Forests and Their Management
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Module - 10
Silvicultural Practices
Lecture - 30
Planting and Tending

[FL]. We move forward with our discussion on Silvicultural Practices. And in this lecture, we will have a look at Planting and Tending.

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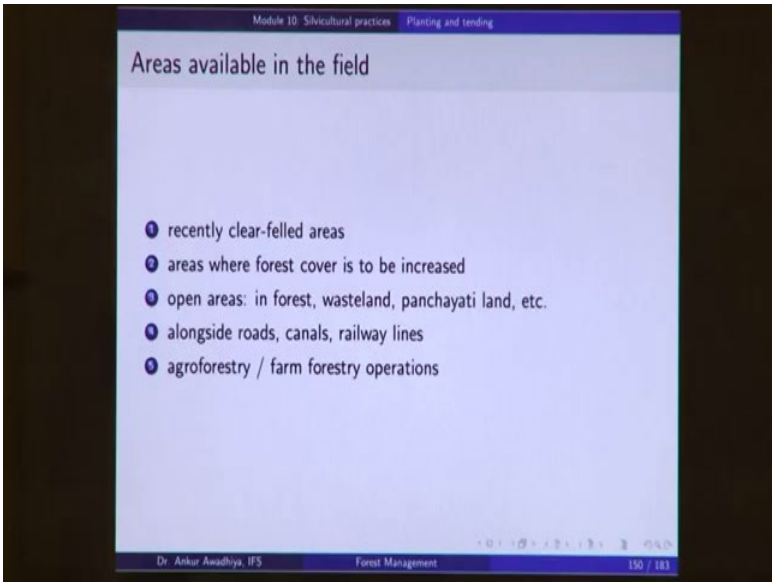

Now, the aim of silviculture is to ensure a regular production of timber and for that we need to ensure the regeneration. Now, when we talk when we talked about regeneration, we also talked about artificial regeneration in which case the young plants are planted in the field. So, how is this planting done? What are the areas that are available for such plantings? And, what is the procedure that we follow to ensure that the regeneration comes up properly.

So, we begin with the areas that are available in the field. The first one is recently clear-felled areas. Now, we had seen in the lecture on clear felling system that, in the clear felling system, we remove all the trees that are there on the piece of land. And, when all

the trees have been removed, then natural regeneration is not possible, except in a few cases where we have copies regeneration or regeneration through advanced growth.

But in general, we can say that in the case of a clear-felling system, you remove everything; so, you will have to go and plant in those areas. So, the areas where you have done clear felling are areas that are available for planting.

Then, there are certain areas where the forest cover is to be increased. So, here we talk about those areas where the density of the plants is less. So, the plants that are there in the forest are not utilizing the whole of the growing space. Some of the growing space is still available and we can plant more number of saplings in the in that area to utilize that growing space, so that there is an optimal utilization of the growing space. This is also done in those areas where our objective is to increase timber production or to do more and more amount of carbon sequestration.

So, those areas are also areas where planting needs to be done. Then, there are some certain open areas; in forest areas, certain wastelands, certain panchayati lands and so on. So, especially, in the case of social forestry, these days people are coming up with a demand that they require fuel wood crops. Now, where will we plant these fuel wood crops panchayati lands are available, and in those areas, we can come up with those plantations. So, these open areas whether they are in forest in revenue land or in wasteland, they can be put up for plantations. Alongside roads, canals and railway lines.

So, if there is a plantation along the road, it is known as an avenue plantation and an avenue plantation is done primarily for two purposes; one is the provisioning of shade. So, if there is a road and there are trees on both the sides, then there will be space on the there will be shade on the road, and because of that shade the movement of traffic will be much more comfortable.

People will feel comfortable when is even in the peak sun. The second objective is to have an optimal utilization of that space that is available. So, because we have a land, and because there are communities that are living close to that land, and they require certain trees, probably they require certain fruit crops, such as mangoes or they require certain fuel wood crops.

So, if there is a land of label and there is a demand, we can put that land into use in the form of an avenue plantation. Then, in certain areas, an urban plantation is also done. Urban plantation is to beautify a city. So, all those areas which are available they can be put up under plantation.

And, another category is that of agroforestry or farm forestry. Now, there is there is a slight difference between agroforestry and farm forestry. Agroforestry is a situation where a farmer is trying to have revenue both from his forest crops as well as the agricultural crops.

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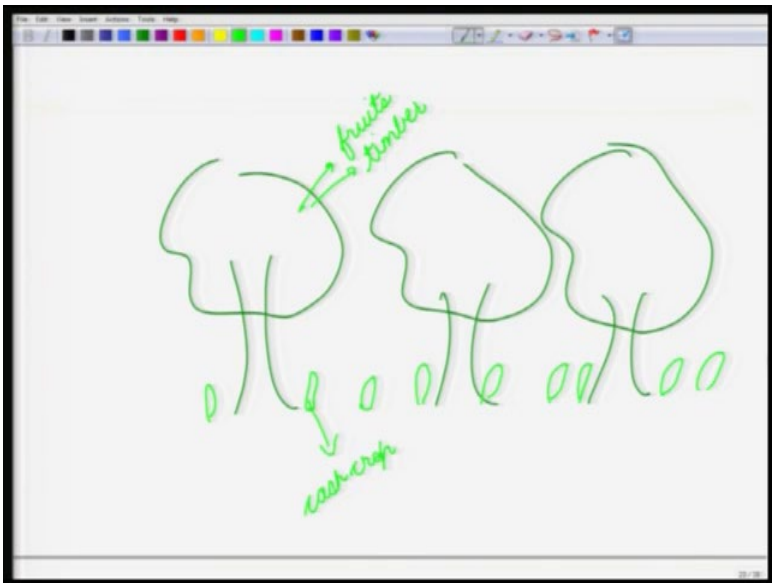

So, a classic situation is where a farmer might want to have mango trees on his farmm and below these mango trees, he might want to put up say haldi (turmeric) crops. Now, haldi is a species, turmeric, which grows in the shade. Now, if he has these trees as well as these haldi (turmeric) crops, then these trees will be able to provide shade for the growth of or for the sustenance of these healthy plants.

Now these haldi (turmeric) plants will be able to grow in a much better manner as compared to if they were put out in the open sun. And at the same time, this farmer is able to get cash crop as well as fruits from these mango trees, and also in certain cases, timber from these mango trees. So, in the case of agroforestry, the farmer is getting income both from forestry as well as from agriculture. Now, the second term here is farm forestry. Now what is farm forestry?.

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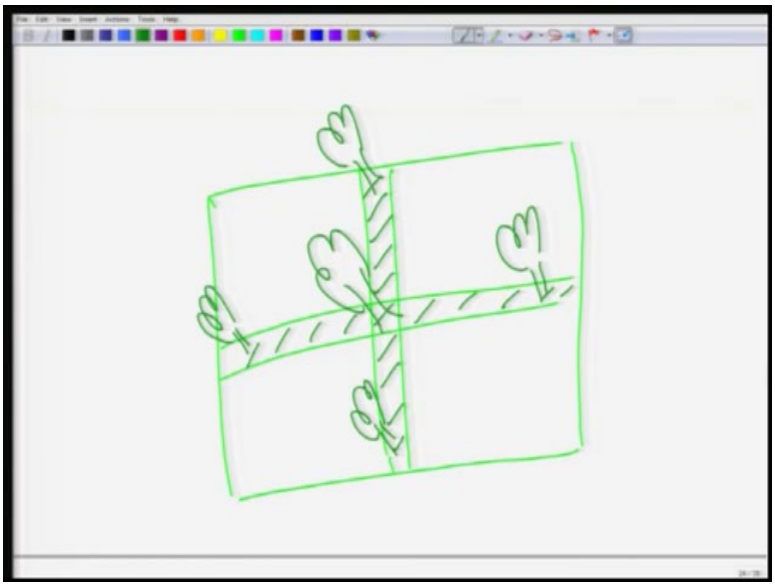

So, there is a farmer who is having an agricultural field, and let us say that this farmer is growing say wheat on his field. Now, there are certain species that are available in the form of maid and this, on this space the farmer is not planting any wheat.

So, what the farmer can do is that he or she can plant a tree here. So, this tree is not being planted to generate revenue, but it is being planted to meet certain small requirements, such as certain requirement of fruits, probably for self consumption or consumption of his family, or certain amount of fuel wood. So, these kinds of plantations in which the primary objective is agriculture. And, the secondary objective is to have a few trees to meet certain requirements is known as farm forestry.

So, basically all these areas; whether they are clear felled areas, areas where cover is to be increased or open areas or areas along the roadways or railways or canals or areas, where agroforestry or farm forestry is to be promoted or done are the areas, where you need to do planting operations.

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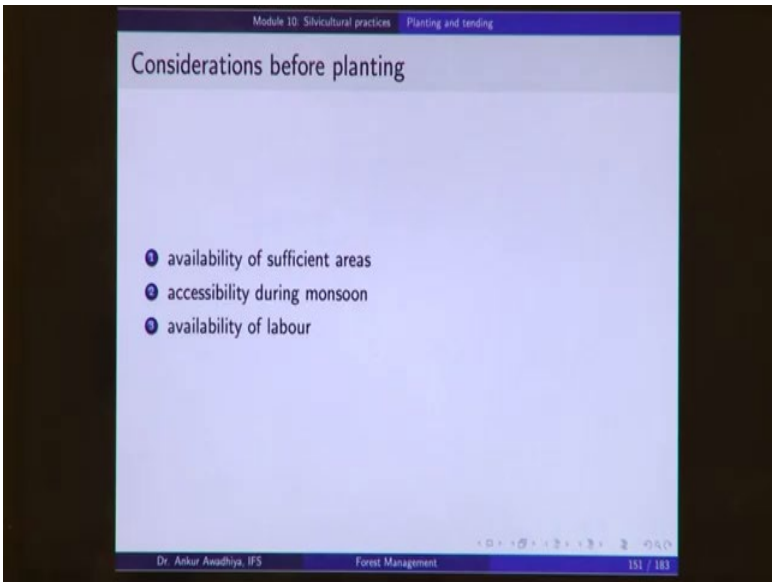

Now, whenever we begin with a planting operation, we need to keep certain considerations in the mind. One is the availability of sufficient areas because when the department does a plantation plant say 3 or 4 plants, because that will become prohibitively expensive to employ a labour just for 3 or 4 plants.

