SOIL PREPARATION EQUIPMENT'S

معدات تحضير التربة

يحيى يونس محسن

***A* tractor** is a a powerful motor-driven vehicle with large, heavy treads, used for pulling farm machinery, other vehicles, etc.

Motocultor · Two-wheel tractor

Lecture 1

Soil Preparation

The advantage of soil preparations

1- Killing the weeds in the seedbed,

2- turning the residue of previous crops

3- allowing the soil to hold moisture better.

4- Creating ventilation for soil

5- Improving the drainage of water,

6- Mixing the residue of crops with soil to supply good nutrient to the plant

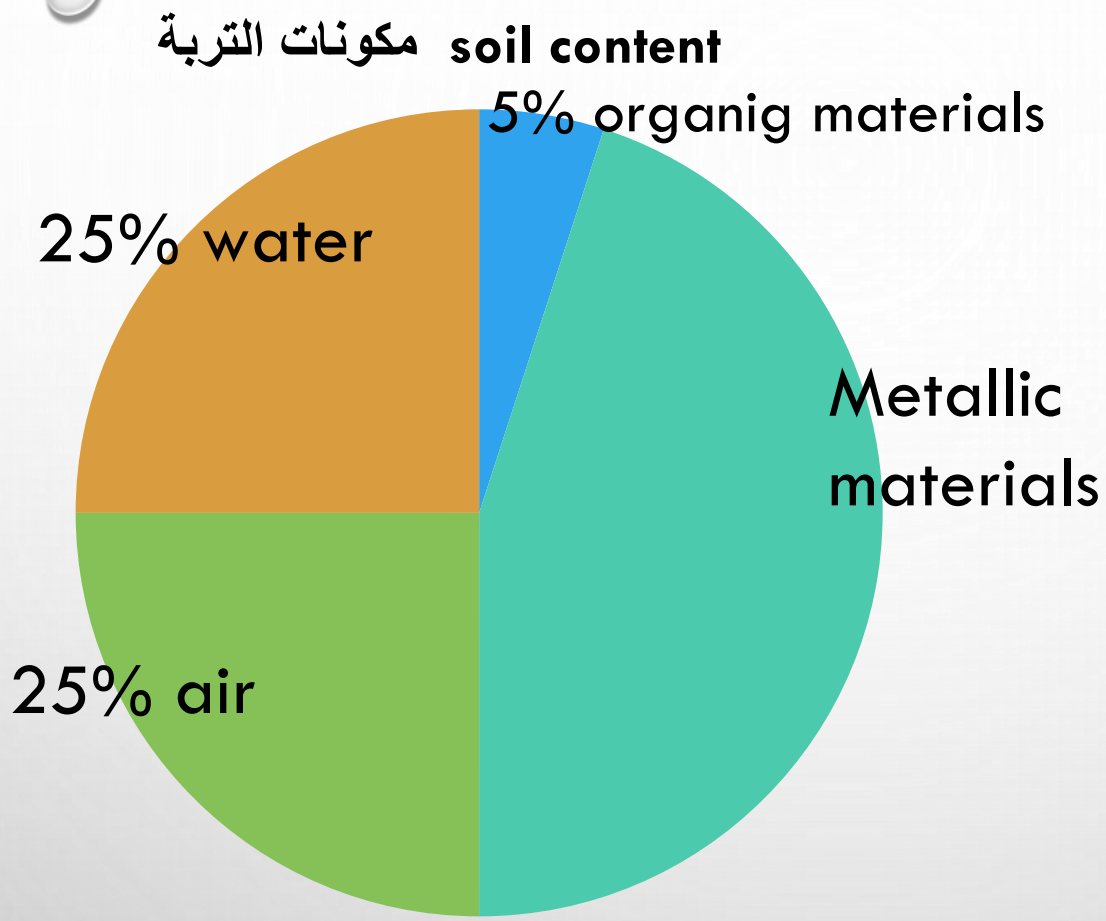
7- Improves the physical properties of soil, especially in Hardpan soil which is found below the uppermost topsoil layer.

8- Plowing changes the formed compaction by repeated plowing, particularly with moldboard plows.

Soil: is fragile or fragmented surface layer that convers the surface of the earth.

Soil in general contain: 1- 45% metallic materials, 2- 5% organic materials, 3- 25% water, 4- 25% air (as in Figure 1)

Water: is a transparent liquid chemical compound composed of two hydrogen atmos and an oxygen atmo, H2O .water occupies (71) % of the earth's area.



The function of the soil: 1- save water, 2- Install the roots of plants

Types of soil: 1- sand, 2- clay, 3- silt

Equipments Used for Soil Preparation

There are at least three main types of equipment's used for preparation of soil

1-plowing equipment's (primary tillage): such as (mould board plow, Disc plow, Rotary plow, Chisel plow)

The plow (British spelling plough) is a tool used in farming for initial cultivation of soil in preparation for sowing seed or planting. Plow turns the soil over and buries all the residue; it is used as primary tillage and deep plowing,

Such as moldboard plow, disc plow, vertical disc plow, chisel plow, rotary plow and Sub soil plow

2- Tillage equipment's (secondary tillage equipment's)

A tiller uses rotating tines to break up the soil and mix in residue, and usually works to a medium depth, and leaves a fine smooth finish, they consider as secondary tillage

Such as (Disc harrows , spike tooth harrows , spring Tooth harrows , picker equipment)

الأمشاط المسننة , ألأمشاط القرصية ,

المهاريس,ألأمشاط المسننة المرنة

3- special equipment's

They are used to finish the work of preparation of soil or other uses

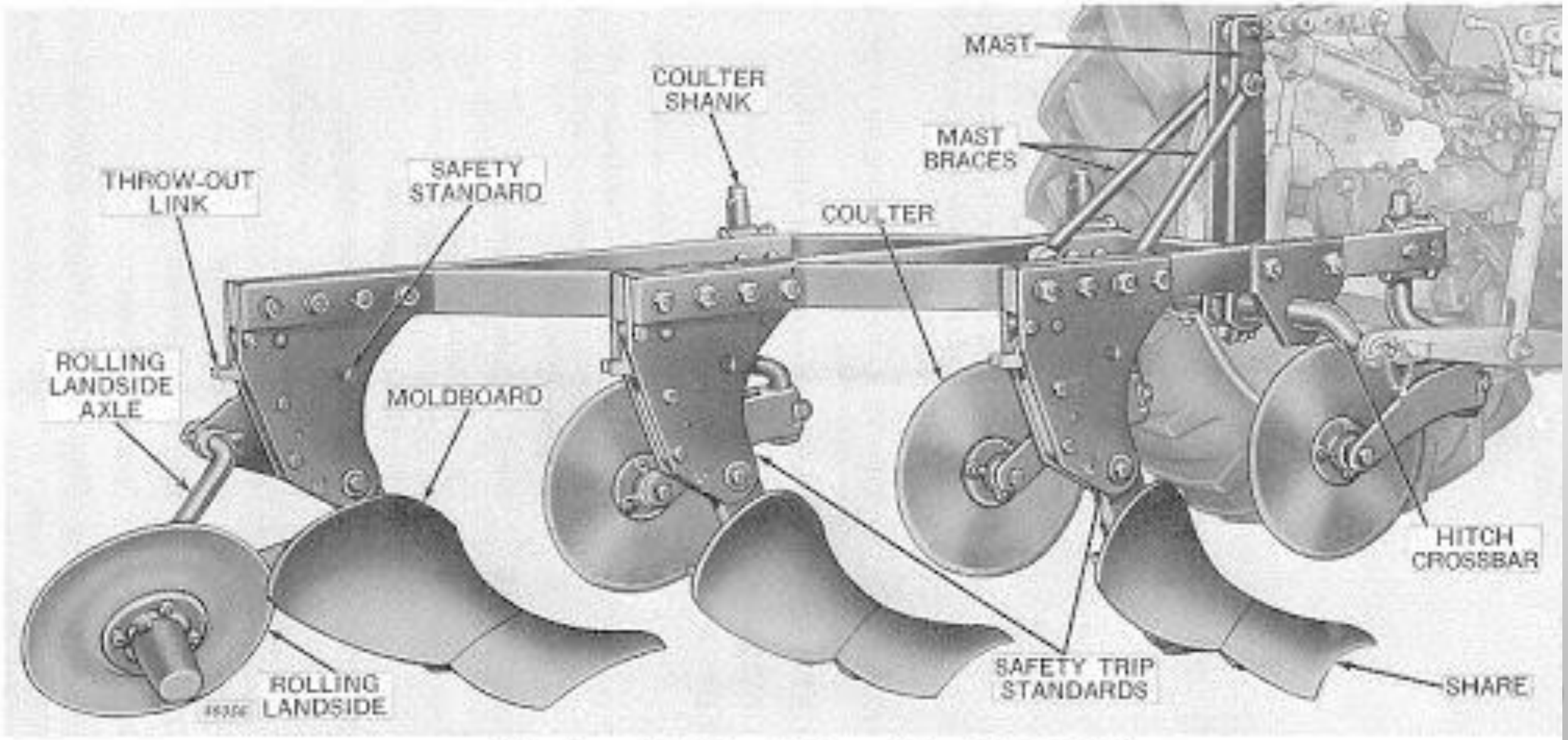
Such as (ditcher equipment , ridge equipment , Disc –bidder ridge , land plane)

١- فاتحة السواقي ٢- المرازة

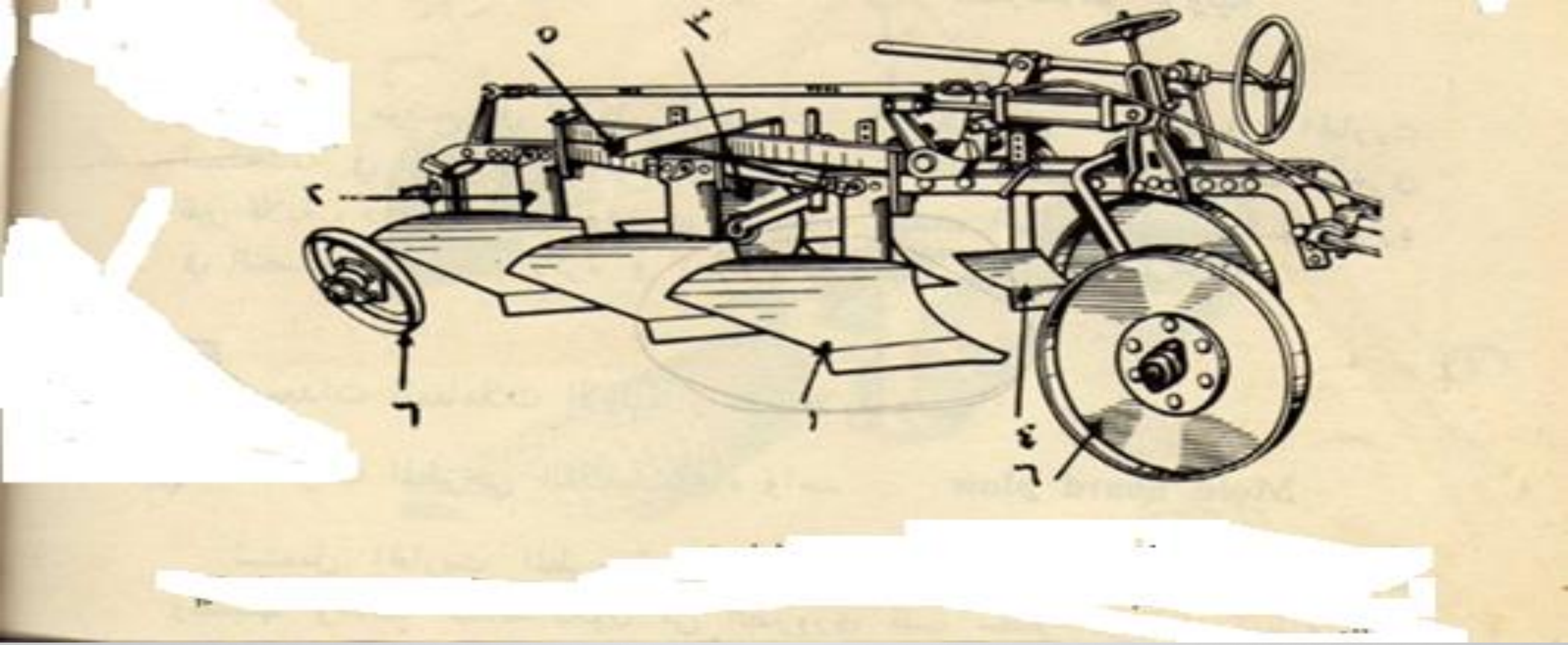
٣- التبان ٤- آلة تسوية

1-plowing equipment's (primary tillage)

