Course on Landscape Architecture and Site Planning-Basic Fundamentals
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Module No 08
Lecture 40: Planting Design (Contd.)

Hi, Good morning, have you gone through the lists? Have you tried to find out different plants name? Have you tried to understand how the names are given? Do you find it interesting? In fact I will tell you, you will get more excited once you start exploring individual trees by its name. And it is again you know, I will take a human analogy. It is, if somebody is trying to assess you then the 1st reference is your name and then all your characteristics or traits. Same is for the plants.

If you want to, if you want plant as an element or component in your landscape to be used, then the 1st thing what you should do is know its name and then try to explore all its characteristics. So so far in the last lecture, I discussed about how to rectify the names and trying to at least get a hint of some distinctive characteristics from the 2nd part of the name. I hope this makes it exciting to you.

Next thing what you should know is, if suppose you know a name and then you try to know about its all characteristics, all attributes, this I will go a little faster because in my 2nd series of lectures, in which I will go into the great detail of all these things but here, I should do justice by at least exposing you to all the kind of attributes that we take into consideration for our landscape purposes because we are discussing about the basic fundamentals. So here it would be, I would say a tip of the iceberg in terms of what you are learning. In the advanced courses, once we (()) (2:02), at that time you will find there are a lots of things will be discussed against each of them. Okay? The characteristics or attributes.

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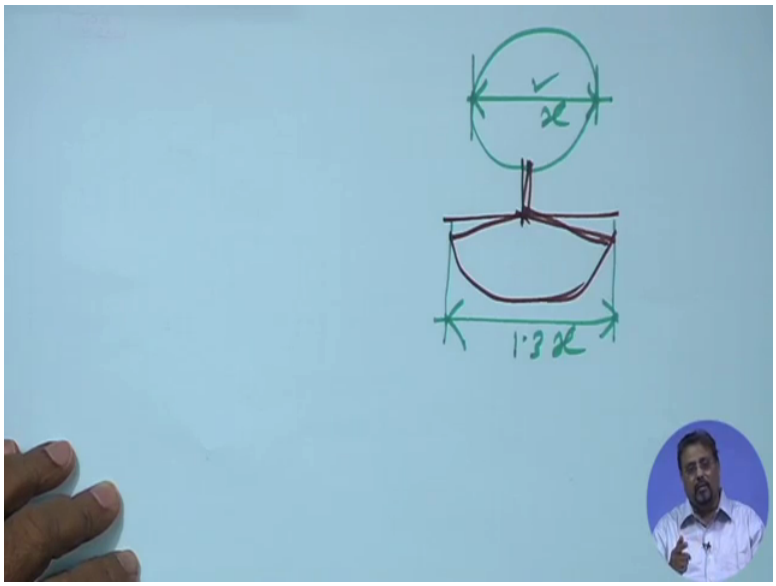

You refer that particular list in which I said identity or identification, spread, height and all that. Again I will say, all these are not written in terms of its priority but what are these let me quickly explain. Spread. Spread you will see with respect to 2 things. Spread is basically diameter on maturity. Means if suppose, refer to this particular sketch. If suppose there is a tree which has the foliage. On maturity, this particular diameter is considered to be the spread. So spread means the the maximum extent the foliage reaches at its full maturity.

That is a spread. After that what happens is, after that it grows, keeps on growing but this spread doesn't change much. So I'm very much concerned about this dimension whenever I'm selecting this particular tree to be located in my landscape. So when you are saying this spread, I will also like to draw your attention to one particular point in terms of 2 forest phenomena, one is called ominous, other is called adaptation.

These 2 I will come to but before that, there is one more thing. The tree is not necessarily just merely a kind of trunk and the foliage. It has also a root. So whenever, let me discuss here itself, again if I am going to go to your roots, root structure, I am also concerned about when I am thinking about the spread, I am also concerned about the spread of the roots. How much extent is going to go through?

That thumb rule says, I will tell you very, there is almost no documents which has (())(4:13) substantiated confidence in me saying that okay, the roots for this tree is of this spread. I did not find. Maybe someday I will find it, some research or maybe if anyone of you know, please forward me that particular sources but the result humble. We always take it as a thumb rule that if a tree is fully grown, then it is always advisable or safe to take one third more than the means about say 1 dollar 3 times.

If this is X, then take the root spread is 1 dollar 3 times of the X. That means root is more wider. Why this is safe? Because you don't know what is going to happen below the ground. You can see this part, you can trim it but this new cannot trim. You can but the thing is it is not regular. This you can trim and bring it to a shape if it is conflicting with other functions but here it cannot.

So it is only better that if you know the spread of a tree, which you can do what you know, just very simple that you take a team of experts and go and measure the same species and the same age of the same locality and keep on measuring the spread and then you take a average of it, you will find that this X will be known to you. And just as it humble role take one third more than that as a spread of the roots. That is safer.

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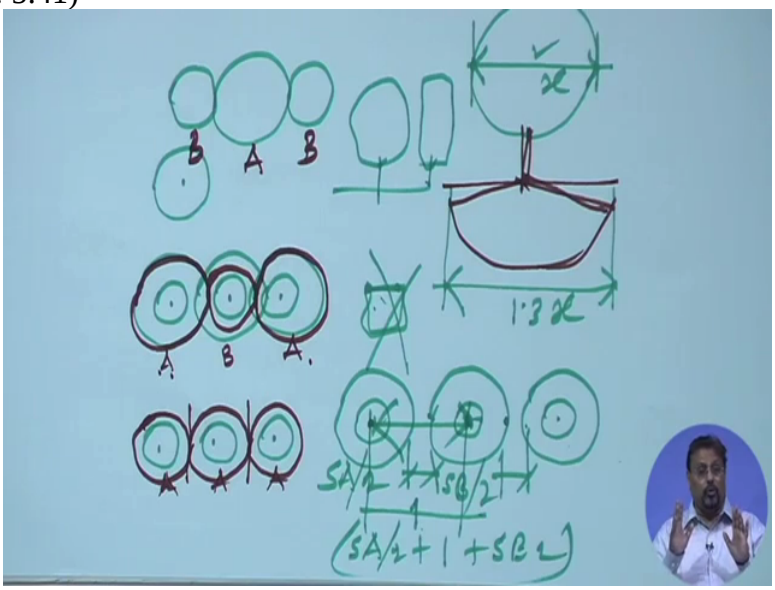

And what is the dominance in adaptation is, I will discuss this later in one of my 2nd series lectures. Let me give just introduce it to you. It is very important. You know, the trees, the different plants, they have their intrinsic power. Okay? That particular power by which it extracts water from the soil, it transpires, it spreads its branches and it takes position in the reality. Okay?

Now if suppose there is a situation where you have suppose there is one tree here and there is, let me draw it this way, you have planted a tree which is of this shape, actually another thing, let me tell you in general whenever we are trying to the present study, we always represent like a globe

or like a circle, most often. In plant, always a circle because we hardly found any tree which looks like this, hardly, unless we tame it and deface it. Okay?

So most often, it is this. And suppose you have planted 3 trees one after another, and the tree which is likely to grow in its full matured shape is like this. This will give you a good idea about what dominance and adaptation I am talking about. If suppose now in this, this is species A and this is species B and this is species A. If A is a dominant species over B by its own intrinsic strength, then what will happen you know?

A will try to grow to its full maturity spread. B will be now restricted or constructed in terms of growth. So what will happen is, there will be some bit of, you know some bit of adjustments at this particular point but A will grow to its full mature spread and B will be restricted to its full, not to this and this A will grow to its full mature spread. This is the phenomena which is found in the forest which is called dominance.

Now the question is, if suppose now this is A and this is all 3 are A. This is A, this A and this is A. Then what happens? Interestingly, just like human culture, human system, they will be adapting to themselves. They will adjust. You note will happen? There will be a centreline coming. This will be a centreline. If you really measure it will be almost centreline and this tree will grow to its shape like this, this tree will now just to this dimension, this tree will adjust to this dimension.

Very interesting phenomenona. This is what is called adaptation and this is called dominance. This dominance and adaptation, these 2 phenomena, do not is regard it. You be very very sensitive about it and whenever you are planting different species one after another, that this option is more you plant them independently, consider each of the spread as the dimension and keep some allowances for you now some kind of uncertainty of growth.