So, the first requirement is the availability of sufficient areas. So, they so, there should be sufficient area to plant say 100 trees or 100 plants. The second is accessibility of this area during the monsoon season because most of the plantations in our country are done during the monsoon season. Now, if this area is inaccessible during the monsoon season, then probably it will not be worthwhile to begin with the planting operation. And, the third one is availability of labour, because in our country the planting is done in a labour-intensive manner and so, there should be an easy and cheap availability of labour in this area.

So, there are three things availability of sufficient areas. Now, this sufficient area also includes the areas that are capable of supporting these plants. So, this area should be preferably an area that has sufficient amount of fertility. It has sufficient amount of rainfall; it is not a very dry or a very wet area. So, when we say sufficient area; it is sufficient area that is also suitable area for plantation, then accessibility of the area during monsoon and the availability of labour.

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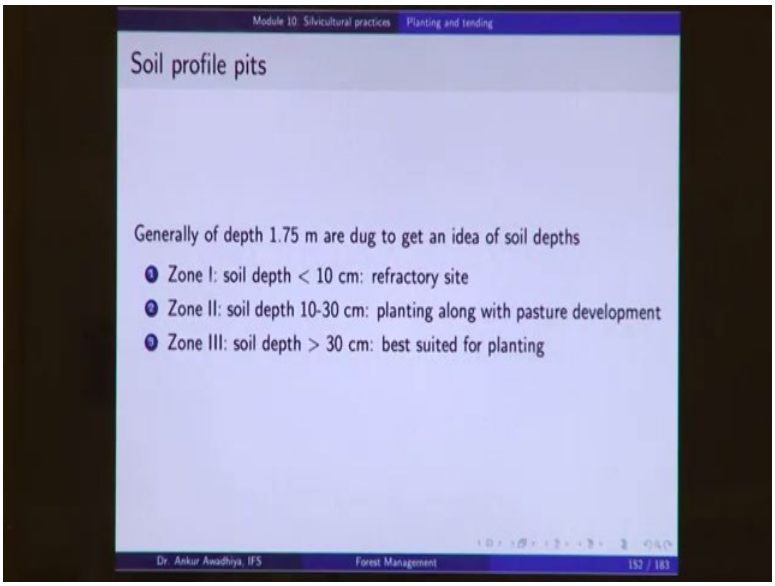

Now, before we do a planting operation, we begin with the generation of a soil profile. Now soil profile is typically figured out by digging certain soil profile pits which are generally of the depth of 1.75 meters.

Now, why do we need to have a soil profile map? Now, this is because soil is of utmost importance in supporting the plants. So, if an area does not have a sufficient depth of soil, then probably it will not be able to support the plants. So, before planning our planting operation, we need to look at the soil profile map of the area and the soil profile map is constructed by digging holes.

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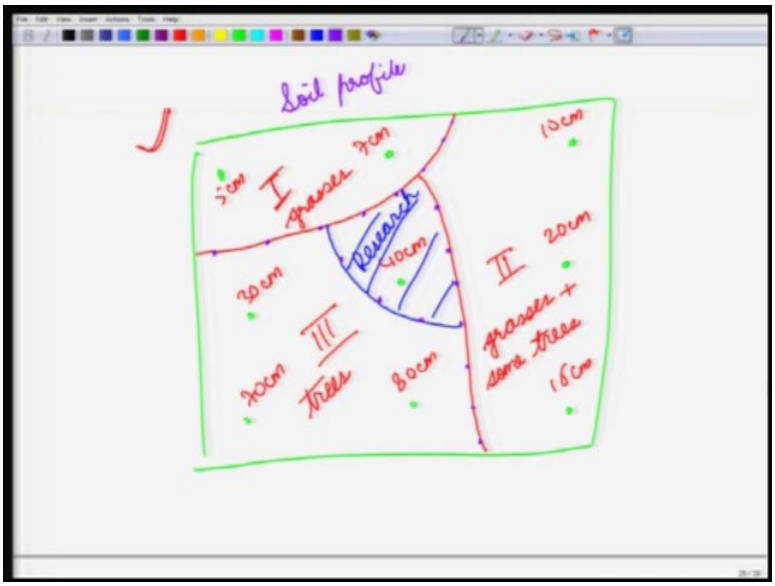

So, if this is the area where you need to do the plantation, then probably you will dig a hole here, a hole here, a hole here, here, here, here and so on. Now, when you are digging the hole, you will see till what depth a soil available. And, depending on the depth, we divide the area into three different zones. The first zone is where the soil depth is less than 10 centimetres and we call these areas as refractory sites.

Now, in these areas, because the soil depth is very less so, it does not make any sense to plant trees in these areas. Because the soil is not of a sufficient depth. it will not be able to support the trees. The second depth or the second zone is where the soil depth is 10 to 30 centimetres, 10 to 30 centimetres is a depth which is not an optimal depth for most trees, but yes some trees can be planted. But primarily this area should be used as a pasture land. So, basically you will be, you will be planting grass slips and also some plants, because there is a good chance that the tree species that you plant in this area might die off.

And, the third zone is where the soil depth is greater than 30 centimetre and these are the areas that are best suited for planting. So, when you were making these soil profile these soil profile pits, then probably this only raised till 5 centimetre, this reach till 7 centimetres, this was say 30 centimetres, this one was 40 centimetres, this one was say 70 centimetres, this one let us say this is 80 centimetres, and here let us say that this was 10 centimetres, 20 centimetres, 15 centimetres.

So, when you are when you get this data, you will be dividing this area into these three zones. This is the first zone; this is the second zone, and this is the third zone. So, this third zone is where you will be planting the trees. The first zone is where you will not be planting anything or probably you will only be planting grasses, and in the second zone, it will be grasses plus some trees. And, in this one, you will be planting the trees. So, this sort of a map is known as a soil profile map. So, before doing the planting operation, you need to figure out the soil depth and get the soil profile map of the area.

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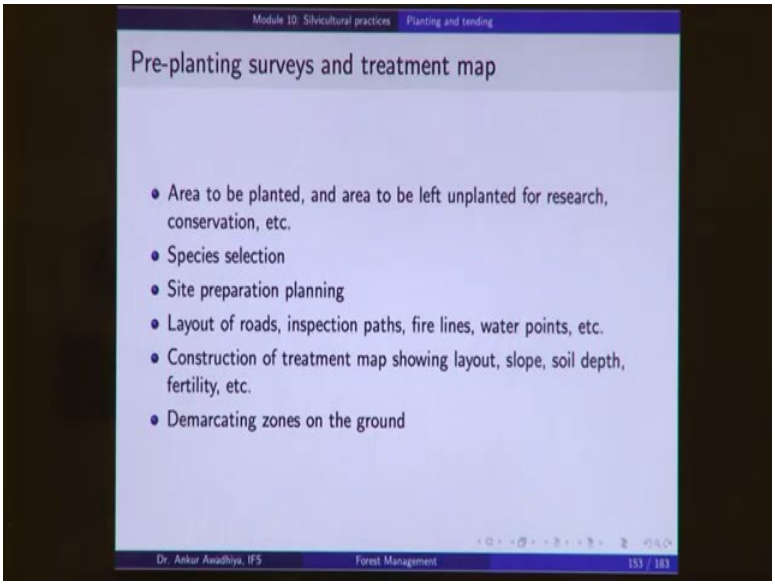

Next, we perform a pre planting survey and prepare a treatment map. Now what is a pre-planting survey? It is a survey; and, we have seen what surveys are; this is a survey that has done before planting and what are we trying to figure out in this survey? We need to see the area to be planted and the area to be left unplanted for research work, for conservation work, and so on. So, for instance, when we were looking at this soil profile map, so, the zone I will not be planted, but it is also possible that a certain portion of the zone III belongs to a research plot.

So, if this is a research plot, then probably we will not be doing anything to this area. So, while doing the pre-planting survey, we have looked at the soil profile map and we have also marked those areas where we should not be doing any planting. So, areas to be planted and areas not to be planted both of them are marked.

Next, species selection. Now, species selection depends on a number of factors. So, especially in the case of hilly areas, there will be a different species that is planted on the south facing slopes, and a different species that will be planted on the north facing slopes. Because, India lies in the northern hemisphere and so, the south facing slopes will be exposed to much more amount of sunlight as compared to the north facing slopes. So, probably the species will be different. Similarly, if the area where you are doing the plantation is large and it rugged.

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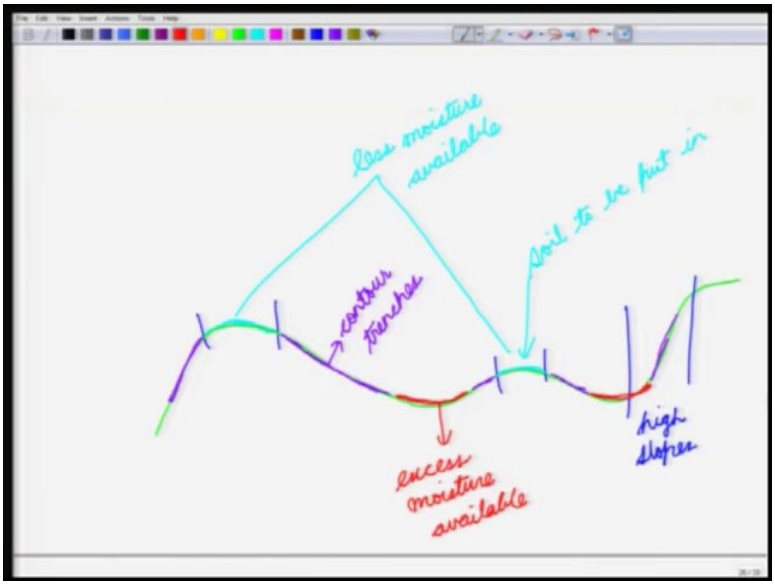

So, in that case, let us say that the area is something like this. So, in this case, these sections with very high slopes will probably be having a very different species as compared to these tops of the hills. So, here, you will have a very different species as compared to these species which are there on the valley floors. Because, in this point, you have an excess moisture that is available, whereas in these points you have less moisture of available.

So, while doing the pre-planting survey, you will also have a look at the topography of the area to decide which species should be planted in which areas. So, we do a species selection. We also do a site preparation planning. Now, what is a site preparation planning? It is possible that in these areas the soil is very less in depth; so, probably some more amount of soil needs to be put in. Probably, in these areas, you need to have contour trenches. Now what is a contour trench?