1- Moldboard plow

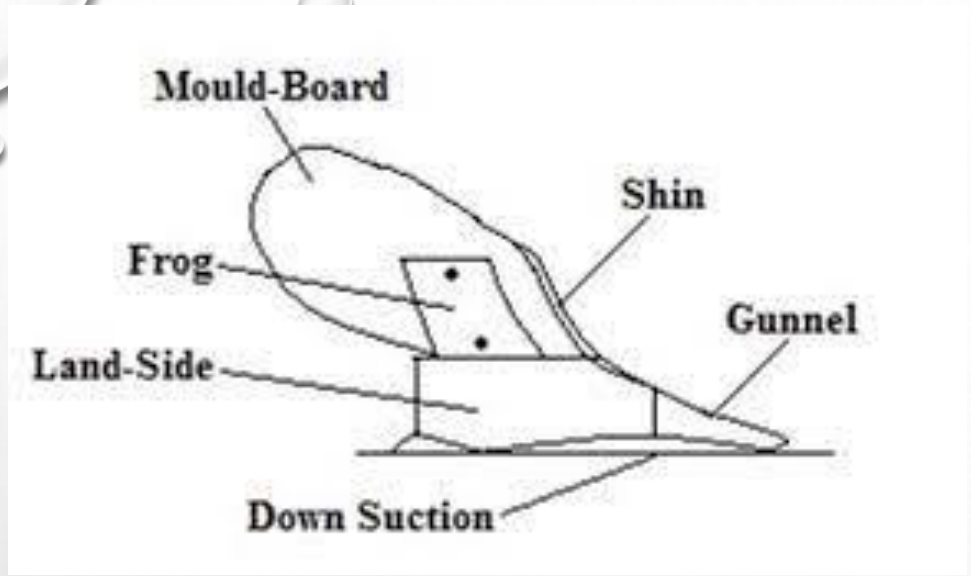


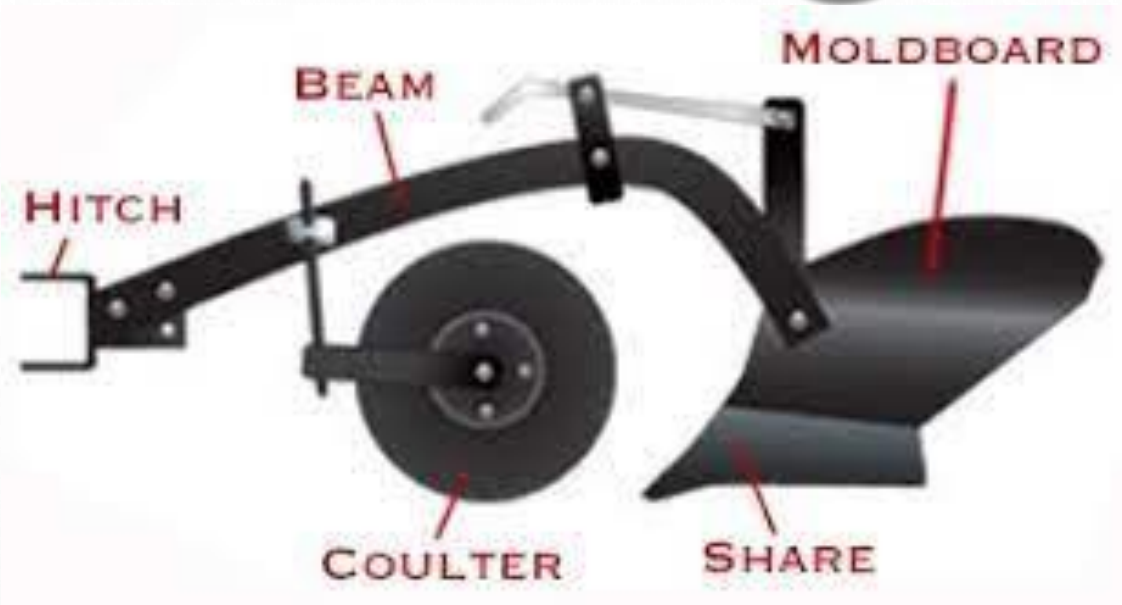
John Deere 416 Three-Bottom Integral Tractor Plow

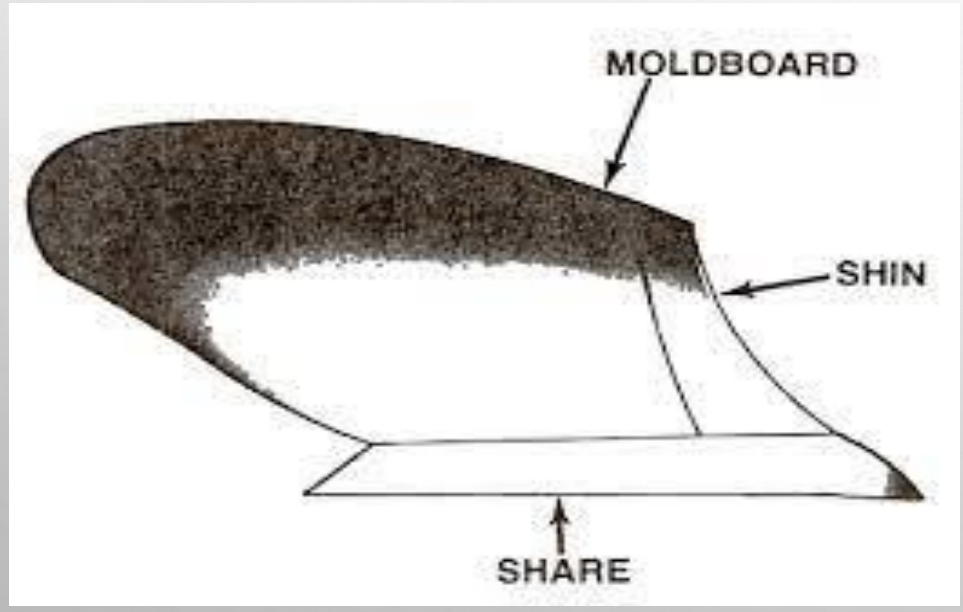


moldboard plow

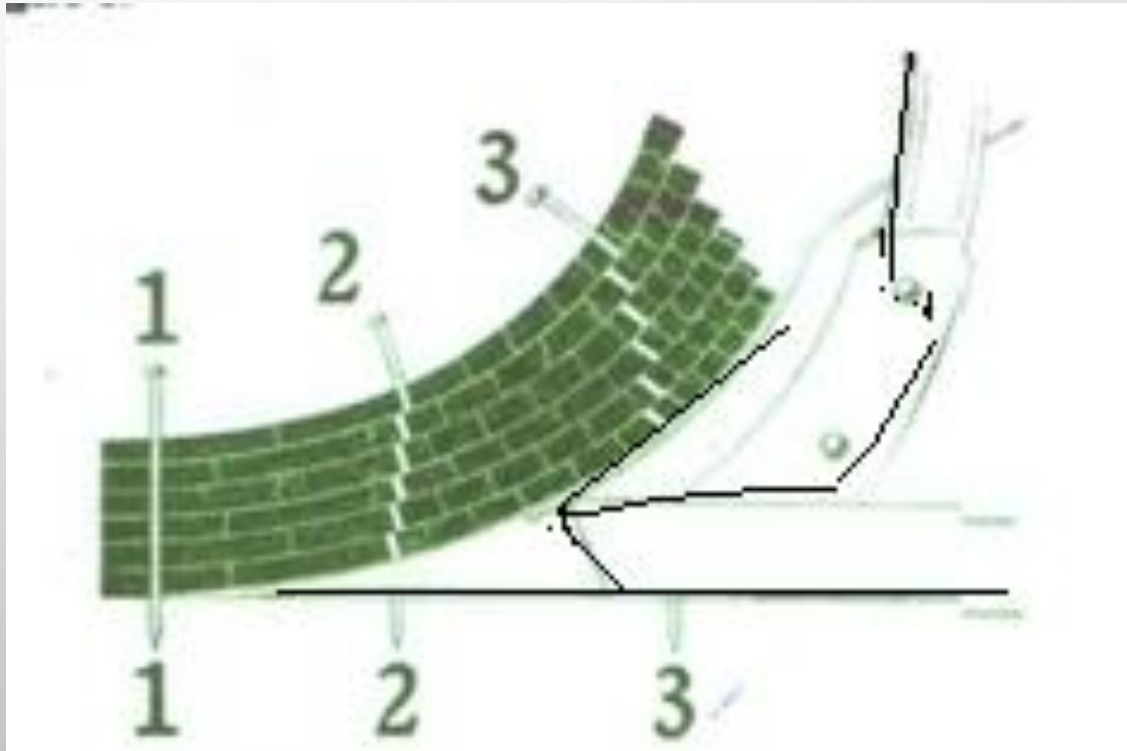
As shown in Figure (4) Parts of moldboard plow are: 1- moldboard (bottom) 2- Shine (beam) 3- coulter (knife) 4-scraper 5- frame 6-wheel adjustment

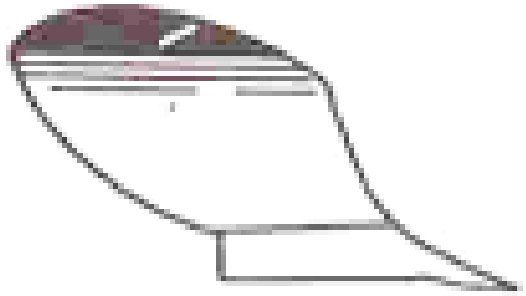




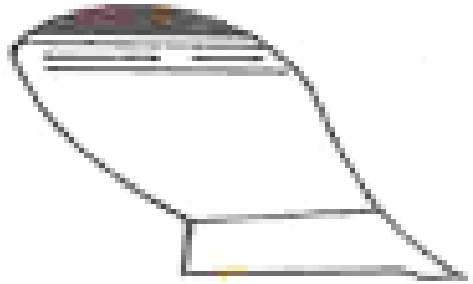


parts of moldboard plow

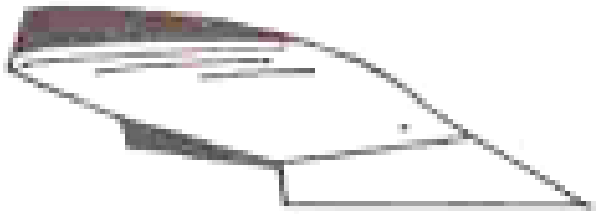




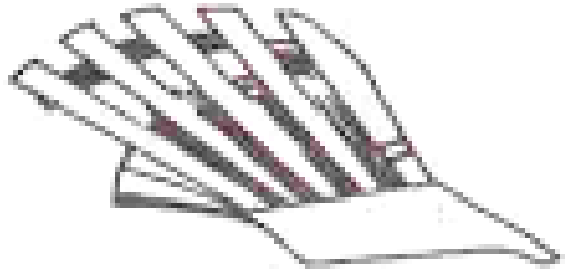
GENERAL PURPOSE MOULD BOARD



STUBBLE MOULDBOARD

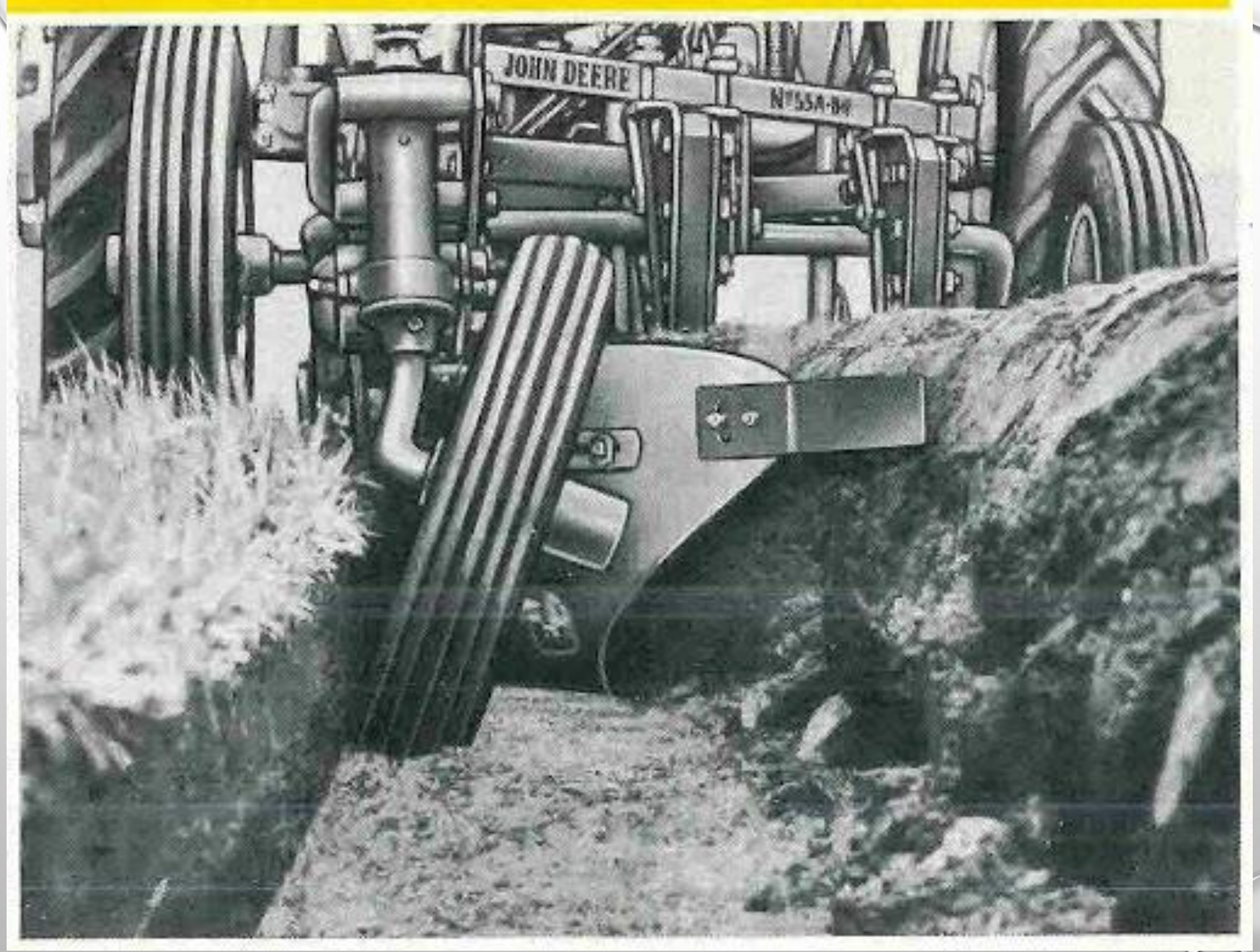


SOD OR BREAKER MOULD BOARD



SLAT MOULDBOARD

types parts of moldboard plow


JOHN DEERE

how does moldboard plow work ?

