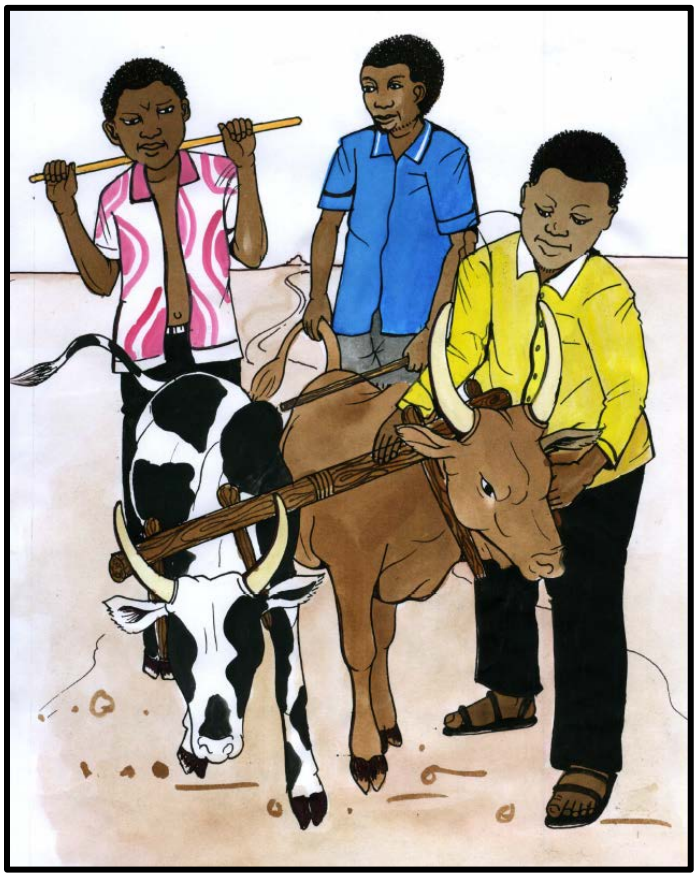
Animal Traction Training Manual for Extension Workers



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USAID | SOUTH SUDAN
FROM THE AMERICAN PEOPLE

WINROCK INTERNATIONAL

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FOREWORD

The U.S. Agency for International Development-funded Building Responsibility for Delivery of Government Services (BRIDGE) Program has worked since 2009 to strengthen the ability of government to meet the needs of its people in the Northern Bahr el Ghazal (NBG), Warrap, Jonglei, and, to a limited extent, in Upper Nile State. BRIDGE's animal traction training programs were piloted in 2009 in NBG and Warrap states, where BRIDGE coordinated with members of Community Action Groups and Women's Support Groups to raise awareness of the benefits of using ox-plows to increase land cultivation and boost crop yields and to maximize farmers' gains. BRIDGE provided a series of "training-of-trainers" (TOT) animal traction courses to state and county agriculture extension workers, who were soon able to directly facilitate and lead most aspects of training for farmers. To ensure sustainability and continued use of newly-adopted animal traction skills, BRIDGE supported development of a viable supply chain system for ox-plow equipment by offering trained farmers the opportunity to purchase ox-plows and related equipment at subsidized rates, and by encouraging farmers to team up in pairs to purchase plows and equipment. BRIDGE also provided training and raw materials to local blacksmiths to ensure plow equipment could be locally repaired and/or fabricated.

This ox-plow training manual grew from the successes and lessons learned during BRIDGE animal traction TOT programs over the past two years. It incorporates contributions from the Warrap Ministry of Agriculture and Forestry and the Yei Agriculture Training Center. It is meant to serve as an informative reference and "how-to" guide to support and promote the continued training of farmers in animal traction techniques in South Sudan.

Domestic animals have been used widely by people to simplify domestic work since old times. Many communities around the world still depend on animal power for crop production, rural transport to fetch goods and commodities including transporting farm products to market. In Africa in general, and in South Sudan in particular, cattle, donkeys and horses (especially in NBG) are commonly used for farming work and rural transportation. There are many benefits to be gained by using animal power to assist in food production instead of relying solely on human power, including the following:

1. Animal power is labor-saving technology, reduces and improves human toil/labor, and makes farming pleasing and more comfortable;
2. Animal power increases and improves productivity by increasing the amount of land cultivated.
3. Animal power and technology use results in earlier planting, saves labor during weeding, and, with good crop husbandry, will result in increased yields;
4. Animal power technology is self-supporting and sustainable technology. For example, animals such as oxen provide manure which can be transported by the animal itself to the farming field. During harvests, the same animal can transport crops and residues (hay) from fields back to the village. If properly stored, crop resides such as hay serve as a source of animal feed during the dry season;
5. Animal power can also create employment opportunities including: transport renting, hiring services to other farmers and blacksmithing jobs (parts repairs and fabrication).

SELECTION OF ANIMALS

This is the first and most important stage for trainers: Selection of animals to be used during training exercises. The herd to be selected from may consist of cows, heifers, bulls, castrates or calves. Generally young castrated oxen are recommended for training, due to their considerable strength and submissiveness compared to adult animals. When selecting a pool of potential oxen for training purposes, all males are grouped together in an open area and observed using the six following characteristics for selection:

1. **Breed:** Local breeds or crosses are preferred as they possess humps, which facilitate harnessing; also local breeds are hardy;
2. **Health:** Animals with sight, eating or breathing problems should be eliminated;
3. **Age:** Bulls between 18-36 months in age are most suitable because they have developed physical fitness adaptable to training;
4. **Weight:** An average recommended weight of between 150-300 kgs is desirable. Heavy weighted animals are not easy to control, whereas light-weight animals/oxen cannot cope with heavy tasks;
5. **Conformation:** Animals with knocking knees (sloped), bow-legged or arched backs are not suitable for training. Oxen used for animal traction should have medium-sized horns;
6. **Nature:** Bulls that appear overly aggressive or nervous should be eliminated.

N.B.: It is very important for trainer to be involved directly in the selection process of oxen for animal traction training. Experience has shown that most farmers unless otherwise advised will select oxen which do not meet appropriate selection criteria, which will affect performance during and after the training.

Animal Harness (Yoke)

