensa - ganchos

## Instructions

The design can be varied according to the materials available as long as the parts remain the same (an arch with two wheels, double hook tongs and a long tongue which acts as a lever). Position the sulky over the middle of the log, tip up the tongue and clinch the log with the tongs (1). Pull the tongue down and fasten the other end of the log with the chain to lift the log completely off the ground (2). The tongs can also be attached near the end of the log to lift only that end and drag the other (3). With this sulky only one log at a time can be moved.

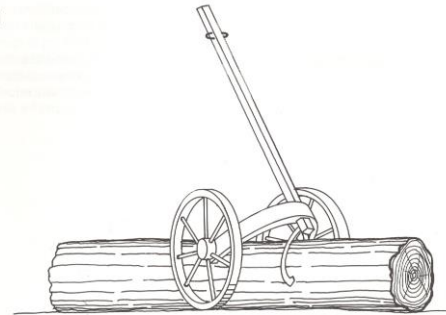


# Arraste de toras com base suspensa - ganchos

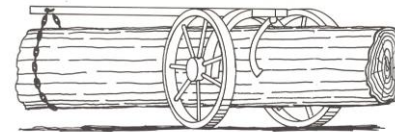
## Instructions

The design can be varied according to the materials available as long as the parts remain the same (an arch with two wheels, double hook tongs and a long tongue which acts as a lever). Position the sulky over the middle of the log, tip up the tongue and clinch the log with the tongs (1). Pull the tongue down and fasten the other end of the log with the chain to lift the log completely off the ground (2). The tongs can also be attached near the end of the log to lift only that end and drag the other (3). With this sulky only one log at a time can be moved.

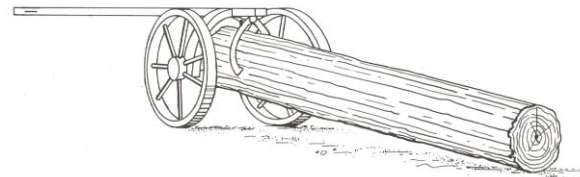
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2