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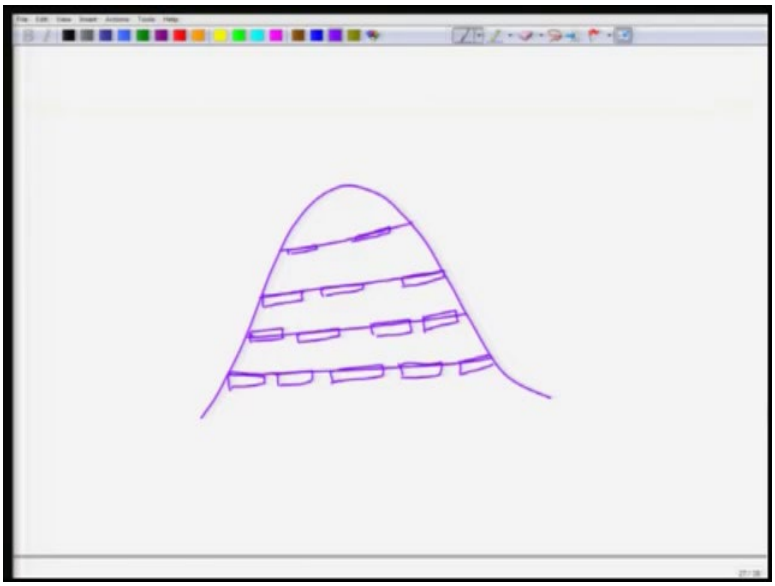

A contour trench is a trench that we dig parallel to the contour lines, which means that, if you have a hill, then along these contour lines, we will be making trenches and these trenches are primarily to retain water and to prevent soil erosion.

So, these are trenches that we are making parallel to the contours to prevent soil erosion, and also to retain moisture. So, in these areas, probably we require contour trenches. And, in these red areas, probably certain pit digging needs to be done. So, while doing the pre-planting survey you are also looking at what are the sorts of soil preparations that need to be done.

So, we look at different site preparations; then, we also make a layout of roads, inspection paths, fire lines, water points and so on. Because whenever you are doing a plantation, at certain times, you will also need to monitor this plantation. You will have to get into this plantation once the plants have established themselves and perform certain tending operations.

Now, if you are doing this plantation from the beginning, then it makes much sense to layout your roads, so that all parts of the plantation are easily accessible for either observation or monitoring or tending operations later on.

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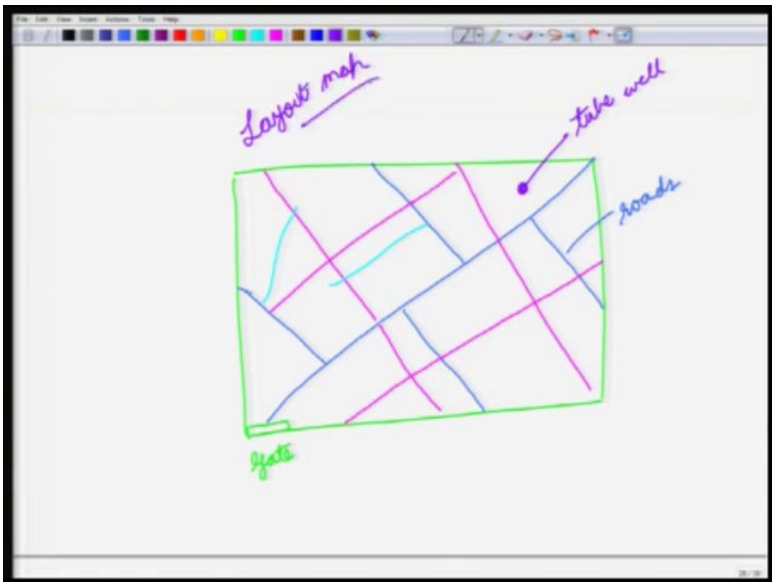

So, what we do in this case is that, if this is the area that has to be planted and probably this is an area which is suitable for making of a gate, then we will say that let us have a road like this and probably roads like this, so that we are able to access different portions of this plantation. So, you need to make for roads also you need to make provisions for fire lines.

Now, fire lines are made so that, if later on; if there is any fire, then the fire should not be able to move throughout the forest. So, because you are doing this plantation to generate a forest, then it makes much sense to do a planning for the fire lines from the beginning itself. So, you plan for the roads; you plan for the fire lines. You may also plan for certain inspection paths. Now, an inspection path will not be a road, but it will be more like a pagdandi (rough path) that is moving inside. So, on an inspection path, people can move on foot, and have a look at the plantation; to monitor the plantation; to grade the plantation.

So, all these preparations layouts for roads in inspection paths, fire lines, water points especially, for plantations being done in urban areas where you want to have a fast growth, you will probably also require certain areas where you will dig a tube well. So, where is the point where you want to have the tube well for irrigation of this area is also something that you will decide during the pre planting service. Then, construction of

treatment map showing layout, slope, soil, depth, fertility etcetera. So, what we are saying here is that you have this layout map, you also have this soil profile map.

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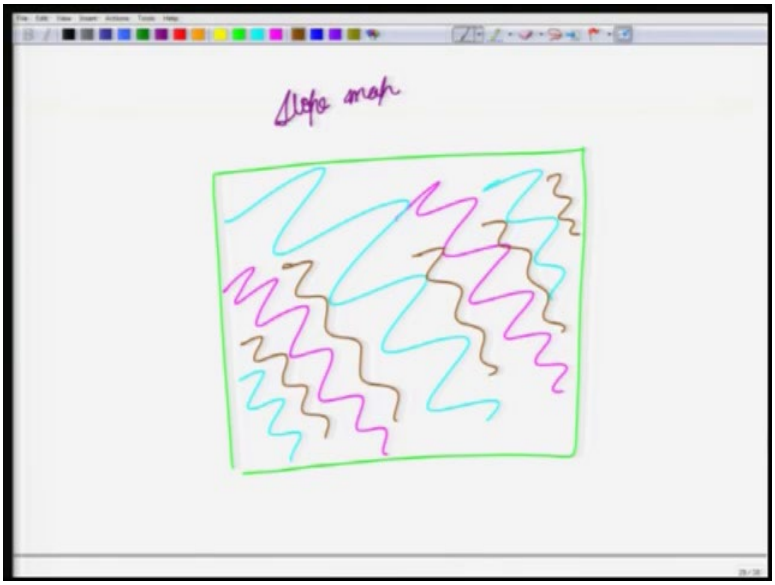

Now, similarly, you will you may also generate a map of the slope of the area. So, this is a slope map, probably, it will show that these are the areas with high slope and these are the areas with low slope and these are the areas with moderate slope. Now, when you combine all of these maps together; so, you have the layout map, slope map, soil depth map, fertility map and so on.

When you combine all of these together, you generate a treatment map. So, a treatment map is generally having a number of colours to depict these different things. And, by looking at the treatment map, you can very easily understand why you are doing a certain operation and where you are doing these operations.

The next point is to demarcate these zones on the ground. So, here we talked about that this is how we are going to do this plantation. But then these lines which you have drawn on the map, will now also be pointed out on the ground itself. Probably through the use of certain sticks, or in certain cases, you may put rocks that are painted with limestone with lime so that, these rocks look white in colour. So, you are actually demarcating all these lines on the ground itself. So, these are all different activities that need to be done even before you have started to do the planting.

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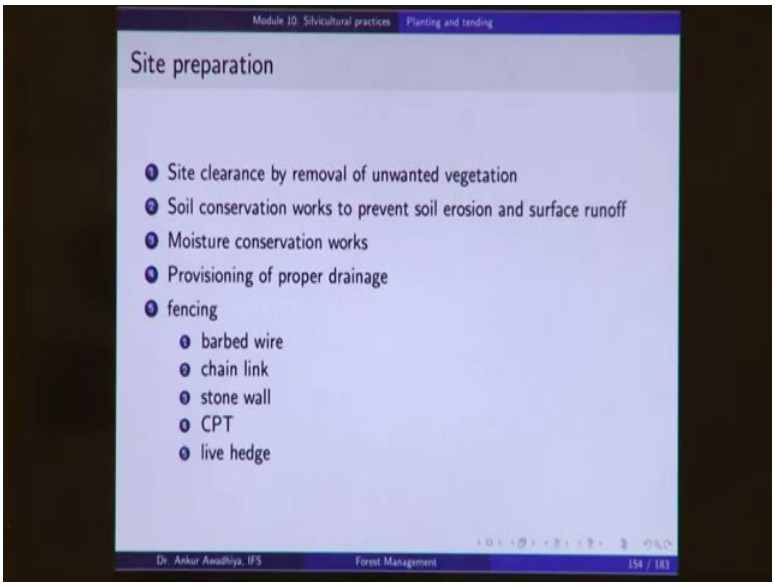

Then, once you have demarcate these and demarcated these lines on the ground, next you need to go with the site preparation. What is site preparation? You are preparing the site so as to make it suitable for the next operation which is the planting operation.

So, what do you do in site preparation? Step 1 is to clear the site by the removal of unwanted vegetation. So, probably your site is full of an invasive species which is Lantana, or probably your site is having certain species that are not useful from a timber point of view, and you want to generate a plantation. Or, probably your site is having certain trees that are very disease trees.

So, in the site preparation phase, you will be removing all of these vegetation and cleaning up your site, so that the planting operation can begin. Next, you will perform the soil conservation works to prevent soil erosion and surface runoff. Typically, soil conservation works and moisture conservation works are done together. So, what do we do in the case of soil and moisture conservation works?

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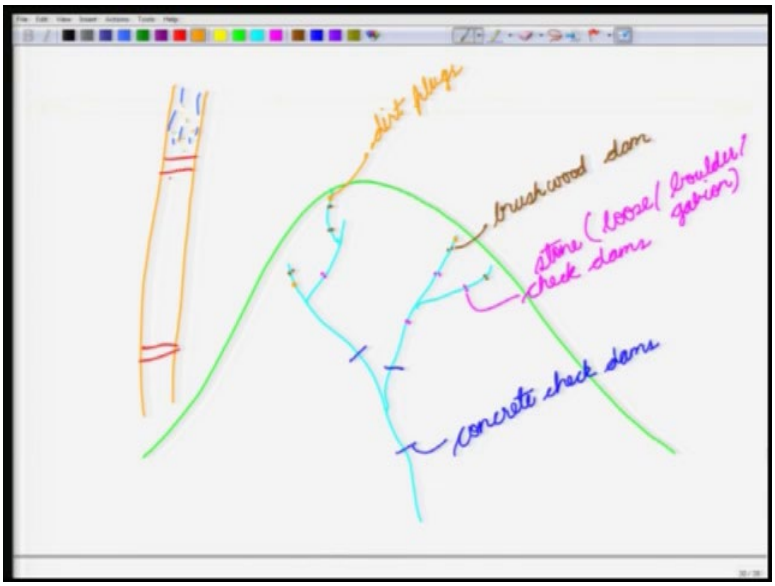

Suppose, you have a hill where you are doing this plantation, and because of erosion, there are a number of gullies that have developed in this hill. Now, if you do not plug these gullies, then with the next rain the soil and moisture both of them will be able to move away from your plantation site to other areas.