What I mean to say by that is, if suppose this is A which is at this point base and which is likely to grow to this size, then I would say, let your B be allowed to grow to its full mature shape and then another A which is here. Now there is no conflict. Each one of them will grow to its full mature spread. Not only spread, even the height. Now in such case, and then additionally, you keep some allowances or clearances between these 2.

You are safe, trees are safe, trees are not disfigured. This you take note of, okay. So what happens is, if suppose now I say that what will be the spacing between these 2? And if this is, that means it is the spread of A by 2, spread A by 2, spread B by 2 plus say 1 to 2 meter in between. Let us say 1 meter, so your spacing between this tree will be SA by 2 plus 1 plus SB by 2. This is the spacing between this and this. Is that clear? Is that clear?

If you do this, you will find that you are in safe situation. But at the same time, let me tell you, FE kind of experimentation we can do. I can deliberately create this. If I want that the B to be disfigured, then I will deliberately place them in between, in a constructed position so that B is not allowed to go to beyond this level. But what happens if it is reversed? A is dominant, it is in the centre, then the B and the B, this also do need to know.

Then what happens is, the B will go to its full mature shape and no A will be restricted. This is what is going to happen if suppose B is in the centre. That this is B, sorry sorry, this is A, dominant one, this is B and this is B. In that situation, this is what is going to be. And not only it is here, you know what happens is tree always tends to grow up words. Okay? In this kind of situation, you know what will happen?

The spread has been delimited by the dominance factor but the height is free because it is clear up what. So the tree which was supposed to be growing to this height, which was supposed to be growing to this height will now after restriction, will become slender because the height is there. So this height, they will reach. This is how you should always seek this particular kind of spread. So as I said, it is going to have a differential variations in spread.

So similarly, the root spread which I just now discussed. So the thing is, you take care of this spread in full maturity and also the root spread in full maturity and then decide what should be the placement of this tree.

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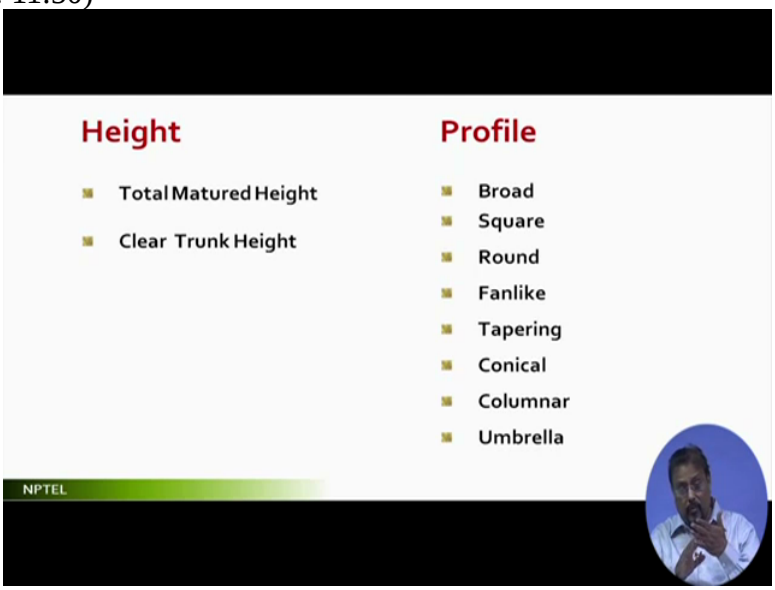

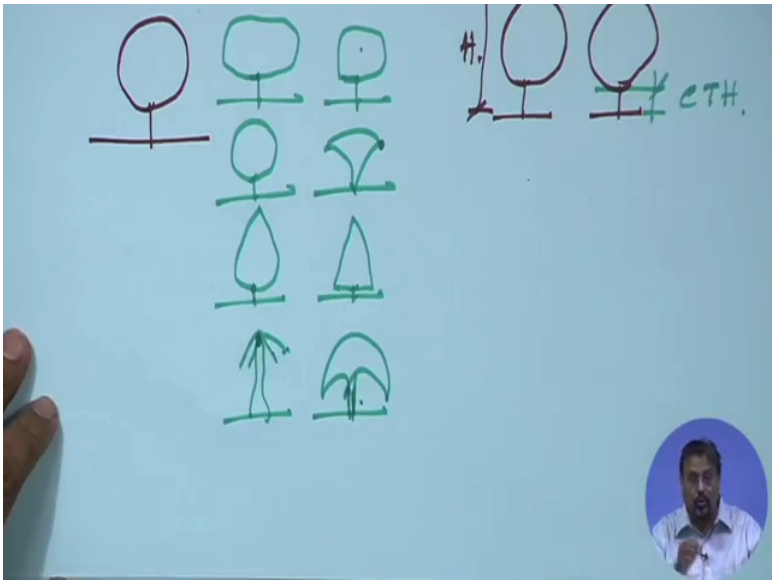

Then comes height. You know height you should see in this way. For a tree, take its full matured height, this height, take note of this as a full matured height. Okay? That in full maturity, what is the height? This is what is the height you are referring to. But there is another height that you have to take into consideration when you are designing, that is this height. This is what is the clear trunk height. So this clear trunk height is the height which is from the root collar to this socket part of it. Okay?

Now take note of the height as well as the clear trunk height. Then comes the form. Form is basically or profile, let me call it profile. It will be better, profile. Let us let us change this. We will call this as profile, not form. Okay? Profile. In this basically what is this profile? Profile is when you are looking at a tree against alighted background, see tree has lots of different kinds of pictures, irregularities and all that.

When you are looking at it from a distance, you look at the trunk. You see a trunk, a stick and then a globe above. Now when you are looking at this against a lighted background, you see there is a dark patch, dark image and that is what is the (())(13:51) image of this and that represents the profile of this. There are different kinds of profiles which are here. It can be broad, square, round, fanlike, tapering, conical, columnal, umbrella. Let me try to give a very quick idea about it.

So if it is something like this, it is broad. If it is something like, a little of this, it is square. If it is something like this, round. If it is something like, fan. If it is tapering. If you have this and very sharp conical. If you have this, like columnal. If you have simply which is like, this is umbrella. I'm just trying to generate different forms and point is, what name will you give and what is the kind of profile that you are representing this, that is purely up to you.

You can always have your freedom in it. There is nothing like (())(15:07) that this has to be set in that form. But usually it is representing that okay?

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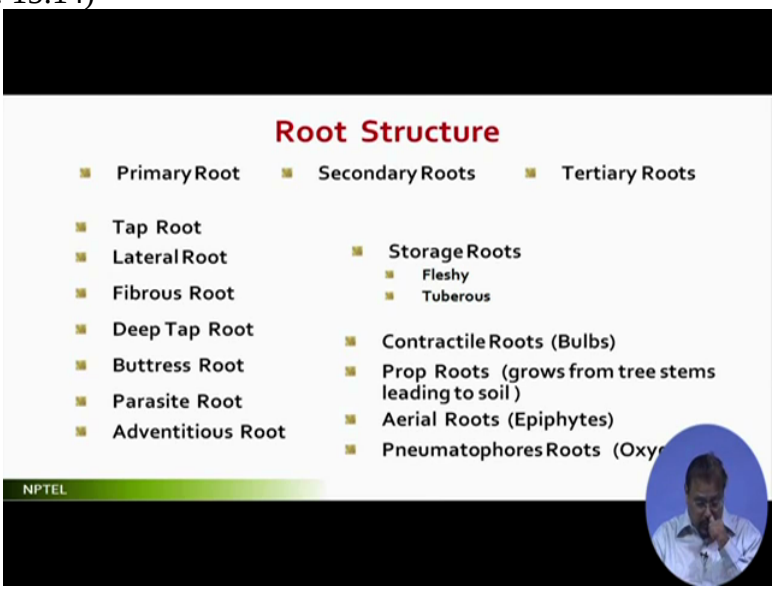

Then comes the root structure. Root structure you know, it's a very essential thing which I just now said. It makes a lot of difference in our plantation things. There are different kinds of roots but let me explain to you slightly more in detail because see for other parts of the plants and all you maybe, you are aware but the roots, it needs a little little elaborate discussion, quickly. Whenever you look at the root of a tree, now if I draw one more thing, that will be good.

There is a, you know if I draw a single line diagram of a tree, then it is a single line diagram. This single line diagram we follow and try to understand. This is the ground like, soil line. This part is called roots. Roots and this part is the shoots. Of this, this part is the root collar, this is the trunk, central leader and this one is are the branches, stems, then we have a leaf. And then we have, wherever it is branching from, there is a bud.

