

Farm Machinery
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Lecture – 56
Machinery for Land Drainage, Land Reclamation and Estate Maintenance Part-II

Welcome students for my lecture number 56. You might have heard my earlier lecture in which I talked of the Machines for Land Drainage, Land Reclamation and Estate Maintenance Machines. Now I discuss that there are we have kept these in different parts and the second part which I will be dealing with now. Well here we would like to see some of the specific machines which have been used for some specific requirements.

It is essential for you to know that these many a times we talk of what exactly is this land drainage and then land reclamation as I said and estate maintenance. Land drainage is one which is very important when you are talking of irrigation equipment and you are doing irrigation sometimes so, much of water comes that you would like to drain that water otherwise the crop will simply get inundated the field and then even the crop which is there either it is a bush crop or it is a cash crop or whatever.

So, in order that we should have machines which will drainage or which will remove the water as and when required. So, for that we have machines which called drainage machines, sometimes we would like machines that they should make holes because sometimes we are talking of orchard plantations, at that time we would like that number of holes will be created of a certain size. So, we would have certain machines for that. Now with these background I think let me go through the lecture which I have prepared for you and we will have more discussion as and when we come to that.

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What is Estate Maintenance?

A process of preserving an extensive area of land

Requirement for Estate Maintenance Machinery	Estate Maintenance Machinery
▪ For heavy pulls ✓	<input type="checkbox"/> Tractor winches ✓
▪ For stone clearance ✓	<input type="checkbox"/> Tractor operated stone picker
▪ For bracken-cutting and scrub-clearing	<input type="checkbox"/> Rotary slasher
▪ For flail hedge and verge trimming	<input type="checkbox"/> Rotary cutters
▪ For hole digging	<input type="checkbox"/> Post-hole diggers
▪ For driving fencing posts	<input type="checkbox"/> Tractor mounted towing trolley
▪ For Road sweeping and slurry clearance	

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Well what is estate maintenance this is one subject which you as an agriculture engineer may be you would say that where is the relevance of that, but I think it has a great relevance here. Because we are a process of preserving and extensive area of land this is what the estate maintenance.

The requirement of estate maintenance machinery what are the requirements. See we have observed down I think it is worth going through it for time being so, that at least you understand what exactly we mean by these see the heavy pulls. Supposing, you are trying to use this then for a stone clearance lot of stones are there you would like to clear those things, for cutting and scrubbing or clearing of the materials for you would like that something has to be done for this.

Then flail hedge and verge trimming you might it will required sometimes maybe trim trimming of the trees, some of them trimming of short bushes maybe some of hedges which are where you would like to clean them for that you would require. As I so told you earlier hole digging maybe you will require holes for plantations.

So, level of plantation you would require at different sizes and all so you drag that machines for that fencing yes fencing post many a times we require fencing posts. Because when we have to do fencing of that, there also you require heavier posts and those holes need to be made. Now it is once we are talking of mechanization we have to

have machines which will do these operations very fast and that is why it is essential that we must use these machines instead of going for manual.

And as such there is no point talking of manual as such because the people are not available and digging a hole even if for two feet or three feet hole it will require a lot of time of a human being and the equipment sometimes some of the equipment which it is not possible.

That is why we need to get the right kind of machines and with right kind of power source for clearing and doing the job at the fastest time that we can do. Road sweeping and slurry clearance sometimes it is also possible that sometimes slurry of the refuse of power plants or some other things when you require and need to do.

And sweeping of the roads may be sometimes lot of say because of the storm etcetera when the bushes or when the trees fall into that, maybe you will require machine for clearing that. So, you can talk of road sweeping when it virtually cleaning of that so these are the requirements of estate maintenance machinery; what are the types which are available.

Well we will show you what are these, but then have a list of these. For example, the tractor winches which are required sometimes when you want to pull the bigger logs of food and all that and you will require these winches which are connected one location and then there pulled by the heavy power machinery.