Now, typically, when you are doing a plantation, you are also digging pits and you are loosening up the soil. So, right after you have done your digging step, the chances of erosion go up. Now to prevent that what we do is that, at certain points we make brushwood dams, in certain locations; we will probably make check dams, in certain other locations; we will be making large size concrete dams, concrete check dams. Probably, these are the stone check dams either loose stone check dams or boulder check dams or gabion check dams.

So, we are making all these different sorts of check dams. And, in certain areas, we are also doing a plugging through dirt plugs or soil plugs. So, we are doing all these different; we are putting all these different obstacles so that in any gully the water is not able to move freely. So, when you have in the rainy season, the water together with the sediments will come and collect at the first checkpoint. So, whenever you are stopping the water flow if what is flowing in this direction and you have put up and put up a stop here.

So, the speed reduces; when the water is touching this dam, then the speed of the water reduces. And, when the speed of the water reduces, its ability to carry the sediment also reduces. So, this water will deposit the sediments here. And, from the overflow, the water that moves is more clearer with less amount of sediment load. And, whatever sediments have remained, at they will get stopped at the next check dam, then whatever sediments I mean they will get stopped at the next check dam and so on.

So, through these operations, you are slowing down the speed of water, so as to conserve water. Because whenever you are stopping this water, this water will also percolate downwards into the groundwater. And, you are also stopping the sediments from moving away. So, these soil and moisture conservation works are also done in site preparation. If your area could be a waterlogged area, then you will have to make provisions for proper drainage.

Now these are typically, in the case of the bottoms of the valleys, where there is an excess moisture that is available. And, if there is a chance of water logging, then drainage channels will also have to be made. And, in site preparation, we also do fencing to protect our plantation. Once it is put up, and these fencing can be barbed wire fencing, a chain link fencing, stone walls, cattle proof trenches or live hedges.

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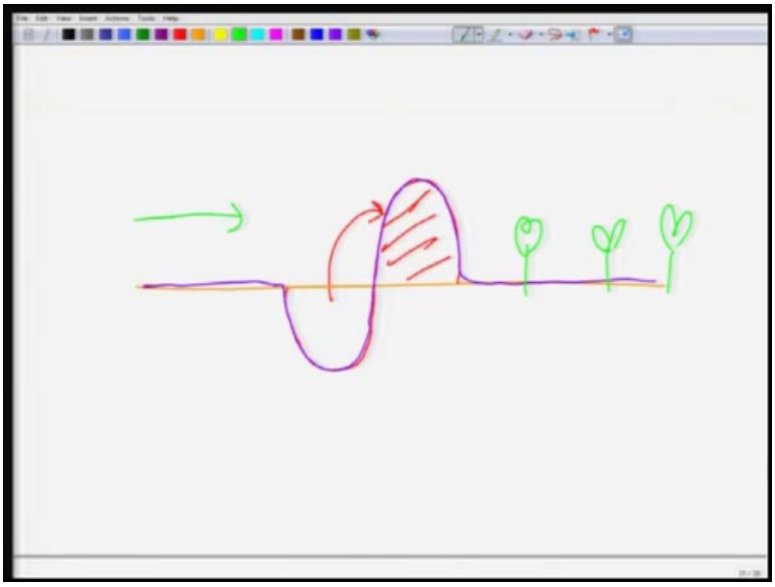

Now, we have seen four of these in the previous lecture, what is the cattle proof trench? So, if this is your ground level; in a cattle proofed trench, you will dig this area and put

up this earth here. So, now, the ground profile looks like this. Now, if you have a plantation here on this side, and if the cattle wants to move inside, then the cattle will have to negotiate this deep trench and also a wall in front of it. And, in a number of cases, the cattle is the these the cattle are unable to cross these CPTs. So, CPTs are also used as fencings in a number of plantations.

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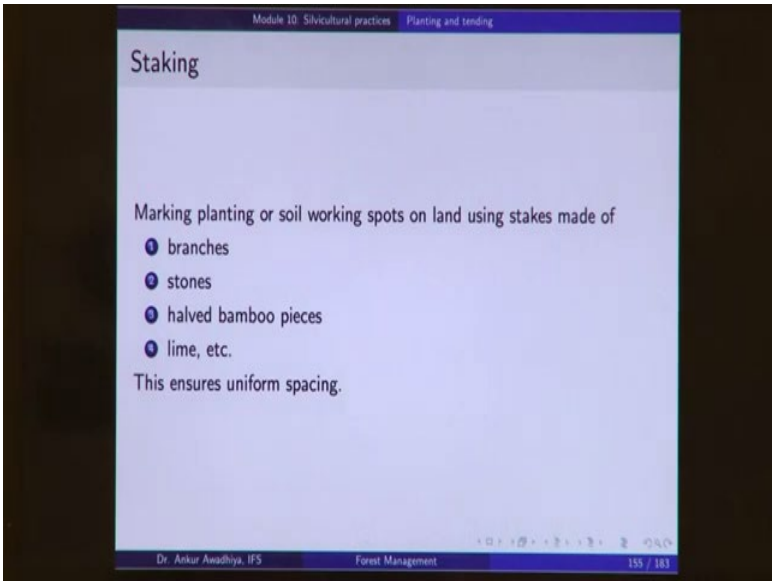

Now, once you are done with your site preparation, the next step is staking. Now what is the staking? It is marking planting wall or soil working spots on the land using sticks. So, here now you are deciding that ok.

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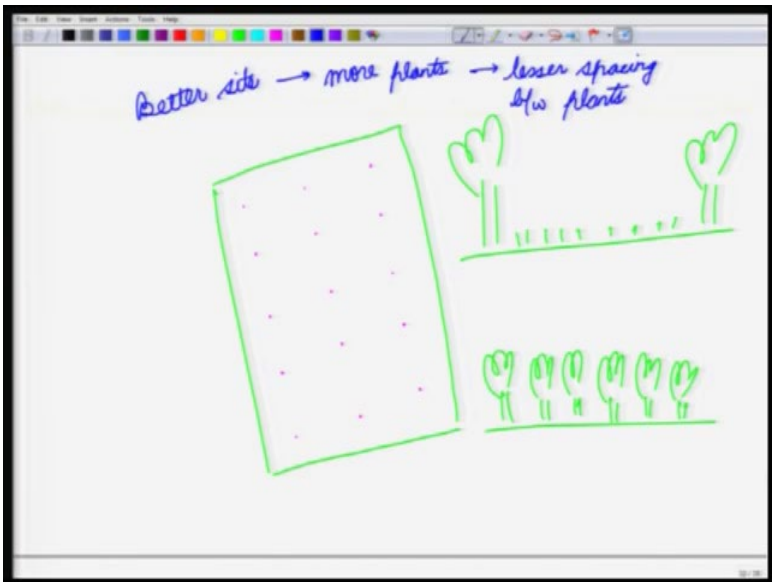

I am going to do a plant, I am going to plant my trees here, but then what are the locations where I should actually plant the trees. So, what you will do is you will mark these points using certain substances, such as either branches or bamboo sticks or rocks that are painted white in colour, or probably you can even make use of plough marks. So, staking is marking of planting spots or soil working spots, on the land using stakes made of branches, stones, halved, bamboo pieces, lime and so on.

And, this ensures uniform spacing. Because, once you have started to dig the holes, if you have done a proper staking, then your plantation will look uniform. If it is not done properly, then your plantation will look very absurd.

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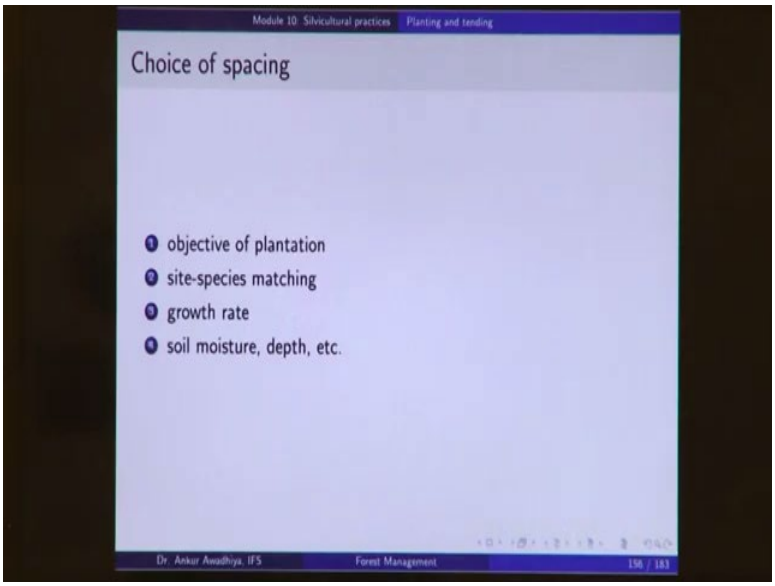

And, this spacing of a staking is decided based on the objectives of the plantation. So, do you want to have a plantation just for fuel wood, in which case, you will want to have the this spacing as to be less, so that all the area is covered up with your trees.

Or, if you want to have a plantation together with a pasture land; so, in that case, you will want to have a few trees, but the area in between should be full of grasses. So, if that this is your objective, you will be having a larger spacing. If your objective is only fuel wood, then probably you will be planting the trees very close together.

Staking also depends on the site and species matching. So, probably you want to go with certain plants that are strongly light demanders. So, in this case, you will probably want to go with a larger spacing, so that your plants are very far away from each other and there is hardly any shadow that falls on any plant. You will also be wary of the growth rate of these different plants.

So, if you have certain plants that grow very fast, then probably it is a good idea to have a closer spacing in the beginning, and then doing a thinning up operation. Or, if you do not have an option of thinning, then you can directly go with a larger spacing, so that more amount of light and nutrients are being made available to the plants for their fast growth.