This particular point where it is branching from is called node and the intermediate zone between 2 nodes is called internode and then the bud from which the stemming really starts is called axillary bud and then at the end of each of these brands, you have a bud called epical bud or terminal bud and then in this branch, you have a leaf and you also have a lover which is called influorescence. And also you have a fruit okay?

If you really see, this is a very sketchy diagram of any plant, any plant of any form. So it has a root, it has a shoot, it has central leader, it has the taproot, it has the secondary roots, that's how.

So now I am bringing back to this root structure. Basically there are 3 such roots. One is the primary roots, and there is secondary roots and tertiary roots. What is it? It is this.

Let me draw it here. If suppose there is a tree and then you have a root which is doing like this, it is a primary root. Whatever comes from these edges, whichever direction, these are secondary roots. And from there again whatever roots is coming, is a tertiary roots. Tertiary roots also, we will have tertiary roots, tertiary roots and tertiary roots okay? This is how you try to view the roots.

Now the roots will have different kinds. See, one is the taproot which goes direct, another is a lateral root which which is primarily going to the sides. Then you have the fibrous roots. When the taproot and the secondary roots, the primary roots and the secondary roots or taproots and the lateral roots are almost of the equal strength and equal size, then it becomes fibrous roots. Okay? And when you find that in some cases, when the root is very much going deep into it, then it is the taproot.

And then you might find sometimes, root is also you know it is coming from here and also going above the ground. As I said, the starcoli alata example, this is called Barkers roots. I will go a little more detail in this in my next flight. And then parasite roots is basically when it is trying to grow from the other branches, they are parasite roots. Adventitious roots are basically they are roots which are, it grows in different directions from different parts of the shoots and all that okay?

The storage roots are which one, where we have a fleshy or say tuberous kind of thing which you know slightly voluminous. Then contractile roots are bulbs which you know looks very big but if you press it, it almost gets pressed like this. So it contracts by this. The prop roots are ones which grows from the stems and ultimately leads to the soil. Like Banyan tree where it is something like, it will start from these branches and it will generate from there and it will fall and ultimately get hooked to the soil. This is all the Banyans trees' situation that you have seen.

They are all you know prop roots. That and that adventitious roots that you will see, that it comes from the stem. If you see that even ficus elastica, we will have roots. If you look at the tree, certainly you realise that the roots are coming from the stems or the branches. They are there.

And the aerial roots are epiphytes which are growing again from the stem. And then pneumatopherous roots or oxygenators which does not require soil. So all those roots which are in water, are this pneumatopherous roots.

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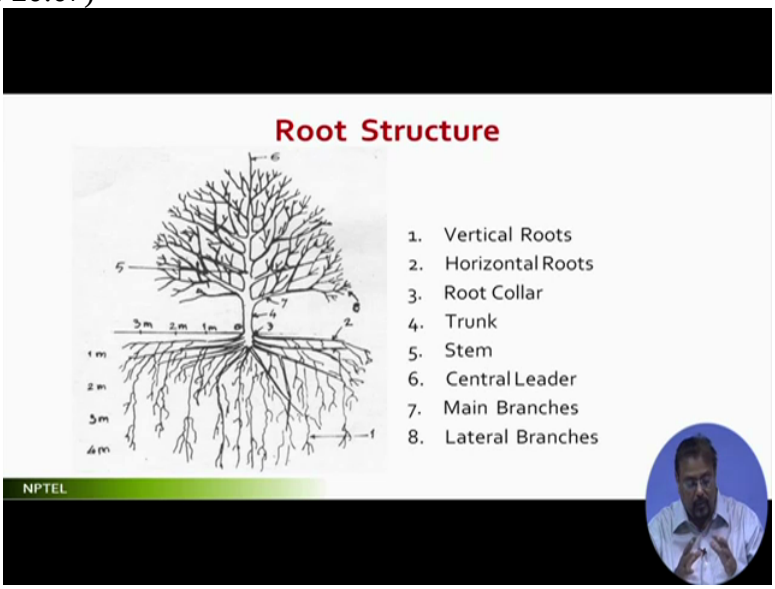

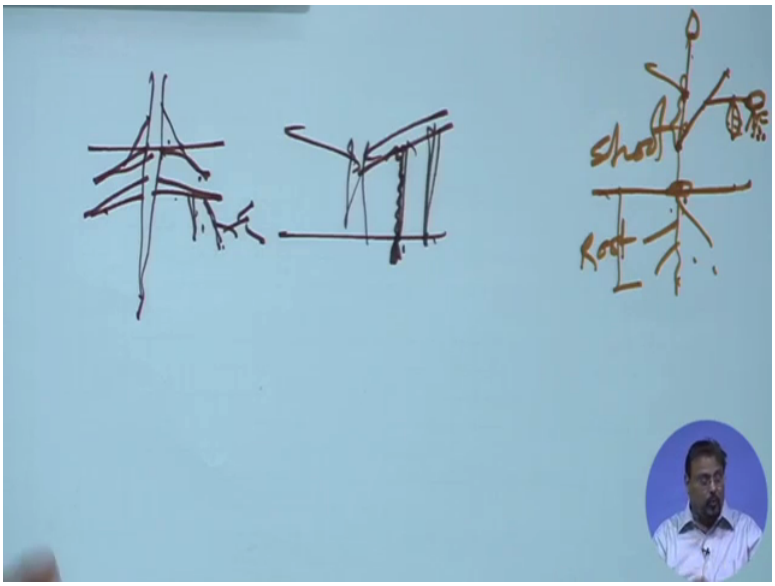

I will just show you one more picture in this which will give you some idea. That in this case what happens is, you have just see with respect to this sketch, pay attention to this one. It is numbered. See, any roots which are going vertically down as the vertical roots, any roots which

are going horizontally towards like this is a horizontal roots. Okay? And this particular junction of the trunk and the roots at the intersection of the soil is the root collar.

Then, number 4 is the trunk, this is what is the trunk and the 5, all these are stems. Okay? And number 6, this particular part is called the central leader. And then these are main branches and the other ones, small are lateral branches. So when you look at the entire tree profile which I tried to give in a very schematic manner in a single line diagram, you will find, in this, I didn't put all those epical birds and all because it is a too complicated drawing here already.

So now what we find that at the end of this you know this lateral branches, there will be an epical bud. Now epical bud is responsible for the trees growth. If suppose you want to impede the growth, the growth of this, you could be epical buds. Means, you cut the epical buds, other branches will come, there will be epical bud. You keep on cutting. You know what will happen? The branch, you not tree will start getting restricted. That is how, through this pruning, (()) (21:30) and all these things are created. Okay. Now some more.

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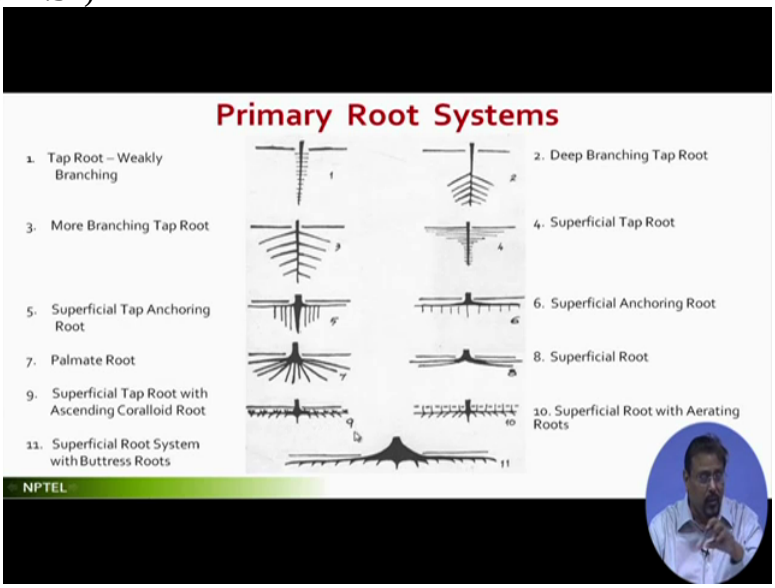

In the primary root system, you have these profile. I'm not going to discuss much on this because I'm putting this on a slide like this but still, they are classified something like this. Like if it is taproot, like this is a taproot, weakly branching, that means branches are very weak. Number 2 if

you see the deep branching taproot, that means taproot comes quite below and then after that, it branches.