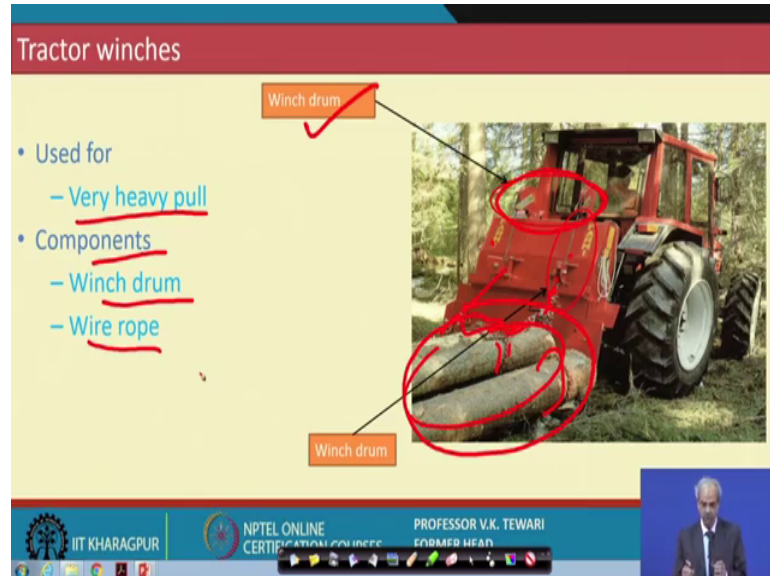
And so you the tractor operatory stone pickers some of these stones which are there we need to pick the bigger ones could be there and we need to clean and we will need to pick up that. Rotary slashers; see sometimes on the air a tract or the maybe that lawns or gardens, we would like to maintain a certain coverage of growth of grass not that very high. So, for that we have machines which are known as a rotary slashers.

Then the rotary cutters maybe they are the these could be called cutters as well when there is slightly higher this thing, then post hole digger as I said that for digging the holes you there known as post hole digger tractor mounted towing trolley.

Some of the sometimes you would like to carry maybe about 200 152 100 kg of material. And in short duration of time in less location and less place then such trolleys are also

useful to us we have these machines and we would like to have a look that you should appreciate where there used and how they are used.

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See the tractor winches as I told you that these machines are very much essential for example, you see here that this is these are the wood logs which are there.

Now, they are connected in fact, through this rope arrangement through this they are to the power source they are very much connected you can see here that they are connected they connected here. And these are the places where they have been tied down because this is otherwise it is not possible to carry these.

So, these are used for very heavy pull you are trying to pull this heavy size of logs or to certain extent or to some location or you would like to pull them and then later on they can be lifted on the some of the towards and can be lifted to another location or put into trucks for transportation etcetera it is possible. Then winch what are the components of this? See the winch drum this is these winch drum which is here which has been shown here.

Then the wire ropes as I showed told you that these are the wire ropes which are there these locations because these are very strong. And mind you that these ropes are proper designed ropes these ropes are just not any rope which can be used, because on the basis of the strength of this itself is the load which you have here you will be pulled.

Otherwise even if we per the tractor is of a high horsepower and you do not have these ropes which are strong enough they will not be able to pull this. So, we have the winch drum on both the locations here and the other details. So, this is one equipment which is used for clearing the ground. Now, in the series of this we are telling you what are the things which are used and let us see what are other things which have been used.

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Tractor operated stone picker

- Used for
 - stone picking
- Components
 - Hydraulic system, Rotary picking unit, Collecting unit

Specifications

- Picking width 150cm
- Picking speed 3 to 6 km/hr
- Minimum rock diameter 5cm
- Maximum rock diameter 50cm

The slide includes a photograph of a green tractor with a stone picker attachment. Red circles highlight the hydraulic system and rotary picking unit. A red line connects the components list to the corresponding parts in the image. The slide footer contains logos for IIT KHARAGPUR, NPTEL ONLINE CERTIFICATION COURSE, and PROFESSOR V.K. TEWARI FORMER HEAD.