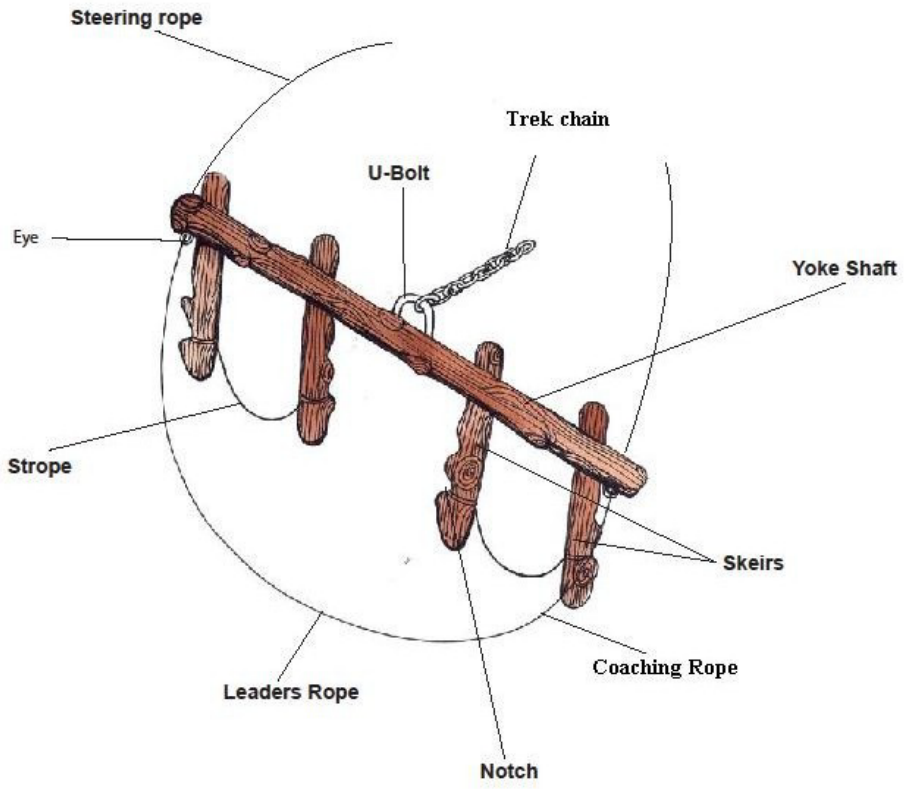
Each type of working animal has its own style of harness. This means the harness for oxen is different from that of a donkey or horse. Similarly, the same type of animals may also differ from one area to another. Due to varying development and designs for harnessing implements from one area to another, different styles of equipment are often used for the same purpose. When making yokes it is important to note the following:

1. Identify the right tree species – for example Ziziphus pubescens, Pinus ssp and/or Balanite eugaptica;
2. Cut the tree before leaf shading. If the tree is cut after leaf shading, the wood should be roasted first;
3. Wood used for yokes should be lightweight and strong. The correct size for yokes is 3-4 feet (100-120 cm).

BRIDGE program Ox-Plow Trainer (middle), Training Government Extension Workers and Farmers on Yoke Development, Warrap State, South Sudan

The yoke serves as the linkage for an animal with the working implements and transmits the force for the animal, while also helping to control and direct the animal at work. For greater power output from any animal at work, the harness must be made accurately and maintained in

perfect condition to prevent injuries such as sores. Harnessing animals for traction work requires the following: (i) Yoke; (ii) Trek chain, (iii) Halter ropes; and; (iv) Coupling and steering ropes.



Components of a Yoke

Components of a Yoke

1. **Yoke Shaft:** This is a shaped pole with four holes from where the skiers that hold the animals' necks are lifted. The shaft should be strong enough to withstand breakage during work;
2. **Skiers:** They are pieces of wood shaped to fit into the slots in the shaft. They keep the bulls at specified distances from each other and stop the yoke shaft from moving sideways. They are notched on the outer edge so as to hold the looped ends of the strops;
3. **Strops:** They are short strings made of twisted animal skin or sisal ropes. They fit around the animal's neck and hook the notches on the outer edge of the skiers. It also prevents the yoke from slipping over the animal hump when pulling the load;
4. **U-Bolt:** It is a curved metal rod with nuts at both edges. It is set in the middle of the shaft as a connection of the trek chain to the load. It also serves as load equalizer;
5. **The Eyes:** These are metal rings fitted at the end of the yoke shaft to hold the steering rope of the harness;
6. **The Trek Chain:** It links the animal to the working implement and should be relatively long and strong enough to prevent the implement from injuring the animal's back legs.

N.B.: Please note from above that steering, coupling and leader ropes are only necessary during training time. They should be removed immediately after the animal has mastered all the training steps.

Standard Measurement of the Yoke Shaft

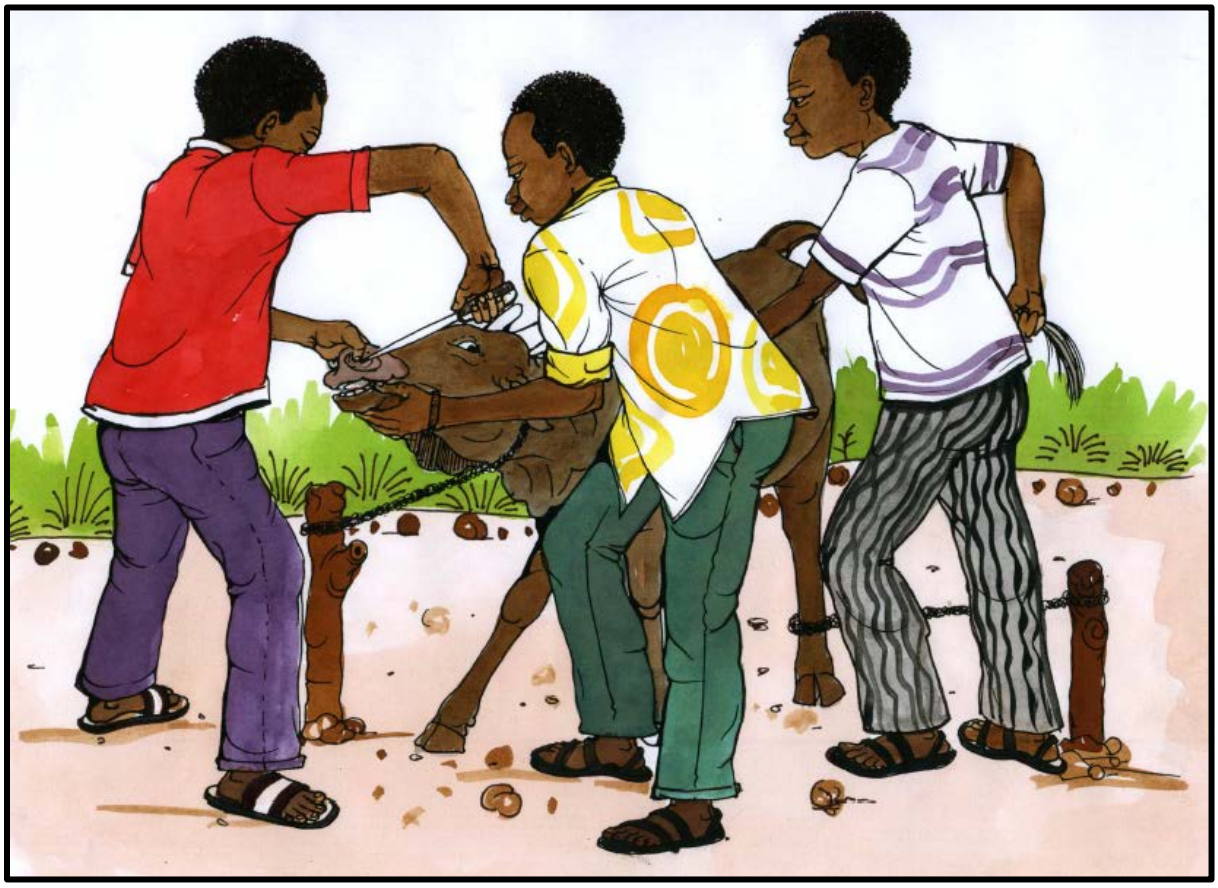
The standard length of a yoke shaft should be between 3-4 feet (100-120 cm). It should be strong enough to avoid easy breakage. Similarly, it should be of medium weight. A too-heavy yoke shaft is capable of adding extra weight to the working animal which can affect the full pulling potential of the animal. Young animals require a bit shorter and lighter yoke shaft of about 4 ft/120cm. The length of shaft from both edges to the outer pair of skiers should be 2 inches. The distances between are also determined by the thickness of animal neck. The trainer should therefore be in a position to judge and make the yoke appropriately.