And, it also depends on soil moisture, soil depth and so on. Because, if the site is more fertile, then probably it will be able to support a larger number of plants. So, what we are saying here is that, a better site would mean more plants; more plants means lesser spacing between the plants. So, this is how you decide use your spacing. So, how is it actually done in the field?

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So, here we are seeing a person who is doing the staking operation. So, these are the locations where the holes will be dug, and this person is now digging a small mark on the ground so as to tell the next person where to dig the hole. So, this is a stake.

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Now, a stake could be in the form of a wood that is projecting outside, or in certain cases you can just make marks on the ground, such as this, to let the next person know that this is the point where you need to dig a pit.

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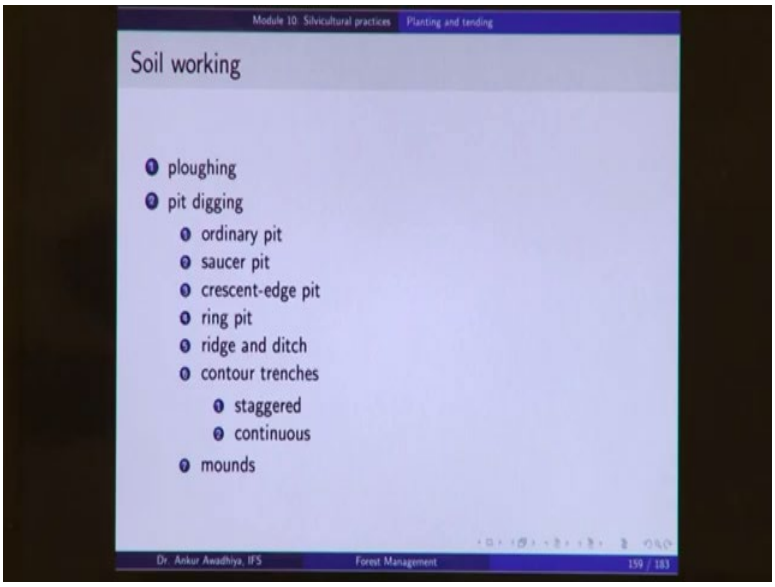

Now, when we want to do these plantations, there a certain amount of soil working that is required. Now this soil working; because, you want to make the soil loose, so that your plants are able to establish themselves easily and quickly. So, how do we do these soil workings? We can either plough the hole of the land as we do in agriculture. So, we can

bring the tractor and plough the whole land, or this ploughing can also be done in the form of strips.

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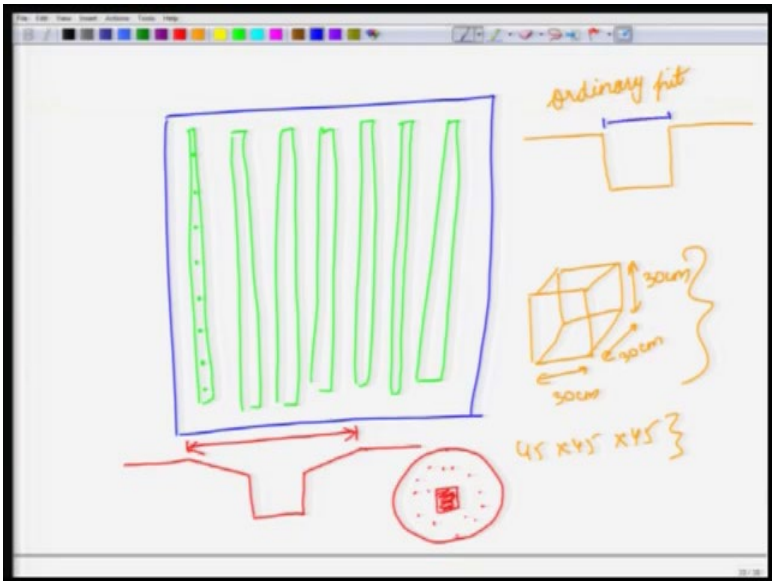

So, we can say that we are going to raise plants in these strips and so, these strips need to be ploughed. So, once you have ploughed up these strips, then you can plant your saplings at certain distances on these strips. So, this is one way of soil working.

Another way is so; ploughing generally requires the use of machines, and in our country, because forestry also happens to be an to be an occupation that provides livelihood to people. So, we generally prefer labour intensive works. So, labour intensive works could be in the form of pit digging. Now, pits are of different shapes and sizes; the simplest one is an ordinary pit. Now, what is an ordinary pit? You have the soil you dig a pit.

So, this is just a pit that is dug downwards, generally the thus the standard sizes are 30 centimetre in width, 30 centimetre in length and 30 centimetre in height. So, this will, if you look at this pit, this will be in the form of a cube 30 centimetres, 30 centimetres and 30 centimetres. Another standard size is 45 by 45 by 45. So, this size is roughly 1 foot by 1 foot by 1 foot. This size is one and a half feet by one and a half feet by one and a half feet roughly.

So, this is a standard pit or an ordinary pit. Another option is to have a saucer pit. Now, in the case of a saucer pit, you will dig the pit like this and here is your this is your

ground. So, essentially when you look at a saucer pit from the top, you will see this area followed by this pit. Now, this circular region this typically circular. So, this region is having a slope towards the pit, and why is that helpful? That is helpful, because such a pit will be able to retain moisture that is falling on this much large area.

So, all the water that is falling during the monsoons in this area will be channelized towards the pit, otherwise, if you went only with an ordinary pit, only this much amount of water is entering inside. So, a saucer pit is generally preferred in those areas that are a bit drier because you want to retain more and more amount of moisture for your plants. Another option is a crescent edge pit. Now a crescent edge pit is generally made in sloppy areas.

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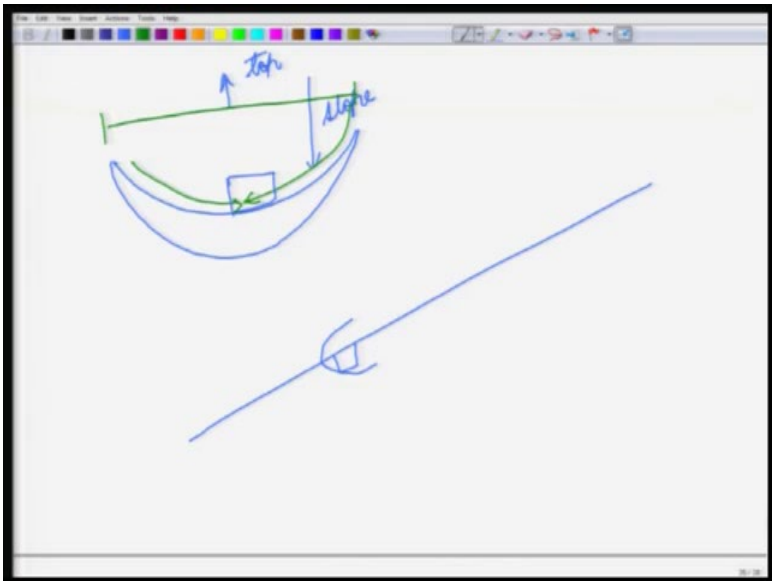

Now, if your area has a slight slope, you will dig a pit, but you will also dig a crescent around this pit; so, from the top it will look like this. So, this is your pit and you are creating a mound out of mud like this, where this is the top portion and this is the direction of the slope. Now why would you want to do this? Because, all the water that falls in this area gets channelized towards the centre and near the centre you have your pit.

So, this sort of a crescent pit is bringing all the water from this big an area towards the pit and. So, this is generally preferred in those areas that have an even drier sort of a climate. Next, we have a ring pit.

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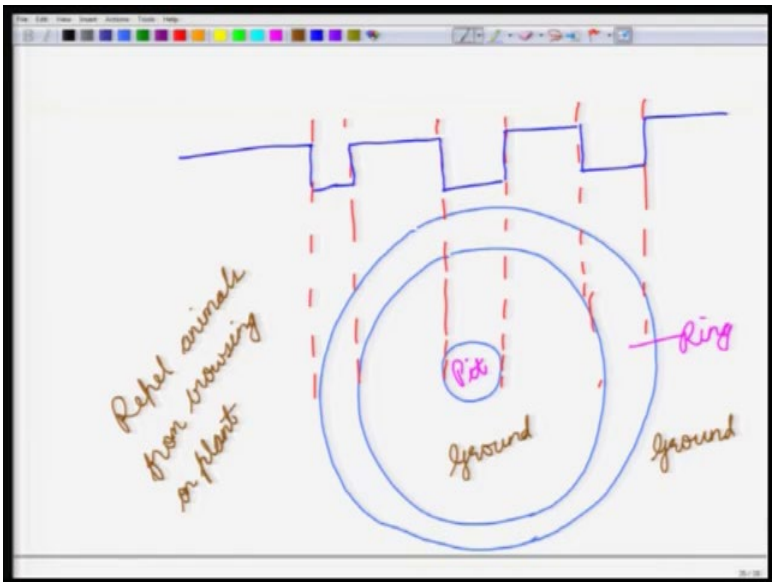

Now, in the case of a ring pit, you have a pit which is surrounded by a large sized trench in the form of a ring. So, if you take a cross section of this; so, this area is having a pit, this area is elevated, then this area again is having a pit followed by the normal ground. So, this is your pit and this is the ring followed by ground here and ground here.

Now, why would you want to go with such an intricate structure? This sort of a structure is preferred for two reasons; one, you have generated a large sized ring in which water can accumulate. So, this is preferred in drier areas; and two, if you have a sufficiently large sized ring, then animals will also not be able to access the plant that is growing in your pit. So, this also serves to repel animals from browsing on the plants. So, if you are going with a ring pit, then probably you do not have to go with other sorts of fencing mechanisms.