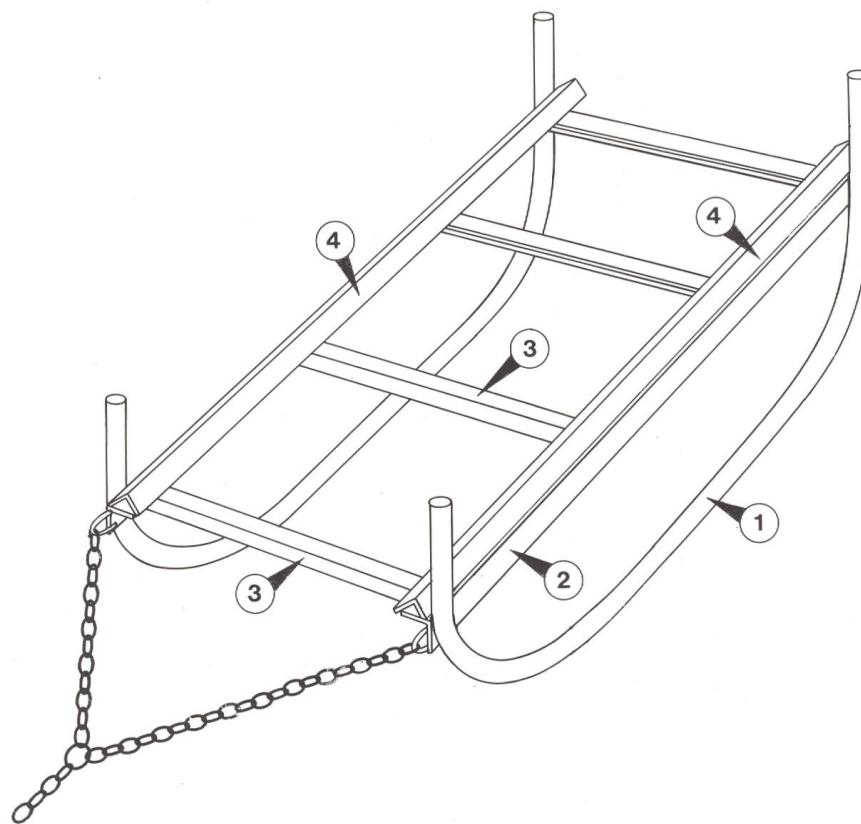
3



# Arraste de toras com base suspensa - trenó

## Instructions

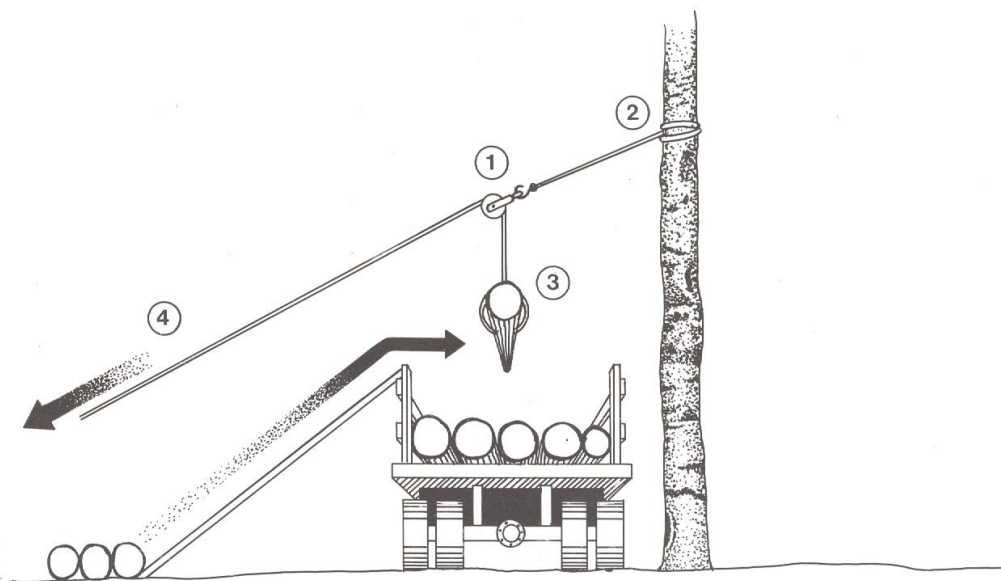
Heat and bend the two pieces of pipe to form the runners of the sled (1). Weld one of the long pieces of angle iron to each runner as a brace (2). Join the runners by welding the four short pieces of angle iron to the underside of the braces (3). Invert the two remaining long pieces of angle iron and weld them to the braces to support the load (4). The sharp edges of the inverted angle will keep the wood from sliding sideways. Attach a pull to the braces at one end of the sled using the chain, the ring and the short pieces of iron as shown.