The working actions of the moldboard plow in soil are in three positions

1- it slice the soil (separate the soil slice from the origin soil) by the nose (point) of share

2 rise - Furrow slices toward moldboard by share action and soil clods are broken and are pulverized by the shearing stress

3- Continuous lifting of soil to moldboard concave increase the bending of soil and more pulverized to soil and turn most of soil by moldboard

The advantages of Moldboard plow

1 -it turns over the upper layer of the soil, bringing fresh nutrients to the surface,

2- Burying weeds' remains of previous crops,

3- Aerates the soil,

4- Allows the soil to hold moisture,

5- It can flip a furrow slices 180 degrees,

6- Provide a clean seedbed for better germination of small –seeded crops

The disadvantages of Moldboard plow

1- Increase the rate of soil erosion

2- Leaves large clods

3- no tillage or zero tillage , minimum tillage , reduce the use of moldboard plow in the world

4- Moldboard plowing rapidly depleting soil resources with a long time use.

In general there are mounted, semi mounted and trailing moldboard plow,

there are , 2- 6 bottom of moldboard ,there are different shape of bottom like brush , universal, deep plowing , general bottom , they depend on the concave of the bottom


SALFORD


N385ERF


MASSEY FERGUSON 285 S


JOHN DEERE

Disc plow

Disk plow: ***It is implements use concave steel disk blades, it works with land that moldboard plow cannot work with it,***

CASE D70 Heavy-Duty Disk Plow

Plow up to 14 inches deep in hard, tough soils

Properties of Disc plow

1- The disc plows work by the rolling of disk blades bottom instead of a bottom of moldboard that would slide along the furrow,

2- It works in hardpan soil , hard ground , rough , stony , ground with roots , and deep plowing lands

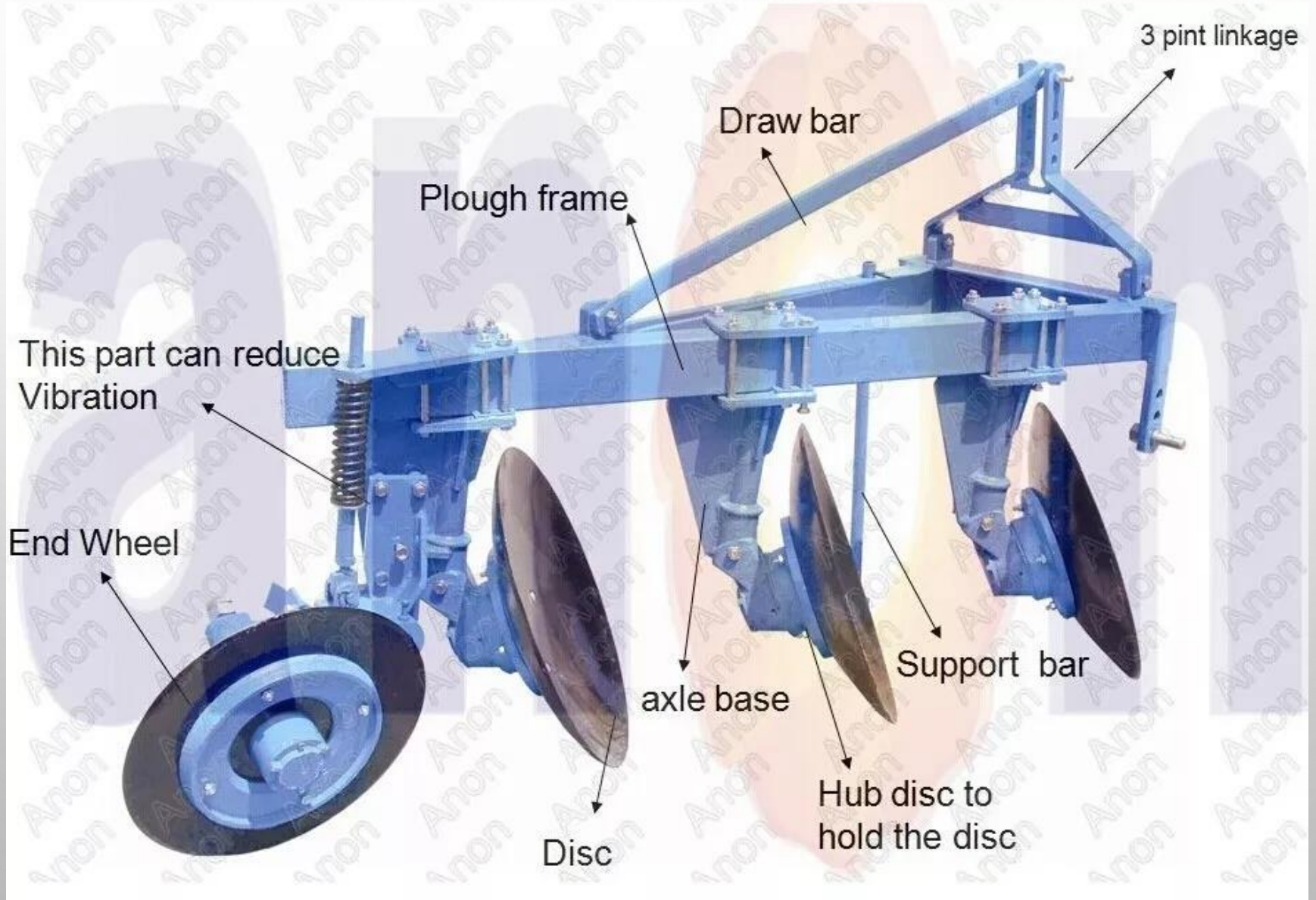
3- Disc plow does not bury the soil, it can turn the soil left or right

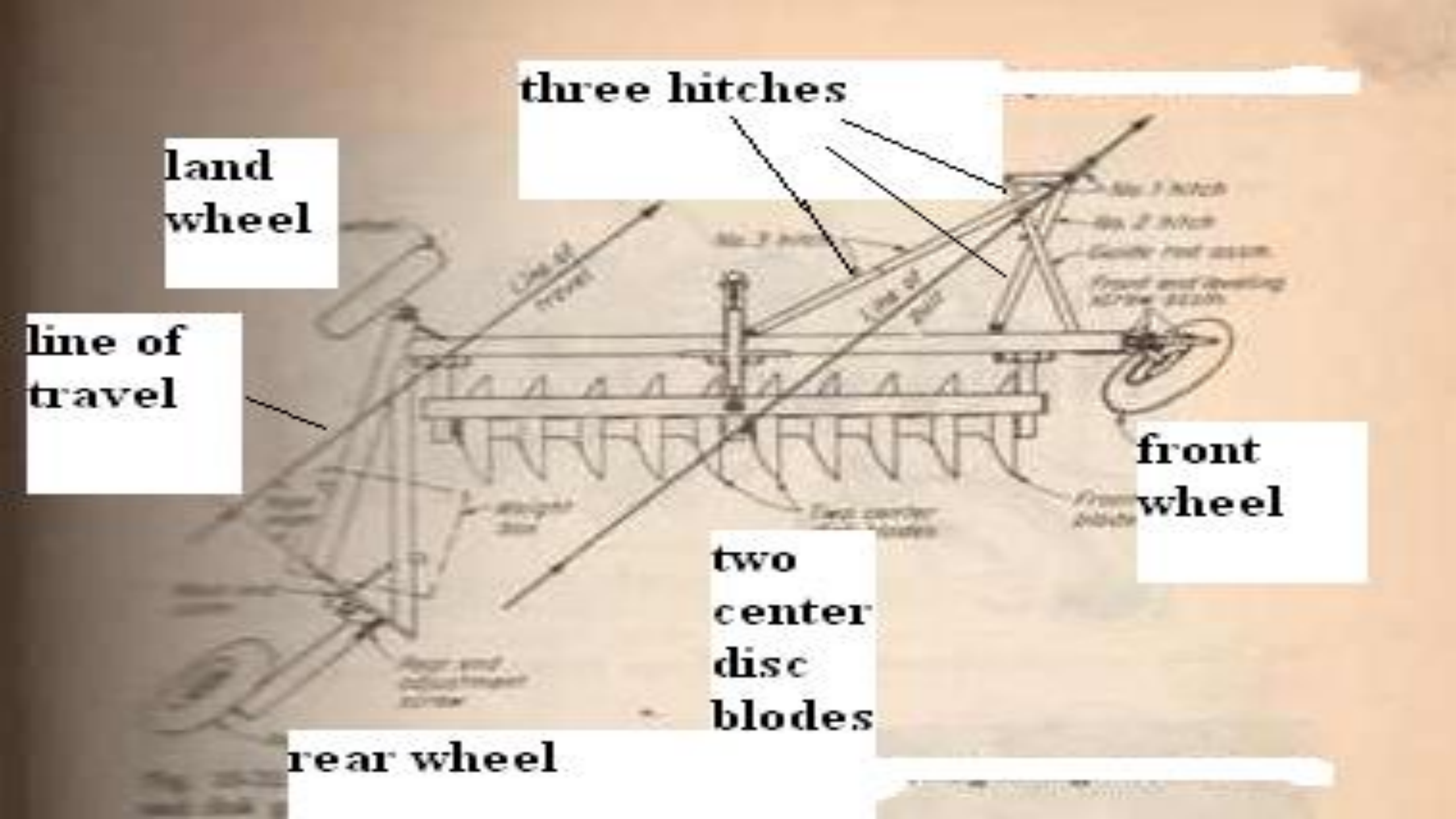
4- Diameters of most disks between 60-66cm

5- Stander working depth 1/3-2/5 of disc diameter and 1/3 of working width

Parts of disc plow

show the main parts of disc plow




three hitches
land wheel
line of travel
front wheel
two center disc blodes
rear wheel


yourchance.en.made-in-china.com


旋耕刀犁铲圆盘耙
江苏建湖县富捷旋耕刀厂
www.eb80.com

The advantages of using local disc plow which have been manufactured by Iraqi factories

1- It achieves the following: plowing, seeding, fertilizing, and covering the seed in the same time

2- The cost of the labor is less

3- The time for plowing and planting is less

4- The price is less than the import machines

5- Uses big discs, 40-60 cm diameter with vertical direction causes more pulverization for soil

6- Iraqi researches explained the efficiency of this type of plow in Iraqi conditions especially in semi-arid region in north of Iraq

The disadvantages of using local disc plow which Have been manufactured by Iraqi factories

1- These types don't contain feeding tubes that arrives the seeds to the ground in lines,

2- Don't have the ability to plant the seeds in lines

3- Not suitable for all seeds

4-It is difficult to adjustments the seed rate per donum

Wheels used with trailing disc plow

Most plows specially trailing types contain one or more of wheels (1-3) as follows

1- <u>Front furrow wheel</u>: is located at the end of the front of plow frame, which is used for guiding and turning the plow, and proper position when plowing

2- <u>Rear furrow wheel</u>: is located at the end of frame, which is used to swivel on left-hand

turns but limited movement on right ,and proper position when plowing

3- Land wheel: it holds and lifts part of the plow

the wheels can equipped with rubber tires ,levers and screw crank provide adjusting for depth and for leveling