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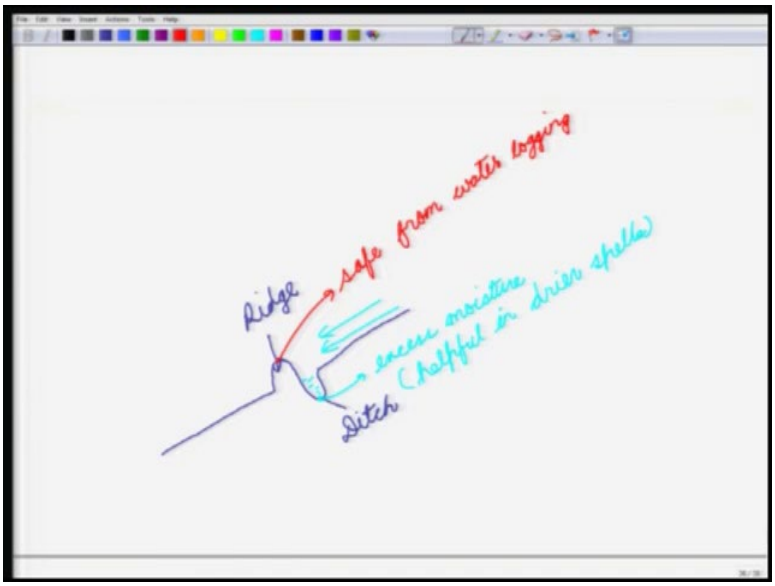

Another option is a ridge and ditch. Now in a ridge and ditch; this is also preferred in sloppy areas. So, here you have a ridge and here you have a ditch. Now, a ridge and a ditch is generally preferred in those areas where you have a slope, and also the rainfall is erratic. So, it is possible in that in a particular year you are getting a very low amount of rainfall it is possible that in a certain year you are getting a huge amount of rainfall.

Now, because you will be doing your plantations in the rainy season, and you are digging these pits beforehand. So, if your area has an erratic rainfall, this sort of a structure provides you with a certain amount of insurance. Why? Because, any water that is flowing along the slope will get accumulated here and so, if the rainfall is less, you will be having an excess moisture here which is helpful in drier spills. Whereas, if by chance, you have a very heavy amount of rainfall; in that case, your ditch will get completely overfilled and it will it might even get waterlogged.

But, if you do if you plant a plant here, then it will be safe from water logging. So, when we do a ridge and a ditch sort of a system, we always plant two plants one in the ridge one in the ditch. So, whether it is a very dry season or whether it becomes a season with more amount of rainfall, in both the cases, one of these plants is going to survive. So, this is an insurance mechanism. Another option is to have contour trenches with a staggered or continuous.

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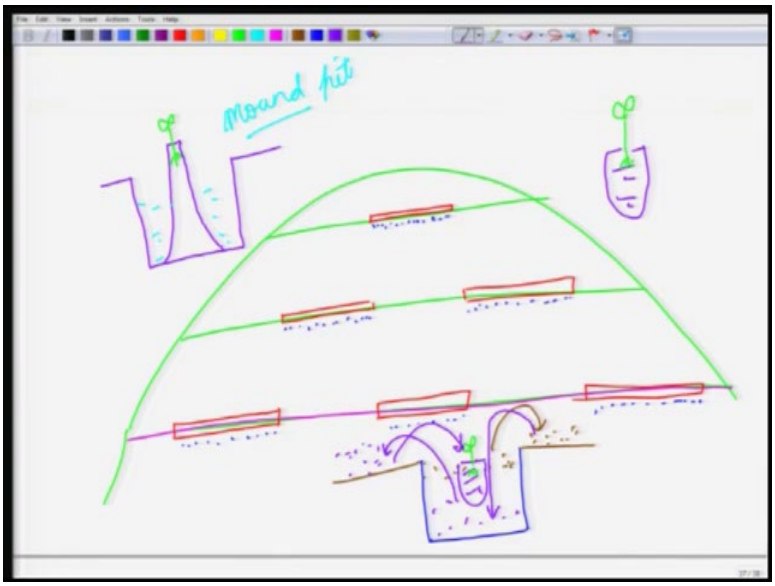

Now, as we have seen before in the case of a contour trench, you will be digging trenches along these contours and these trenches can either be continuous in which case you will have all these areas that have been dug up in the form of a trench, or you can have it in a staggered manner, where if you have a trench here. Then, in the next line, you would not be having a trench, but you will be having a trench in these locations and then in the next line, you will be having a trench here; then you will leave this area and then you will have a trench here, so that any water that is falling on this hill it gets accumulated in one or the other trench. So, you can have a staggered trench or a continuous trench, and typically in these trenches also, we can make use of these trenches also to plant the saplings. And, you can whenever you are making these trenches, they these the soil that comes out is generally accumulated on this side. And, in this case, you can also use these contour trenches as your ridge and ditch pits.

So, in certain cases, you can plant your plants inside the trench is also and also on the up side another option is to have mounds. Now, mounds are preferred in those areas that have an excess amount of water. So, what do we do in a mound? In the case of a mound, you will be digging a pit, but the soil that is coming out of this pit, you will put it like this and later on you will plant you plant here.

So, in this case, the water that comes it gets accumulated here in the pit, but your plant is not exposed to a waterlogged soil. So, your plant is protected against water logging. So,

this sort of a structure is a mound. So, we can call it a mound pit. So, let us see how this happens in the field.

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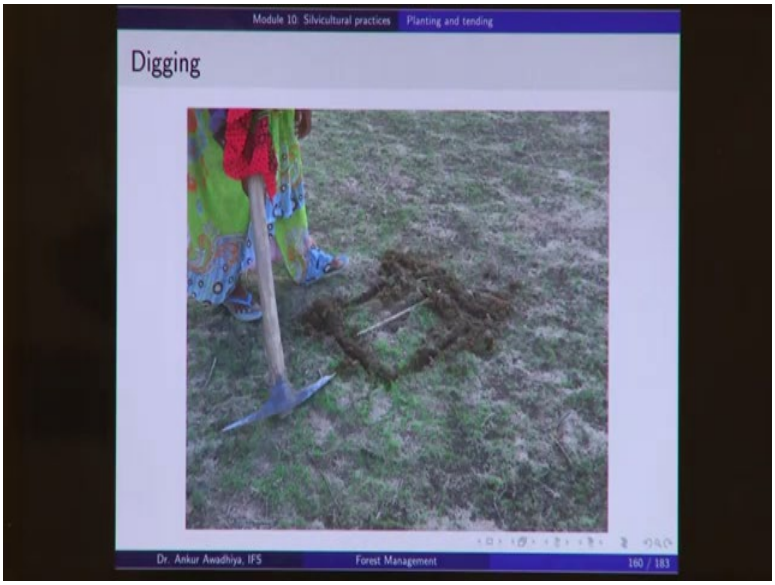

So, we saw that there was a stake that was made here. Now this person is now marking the area where a pit needs to be dug. And, you can see this is stick which is used to decide the size. So, this stick is say a 30 centimetre stick and this will be used to mark exactly where this pit needs to be dug.

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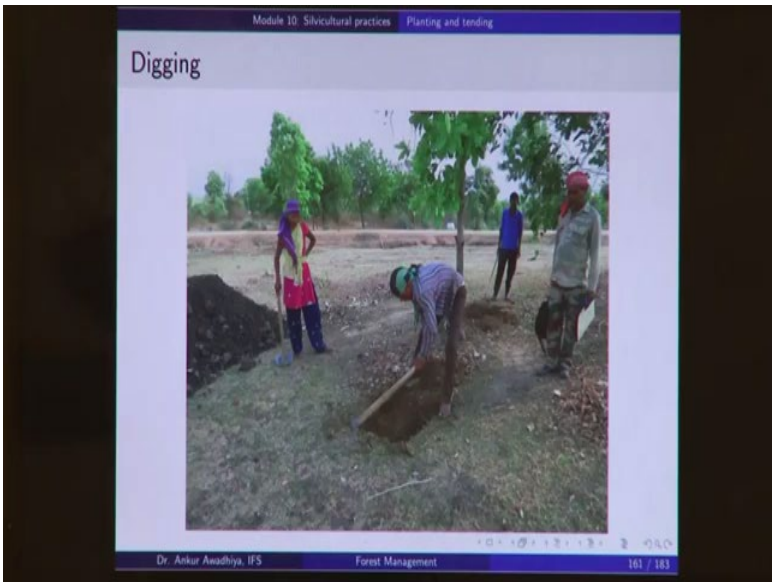

Next, the digging operation will begin. So, this person is now digging a pit. Now, whenever a pit is being dug, we keep the soils in two heaps.

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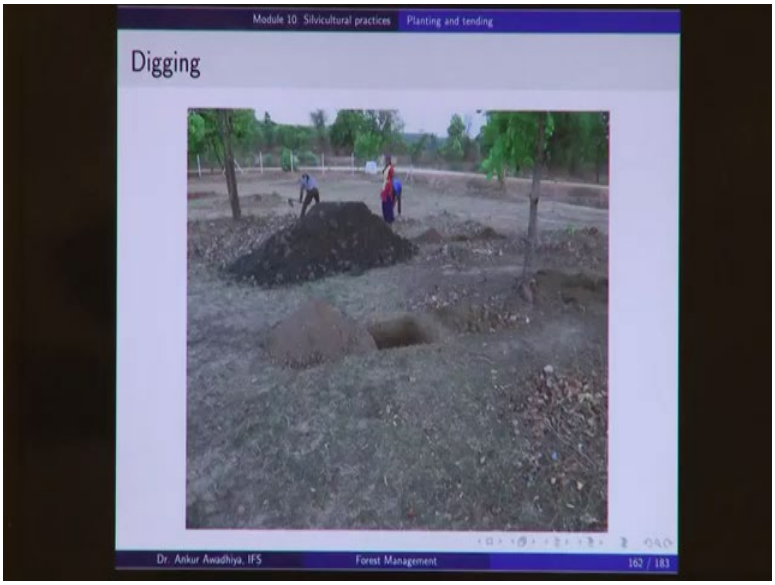

So, the first heap is that of the topsoil. So, when you are digging a pit, the topsoil will be kept on one side and the subsoil will be kept on another side. So, you will be creating these two mounds. Now why would you want to create these two mounds? Because, typically the topsoil is much more fertile as compared to the subsoil. And, you want your plants to have the maximum amount of nutrients that can be made available.

Now, whenever you are planting your plants, they will come, if you are taking these plants from a nursery and they are being grown in a poly pot, which is a polythene bag with soil, and here you have the plant. So, before planting, you will get rid of this polythene bag, but the soil is retained because this soil typically is having a large amount of nutrients.

Now, when you are digging up, it the amount of soil that comes out and the amount of soil that you will be putting back in will be different, because, later on, you will when you are putting your plants like this. So, this much of this space has already been taken. So, when you are when you have put your plant and when you are putting the soil back in the first go you will put this soil back.

So, the topsoil will be put back first in any of the space that remains after putting your plant and after putting the topsoil will be filled up by the subsoil. So, this is what we are seeing here, there is a mound for the topsoil and there is a mound for the subsoil.