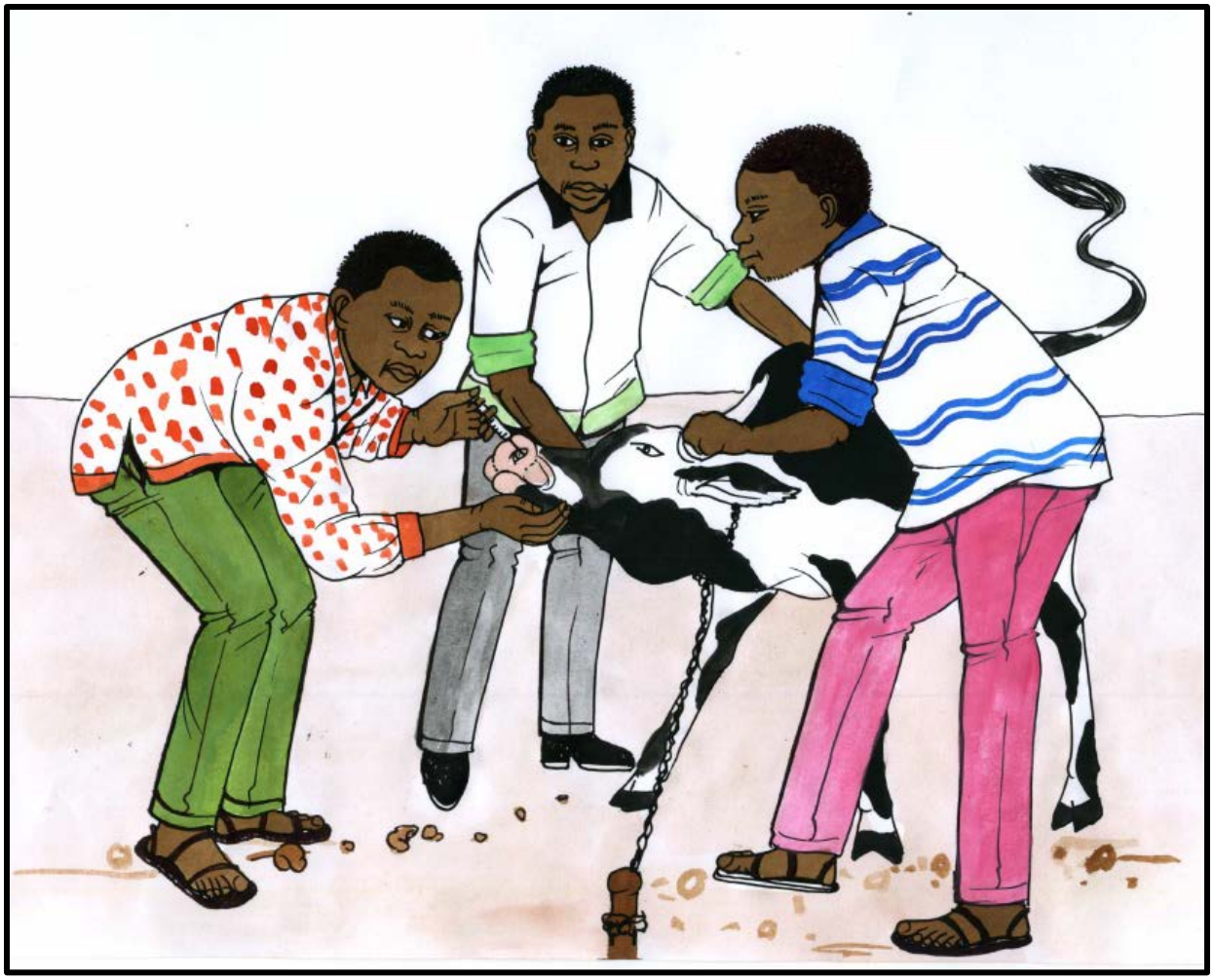
ANIMAL TRAINING

In this step, the trainer starts training the animal. The efficiency, performance and obedience of the animal will entirely depend on the ability of the trainer. Therefore the trainer should be well versed with training procedures. The trainer needs to employ a firm, calm, patient and consistent approach to the animal.

Nose Septum Piercing

Some trainers prefer nose piercing the animal before the training activity. Its main advantage is to have easy control of the bulls during operations. This operation is, however, mandatory and necessary for the most aggressive animals. Should the trainer be deemed fit to perform the above exercise, he/she must do so one week before actual training commences. The hole should be punched as far from the nose as possible in order to reduce risk of tearing later.





Treating pierced nose

Special tools designed for this purpose are used. Most commonly used tools are a bull ring, pliers, pincers, trocher and canular or any other appropriate sharp instrument. Nose punching is also referred to as the "Indian Methodology" of bulls training. It is also common in the Bahr el Ghazal and Nuba regions. When piercing the nose septum it is important to note the following points:

1. Prepare the tool for piercing with nylon rope of medium size, and keep healing oil handy;
2. Restrain the selected oxen and identify the part to be pierced in the nose; at least four people are needed to restrain the animal;
3. Pierce the restrained animal correctly on the nose;
4. Insert the rope through the pierced hole and tie it behind the horns of the animal;
5. Treat the pierced wound with 1 cc of healing oil on both sides of the hole, twice a day until the wound is healed.

Language Commands

This is a simple language spoken by the trainer to the animal. The same words should be consistently used to avoid confusing the animal. The commands must be simple and few in number. They are only

needed for go, stop, turn right or turn left, etc. Each animal should be identified with a name different from each other during and after the training.

When a certain command is given to a particular bull, the trainer should call its name first, and then give the command. If you want to give a command to one animal, let's say it is offline, the trainer can say "Brown (the name of the animal in one's own dialect) you are off the line, come back to line." If both animals have slowed, the trainer commands them to pull forcefully. On reaching the edge of the farm, he gives them the stop command, then commands them back and follow the line. This should be repeated at all times when the bulls are working. After all of the above operations have been achieved, the animals will be in position to perform other duties like cart pulling.

Training Steps

There are four main steps involved in animal traction training program. The steps should follow one another in a sequence form. After the animal masters one step, the trainer progresses to the next step. Wrong orders of steps, interruptions or too many new situations could confuse the animal.