Design of disk plow

The disc plow bottom should be

1- Perfectly round

2- concave disc of heat-hardened steel

3-sharpened on the edgeto aid in the penetration of the soil ,

4-the size of disc plow bottom 20-3-inch

5-the thickness of the steel 3/16- 3/8inch

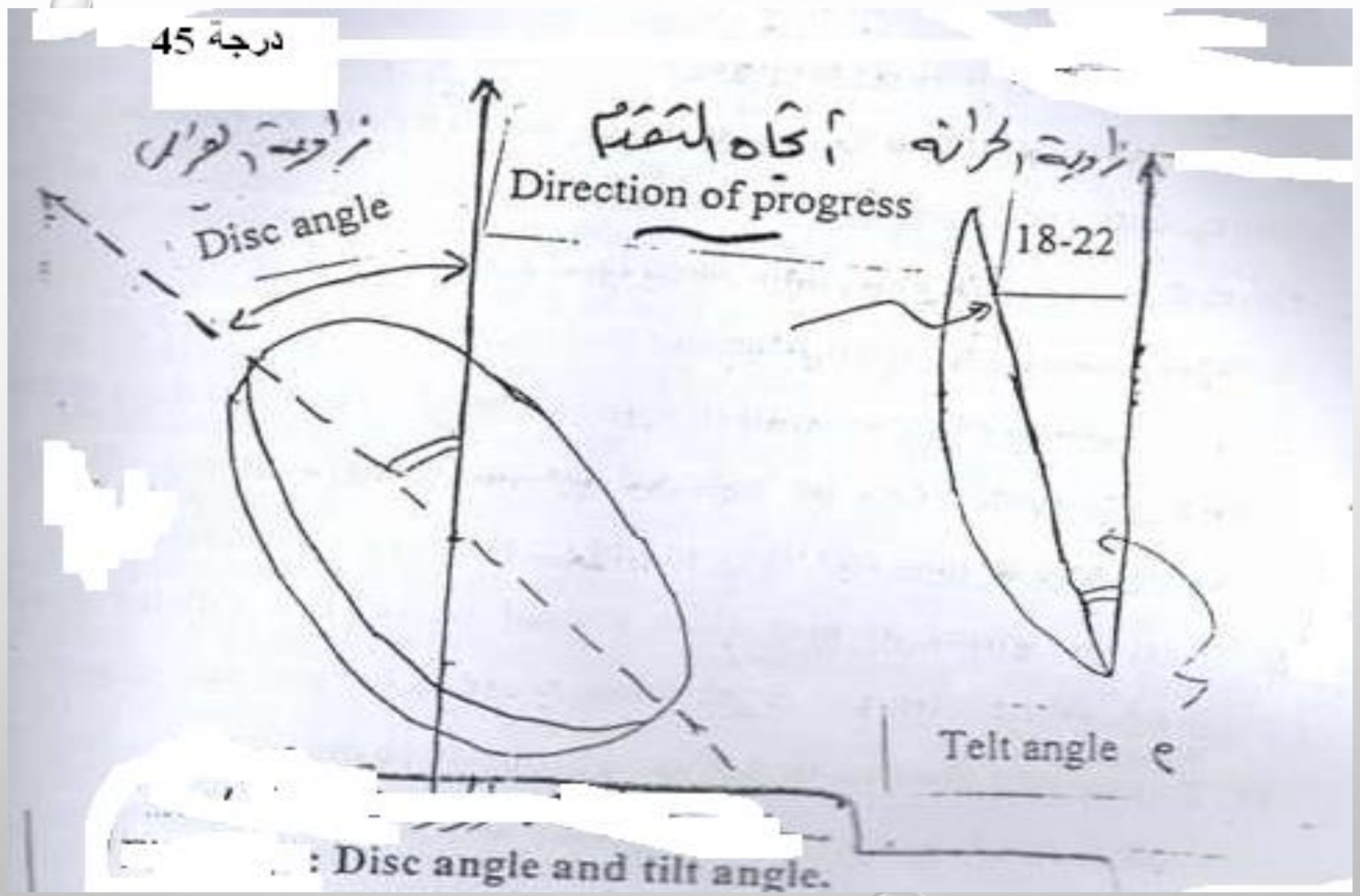


Figure 14 angles of disc plow (Disc angle and telt angle)

Vertical disc plow

As shown in Figure 12 , there are many Vertical disc plows may be mounted or trailing, it is use in semi arid region , it has the following characteristics'

1- Big width work (8-35 discs) 2- discs diameter 50-60 cm 3- depth of plow 15-20cm

4- Discs around by shaft as one unite 5- tilt angle zero 6-disc angle 35-55

Factors affected on the plowing of disc plow

1- Weight of plow *2- sharpness of discs* *3- working speed*

4- size of discs, *5- The concavity of disc*

Lecture -5-

The characteristics of best soil plowing

1- The top of furrow may be slightly ridged

2- The soil must be pulverized thoroughly from the top to the bottom of the furrow

3- Each furrow must be perfectly straight from end to end on level land

4- All back furrows must be slightly raised, and all trash completely

5- The outline of the furrows must be in a point without break or depression.

6- All trash must be buried completely in the lower right-hand corner

7-Furrow must be thoroughly uniform

8- The depth of all the furrow must be the same, continuing in uniform depth

9- The dead furrows must be free of all trash

10- Unbroken strips must not be left between furrows in contour plowing

Center of resistance on disc plow: it located in left and below the center of disc

Accessories for disc plows:

1- Scrapers: it aid to get good pulverized, good invert the furrow slices, and cover trash much better

2- weight's: enforcing discs into the soil hold the wheel in the furrow

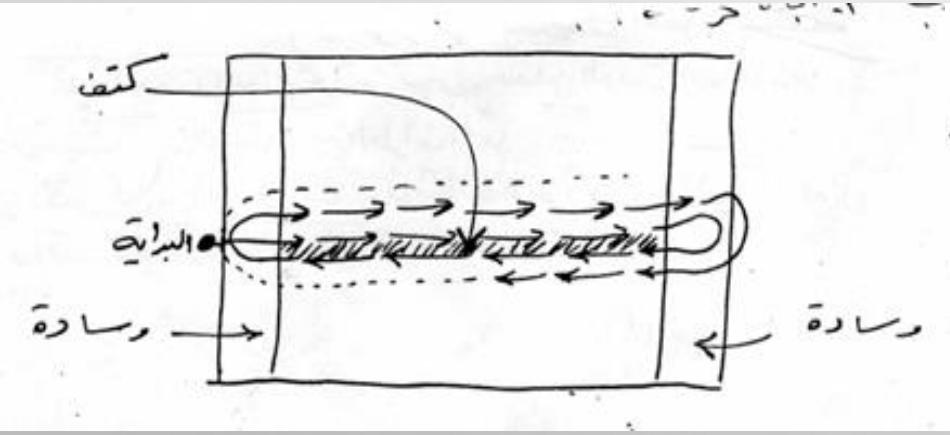
3- Levers or screw cranks for rise or lower the discs to control the depth of plowing

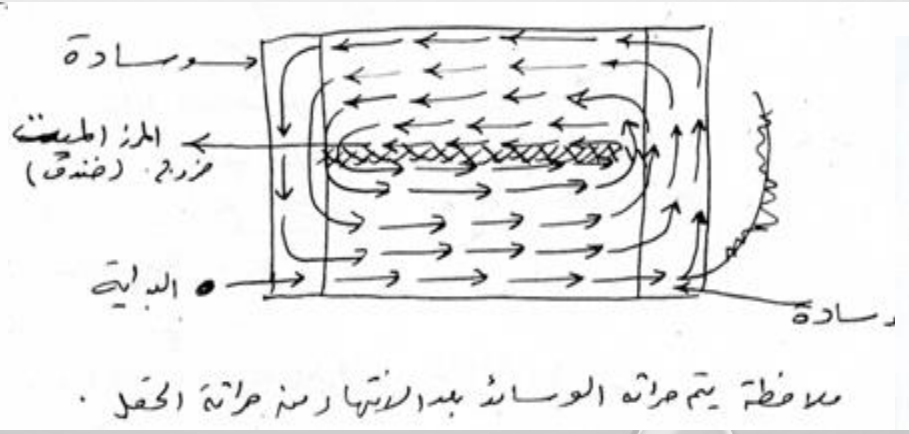
Types (methods) of plowing

1- Throw in plowing: It started from middle of the farm as in figure 15 and go out in

circle way ,it leave groove in the middle of the land

2- Throw out plowing; it started from out of the field to the middle of the field as shown in figure 15





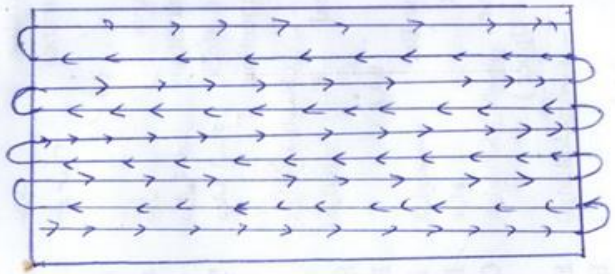
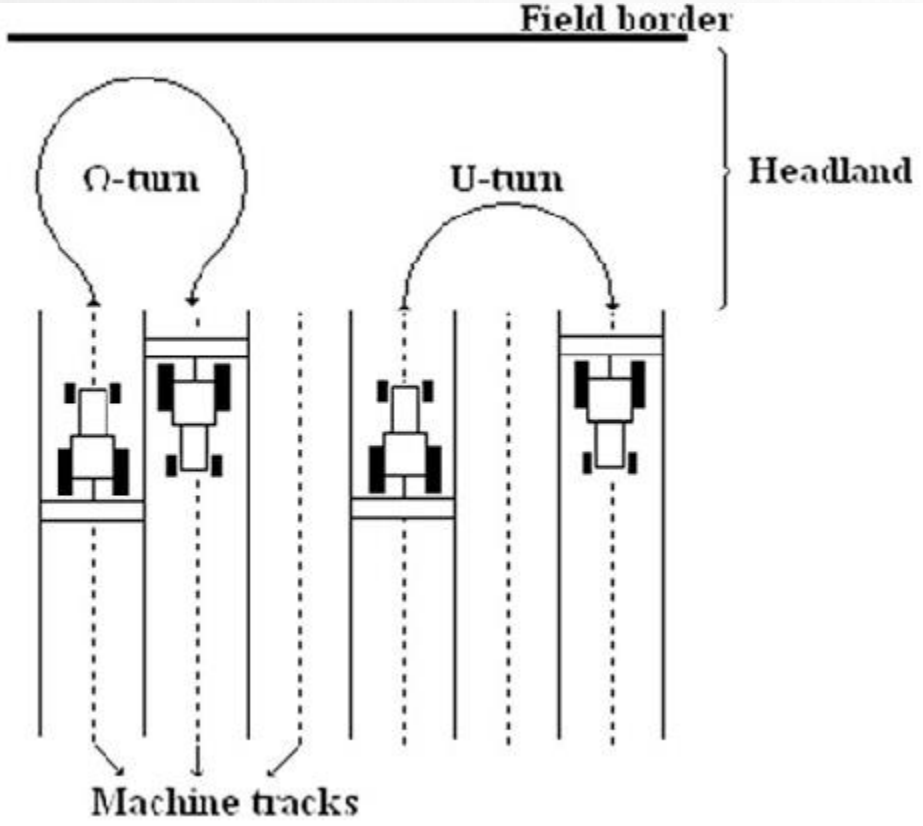
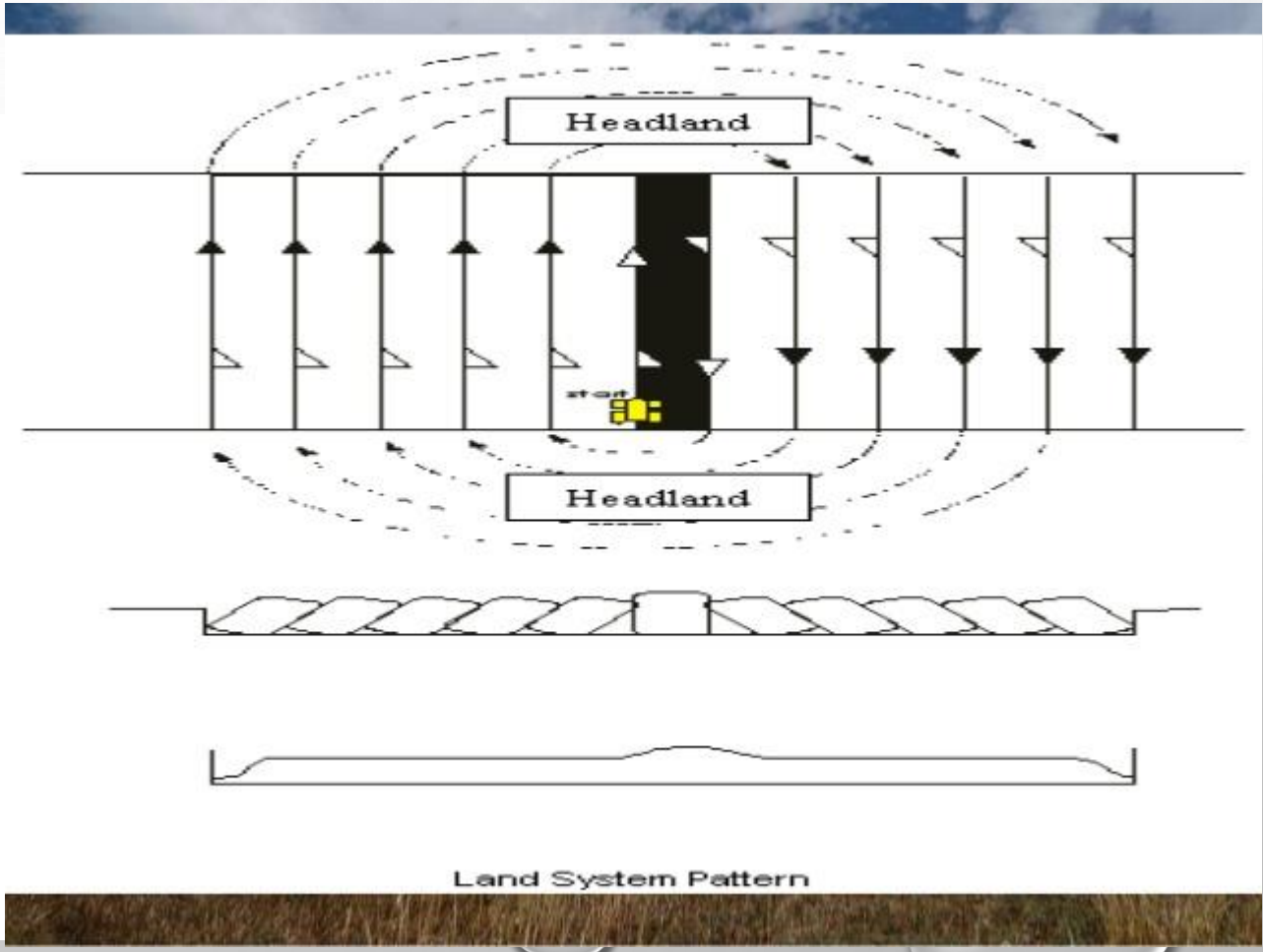