# Carregamento de toras

## Instructions

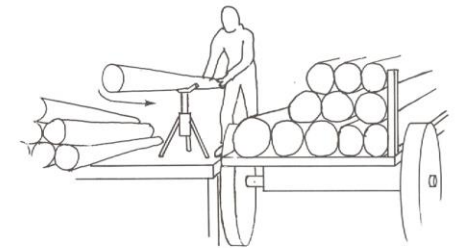
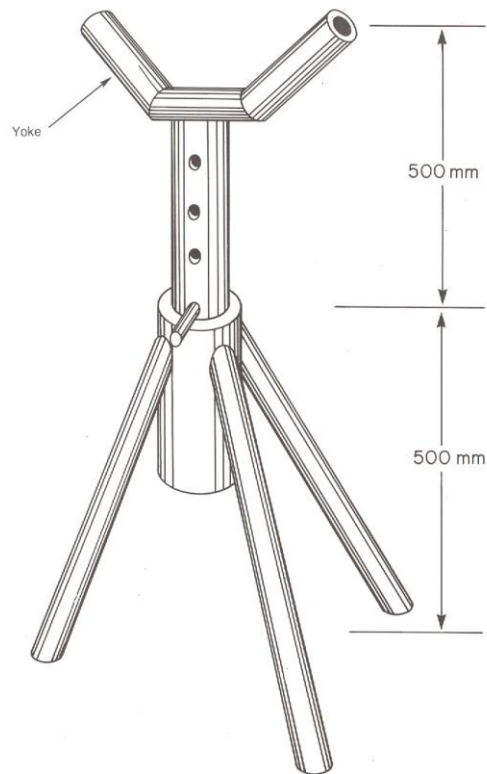
Attach the pulley block (1) to a tree using the short cable (2). Attach the log-loading tongs (3) to one end of the long cable and thread the other end through the pulley block. Attach the long cable to the source of power (4). You can adjust the chain or cable supporting the pulley so that it will be directly over the place where you want to drop the log on the truck or cart.



# Carregamento de toras

## Instructions

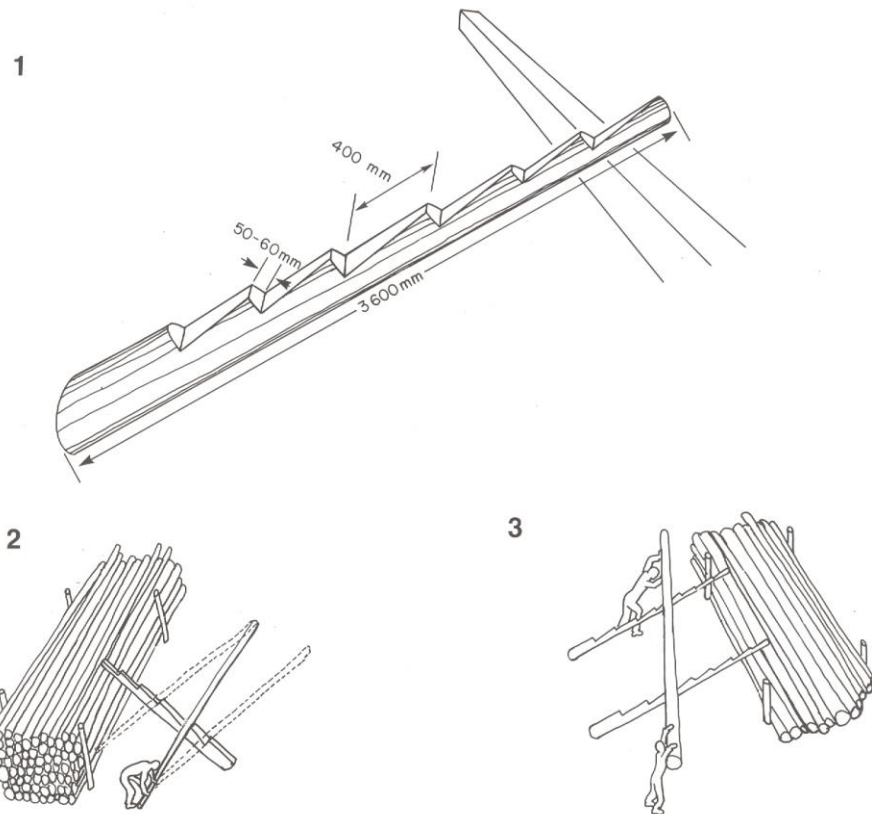
Make a free-standing tripod with legs sufficiently spread to be stable. A yoke-shaped bracket is welded to a length of pipe that fits into the tripod. Drill holes in this pipe and insert a pin to adjust the height. Loading is done by placing a log on the yoke and then swinging it over on to the pile.