The steps are as follows:

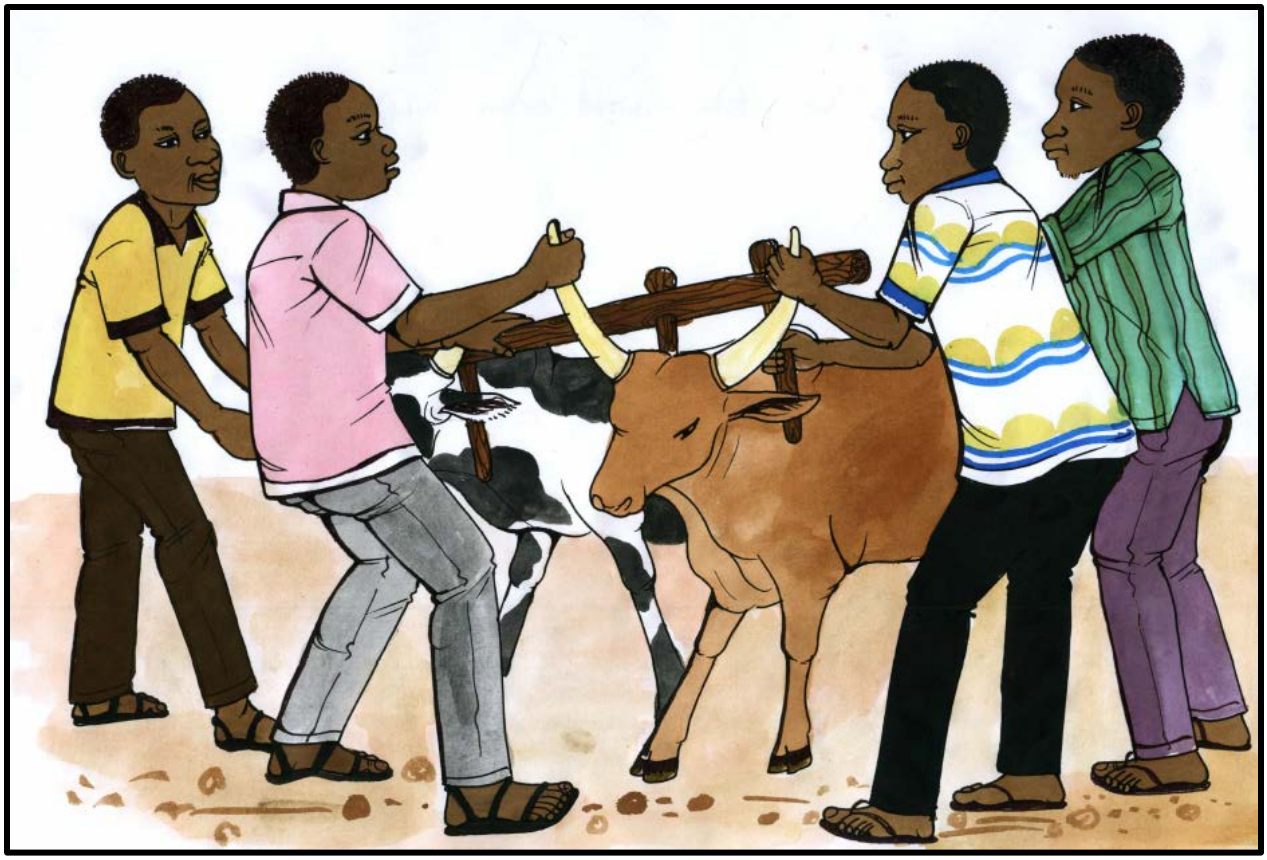
1. Reining and Walking

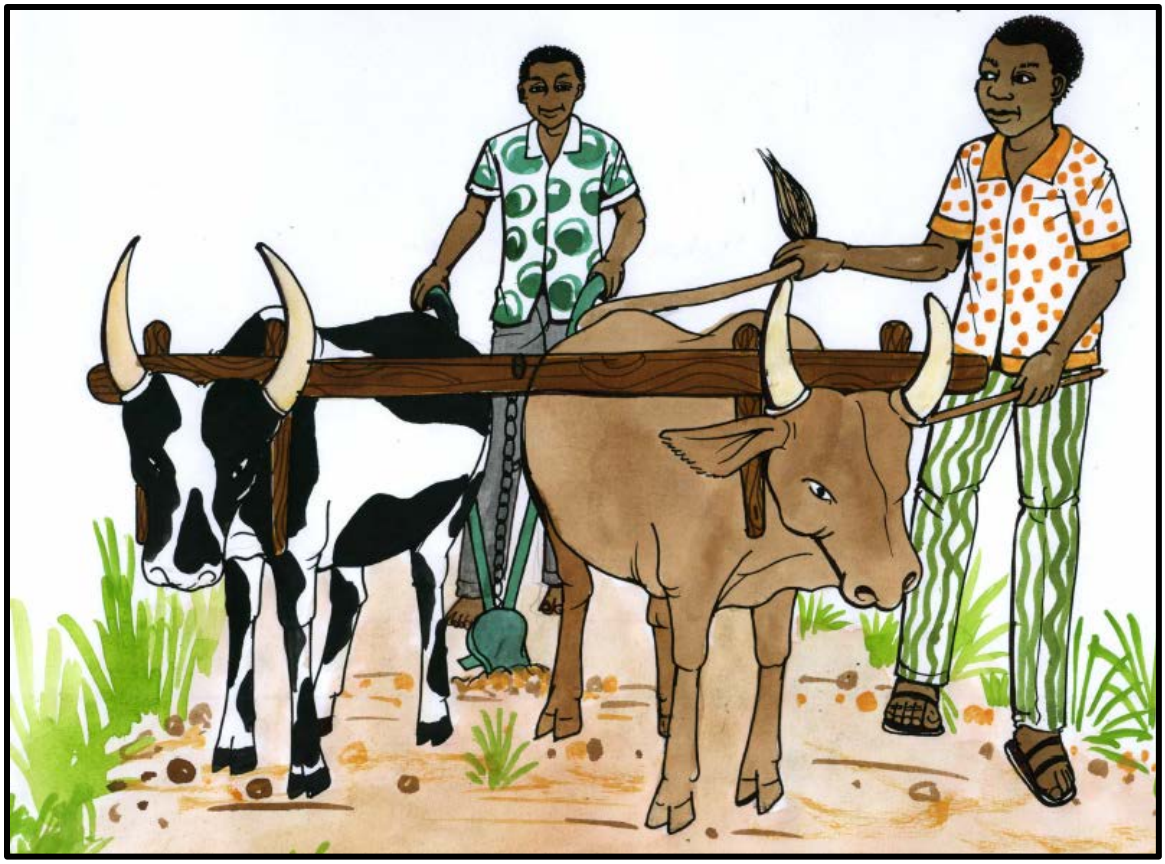
This is the first step undertaken by the trainer. It is also referred to as the familiarization step. During this step, the trainer puts the rope at the base of the horns. Experience has proven that the base of the horns is more convenient in controlling the animal than the neck. The trainer assumes full control of the animal when he/she manages to put the rope at the base of the horns and then allows it to walk or stop as he/she speaks. The animal at that particular moment is usually nervous and excited due to the harness and isolation from the rest of the herd. This step takes five days depending on the ability of the trainer.

2. Harnessing (Yoking) and Walking

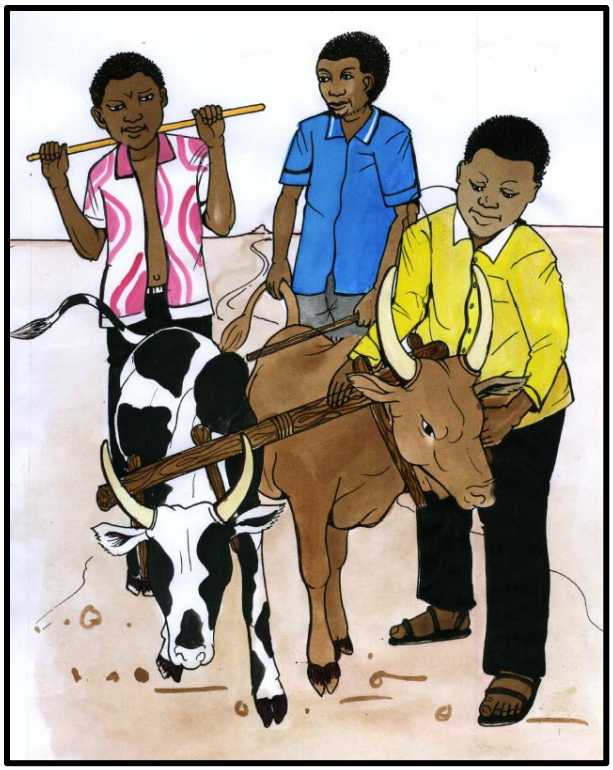
During this step, the trainer joins two animals of approximately equal size and strength with a yoke. The animals are still nervous at this stage due to harnessing and isolation from the rest of the herd. The trainer walks and controls the animal through use of commands such as walk, stop turn right/left, etc. This portion of the training takes approximately five days to complete.