Figure 16 one way plowing

Types (methods) of plowing

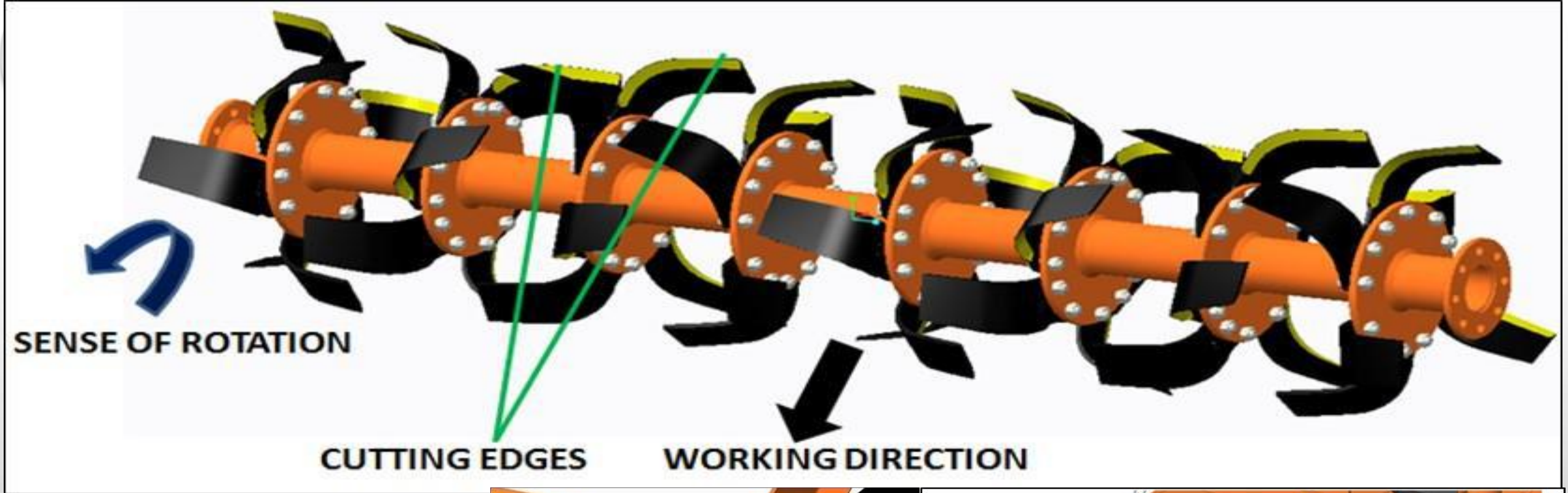


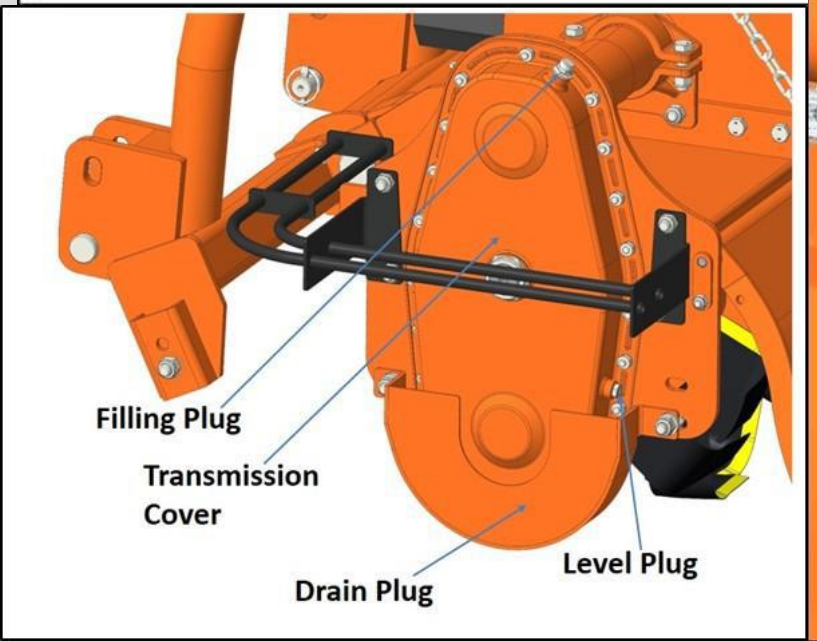


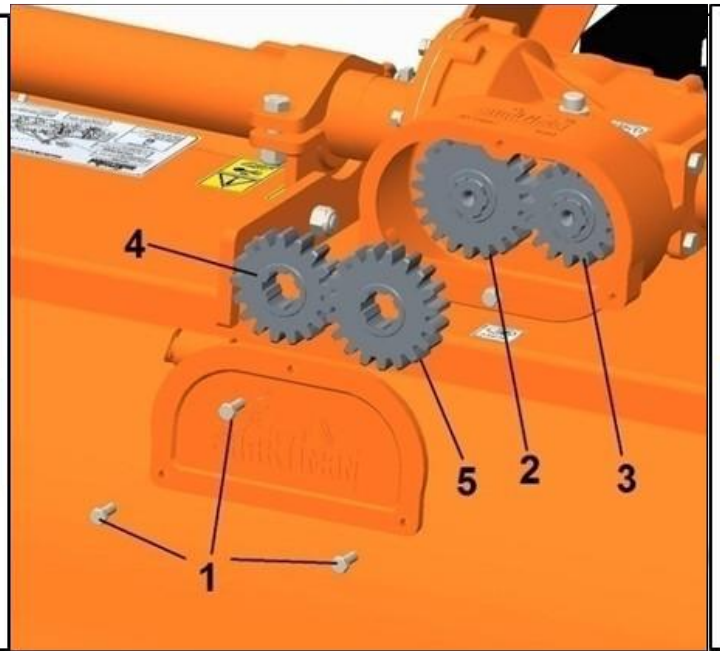
Rotary plow

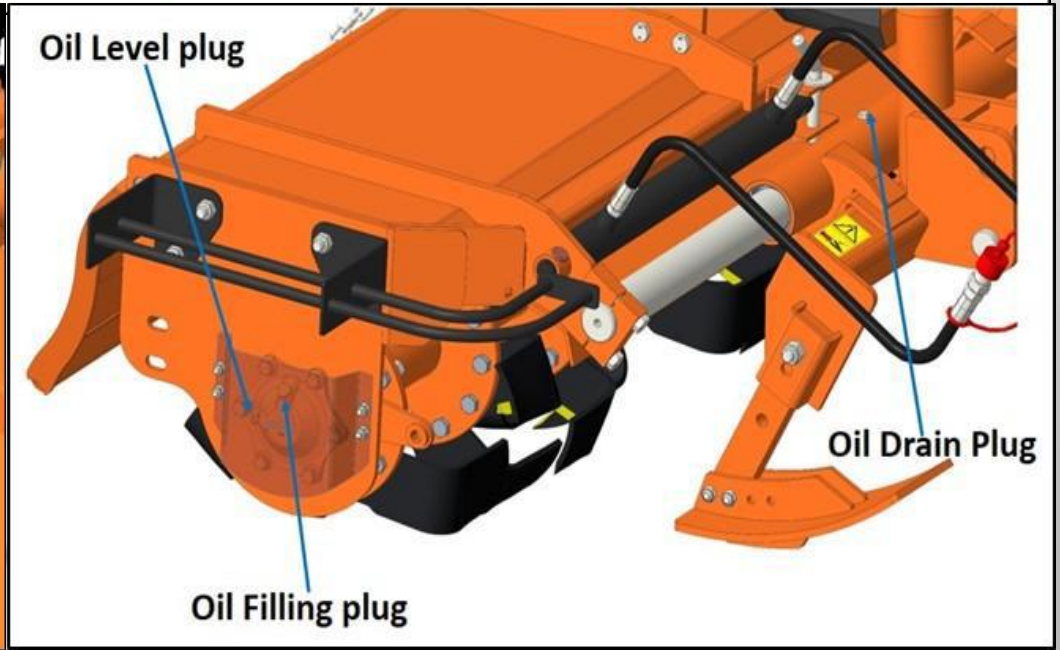
This type of plow depend on rotating movement of the knifes of the plow it take the movement from the P.T.O of the tractor .

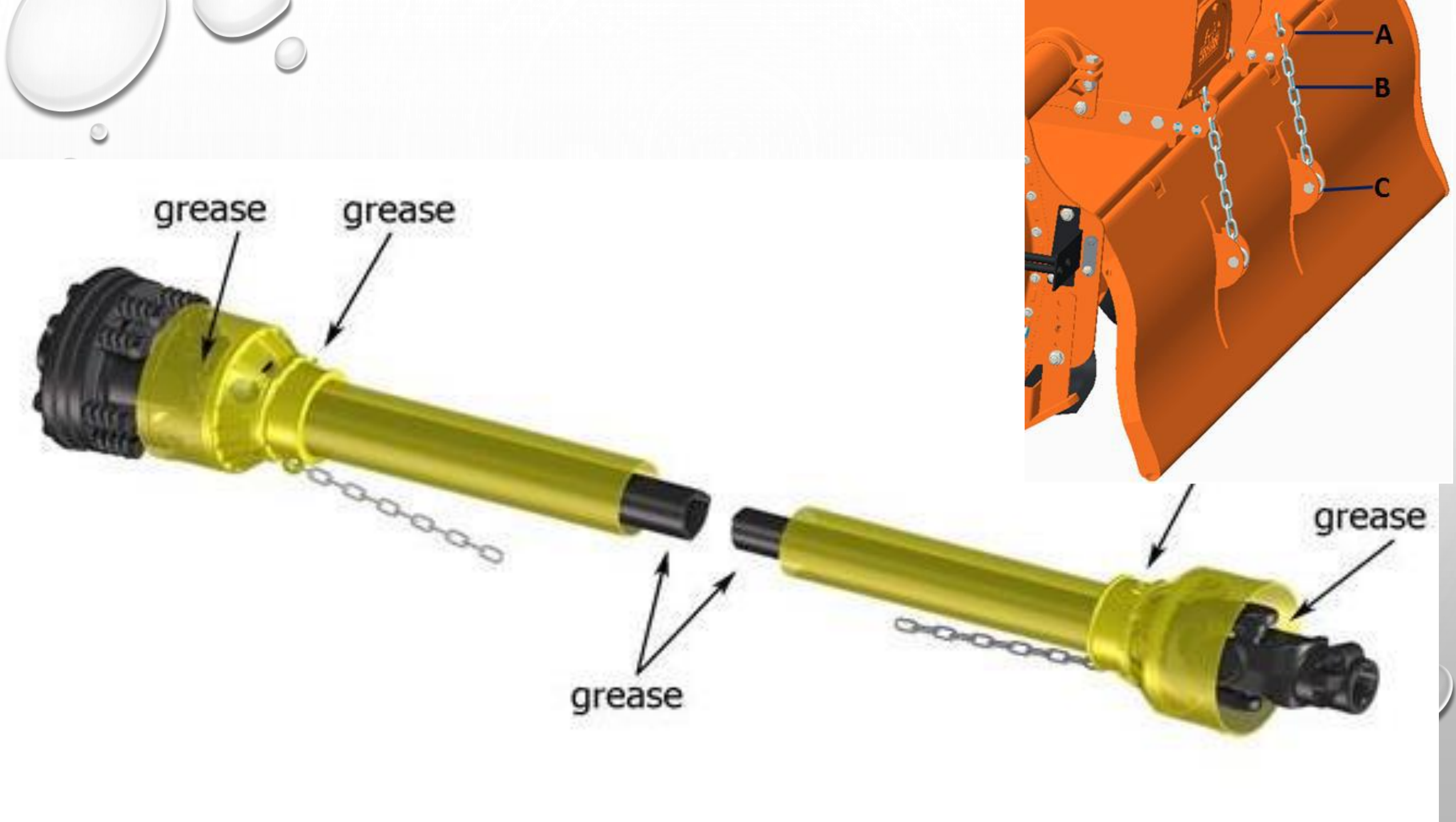
A Rotavator type of machine with rotating blades that break up soil