Tractor operated stone picker well you could see here that the stones were there and now you these need to be picked up because it is essential that it is not possible to broom them off and all that and many a locations these stones need to be removed for clearing the ground or for clear making the hole location acceptable and to the requirement of the job, which is planned for the future. So, this is used for a stone picking yes and definitely as the name suggests then what are it is components the various components of this well it is connected you can see that these connected due to the tractor over here and it is simply pulled here.

Hydraulic system yes it has to be hydraulic system power or hydraulic power which has to be used as I told you earlier. And it was very nice that we introduced you the hydraulic circuit which has which was told you earlier.

Because this is the one which will be required quite often in all these a heavy machinery wherever is chase whether you are talking of lifting cranes bigger cranes which are lifted. Which are lifting some of the you can see there some of the used material sometimes

when there is accidents you might find bigger cranes which are used, sometimes cranes are used for lifting people to locations and remove them from some of the problems which has take place particularly if someone say the fire has taken place and there you would like to remove people.

So, some of these things which will be required so rotary picking and then collecting unit this is a rotary unit which picks and then collect collection and these corrections will be put at one location and then later on you can be these can be pulled and discharged at one location. The various specifications of the one which as shown over here are the width is about 150 centimeters 1.5 meter.

The speed at which these are to be taken well this is 10 to be speed which is given from 3 to 6 because many a times when the when it is very heavy there you will require that lower a speed, but that it has to be pulled and then if these stones are stronger smaller.

Then maybe up to 6 kilometer 7 kilometers can be used minimum rock diameter 5 centimeter well this has hardly any meaning although out of literature if you find such things are there. But then this does not have any meaning as such what exactly is required is we need to remove those boulders or a small stones which are there mean they need to be picked up and then they need to be removed.

So, as such definitely we will talk of a size it is not that we are talking of very big ones, but if you can look at these you will find that yes this is required for such work. And hence a minimum and maximum situation is given for such machine. If the is a very big boulder maybe it will be of the size of this then definitely we are not talking of lifting or picking such a thing. So, there is a relevance of giving this minimum and maximum size of the rock or the stones which are to be picked.

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Rotary Slasher

- Used for
 - Grass and weed cutting
- Components
 - Gear box, rotary blade guard

Specifications

- Cutting width 130cm
- No of blades 2
- PTO speed 540 rpm

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FORMER HEAD

Well rotary slasher actually as I said for grass and weed cutting many a times as such when we call of weeds particularly more relevance in a crop field. But then when you are talking of grasses you see when we are talking of grasses we are talking of maintenance of lawn maintenance of a aero aircraft landing say place etcetera. Or any orchard which is there and where lot of grasses are there in between the in a plants or the bushes we would like to clean.

Now, what are the different components of this well the components are simple. In fact, this is a tractor drawn unit and it has this particular unit where we have beneath this we have the rotary blades which are there. So, as connected via you can see here that the PTO and the, from this is a Cardan shaft which is used and on both sides through this PTO is a hooks joint.

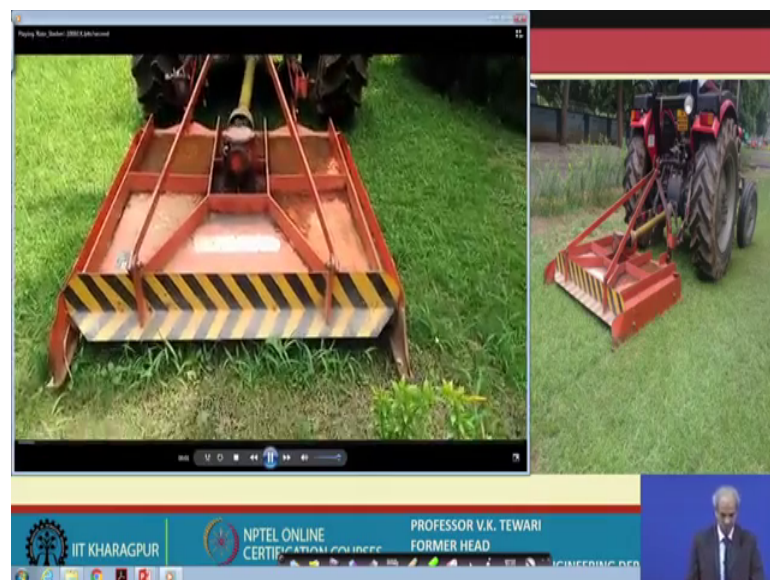
So, this joints are connected and then it comes to this gearbox be here. So, a certain speed we are getting from the PTO and that speed is you can say manipulated to get the right kind of a speed which is required for this particular RPM of this. So, we are getting about 540 RPM or depending upon what we have for the tractor which is there. So, about and there are two blades in this maybe we will show you the operation of this now and you will be a then you can appreciate what it is.