Harnessing



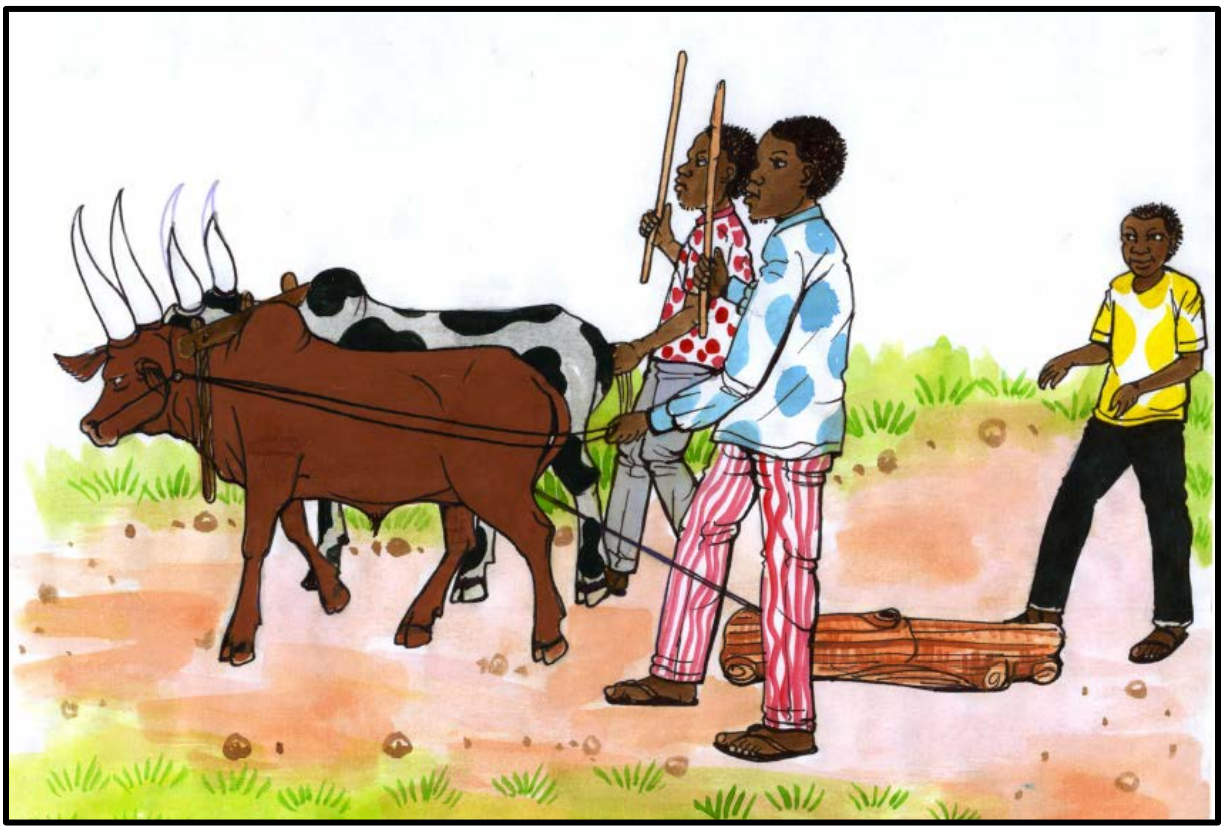


Pair of oxen joined with yoke



3. Pulling (dragging) the Load

The trainer at this stage has full control of the oxen. Pulling the load helps the animal to develop their muscles and energy/endurance. They are made initially to pull a load of between 25-30 kgs for a period of two hours at normal speed with short breaks of about 15 minutes. The weight eventually should be increased to between 40-50 kgs. The trainer continues commanding the animal to follow the instructions of go and stop, passing through the line furrows, for the duration of one week. The oxen are made to move in a straight line. This enables them to move straight once they start pulling the plow.



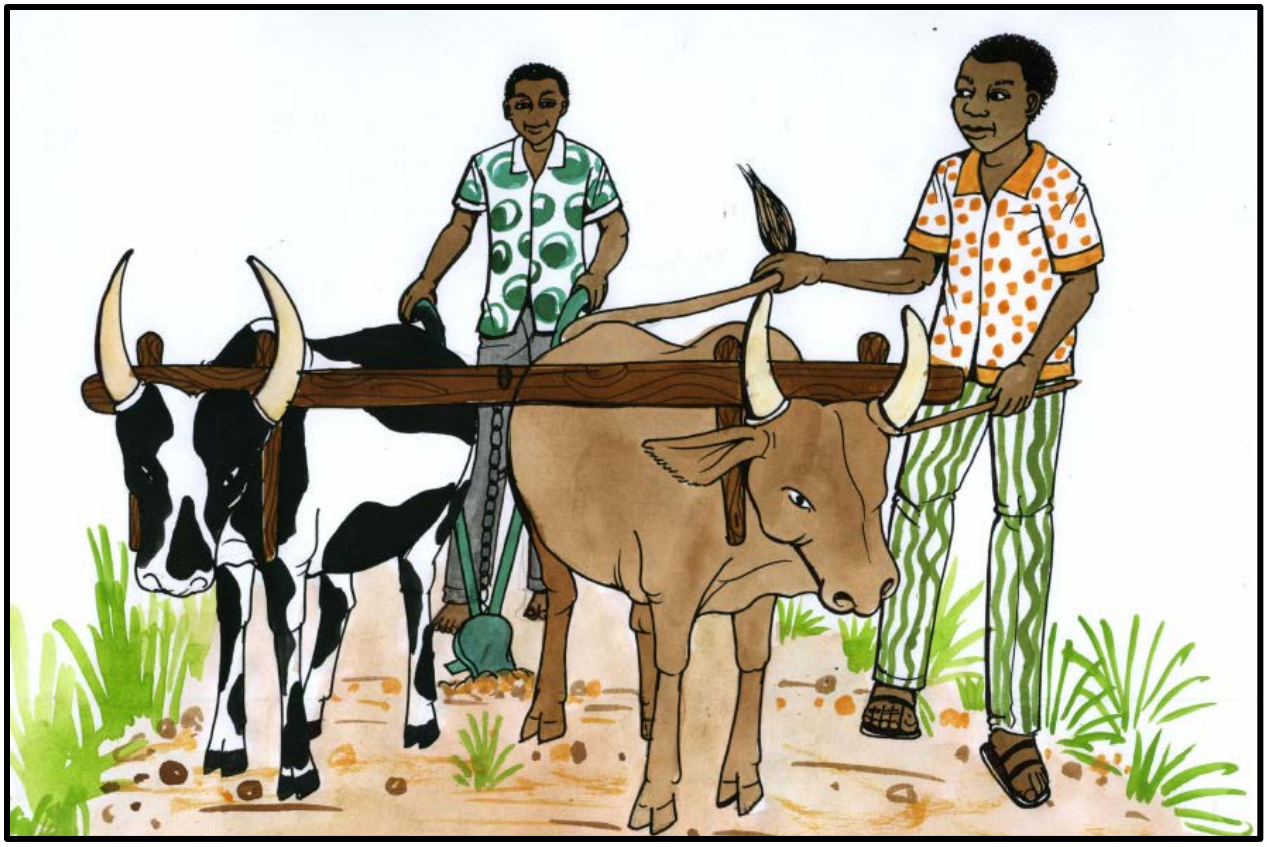
Pairs of oxen joined together and pulling or dragging loads