Number 3, more branching taproot but that means you have the taproot and the secondary roots almost in the similar nature. So if it is more branching taproots, this might ultimately turn out to be fibrous roots. Superficial taproot in which, this is a taproot but there are many other secondary routes which are equally strong. Superficial tap anchoring roots means this particular taproot and after that, the other secondary roots also will have anchoring here.

And then number 6 is, superficial anchoring roots in which the taproot almost non-existent. The secondary roots are very strong. And then we have the anchoring. Then we have the palmate roots, it looks like palm leaves. Like roots are going in the palm nature. Then we have superficial root in which the taproot is almost negligible. Superficial taproot with ascending coralloid roots means here multiple such roots you know as like corals, they almost start going against these roots.

Why all these are superficial wherever the taproot is almost missing? Okay? Now here, superficial root with aerating roots. In such case what happens is that secondary roots are very strong, taproot is very weak and then the aerating roots which are popping out of the soil. It is just like banana tree if you see. You know that roots and from there, the tree grows. There are many such cases and many of the trees like, something like say mango tree, you know similar nature where the roots is going to grow from the secondary one and ultimately becomes a shoot above.

And then you can take it out very carefully out and ultimately grow another mango tree somewhere else. And superficial root system with buttress in which the taproot is almost missing but the roots are going above the ground, the buttress, the one just now I said here in this particular issue tap an example okay? So these are different our roots.

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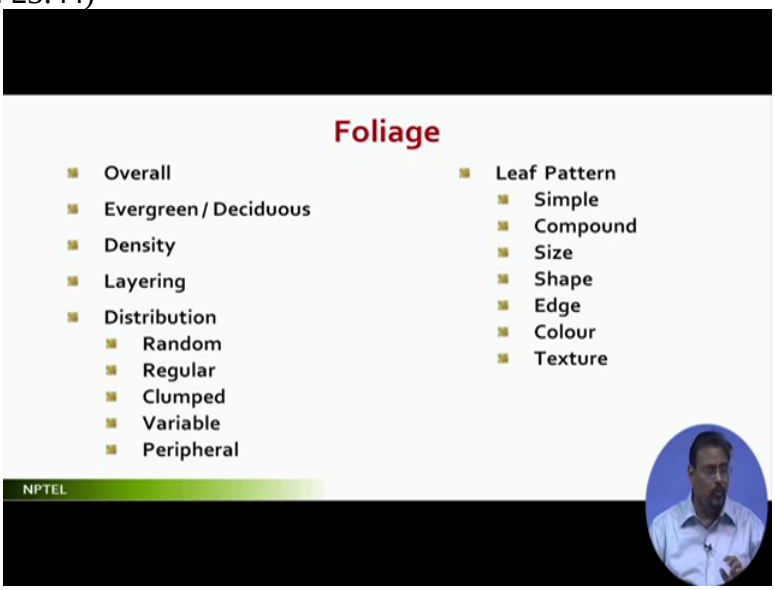

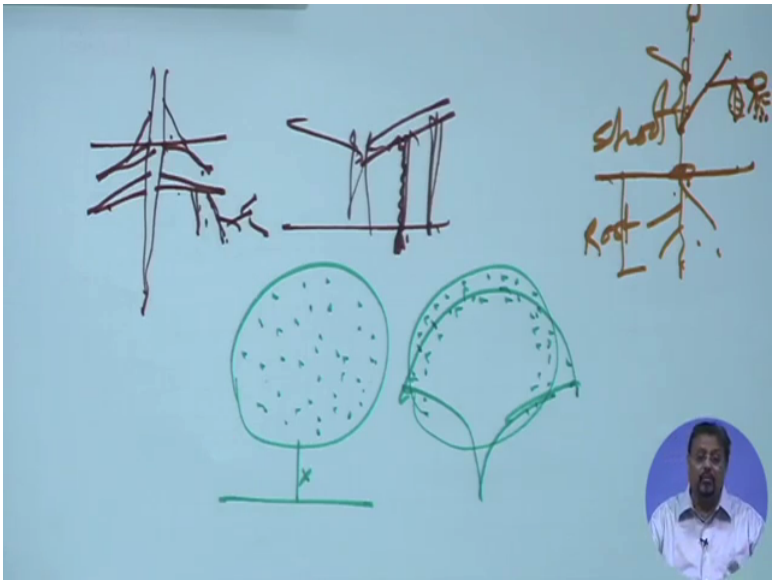

Now let's see about the foliages. In foliages, we have what you have to check is foliage is which part I am talking about? It is this part of the tree, not considering the trunk part okay? This part of the tree. Then what are the things be seen in this is, the overall, overall foliage, then evergreen or deciduous, that means it has leaf throughout the season, throughout the year or it sheds its leaves intermediately for different seasons.

Then what is the density? That what number of leaves within the volume, then layering, how are they placed over each other? Then distribution. Distribution means here note I say that there

could be 2 situations. I am just drawing very quickly on this. Either the leaves are all uniform distributed all over or it may be the leaves are all distributed over the surfaces okay? This distribution is very important.

It is important in terms of solar interception, solar radiation and reception and all that. But however, you are trying to know about the foliage. Are they uniformly distributed like (())(24:54) Bakul tree in which they are very uniformly distributed. And here, like this, a tree called samaniya saman in which you have all those as peripheral. So how it is distributed over? Are they clumped structure just like you know (())(25:11) in which the leaves are crusted, clumped together.

Are they variable, irregular or are the peripheral, something like see what I am saying here, like are they peripheral, on the surfaces? And then comes the leaf pattern. Whether it is simple, simple leaf or compound leaf, what is the size, what is the shape, what is the edge and what is the colour and texture. Today I will, in this discussion I will just introduce you to this. In my next series, I would advise you to join my next series of lectures in which will be lots of details which I will be discussing about this because if I start discussing the details in this, you will lose the actual path okay?

But when we are thinking about the leaf pattern, what we are seeing is whether simple, or compound or size, what is the size of it, what is the shape of it, what is the edge, colour and texture.

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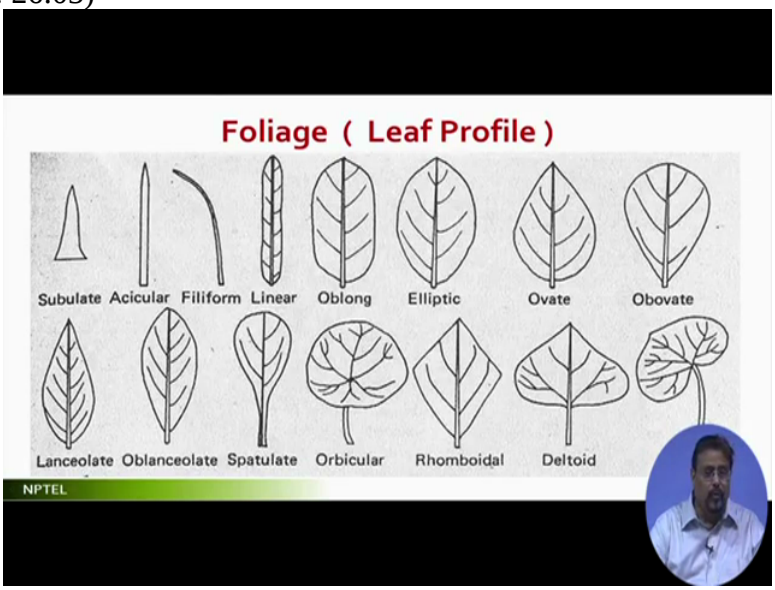

I will just give you a few examples, quick examples. You know the relief profile is this. They have different names scientifically developed and they are unique. And any leaf that you see, if you compared with this you definitely can make out that which it is what type okay? Subulate, acicular, filliform, linear, oblong, elliptic, ovate, obovate. Then we have lanceoalate, oblanceolate, spatulate, orbicular, rhomboidal, deltoid, and reniform.

These are different profiles. So each leaf is different type. Each leaf means each plant's leaf is of different profile. And that will tell you, all these profiles together, profiles and the size and the texture and the edge together, if you now combine all these attributes of a leaf, that makes the whole foliage. So ultimately the attribute of the foliage is contributed by these. So you have to be really you know knowledgeable about it, try to know about it.