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So, this is how the pit looks. So, this is a pit, you have topsoil you have the subsoil.

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Next measurements are taken to ensure that these pits are of sufficient size. Now, it is important to remember here that the larger the pit size, the more friable is the soil in that area, because you have you have worked a larger volume of soil; because of which more

and more amount of moisture will be able to seep in during the rainy season. So, if you have larger sized pits ,then you will have a better growth of plants.

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So, it needs to be ensured that the minimum sizes of the pits; the minimum depths of the pits also are being maintained. Now typically, these pits are dug before the planting season; so, they are dug generally in the months of April, May and probably the first half of June, because this is also the season where a number of labourers are available; because this is not an agricultural season. So, you can provide employment to people during this season. Then, these pits are left for a while and then the planting is done.

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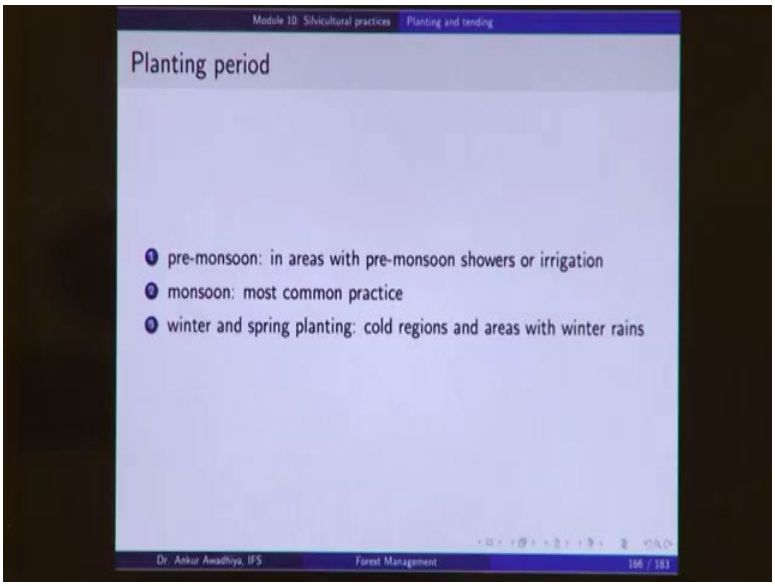

Now, planting in our country is generally done in three different seasons. The most prominent is the monsoon season. So, it is most common to have your plantations done in the monsoon season. But in those areas where you get pre-monsoon showers, you can also have planting in the pre-monsoon season. And, in those areas where we get a winter rains or spring rains, we can do plantations in those areas as well.

In very cold areas. winter planting is preferred, because the plants are dormant in the winter season. So, if you plant them in the winter season, then they will be able to make maximum utilization of the spring season.

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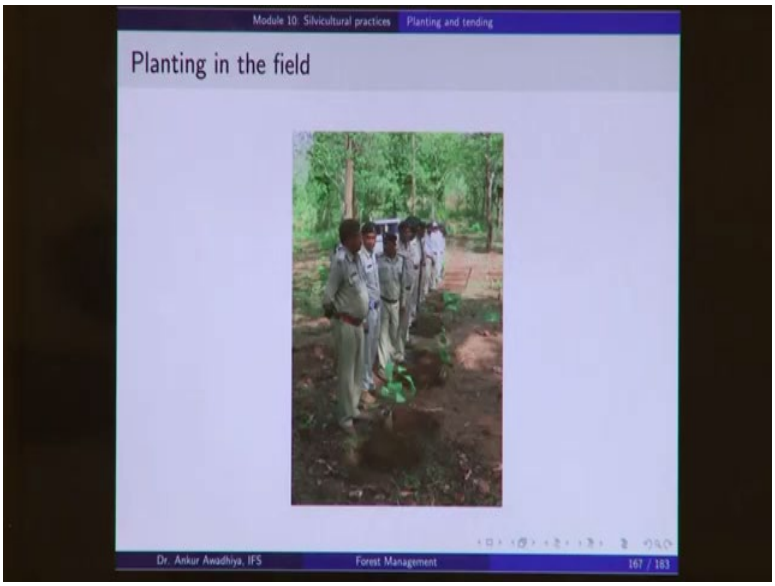

So, how is planting done in the field? Here ,we are seeing that you have the pits the plants have been brought to this area.

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So, in the planting operation; the first thing is to get rid of the polythene bag around the plants. So, the polythene bag is cut away using a blade and the plant is exposed along with the ball of soil that is here.

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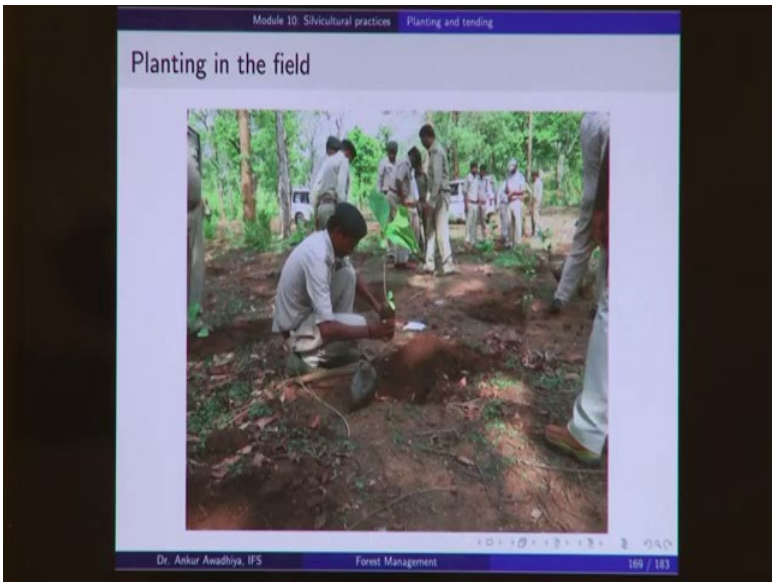

Now, at this stage, it is very important to ensure that the ball of soil is not broken. So, essentially, you have to be careful that you handle this plant together with the soil very carefully and that you do not expose its roots to the air; because, suppose this is the plant and if in place of holding it like this; if you hold it like this, then it is possible that the soil will fall down. And, if that happens, the roots get exposed and we do not want that.

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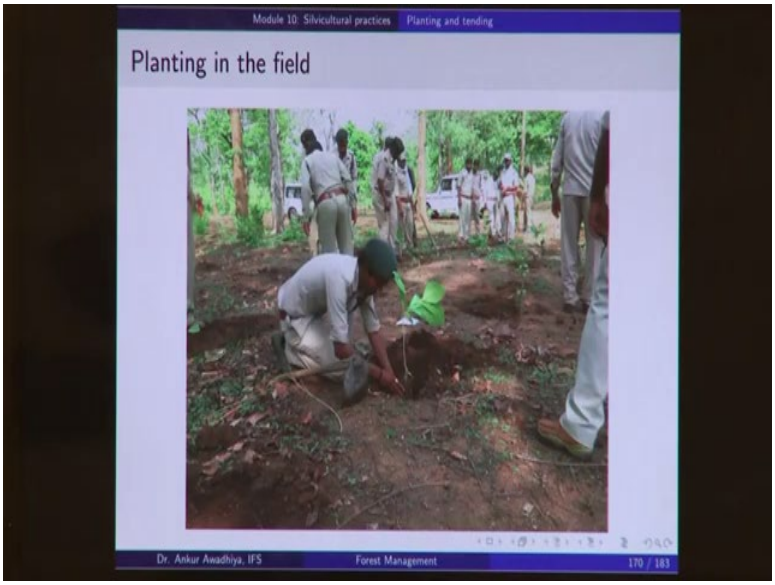

Now, once you have exposed; once you have removed the polythene bag, the next step is to put the plant in position.

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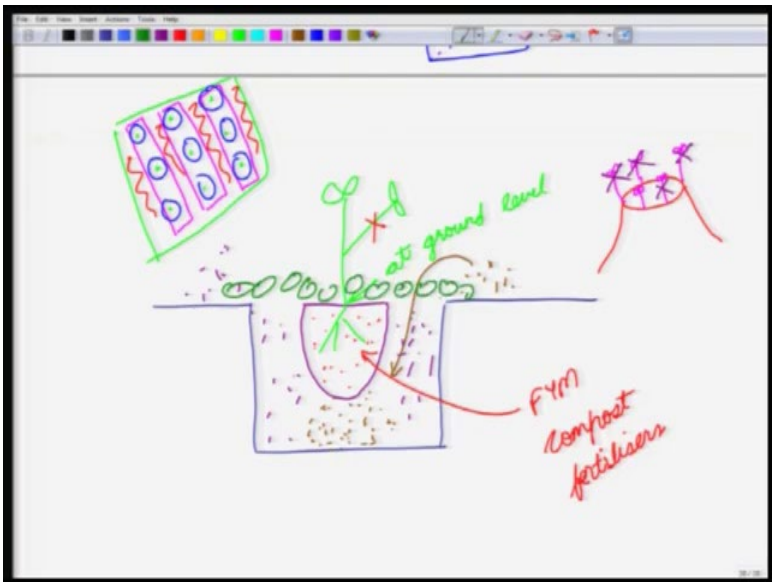

Now, when we are putting the plant, it is essential to ensure that the collar depth is maintained which means that, when you are putting your plant, the plant should be put in such a position that this collar is at ground level. Now, typically, the pits are a bit deeper in depth.

So, what we do is that we had collected this topsoil on one side, and we had collected the subsoil on the other side. So, we add this topsoil downwards, so as to make some sort of a stand on which this plant can now be kept. So, your plant will be kept in such a manner that the collar remains at the ground level.