SENSE OF ROTATION
CUTTING EDGES
WORKING DIRECTION


Filling Plug
Transmission Cover
Drain Plug
Level Plug


4
5
2
3
1


Oil Level plug
Oil Drain Plug
Oil Filling plug


grease
grease
grease
grease
A
B
C


FRONTIER


RT2283


FRONTIER

Parts of the Rotary plow

1-Knifes: they use to cut the soil and push them strongly to the cover behind the machine, the cover break the soil and pulverized it , the speed of the rotary knifes about 300 r.p.m the knifes are crooked and sharpened ,

2- The cover: the cover of rotary plow complete the work of the knifes

it response for pulverized the soil , it adjustable cover , the distance between the cover and the knifes and the speed of the rotary knifes limited the soil pulverized

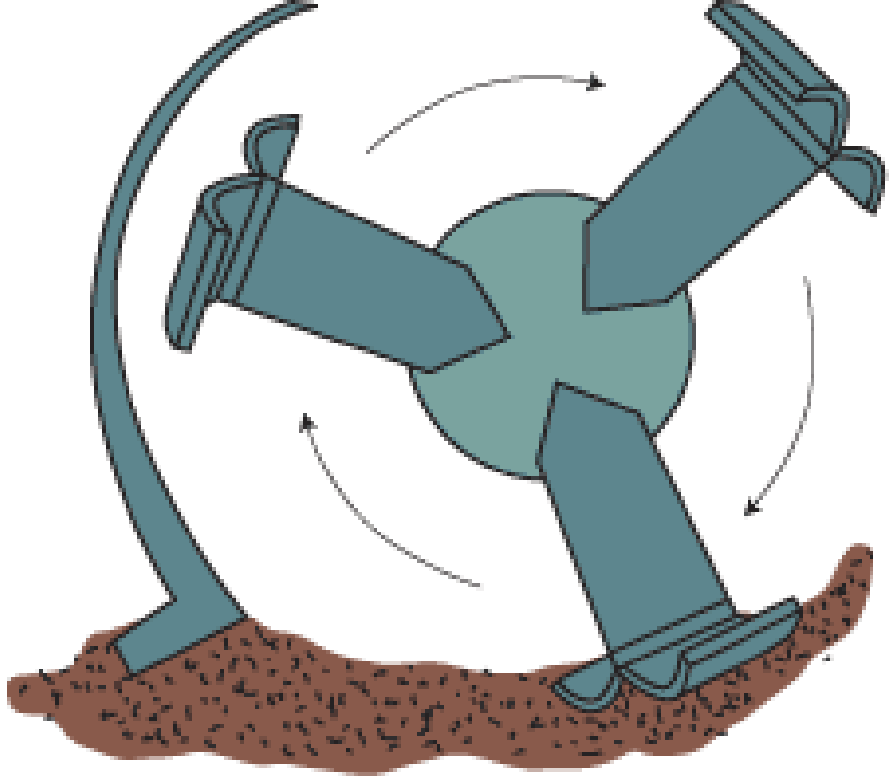
***3- Gear box**, it contained two or more of gears, the gear box receive the movement from the P.T.O and deliver it in two direction or one direction ,*

gear box should be contain oil to lubricate the gears

***4- Chain with two stars box:** these parts transport the movement from the gear box to the shat of knifes, also should contain oil, some type has two gear without chain*

***5- shoes:** this is used to limit the depth of work, and it adjustable*

***6-shoes:** these shoes used to limited the depth of work, it is very necessary to save the machine from damage especially the knifes*


direction
blades
soil compacts
and smooths to
depth of blade


24
PIECES
24 PIECES HARD-DRAWN AND SYNCHRONOUS-
ROTATING STEEL TILLER BLADES

Specifications of rotary plow

1- This plow need high horse power 10-15 horse power for 30cm width

2- it work with two speed of P.T.O of tractor 540 or 950 r.p.m but the gear box decrease it to about 300 r.p.m or more

3- Popular safety very important with this type of plow

4- Safety clutch should be provide with rotary plow to prevent the Knifes from breaking when they come in contact with a rocks or stones or other hard materials

5- It didn't work with land contain rhizomes because it spread rhizomes

6- It didn't work in hard land or land contained rocks and stones

7- It didn't work with muddy land

8- The operating width 0.7-4.2, depth of tillage 6-20cm , the field productivity 0.2-0.3 h/hour


HOWARD

Maintenance of rotary plow

- ***Checking the following***

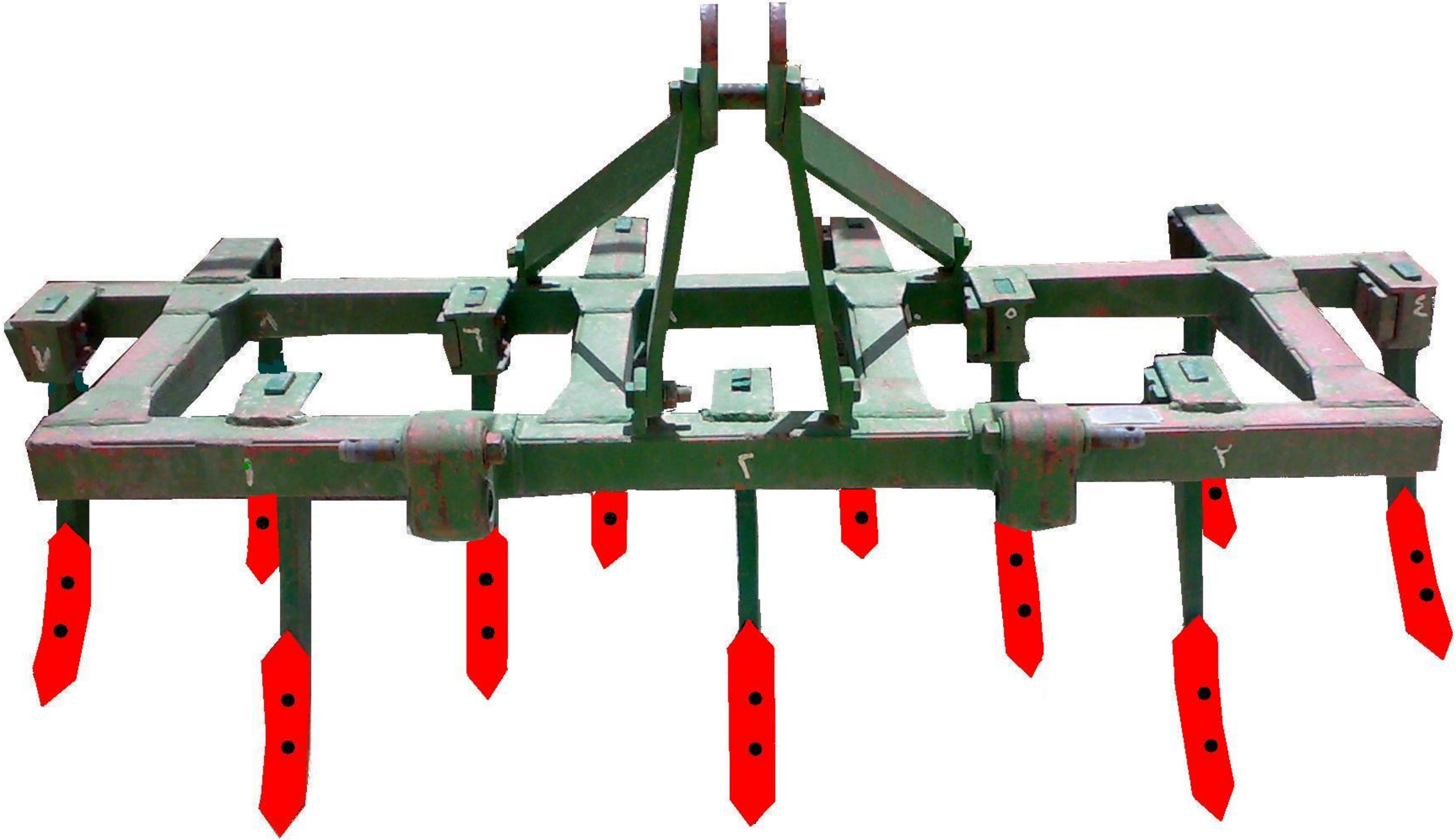
1 -oil in the gear box and chain box

2- The knifes

3- The safety clutch

Chisel plow

It tools formed from frames with rigid curved or straight shanks with relativity narrow shovel points, as in figure 19, most of Chisel plows arranged on heavy frames in two or three staggered rows to permit trash to pass between them without chocking



The specifications of Chisel plow

1- This type of plow used to break the subsoil surface -

2- it used in dry soil

3- it is inverted and pulverized the soil

4- Not able to throw soil to cover the trash completely

5- The distances between the shanks 20-90cm the depth between 10-25cm width 2-4 m

6- Most chisel plows are provided with coil cushion spring in conjunction with the clamp .this permits the ground tool to swing back and up and to unhook the point


Advanced
298
MASSEY FERGUSON


erneland


MASSEY FERGUSON

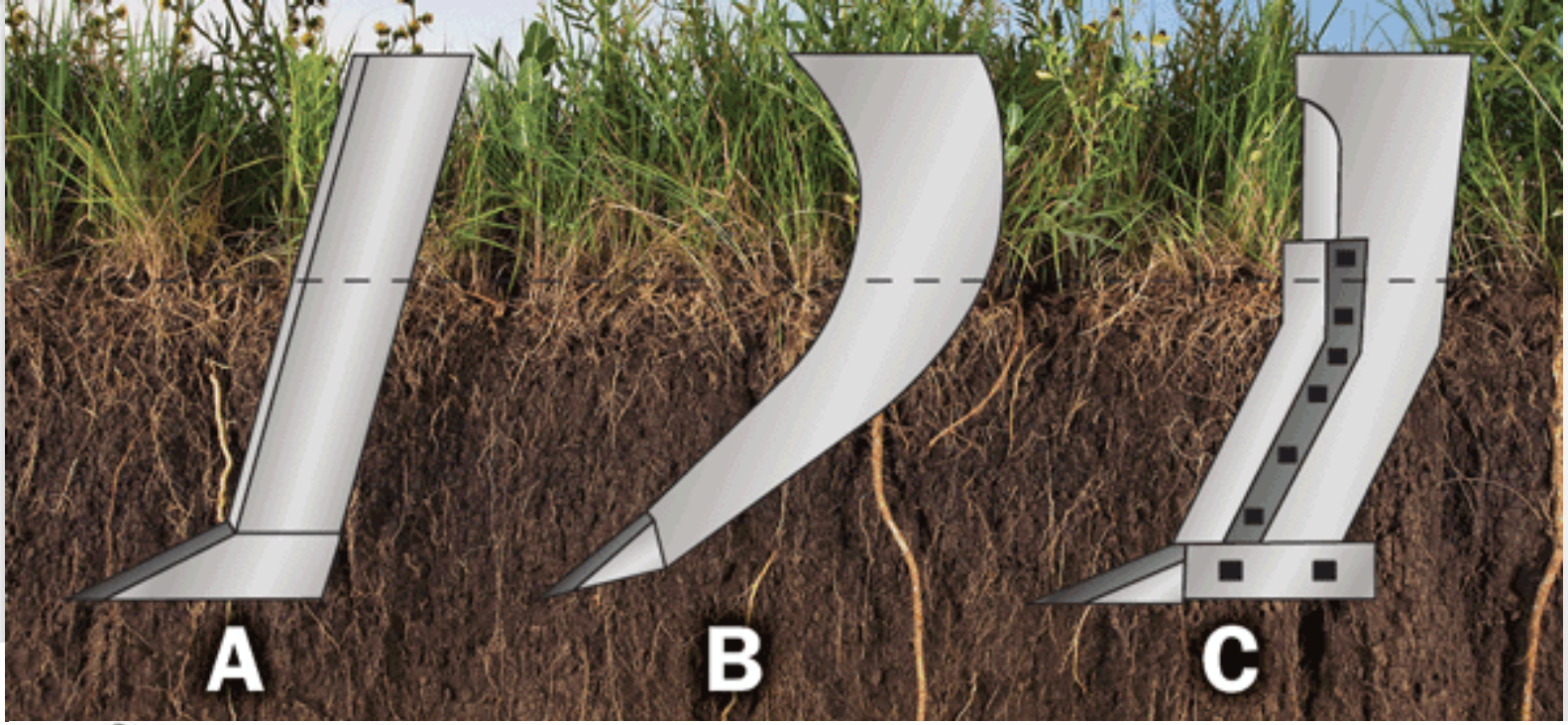
شكل السلاح المطور والتقليدي (منظر أمامي وخلفي وجانبي للسلاح)