4. Pulling the Implement

During this last stage, the oxen are made to pull the actual field-operation implement. This task is fully accomplished when a harnessed pair can pull implements such as plows, harrows, cultivators, weeders, or ox-carts by obeying the language commands of the trainer accurately according to the task at hand. This step takes two weeks duration. Re-training or rehearsing may be necessary if the oxen have not done any animal traction work for weeks or months after the first training.

It should be noted from the above steps that in order to conduct an exhaustive training, duration of **one month** is the most ideal.

Oxen pulling plows



MANAGEMENT AND CARE OF ANIMALS

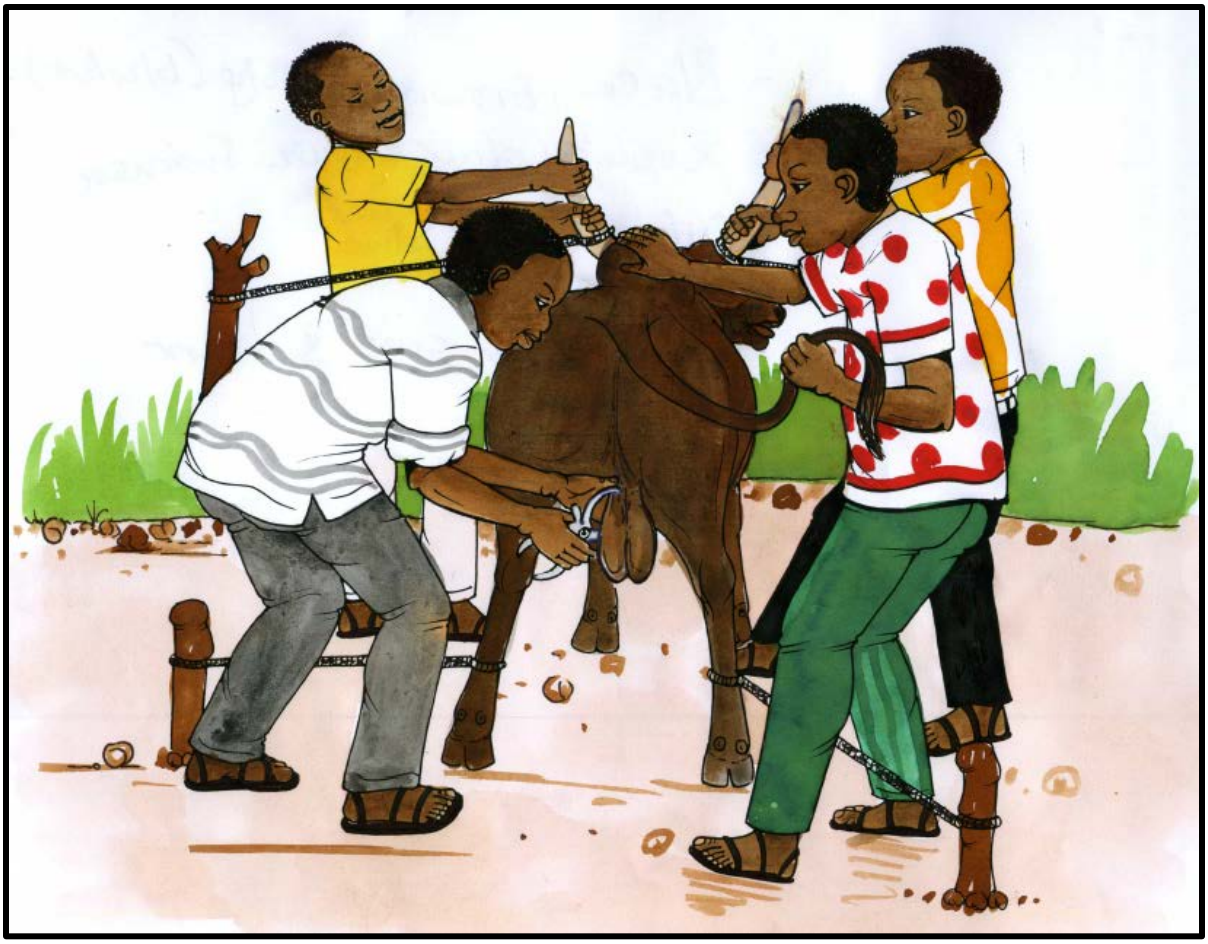
Animals used for traction should be well managed and cared for, as they perform vital tasks to the owner. Healthy and well treated animals give better output than those in poor health or condition. Normally, animals used for traction are enduring strenuous physical exertions when plowing commences, which can impact their health and condition. Management and care of the animals/oxen includes:

Castration

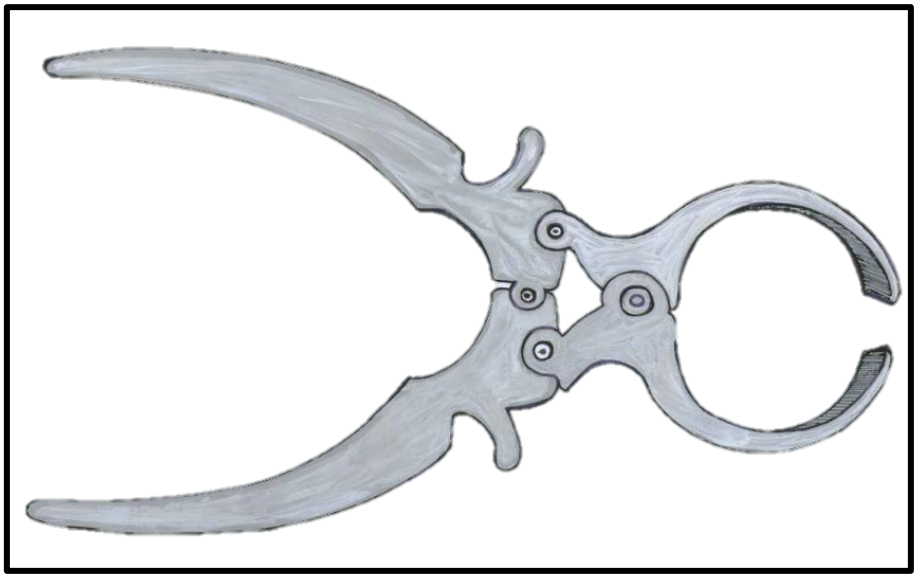
Oxen should be submissive for easy handling. Oxen are usually aggressive; therefore, in order to achieve submission, castration is of paramount importance. It also makes the bull gain considerable weight and improves body quality. When castrating an animal for traction, it is very important to take note of the following:

1. Prepare castration tools such as Burdizzo, rope for restraining the animal and healing oil.
2. Restrain the animal before starting castration. This requires at least four able men.
3. When castrating, first pull the testes of the animal, identify the sperm duct and crash the two ducts, one after the other, using the Burdizzo.
4. Apply healing oil to the wounds created by the Burdizzo.
5. Castration should be done after farmers have completed cultivation, preferably in the month of November. Alternatively, castration should be done at least a month prior to training the animal.