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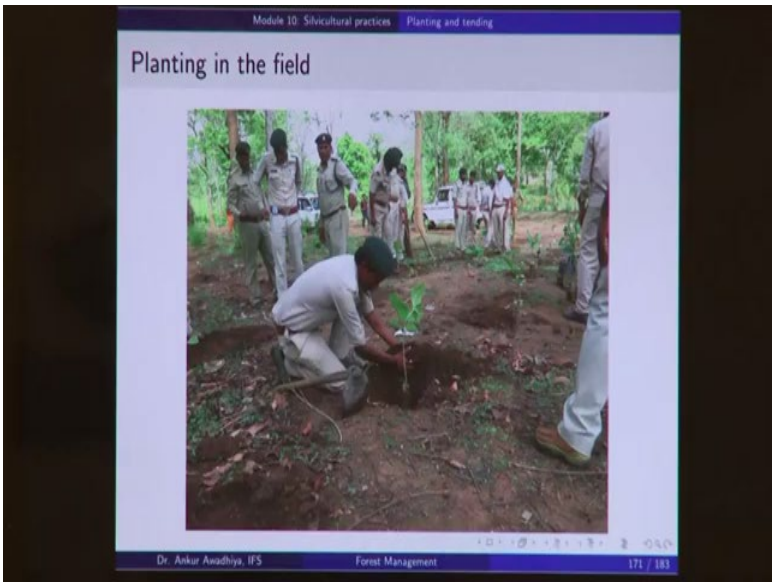

Next, you start to fill up the hole. So, here again the topsoil will be put up first followed by the subsoil. So, the hole is being the pit, is being filled up.

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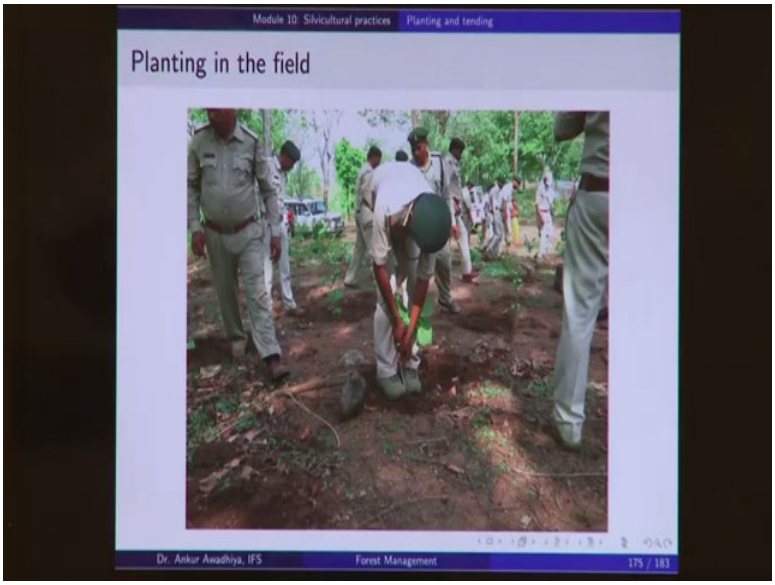

And, once this pit has been filled up, the next step will be to compress the soil surrounding the plants. So, this compression is generally done by holding the plant and compressing it with compressing the surrounding soil using feet or boots. So, now this person is compressing the soil and once this is done your planting is complete.

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Now, typically, when we do plantations are done on a very large scale. So, here you can see that all these regions have are full of pits.

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So, before you are doing the actual plantation on the field, it is important to train the people to ensure that no polythene bags are put together with the plant; to ensure that the plants are planted in such a manner that the collar depth is maintained; to ensure that the compression of the soil is done properly.

If there is an excess compression, then it might lead to soil compaction. If there is a less amount of compression, then probably with the next rains, the water will enter in will enter into the pit in such a huge volume, that there might be water logging. You also have to have train people to ensure that they are having a maximum utilization of the topsoil and not the subsoil.

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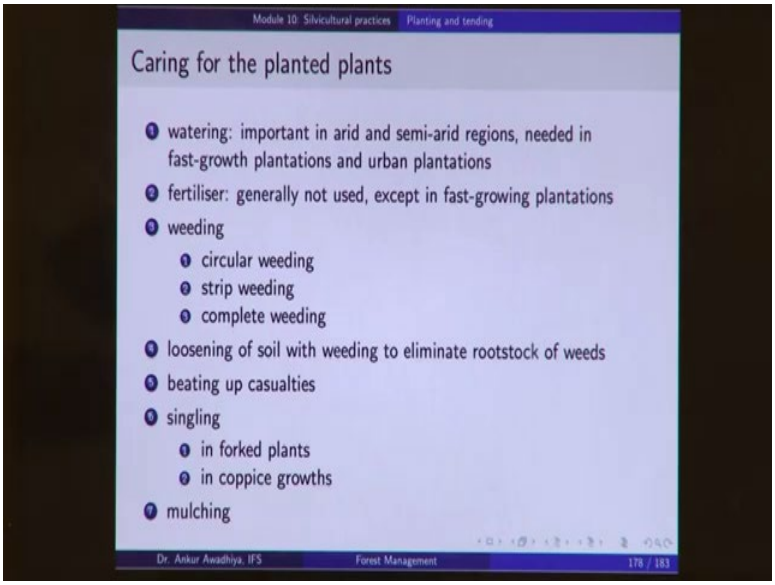

Next, once your planting is complete, you need to care for these planted plants. You need to perform tending operations on these plants. Now, what sort of care is done? First is watering. Now, in those areas where you have a dearth of water in arid and semiarid regions, watering of the plants at least right after plantation it becomes important.

It is also done in those areas where you want to have plants showing of higher speed of growth typically in urban areas and in plantations. In certain areas, you will also have to add fertilizer. Now, fertilizer is generally neither used nor required for 2-3 different reasons. One, when you are doing this plantation; the soil ball that is surrounding this plant this soil ball has come from the nursery. And, in the nursery, you had added farmyard manure; you had added compost, and you had added fertilizers to this soil.

Now, this soil is already there with the plant. So, for the first few months of its life this these fertilizers are already available. Now later on because plant because these tree species grow at a very slow rate so, if you add fertilizers, they will not be able to use those fertilizers at that faster rate. So, typically, the rocks and the minerals that are

present in that area when they undergo degradation the minerals are slowly and slowly released and they are being made available to the trees.

So, fertilizers are not required. Also, a addition of fertilizers would increase the cost, and if it is not leading to that larger benefit, then there is no need to put fertilizers. We typically put fertilizers in those areas where you require a very fast growth, especially in species like eucalyptus or poplar where the cycle will be complete in say 5 years.

So, in those 5 years, the plant has to grow to the maximum height, and in those cases, fertilizers might be given. Or, fertilizers may also be used in those areas that have a very poor soil, but those are exceptional cases; in general, fertilizers are not used.

Another caring operation is weeding. Now, weeding can be done in the form of circular weeding, strip weeding or complete weeding. Now, in the case of a complete weeding, if you have this plantation, then everywhere all the weeds will be removed. So, even though you are having plants like this; in the case of complete weeding, all the areas cleared of all the weeds, but then that becomes extremely labour intensive and cost intensive.

The second option is to go with a strip weeding. Now, in the case of a strip weeding, these areas outside of the strips; but inside the strips, all the weeds will be removed. And, the third option is to go with a circular weeding. So, around every plant, you will be removing the weeds, but you will let all the other weeds remain in on the side, because they hardly matter for your plants.

Next, is loosening of the soil with weeding, to eliminate the rootstock of the weeds. So, whenever we are removing the weeds, we also loosen up the soil so as to break up all the rootstock of the weeds that might be present in that area. So, this is to ensure that the weeds will not come up again. Next is beating up of casualties; which means that in the plantation after some time, when you go to your plantation site, you might see that a few plants have died out.

So, those plants will be replaced with new plants, and this is known as beating up of casualty. Another caring operation is a singling operation. Now, singling operation means that, suppose you later on you went to this site and you saw that this plant is having these two main shoots; so, in the case of a singling operation, one of these shoots

will be removed. So, as to ensure that the plant does not show a forking in a later stage of its life. And, this is typically done for those plants that are to be used for timber.

Also, a singling operation is done in the case of coppice plants. So, if there was a there is this stump, and a number of plants are coming up through coppice. So, in this case, all the plants except one will be removed so that only one plant is able is able to grow on this side. And, it is getting all the nutrients that were being made available by the root stock. So, a singling evaporation is also required in certain cases.

A mulching operation may also be needed in certain cases. Now what is mulching? Mulching is the process in which once you have; so, in this case, you have filled up this pit. Now, your plant is ready; now, what you do is, you add a mulch on the top. Now a mulch may comprise of any organic matter or even inorganic matter that is put on the site so as to conserve moisture.

So, essentially when you are doing this planting, why not put the polythene bag on top of this soil in a flat manner, so that the amount of evaporation from the soil will reduce, or you can make use of organic mulch such as sawdust or even leaves that have been broken. So, these leaves will be or the sawdust will be spread on this area, so as to ensure that more and more amount of moisture is retained in this area. And, later on, when they get degraded, they will also add to the quality of the soil. So, a mulching operation is also done in certain instances.

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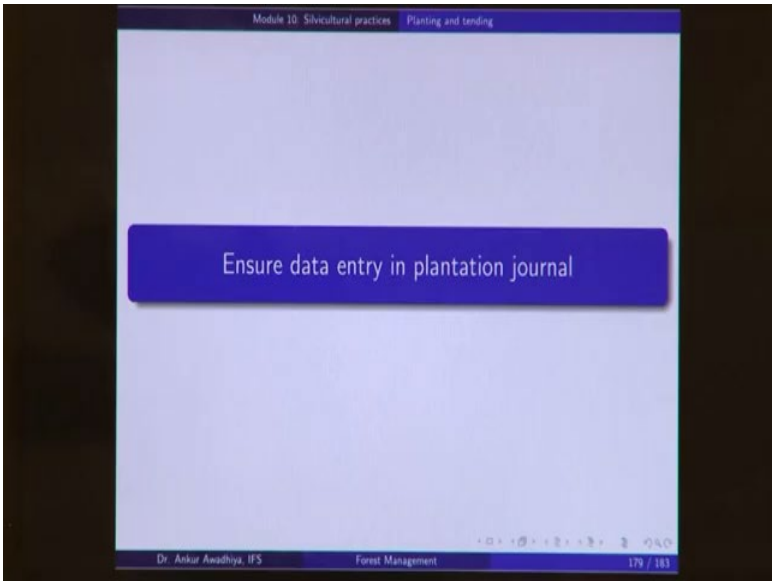

And, one of the most important things is, to ensure that whatever you are doing, is being also recorded in the plantation journal. So, plantation journal is a document that records how the how you selected the site, how you selected the species, when did you dig the pits, how many pits were dug, how many plants were planted what are the; what are the kinds of caring or tending operations that you did on the site and so on.

So, in this lecture, we looked at the planting operation in great detail. What are the different steps; what are the different stages of planting; and, how do we ensure that our plants are able to survive, and the regeneration is able to come up. So, that is all for today thank you for your attention [FL].