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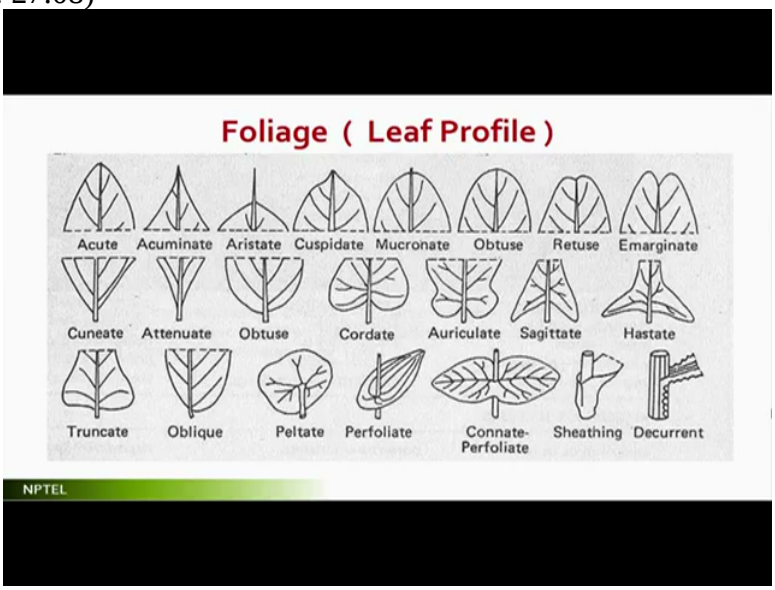

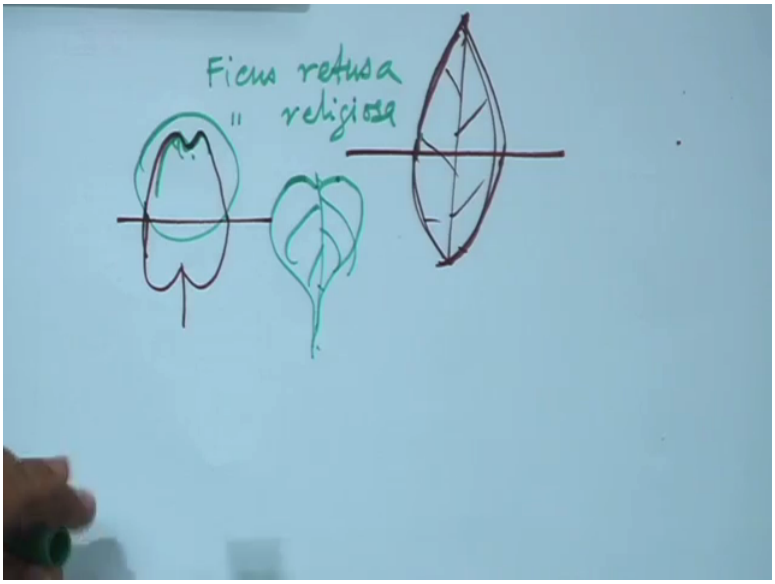

Some more in terms of profiles. Here, the profile is definitely explained. You know what happens is, just let me explain. You should not think that the leaf which is like this, is of this form. Always try to see what is the profile of the top part of it and what is the profile of the bottom part of it. And this is where it is explained here. So there are different kinds of nomenclatures for the top parts and the bottom parts okay?

See here, acute, acuminate, Aristate, cuspidate, mucronate, obtuse, retuse, emarginate. If you see the lower part, cuneate, attenuate, obtuse, cordate. Auriculate, saggitate, hastate. If you see this

obligue, now what happens is, see why this knowledge is important. You might find a leaf which has the top part as let us say like retuse. Top part is like retuse. What is the bottom part?

Bottom part maybe cordate. Just take this picture, follow this picture, bottom part maybe cordate. So when I am looking at it, what is the actual profile? This particular profile does not match with my this anyway. So we have a combination of such profiles in which you know you have to now know. But let me draw your attention to one more information. That is, you know this is retuse.

This is the retuse part of it. This gives rise to another, nomenclature of another you know ficus group that is called ficus retusa. Now how do you differentiate between ficus retusa and ficus religiosa? You should know that even if they are ficus, but the retuse retusa tree must have a leaf which is the top part is this. And what is the religiosa's peepal tree leaf like? Peepal tree leaf if you remember, it is like this. Is not it?

If if this is so, then the tape is this, than the religiosa's top part is aristate and religiosa's bottom part is cordate. That is how you should know about the leaf. Okay.

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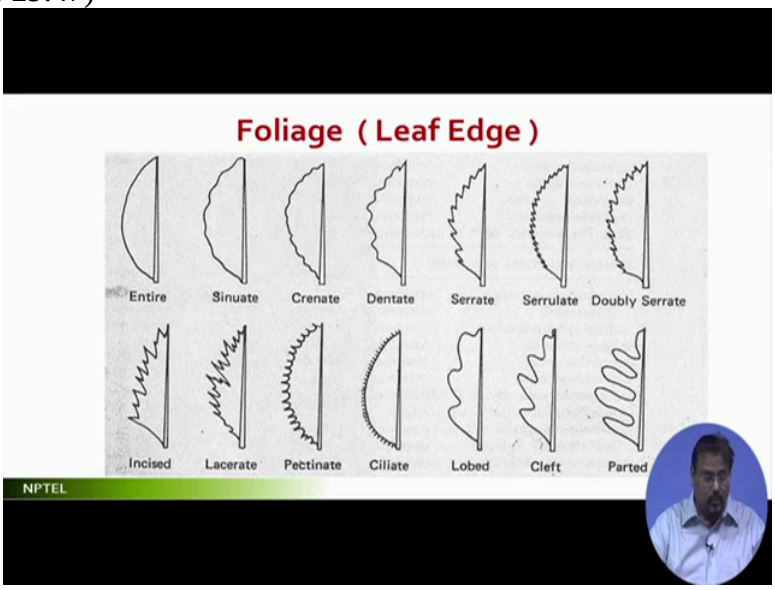

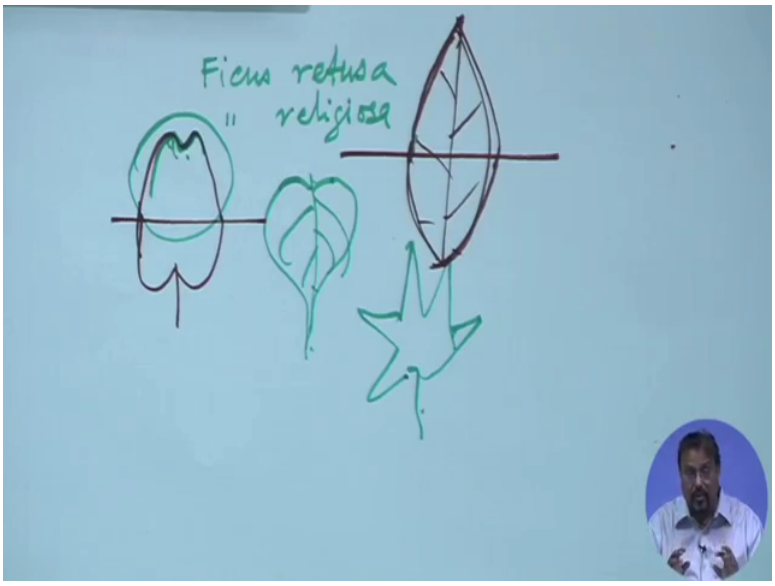

Let me go forward quickly. Also there is certain thing called as edges. So leaves when you are seeing, you are also seeing with respect to the edges, edges in terms of entire, means very clean, clear or it is sinuate, slightly curly, or crenate is slightly more is regularly curly, or dentate like almost tooth like and serrate is like sawtooth like. And serrulate is very sharp sawtooth like and doubly serrate is you know it is a mix of this.

If you now start going through all these things, when it comes to parted, means there are say papaya leaves if you remember the papaya leaf is something like you know, it is this. Or maple leaf is something like this. It is parted. Okay? So every such identity of the leaf of different plants have something to offer in terms of its visibility, in terms of its existence. So when you are seeing this, take note of it.