There is a guard here yes this is important so that sometimes when this cutting maybe that the stones etcetera which are there may fly off and it may hit the people or the

persons if somebody's around. So, that is why there is a proper guard is there and also for whatever cut material is there will cut material will not be thrown off into the air, but it will because these are meant for actually you can say carpet like maintenance.

For the grass which is there these are not meant for very heavy tall grasses maybe 3 4 4 feet or so. For them in fact we use the flame watts which are having actually about one and one and half feet chains and those chains are useful for cutting of the those taller ones, but these are meant for a carpet sort of a operation and carpeting of the grasses. So, these are you can say the finer ones and more sophisticated and sort of used for such equipment we may like to give you a operation of this.

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So, you can have you can see that this you see here that Cardan shaft is rotating taking power from the PTO there and this is the hole slasher, here below this we have the blades which are there two blades are there in this. And the rotary blades which are there and at the end the blades are connected we will see the operation of this when it will starts moving yes it is started moving.

Now, you can see that the carpet virtually you can see here that what is the type of grass which has been created. Now you do not know even where is the grass which goes maybe once these are removed you will find that proper lines are there on the two sides here. There are lines which can be easily corrected because it is simply topping off you

are simply topping off the grass which is there you can see the condition which has been met.

And well the grass is near the blades need to be taken care of properly sharpening of the blades is important. And you can see that where are those locations where the whole thing is in operation now; well this is what a rotary slasher is and it is meant for certain specific purposes such for operation it takes power from the PTO of the tractor. We know the PTO of power is about 540 RPM and in fact, you know that the maximum power we get from the PTO. So, better utilization of the power of the tractor is done through such machines if they are utilized for a longer duration of time. So, better matching could be this equipment which are used.

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The slide is titled "Rotary cutters or Boom mower". It contains the following text:

- Used for
 - overgrown and neglected hedges to reduce them to reasonable proportion
- Components
 - Hydraulic system, rotary saw cutters, Guards
- Specifications
 - maximum reach horizontal 15.5m
 - maximum reach vertical 4.8m

There is a photograph of a green tractor with a rotary cutter attachment working on a hedge. Red circles highlight the tractor and the cutter. A red arrow points from the "Hydraulic system" component to the cutter in the photo. At the bottom of the slide, there is a small video inset of Professor V.K. Tewari, former head of IIT Kharagpur, and a taskbar with various application icons.

The rotary cutters or boom mowers sometimes we are we would like that the whole tree sometimes streaming of the trees are required. And maybe it is not possible that people can go on top of this and then trim it, but then these machines are available and these machines can do the job of trimming.

Well here these are as such it is written here you can have a look at this is used for overgrown and neglected hedges to reduce them to the reasonable proportion. Well either to maintain the beauty of that area or to see that they do not fall into the electrical lines and all that which may come into picture. And that is why you can see here that they are meant for cutting and trimming of the plants bigger plants.

The component regardless of what you have the hydraulic machinery the hydraulic system is definitely one of these and you should know. So, I would like to tell you here that hydraulic system you must be very clear and good knowledge about the hydraulic system, when you are talking of or you are thinking of even changing or design or designing a new type of equipment for any earthmoving machinery or for such tasks like trimming of the trees or even for harvesting of some of the fruits.

