Forests and Their Management
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Module - 09
Logging and Yield
Lecture – 27
Yield and Sustained Yield

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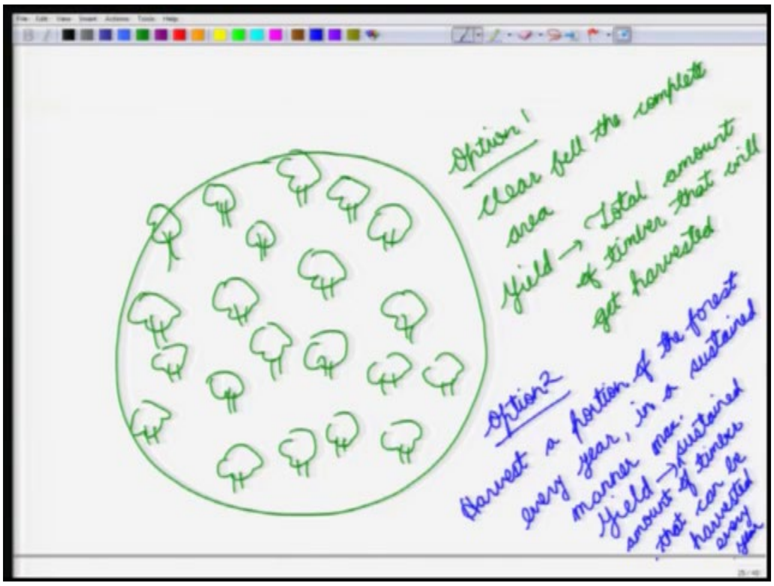

[FL] We move forward our discussion on Logging and Yield. And, in today's lecture, we will have a look at Yield and Sustained Yield. Now, the basic question when we are doing classical silviculture is this. You have a piece of land and there are a number of trees on this piece of land. Now, you have got two options; option 1 is to clear fell this area and extract all the timber. Now, if you go with this option, then yield - we will ask "what is the total amount of timber that will get extracted or harvested?" So, this is the first way in which we can define yield.

What is the total value of timber or what is the total volume of timber that we can extract from this forest? But in a number of situations, we do not want to go with this clear felling. So, we can look at option 2. Now in option 2; the owner of this forest might say that, "I do not want all this timber right away, but then I have my own needs."

So, like every year, I require some timber for my own use, I require some timber that I can sell to the market and get some money. Now, if I wanted to manage this forest in such a manner that every year, I should be getting some amount, and this amount should be steady it should be constant. So, in that case, how do I manage this forest? So, option 2 is, you harvest not the complete forest but a portion of the forest every year, and the objective would be in a sustained manner.

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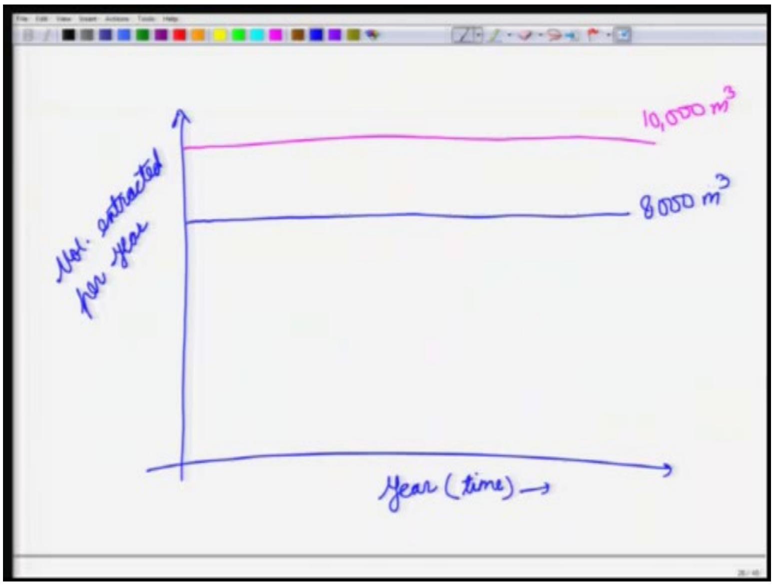

Now, what do we mean by a sustained manner? If we were to draw a plot between the volume extracted per year versus the year, or let us say time then sustained yield would say that the same amount should be extracted every year. And, it will be of benefit to the forest owner, if this amount could be maximized.

So, what we are saying here is that suppose, it is possible to extract say 10000 cubic meter every year, but we are extracting 8000 cubic meters every year. Now, from this forest, it is possible to extract 8000 cubic meters per year, but if we extracted 2000 cubic meters more, even then it would have been a sustained operation.

So, every year, we could have gone with 10000 cubic meters. So, why not go with that? So, this second definition of yield says, what is the sustained amount of timber or rather the maximum sustained amount of timber that can be extracted or harvested every year.