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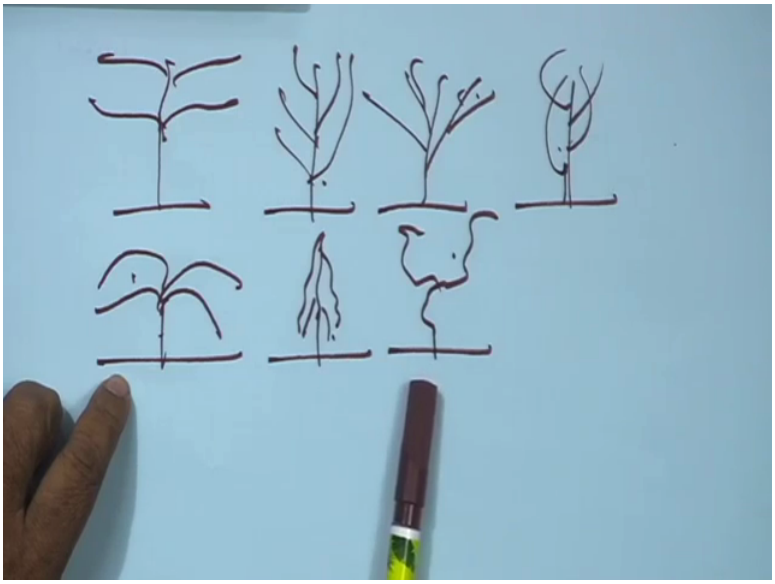

Quickly going through the others. In terms of branching habit, horizontal spreading, angular branching, I will just explain what it is very quickly. See horizontal branching is basically if, if a tree is growing horizontally, this is horizontal branching. Angular branching is if the tree is growing in angle like (())(31:05) bone. Fanlike is if the branching is of this nature. Arrowhead is if suppose it is it is like you know like this.

Okay? Umbrella is if the branching is of this nature. Weeping is if the branching is like this nature. Contorted is if the branching is absolutely regular. If you follow this, this is horizontal

spreading, this is angular branching, this is fanlike, this is Arrowhead, which is umbrella, this is weeping or grouping and this is contorted. So now one thing keep in mind, there is no correlation between the branching pattern and the foliage profile. No.

There may be a contorted branching pattern with a very regular profile. So do not get disturbed by that. Okay.

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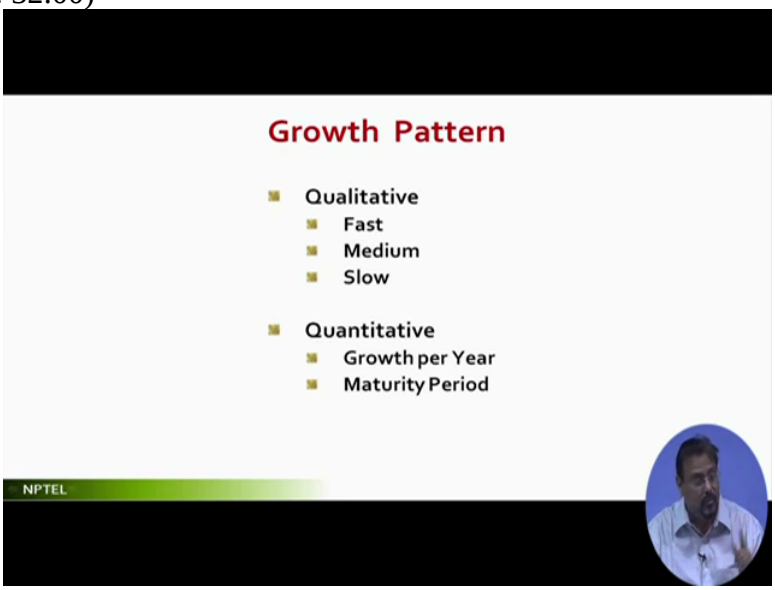

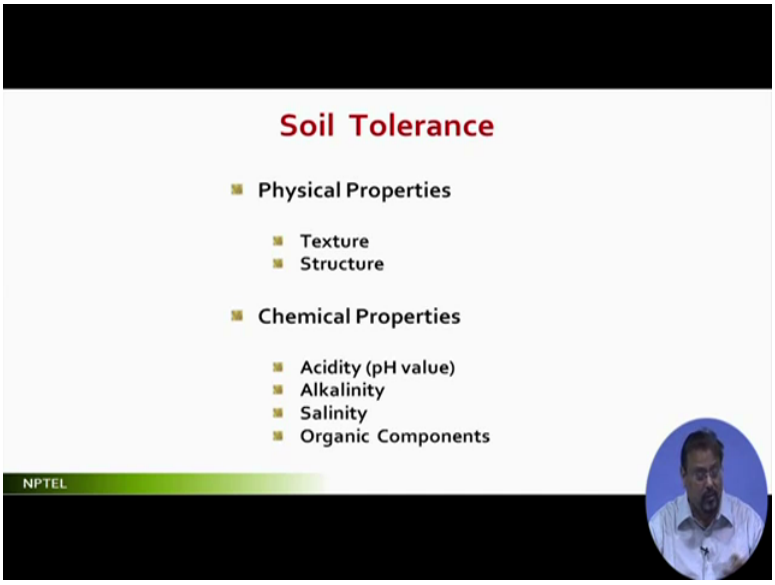

The next few points in terms of growth pattern. We take care of the qualitative, fast, medium, slow growth or quantitative in terms of growth per year or maturity period. And in terms of soil intolerance, we check with the physical properties or texture and the structure of the soil which I have discussed earlier. And the chemical properties in terms of acidity, alkalinity, salinity or organic compounds because that makes the plants survivability with respect to the soil chemistry and the soil structure. The physical properties like texture, structure is for roots holding and the chemical properties are for essentially nourishments.

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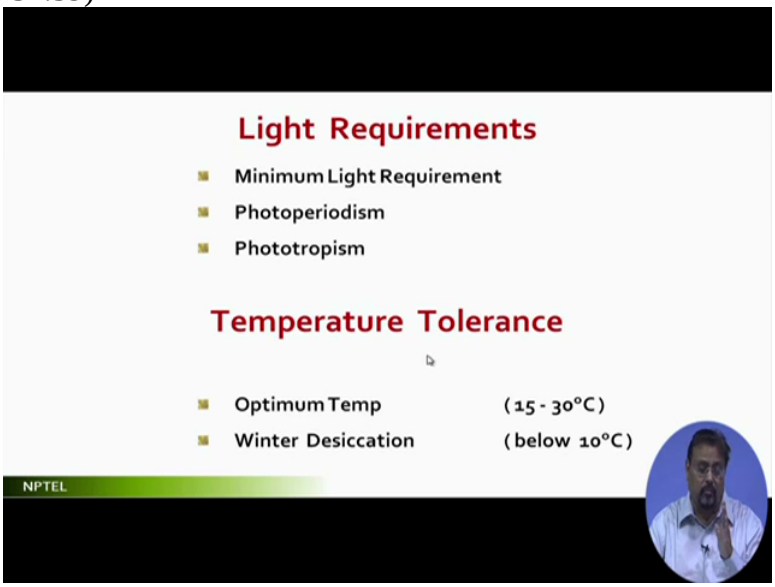

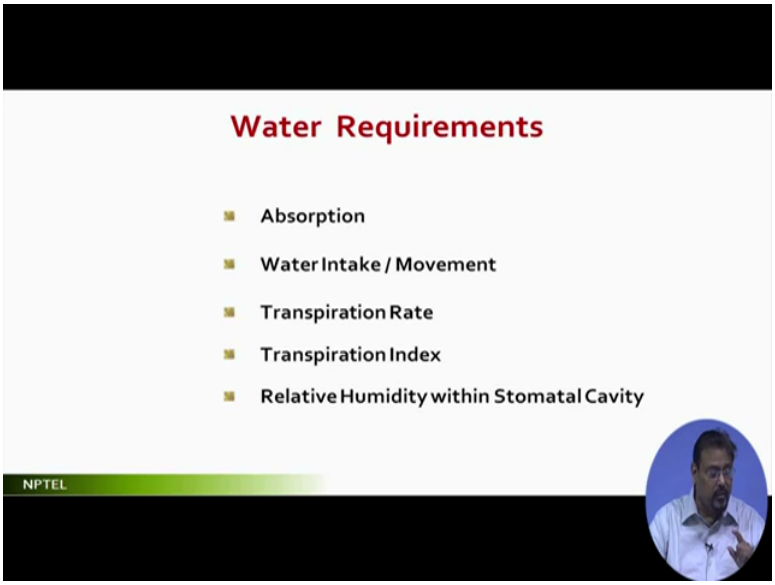

In terms of light requirements, solved came in a different form. In terms of white requirements, what is the minimum light requirement and what is the photoperiodism means how much time of the day it should get the light and the phototropism means if it does not get the proper light in that direction, then it tends to bendtowards that. All these I will discuss in my next lecture because I am just introducing you to this.