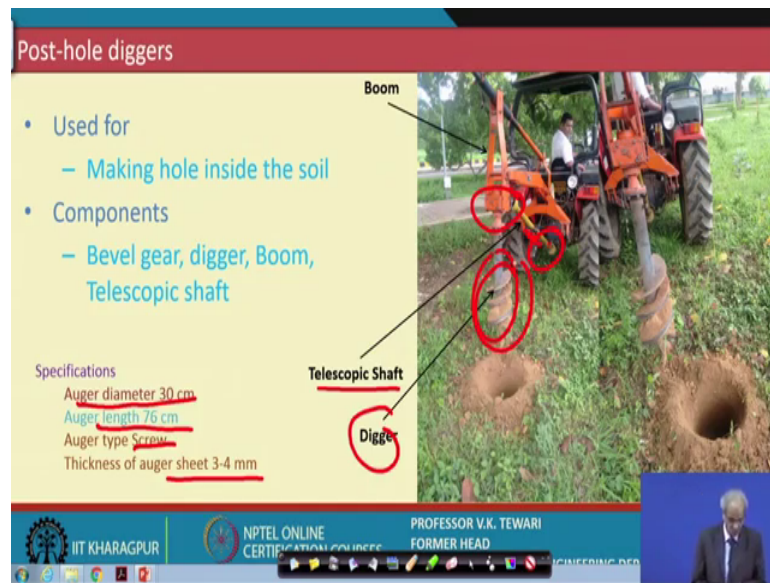
We are talked in one of the lectures about harvesting of fruits if you want that may be that the hydraulic system will be used and the person can go closer and then harvest those fruits. So, that they don't fall and if they fall the quality will be deteriorated.

So, even for that you would definitely require the hydraulic system here and which takes power from the tractor itself. Now the maximum reach horizontal you is 5.5 meter and maximum reach vertical 4.8. Now these are some of the important things which are to be taken into consideration depending upon the size of the tractor that you have size by mean the power of the tractor.

And then also the CG of this tractor see depending upon the CG of this which is very important. So, you cannot go as high as possible see that is why there is a cap on the vertical and the horizontal distances, otherwise there is every chance that this particular machinery will topple the CG will change because they are narrow track machines.

And therefore it is very essential to maintain this maximum and maximum reaches in the horizontal and vertical direction very, very important. Well other guards are definitely important because until unless you have the guards maybe that whatever is being cut will be thrown and then it will thrown on to maybe the chips could come onto the person itself who is involved in the system or sideways or it may be thrown off onto the atmosphere or to other locations and scattered everywhere. So, we would like that this sort of things must be taken care of carefully and understood before they are being used for your purpose.

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Well another thing which I said earlier is the post hole digger this is one equipment which is very extensively used in most of the operations particularly for orchards development and different types of plantations which we want to have.

Because as I said making a hole of about 4 inches 5 inches diameter or 6 inch in diameter and about 50 centimeter, 60 centimeter depth is not easy. You require some of the equipment which manually it is very, very tough and that is why these equipment which is known a post hole digger is one which is very commonly used.

Now, it takes power you can see here that it takes power from the PTO of the tractor see here this is from PTO of the tractor it is taking the power under connected to the 3 point linkage here. And a see this is power here and this is a particular blade you can say that which will have certain diameter because in this is, in the form of a auger you must have seen augers.

So, they keep on moving and this will once I show the operation of this you will appreciate that yes the these augers actually churn out the material as they go down while giving a certain force of this and take the material and then ultimately this comes out.

So, the this specifications of this so the telescopic shaft definitely we have a telescoping shaft as I told you here and both sides just like the earlier one. Since we are taking power from the tractor PTO this is the only method you have to have a Cardan shaft or a

telescopic shaft which can be extended now telescopic shafts particularly. So, they can be extended depending upon the length that is why it is telescopic here it can you can see here that you can increase the length. And the connection here to here is through the universal hooks joint which is employed and this is the digger the digging blade which is there.

The auger length is varying length, but generally you will find these about 76 centimeter or so. The auger type is a screw type auger as if this screw moves inside and then you get the various thickness of the auger sheet is generally 3 to 4 millimeter that means, this is the auger which is there and the thickness of the blade which is there has about 3 to 4 millimeter is the thickness of that.