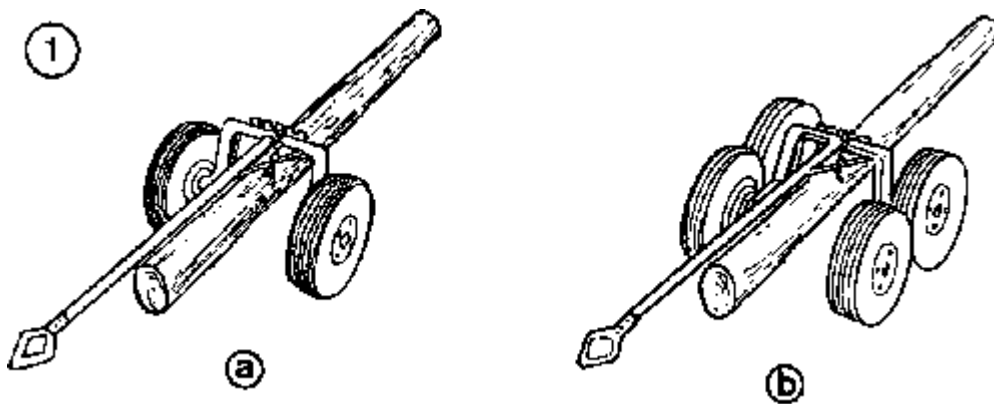
# Carregamento de toras

## Instructions

Chop or saw steps 50-60 mm deep and about 400 mm high in each log as shown (1). One person can use one log jack to pivot medium-sized logs on to a pile (2). If the logs are large, two people and two log jacks may be necessary (3).



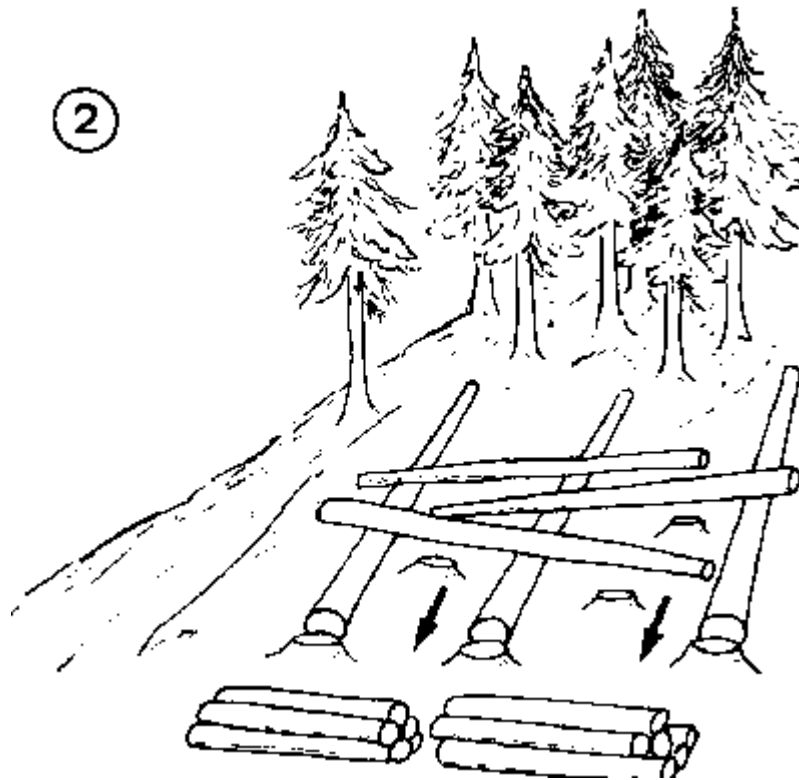
# Opções para pequenos proprietários



Trenós para arraste são usados em curta distância para o transporte de pequenas toras, principalmente em declives moderados. Peso de até 200kg.

A carga é atada no centro de gravidade em terrenos planos. Em terrenos mais inclinados, a carga é posicionada mais atrás para servir de freio. O trenó com 4 rodas permite o manuseio de cargas maiores e enfrentar condições de terreno mais acidentadas.

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