Temperature tolerance in terms of extreme temperature, optimum temperature, winter desiccation. That has to be taken into consideration. In terms of water requirements, absorption, coefficients of this, water intake or movement, that is in the tree and the transpiration rate. And the relative humidity and transpiration index. Okay? Relative humidity of the stomatal cavity. That is going to be taken care of.

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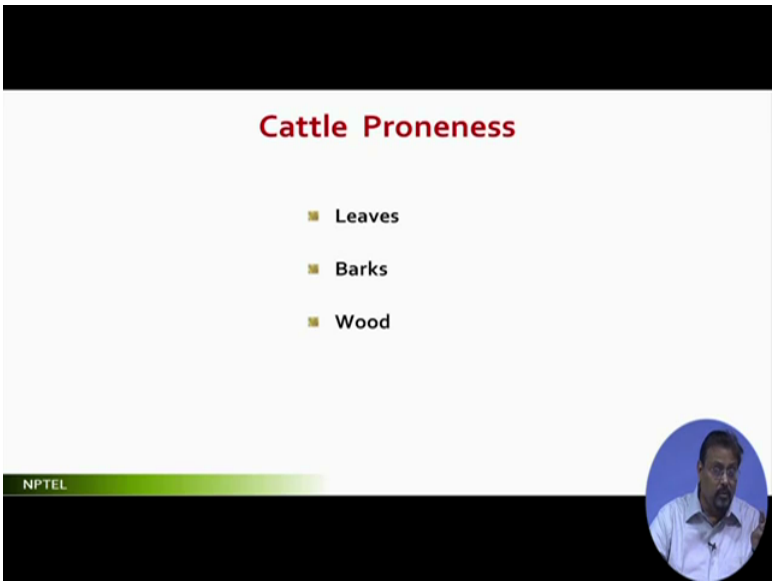

In terms of bark character, the texture, colour and the utility. In terms of cattle proneness, leaves barks, or wood, what is being attract or attracting the cattle?

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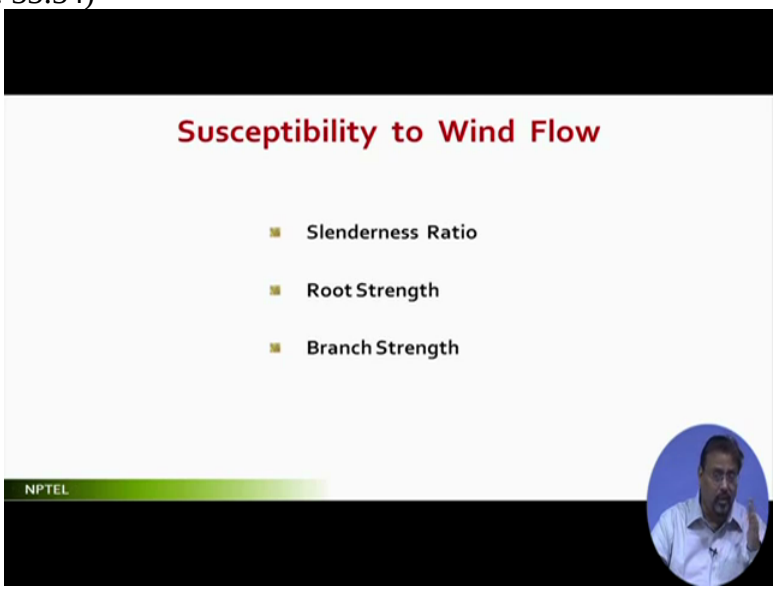

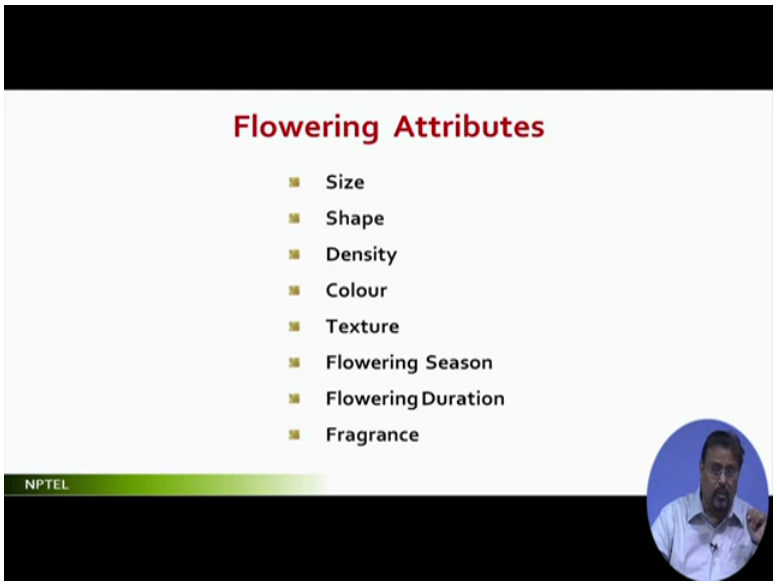

In terms of susceptibility to wind flow which are discussed already, slender and this ratio, proves root strength and the branch strength. In terms of flowering attributes, various things. Size, shape, density, colour, texture, flowering season for flowering duration and fragrance. Wait for my next set of lectures and I will go into each one of them with samples and examples and explain scientifically what is what. Okay? It is just the intro, basic level.

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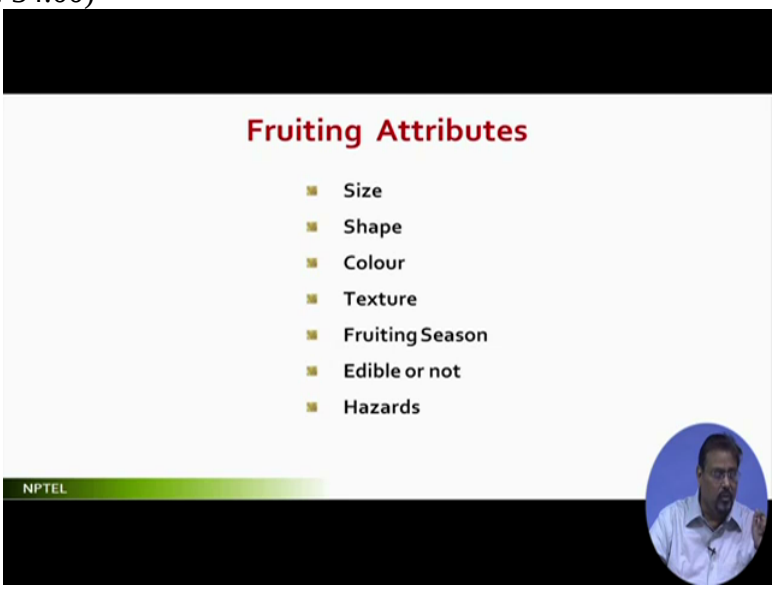

In terms of routing attributes, size, shape, colour, texture, fruiting season, edible or not or is it hazardous? In terms of pollution sensitivity or pollution resistance, there are from the researches or resources, I have found out some of the plants name in that list. I am not very sure how substantial it is but still, since I have got a published report, so I am just pressing it to you so that you have in your stock that these are the common plants which we get in our country, in India which are pollution sensitive and these are pollution resistant okay?