It is important because these are made of special material. In fact, I have planned another lecture which I will be telling you at the end of this course because at about the material what are the materials which are required for which part of the, or which component of particular equipment.

So, these materials of this auger is very important because it has to sustain cut the soil and then get inside and remove the soil. So, lot of scouring of the these blades takes place while they are going to different types of soils sometimes they will go into sandy soils sometimes they will go into hard soil sometimes they will go into stony soils and things like that. So, we need to look into this and we need to see that they remain strong enough and that is why the material of construction of this is a special material which is used to, may be that we will like to show you in the working of this particular equipment.

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See let us see yeah you can have a look at this how it is connected you can see that this connected to this side from here and then this is the auger. Now, we will see how this operates the power will come to the PTO through this Cardan shaft and then from here to this box here. And then it will come to this yes you see the operation here you can use it anywhere you want.

Of course, we are not talking of completely stony land, but then definitely we are talking of the places where such swire is there. this is softer swire it appears. And that is why it is easier to make this particular hole easy maybe the capacity their capacity depends on several holes of certain size per hour. So, they are known as per there capacity and as per the size of these plates which are important this is the equipment which will help you in making it as early as possible.

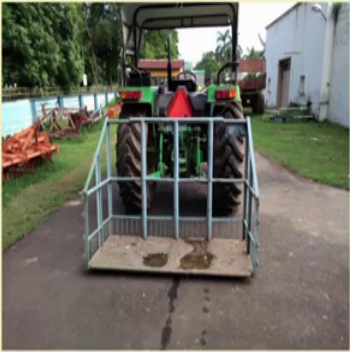
So, you can have a look at this the speed at which you want to remove the material you can see the material has been totally removed then it is cleaned and later on you can go to another hole and so on, complete well so this is about the post hole digger.

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Tractor Mounted Towing Trolley

- Used for
 - Transportation of materials
- Component
 - Three-point-linkages, trolley

Specifications
Length 1.5m
Width 0.5m
Loading capacity 250kg



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Now, another tractor mounted towing trolley this way we have developed at IIT Kharagpur in fact, it is not a big job done. But then this is the one which we are using it and for you can see that in a small area in a small locations if you want to have you can use this thing.

The length is about 1.5 meter width is 1.5 meter and loading capacity goes up to 250 k g or so. And this is very handy it is connected to the 3.0 linkage of the tractor and transfer transport materials you can be the fertilizer seeds oil drums several things, we may have a look at the working of such equipment here very handy equipment.

So, and well although these equipment are available the knowledge of agriculture engineer or the ingenuity of the agriculture will be on the use of them. What is required at what time when will particular item will be used? Not necessary that if you have the bulldozer or if you have the dozers you can use it at each and every time because they have the power and all that, but sometimes for short duration depending upon the requirement you can keep on changing this let us have a look at this video.

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If you have I think some material is based transporter you can never look at this some material is being transported here and it is easy we can maintain a certain angle to this so that it will not fall. And it does not require so much of a space about 1.5 meter width only the, of this particular item the video gives you a lot of information if depending upon what you want to do.

So, in this well you can use for any other requirement if you have. So, I can tell you that in this specific equipment that we have talked so far. It is very essential that we keep these in to at into our knowledge and try to see what machinery is required how cost effective a particular machinery will be for the job that is there.

Whether you want to create a park whether you want to create orchards or what is the time apart and exposure of material and bulldozing of materials or you can say plain land etcetera. So, this is all depends on what you have the information is fed to you and now it is on you to look into these and try to use. I hope you will have several questions many a times because as an engineer we are not going into the more details of the mechanics of the system the system have been told to you.

Now, what is the type of job it can do and what are it is important components where they can fail you must have an idea about this you must know what are the critical components which should be kept in inventory. So, that if it is required it can be replaced immediately and the system will work so these are very important things which you must

have I am sure that you will like to have questions which we cannot know handle at any time that is required and I think we will close here and.

Thank you very much.