Castration method



Burdizzo



Nutrition

Oxen should be kept in a fit, but not fat, condition. Their most demanding workload often occurs when rains break at the end of the dry season, when grazing land and feed is in short supply. If there is no feed available during cultivation, the animal's body condition deteriorates. The owner is therefore expected to collect and store residues of sorghum, groundnuts, maize or grass for feeding the animal during the cultivation period.

Supplementary feeding could also be availed by planting fodder trees like leucaenea or other multipurpose trees. Grass should be cut while wet, dried and stored for feeding during plowing time. If possible, mineral supplements should also be provided. Animals should be fed early in the morning before working. More food should be available after working to compensate animals for their lost energy.

Animals used for traction should be provided with clean drinking water and a small quantity (half handful) of normal salt every day before being released for grazing.

Dipping/Spraying

This is a very important activity in animal management and care. It aims at preventing tick-borne diseases like anaplasmosis, heart water or red water. Dipping or spraying, depending on which method the farmer uses, should be done once per week. Pygrease should be applied where the above services are not available (or any other local preventative methods.)

Animal Health

Health of the animal plays a vital role in its performance. Therefore animal health care should be observed. It includes vaccinations against major diseases like ***rinderpest, foot and mouth, lumpy skin, anthrax and black quarter diseases***. This however depends on the disease prevalent in a given locality.

In areas with prevalence of tsetse fly, drugs like Novidium, Berenil or any other trypanosomal drugs are essential. Once animals show symptoms of sickness, the farmer should urgently report to the community animal health worker or any other veterinary personnel. Drenching should be done three times per year to kill endo-parasites.

Good treatment of animals used for traction includes:

1. Animals should be injected with antibiotics after every three months.
2. De-worming should be carried out after every three months.
3. The animal should not mix with other animals to avoid disease transmission.

THE OX PLOW

Among all the tools farmers possess, the plow is one of the most important, because with only a few replacement parts, the farmer can reuse the plow again season after season. Replaceable parts include the shear, landslide, and to a lesser extent the wheel and wheel arms. Below are some functions of essential plow parts.

The Beam

This is a strong metal beam curved at one end. It is the prime part, with nearly all other plow parts joined to it.

Spreader Bars

They are two metal bars attached to each arm and joined together to the beam. They control the arms from slipping up or downwards.

Cross Bars

These are usually two or three metal bars joining the arms at particular points. They hold both arms firmly.

Arms

They are two strong and long metal bars. The farmer holds them while plowing. They are joined together at the curved end of the beam.

Plow Share

It is a strong piece of metal blade. It penetrates and then undercuts the soil horizontally during the plowing operation. It wears down fast because it is always in contact with the soil during plowing operations. It should therefore be replaced regularly.

Landslide

It is a strong piece of metal made of steel and of about 2 inches in width. It runs against the furrow wall. As it pushes against the furrow, it resists the side thrust of the plow. It thus helps to stabilize the plow from moving sideways when plowing.

Wheel and Wheel Arms

The wheel and the wheel arms control the depth of tillage of the plow. For deeper tillage, the wheel is raised. For shallow tillage, the opposite is done.

U-Bolt

It is a D-shaped metal rod joined to another piece of metal and nuts. It holds the wheel arms firmly to the beam.

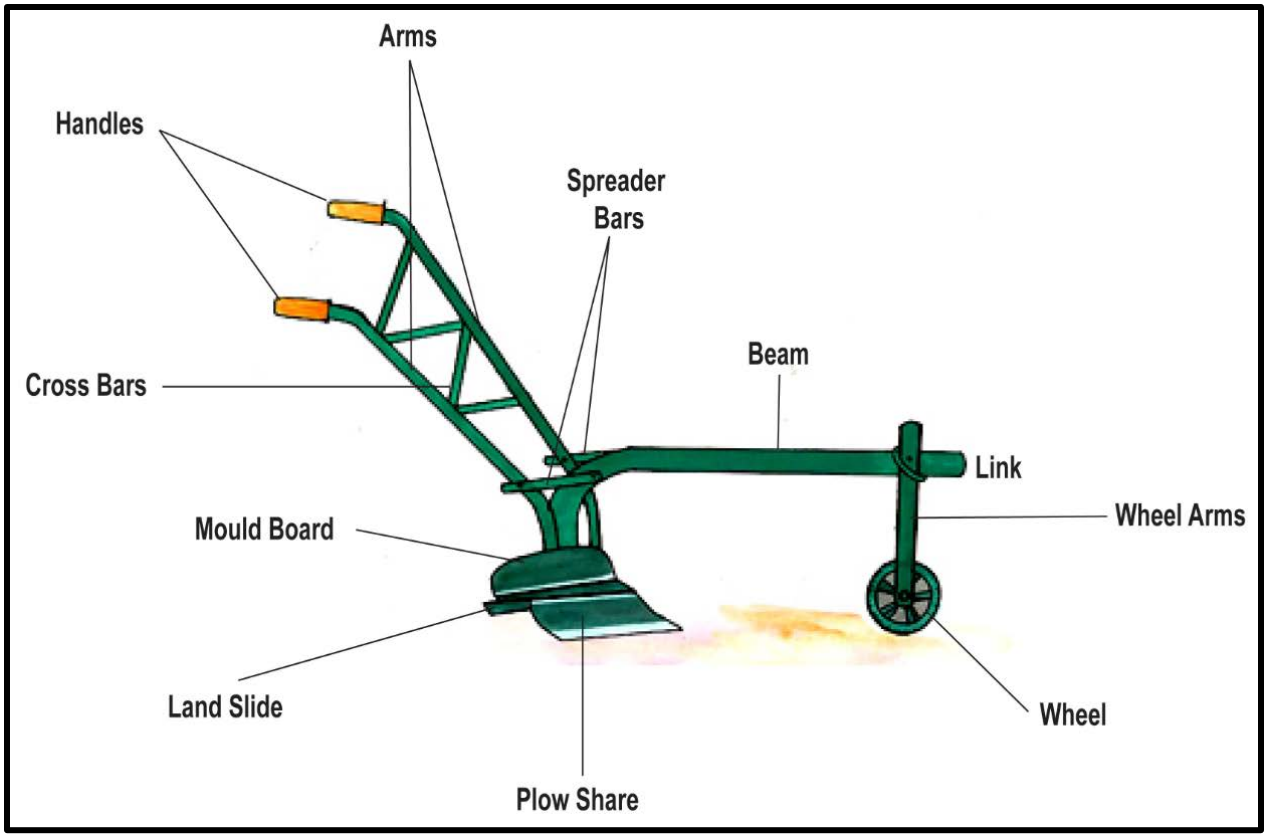
Mould Board

It is slightly curved piece of metal sheet. It overturns the soil cut by the shear and fills the furrows to cover the seeds.