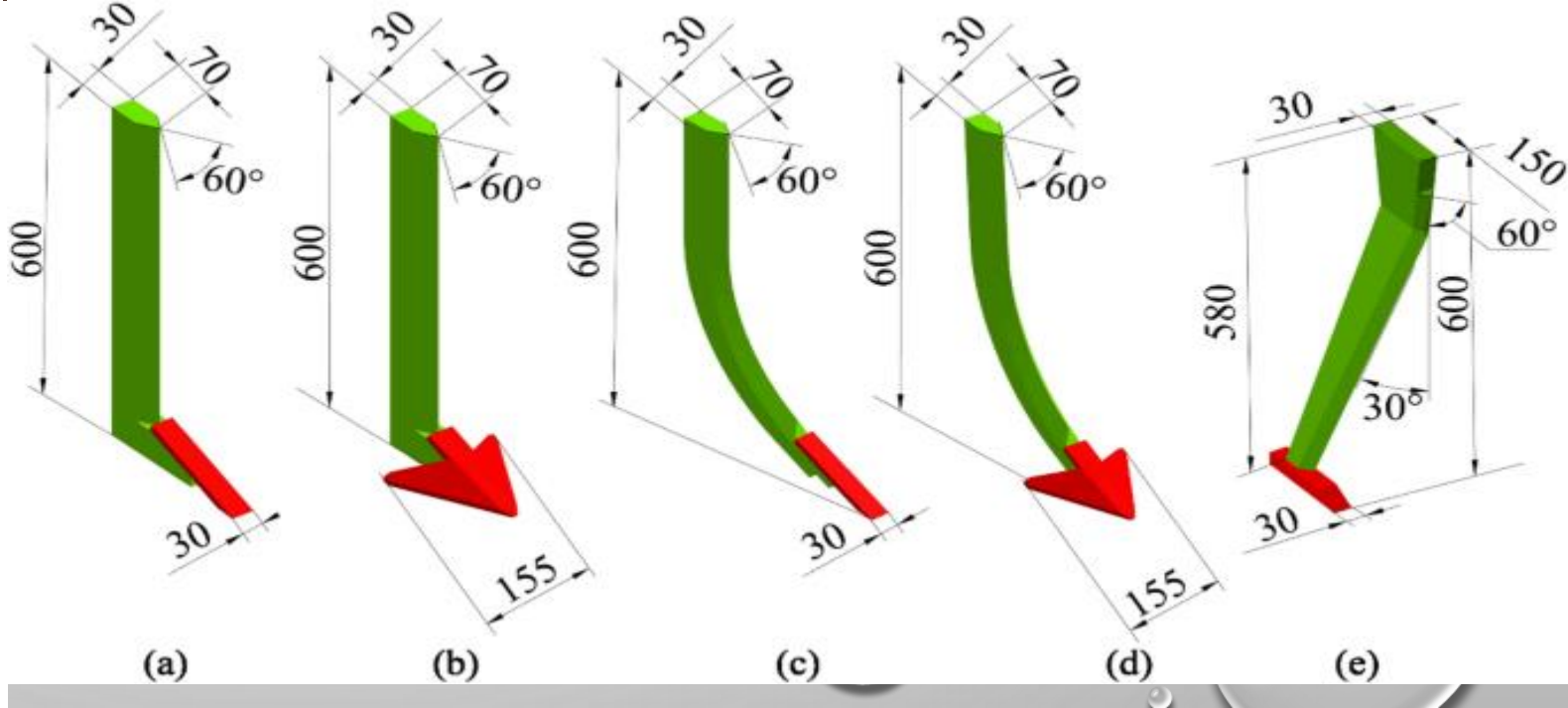
السلاح المطور على اليمين السلاح التقليدي على اليسار

SWEEPS & CHISELS/SHOVELS

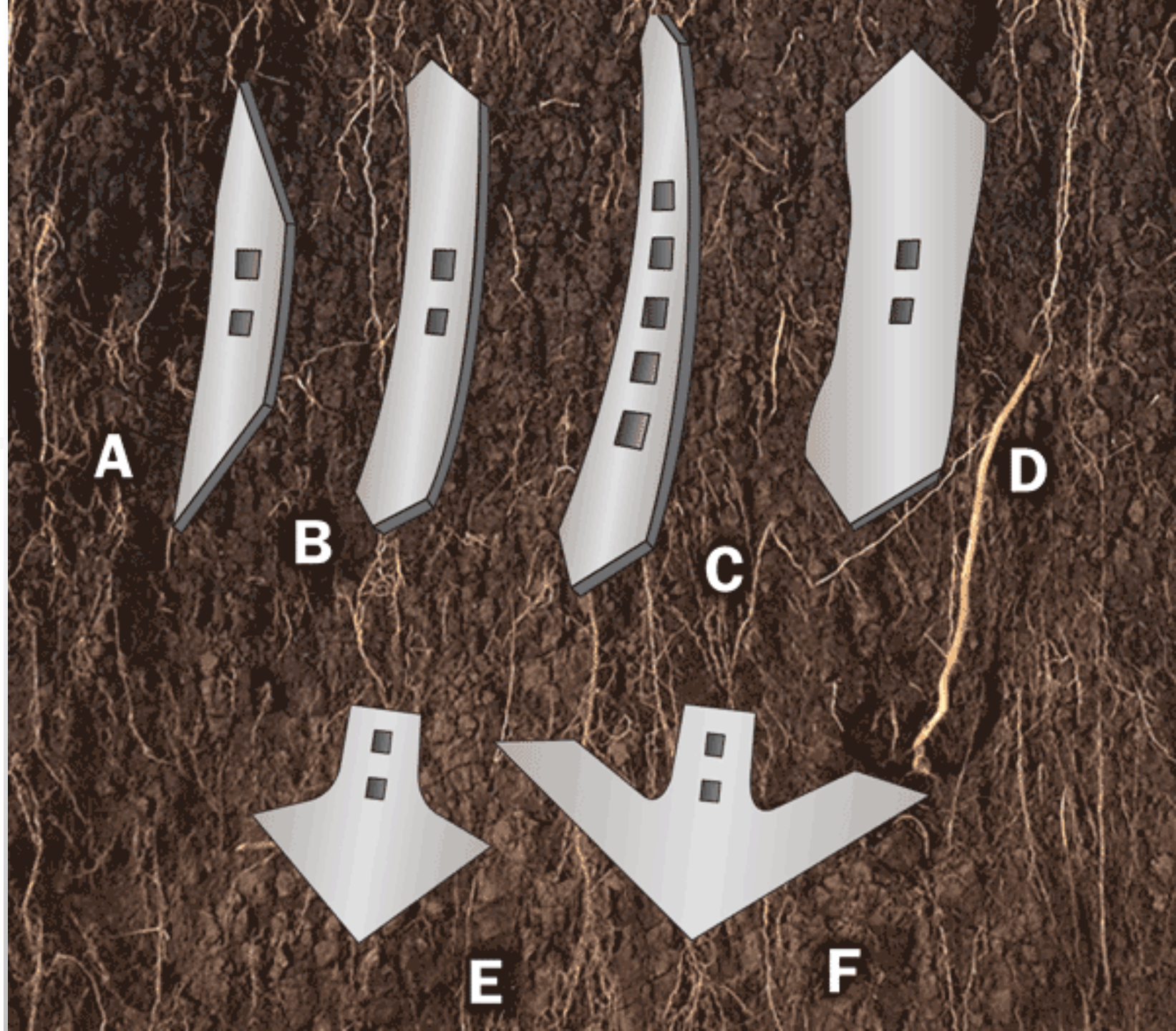
Optional heavy duty sweep

for deep tillage,


A
B
C


30
70
60°
600
30
155
150
580
(a)
(b)
(c)
(d)
(e)


Twisted Chisel
Slash Point
Cupped Twisted Chisel
383L
SL124L
598C-L


A
B
C
D
E
F

Subsoil plow

- It is heavy duty tool designed to operate below the normal depth of tillage and to loosen the soil by lifting or displacement it .

Specifications of subsoil plow

1- It used to penetrate the soil to depth 30-80cm
2-it needs high horse power for the tractor to pull it, especially at deep depth the tractor should has 70-80 horse power or more

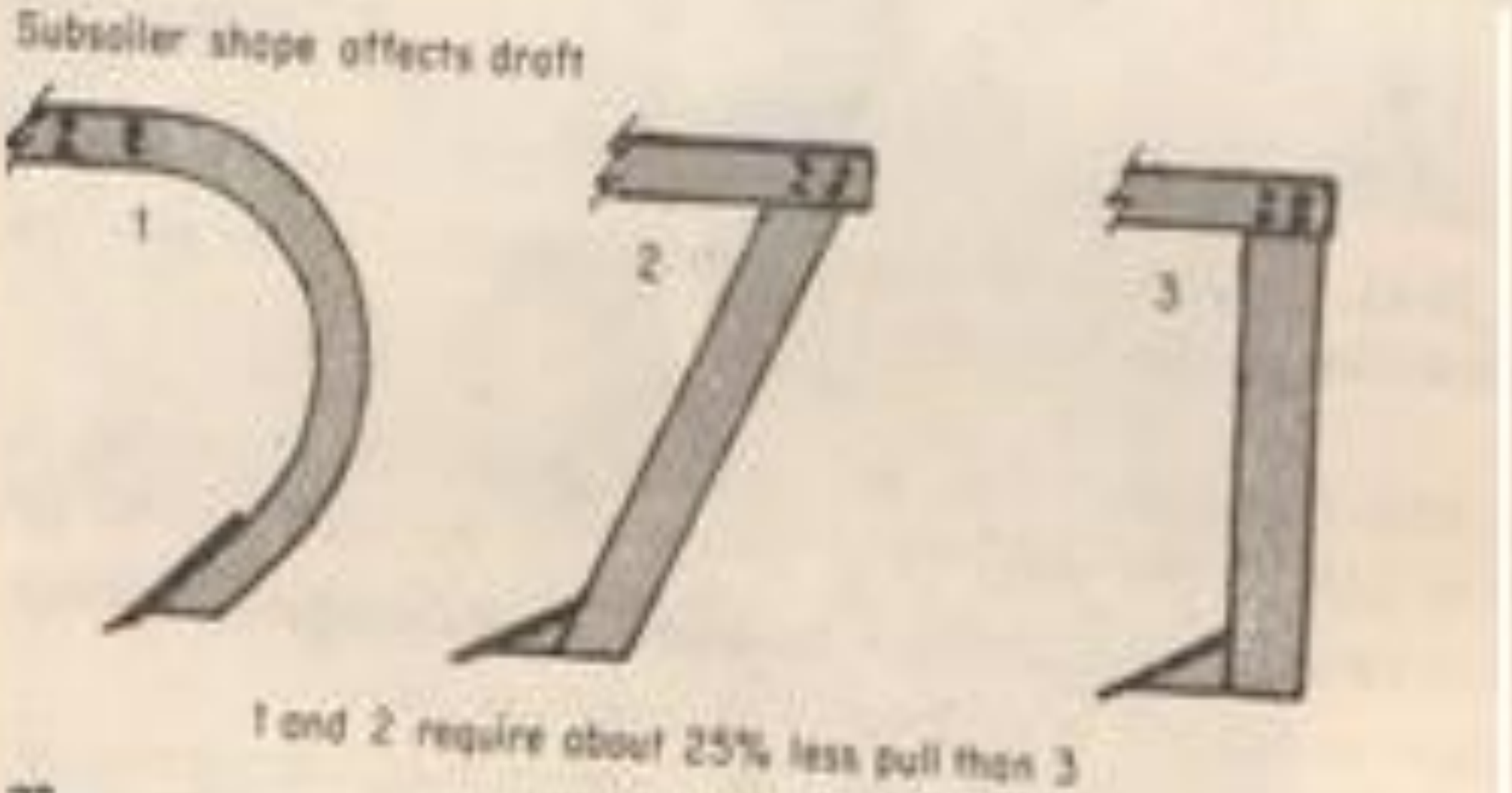
3- It used to break the hardpan soil,

4- Mole ball used with this tool to save the furrow which created by the point of shank

5- It used in drainage channel for water,

6- The subsoil plow is available as mounted or trailing ,

7- Chisel subsoil plow not invert the soil.



65. Three types of subsoiling standards. (*Cornell Univ., Agron. Mimeo.*


22 B
BKT

(Harrowing or disking)

The aims of the harrowing implements are:

1- Break the big clods created by the primary tillage (moldboard or disc plow)

2- Increasing the soil mixing with other materials

3- Killing the residue grasses and herbs

4- Helped in landing the land

Types of harrowing machines (implements)

There are at least four types of harrowing machines

1- Disc harrows

2- spike tooth harrow

3- spring tooth harrow

4- reciprocating tooth harrow الامشاط ذو الاسنان الترددية

5- tandem *disk harrow* *الامشاط ذو الاسنان الترادفية*

Disc harrow

It consists of many iron or steel discs which have slight concavity and are arranged into two or four sections. When viewed from above, the four sections would appear to form an "X" which has been flattened to be wider than it is tall.