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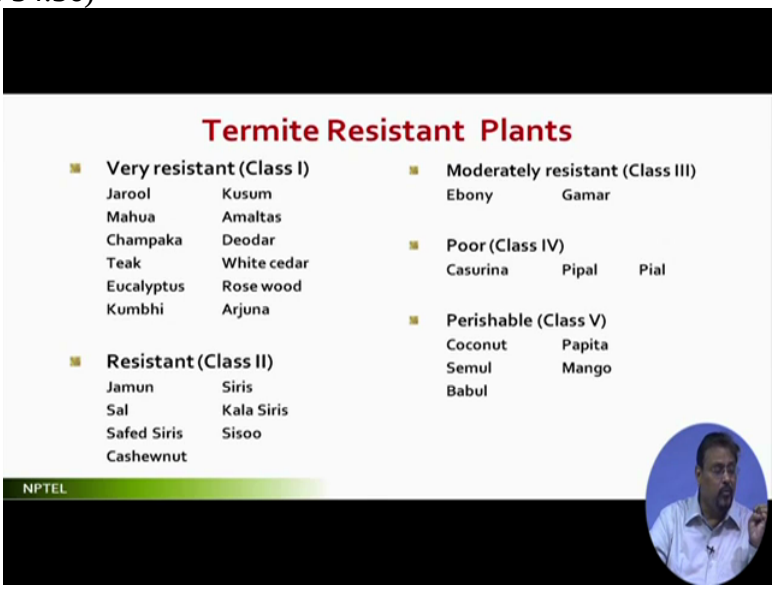

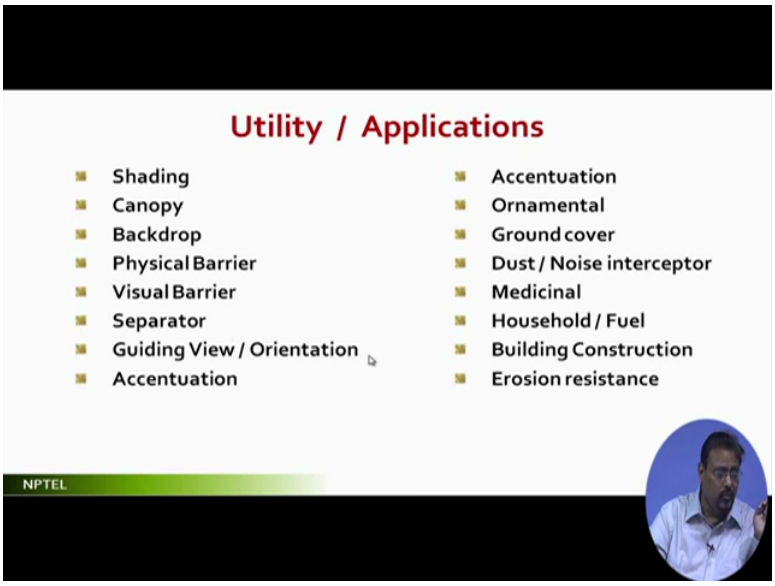

And then, termite resistant plants. This data I have got from the Forest Dept, Forest Research Institute in Dehradun and I have noted down and I have found out that they always classify this as class I, class II, class III, class IV and cost V as termite resistant plants. And they are all common plants under this. So if suppose you are going to make a landscape in an area which is highly termite infested, then these are the trees which are very resistant. So your selection will be automatically very easy to take this data into consideration.

But always I will say that you search for the best possible resources which I am always constantly trying and then another thing is, utility or applications in terms of these. Whether a shading utility, canopy, backdrop, physical barrier, visual barrier, separator, guiding view or orientation or accentuation. Sorry, accentuation came twice. Ornamental, groundcover, dust or noise interceptor, medicinal, household or fuel, building construction, erosion resistance.

So when you are looking at the utility or the applications of the plant materials, you are saying with respect to this. Wait for my next lectures in this, all details will be shown with examples.

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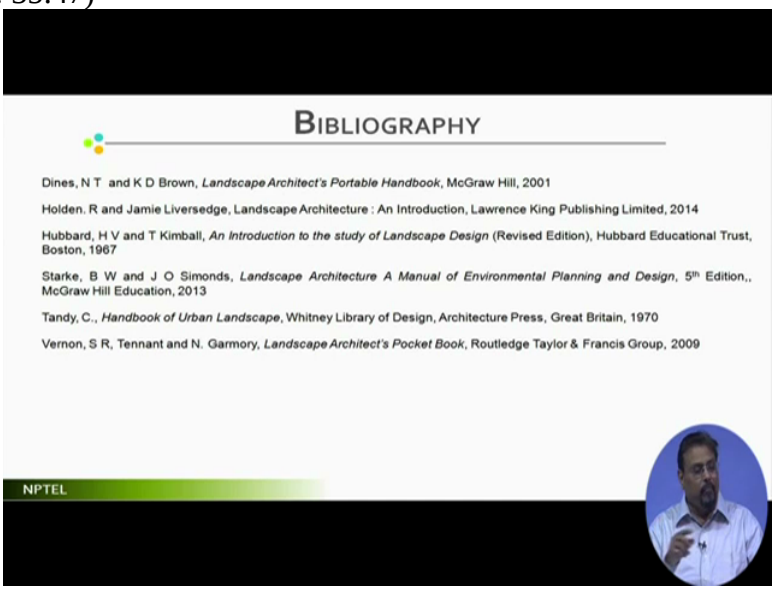

This brings me to the end of this series of lectures of the basics and fundamentals. I have just given a very brief bibliography here but I can tell you, if you can get hold of these books and read it through, you will be highly benefited. Many of my points which I have brought here, they are referred from this particular book but altogether if I really be frank with you, maybe more than 300 books on landscapes and all other aspects, drainage, landform and other aspects, rendering of landscape, all these I have studied.

And my research team is constantly working and they are doing Ph.D. under this. Okay? So this bibliography is not enough. It is just few which are in front of you. If you read this, my 1st point is, if you read this, you get a good amount of idea but be interested. My focus of, you know a purpose of giving this particular lecture, offering this at the national level is essentially to make people interested in the landscape and site planning.

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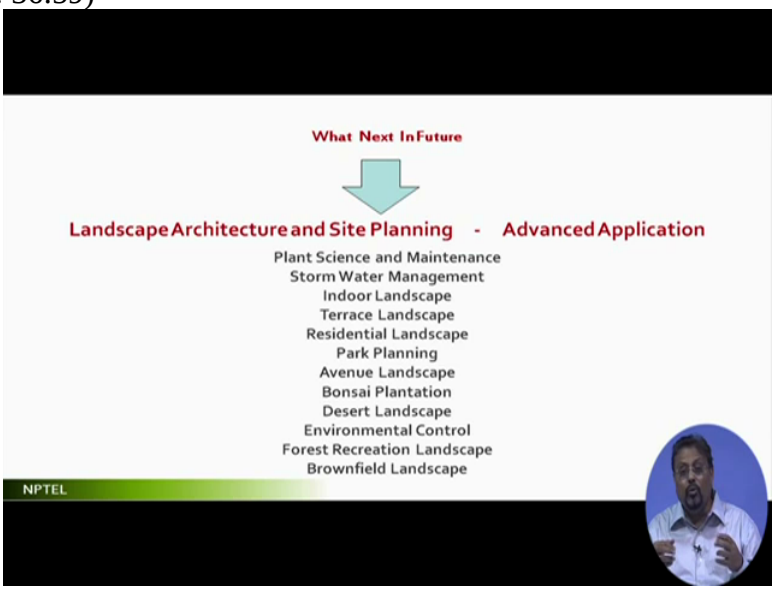

But I will tell you, this is only the tip of the iceberg. So what we have learnt is the basics and fundamentals with respect to this. What lies ahead? Let me just give that intro. What next in future? Most likely, I am not very sure but most likely it would be floated in the month of August. If my lectures have created a bit of interest in your mind, you share this with your friends and families, make them interested, try to learn more through my next level, that is advanced applications in which I am just giving you many of it, that what all are likely to be discussed.

We have Plant science and Maintenance. In This Plant Science And Maintenance, I Am Going To Discuss Whatever I did not discuss here. I kept it for the next level where I will go deeper into it with all plantation sciences and then the real way how you should handle in the landscape projects, that will come. Okay? Storm Water Management which I deliberately kept it in the next section so that you know I can do justice with the detailing engineering aspects of it.

Indoor Landscape, Terrace Landscape, Residential Landscape, Park Planning, Avenue Landscape, Bonsai Plantation, Desert Landscape, And Environmental Control, Forest Recreation Landscape And Brownfield Landscape.

If you now go through this, you have gone through the 1st set of lectures of 8 weeks, if you now go through the next set of lectures of 12 weeks, I am very confident that you have a very good

idea about the entire landscape process on the subject. How you imbibe it, how you extend your knowledge beyond this, and how you practice it, it is up to you but I will be very happy, if suppose people who have registered for this particular course, I am very thankful to them that you have registered and you have taken interest to learn this particular course.

And this is a never-ending study. So in man next set of lectures, in the part 2, in advanced applications, when it will be through, from then on, I would advise you that you can always be in touch with me and try to know more and more and more. I will be very happy to communicate with you and you can always shoot a mail to me for any further clarifications. Thank you very much for joining this course. All the best. Thank you.