Link

It is metal ring that is fixed at the end of the beam from where the chain is joined to the plow.

An Assembled Ox-Plow



PLOWING TECHNIQUES

Plowing on Time

Plowing should be done just before or after the onset of rains. Delay in planting affects other things like maturing time and yield. It should also be done when it is not too dry or too wet in order to avoid soil compaction. Planting early also benefits the farmer as crops will mature earlier and fetches higher prices before the market is flooded with similar commodities. Early planting also enables the crops to fully utilize the available moisture to maximum. Early crops will also become established faster than weeds. At times, crops planted early escape both pests and insect attack.

Depth of Plowing

A typical plow is capable of digging to a depth of 8 inches or more depending on type of soil. Deep tillage enables the roots to penetrate the soil deeper without much obstruction. However, a depth of between 5-8 inches is advisable for most field crops. It also enables seeds to obtain enough moisture for germination. Depth of plowing depends on moisture content, size of the seeds and spacing.

PLANTING METHODS

Broadcasting Method

Advantages

a. It is quick and saves labor.
b. It is good for small seeds.
c. If established, it can provide good ground cover.

Disadvantages

a. More seeds are used in covering a given area plot.
b. Seeds germinate unevenly.
c. Not easy to mechanize during wedding.

Row planting

Advantages

a. Uniform spacing.
b. Controlled, uniform depth of seed placement.
c. It facilitates the use of machinery like plow or tractor.
d. It controls soil erosion especially over contour farming.

Disadvantages

a. Row planting can be tedious and time consuming.
b. It can lead to low crop yield if farmers fail to use correct spacing.
c. It can lead to under-utilization of soil nutrients.

Width of Cultivation

A standard ox-plow cuts a width of 1 foot. This is achieved when the plow is held perpendicular during plowing. It cuts less area when it is tilted during cultivation. The farmer should try if possible to maintain the plow in an upright position during plowing activities. Row-to-row distances are determined by the type of crop being planted. For maize, the farmer should skip two unplanted rows, and one for sorghum.

Width of Tillage

Spacing

The main objective of spacing properly when planting seeds is to obtain maximum plant population per plot, in order to maximum use of the land without jeopardizing quality. Planting at low optimum population may produce higher quality crops. Planting to the maximum population enables the farmer to get more quantity and less quality. Soil fertility also determines spacing. Low-fertility soils cannot accommodate the same high volume of crops as fertile soils. The intended purpose of crops grown also determines spacing. For example, maize or sorghum to be harvested for fodder can be planted closer together than crops intended for human consumption.

Ox-Plow Weeding

Weeds are harmful to most field crops. They compete with crops for scarce resources like water, nutrients and light. Failure to weed at the appropriate period could result in reduced yields or even complete crop failure. Ox-plowing weeding is the top-most technique applied in ox-plow cultivation technology. Few farming communities have attained this technology. To practice this operation the crops must be planted in rows in order to allow oxen and the plow enough room to pass without damaging crops. Good control is necessary to reduce damage. Often, muzzle nets are used to prevent oxen from nibbling on crops and getting distracted. After weeding with the ox-plow, there are some weeds that remain in hiding between the crops. The farmer should therefore follow up later, using hand tools (e.g. hoe/toria, maloda or machete) to remove weeds. Ox-plow weeding has many advantages as compared to weeding by hand. First, it loosens soil particles, allowing crop roots to penetrate deep into the soil with ease. In addition, furrows cut by the plow during weeding acts as barriers for water, thereby reducing soil erosion. The soils placed at the base of crops by the plow can make the plants stronger.

Also, ox-plow weeding increases water retention between furrows, preserving moisture. At the end of planting or weeding, the farmer should clean the plow, apply grease or oil on all the bolts and nuts, and keep/store in a dry place.

PLOW MAINTENANCE

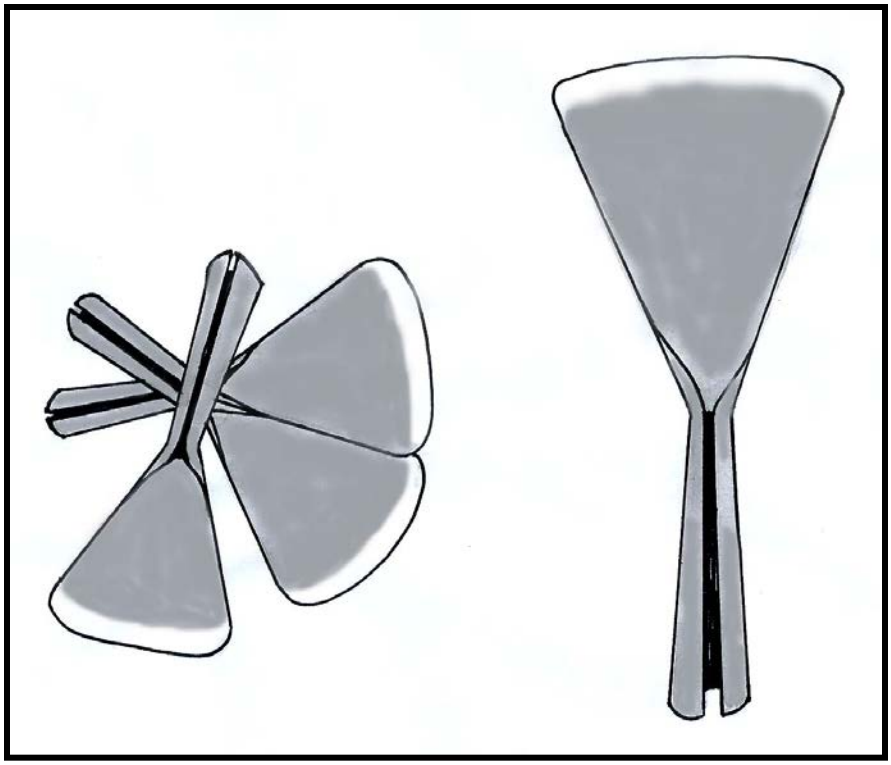
1. Before the beginning of any ox-plow operations, the farmer should ensure that all nuts and bolts are well fixed. The idea is to minimize the chances of losing them during the operation;

2. Worn out parts like shares or landslides should be replaced;

3. Before storing the plow at the end of cultivation season, the plow must be cleaned to avoid rusting;

4. All movable parts (e.g. nuts, bolts and wheels) must be greased to avoid rusting. The plow should then be kept or stored in a dry place. Many farmers play little heed to proper storage of their equipment; however, poor storage minimizes the life span of the plow;

5. Plow parts can be fabricated by local artisans/blacksmith. Farmers should look for the nearest blacksmith business to procure parts that wear out frequently. As noted in the foreword, the BRIDGE program supports groups of blacksmiths who now have technical skills on fabrication of plow spare parts and tools in Wau, Western Bahr el Ghazal State and Tonj North County, Warrap State. Also within the three counties where BRIDGE program is working, government extension workers and trained farmers who benefited from ox-plow trainings now have basic knowledge and skills in repairing/replacing worn out plow parts. Farmers are encouraged to share information and seek technical assistance from farmers who are experienced in the use of ox-plows.



Local blacksmiths fabricate farm implements and ox-plow spare parts