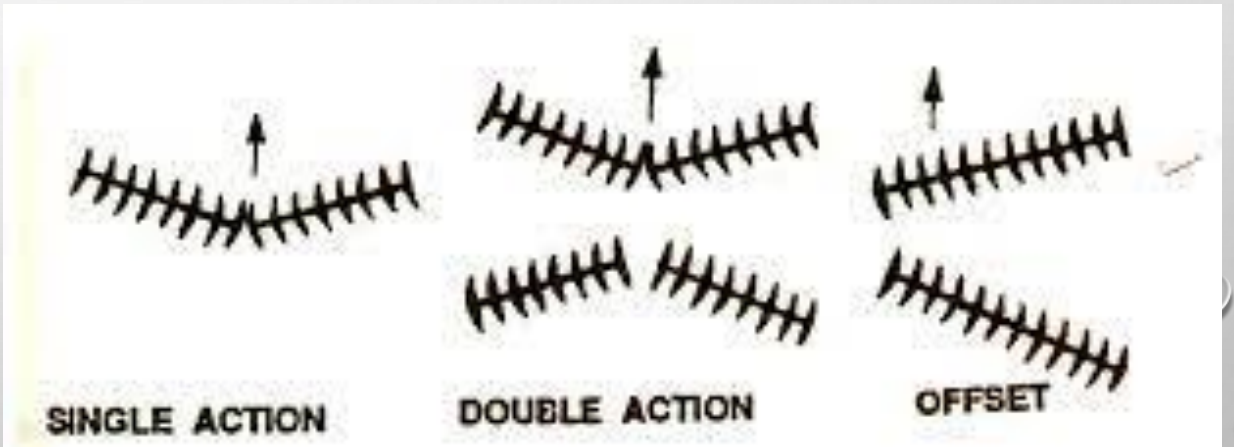


Fig.1. Types of disc harrow


TO 18/510

Uses of disc harrow

1- it used after the plowing to pulverize the big clods lifted by the previous plowing

2- A disk harrow can be used for primary or secondary tillage.

3- It used in any time of year

4- disc harrow contains serrated discs

Spike tooth harrow

As shown in figure 23 the spike tooth harrow has many steel tines and in many rows

Specifications of Spike tooth harrow

1- it is not one of its primary functions

2- it is not turn the soil

3- Spike Tooth Harrow cuts through clods, manure, and grasses to break up material into finer pieces so that it can be spread evenly across the ground

4- This harrow does an excellent job of smoothing garden plots, fields and areas

5- It loosens crusted soil, aerates legume crops such as alfalfa

6- It use as cultivator

جميع الطلبة غياب لعدم حضورهم في الوقت المخصص للمحاضرة


frtrade.en.alibaba.com

Spring-tooth harrow

It use many flexible iron teeth mounted in rows as shown in figure

it used for

1- Loose the soil before the planting ,

2- Kills some weeds that may be present

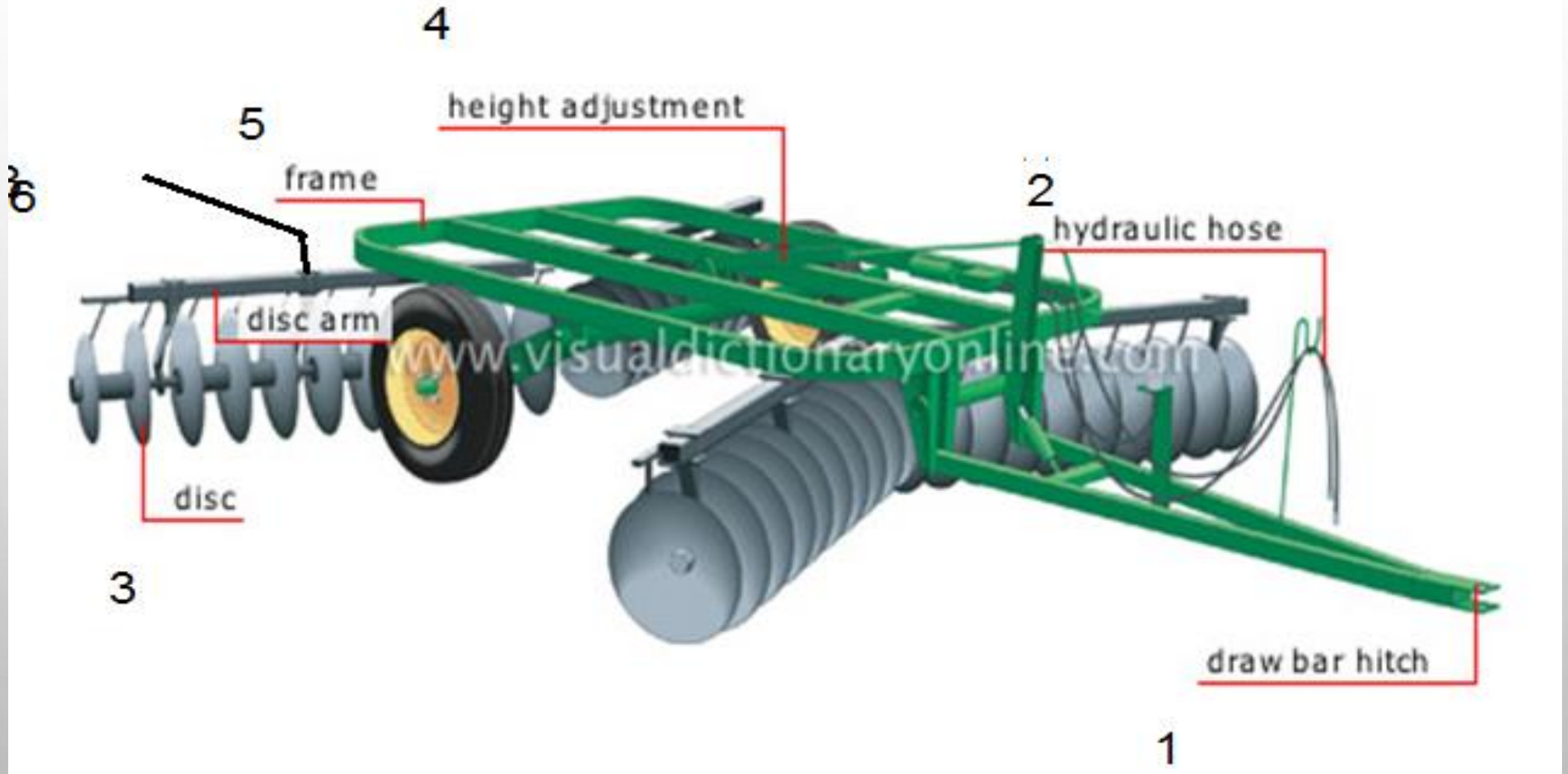
3- It is not one of its primary functions,

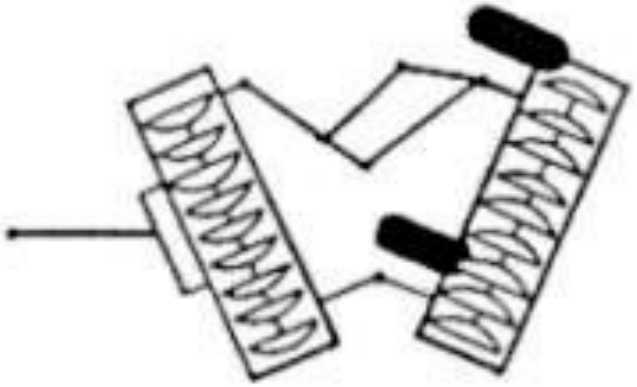
4 spring- tooth harrow don't turn the soil


McCORMICK

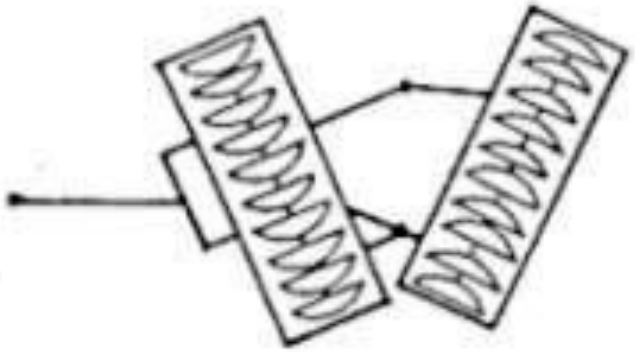

trade.en.alibaba.com

Tandem disc harrows parts

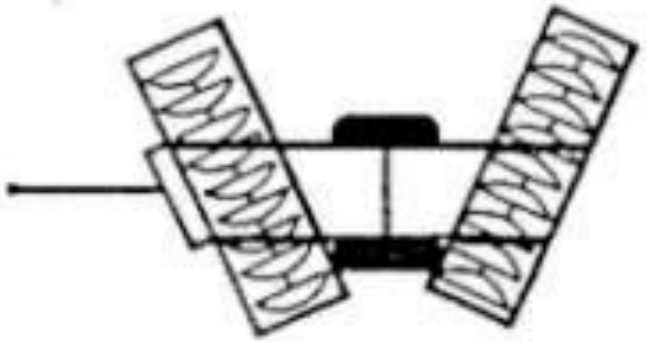

4
height adjustment
5
frame
6
2
hydraulic hose
disc arm
www.visualdictionaryonline.com
disc
3
draw bar hitch
1



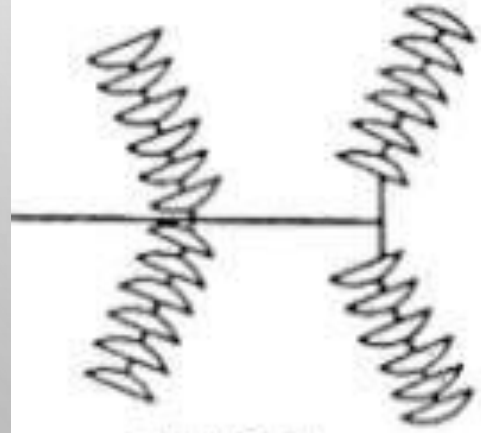
HINGE WHEEL OFFSET



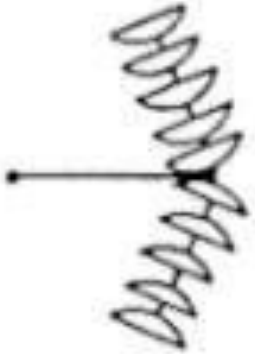
HINGE OFFSET



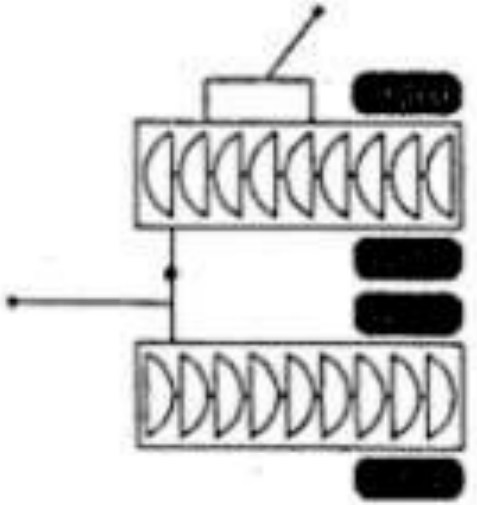
WHEEL OFFSET



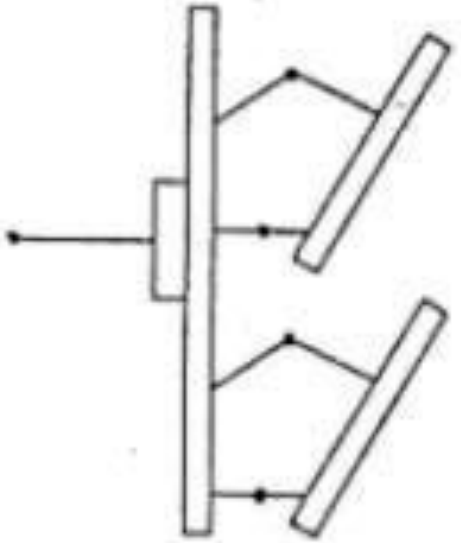
TANDEM



BUSH AND BOG



HINGE WHEEL OFFSET
END PULL



SQUADRON

Tandem disc harrows parts

1- Draw bar hitch

Device that secures the tandem disc harrow to the tractor's towing hitch.

2- Hydraulic hose (optional)

Tube connected to the tractor's hydraulic coupler that uses a fluid (oil) to transmit power from the engine to the device's mechanisms.

3- Disc: Dish-shaped part that breaks up clods of soil .

4- Height adjustment: Crank for adjusting the depth of the discs' penetration into the soil.

5- Frame: hold Tandem disc harrow's

6- Disc arm: hold the disc gang

Heavy Tandem disk harrow

These types used for heavy duty, it built for cutting and maintaining fire lines of forestry. As well as forestry road maintenance


DISCING AND LEVELING THE FIELD

Rollers agriculture equipment

The rollers are an agricultural tool used for flattening land or breaking up large clods of soil, especially after plowing .

The rollers are

1- Flatter land 2- makes weed control , 3- harvesting easier and rolling

4- Help to increase moisture for cultivated soil.

5- On grassland, rolling levels the land for mowing

a heavy roller may consist of one or more cylinders made of thick steel, cylinder filled with concrete, or a cylinder filled with water

leveling machine

The most commonly implemented land-leveling technique is a tractor-drawn leveler with a blade or a bar moving soil from higher elevations to lower ones

many names such as landing , leveling ,landplane , Grader, landing machines all the aims of these implements are to make the land flat and to facility the farm work for good Soil Preparation .

Traditional leveling machine .


MFG RAM AGRITECH 9825109004

traditional leveling machine it uses for landing ,

this machines contain the following parts

1- frame to hold all parts

2- links attach with tractor

3- the knife which cut the soil

4- concave blade

this machine has the following advantage

1- it is cheap mahine 2- the knife connected with the blade and frame it changeable

3- it can easy adjustable 4- it does not need high horse power

Work with the machine

1- connect the machine with the tractor 2- adjust the knife to the right or to the left

left or lower one side 3- move in the straight direction 4- by hydraulic system riseor lower the machine to gave smooth cutting