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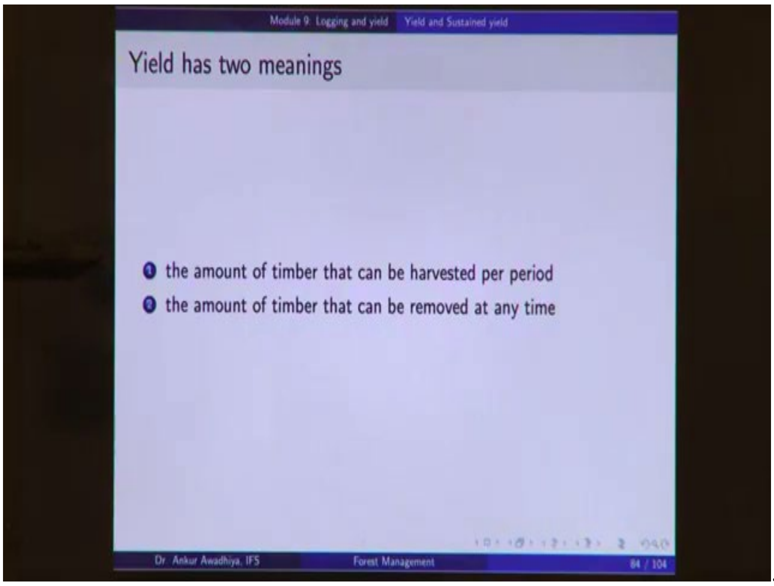

So, these are the two meanings of yield. The first meaning is the amount of timber that can be harvested per unit period; generally, this period is taken to be one year. So, the amount of timber that can be harvested every year or the amount of timber that can be removed at any time. So, at any time, it means that we are taking a snapshot and we are asking the question what is the total amount of timber that I have.

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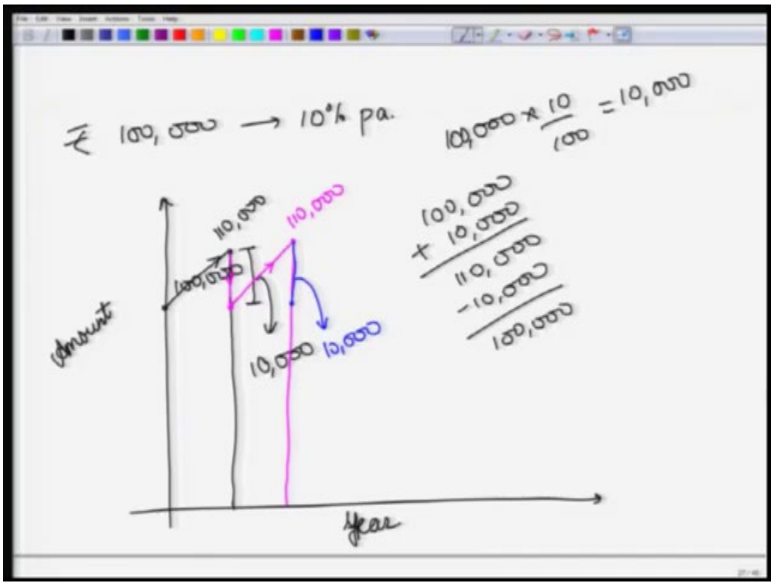

To understand this problem, suppose you have deposited 10000 rupees into your bank account and this bank is giving an interest at the rate of 10 percent per year. Now, let us plot the amount that we have in the bank versus the year. Now, in the 0th year, you deposited 100000 rupees. Now after 1 year, the amount plus the interest so, the interest that we will have is 100000 into 10 by 100 is equal to 10000.

So, at the end of 1 year, the amount that we have in this bank is now 100000 plus 10000, is 110000 rupees. So, at the end of 1 year, you have 110000 rupees. Now, similarly if you have a forest that suppose currently has a total growing the stock of say 100000 cubic meters, and it is having an increment of 10 percent, and we will say that at the end of one year we have a volume of 110000. So, it is one and the same thing.

Now, out of this amount, suppose you were to extract 10000 rupees. So, out of your 110000 rupees, you extracted 10000 rupees from that account for your own use. So, now, the amount that remains is minus 10000 is back to 100000.

So, from here you have shifted back to this point. Now, at the end of the second year, again the bank is giving you the interest. Now because the principle is the same it is 100000 rupees. So, now, the interest also is the same; it is again 10000 rupees and so, the amount again goes up to 110000.

Now, in this year, you again extract 10000 rupees and so, you are bringing the situation back to the starting position. So, as long as the rate of interest; or in the case of forest, the rate of increment does not change; and so long as the your principal is not lost, such as in the case of forest, if there is no forest fire; if there is no infestation.

So, at the beginning of every year, the situation would be the same as what it was at the beginning of the previous year. At the end of every year, the situation will be the same as it was at the end of the previous year. So, this is a sustained yield. Now what will happen? If suppose in place of extracting 10000 rupees you extracted more.

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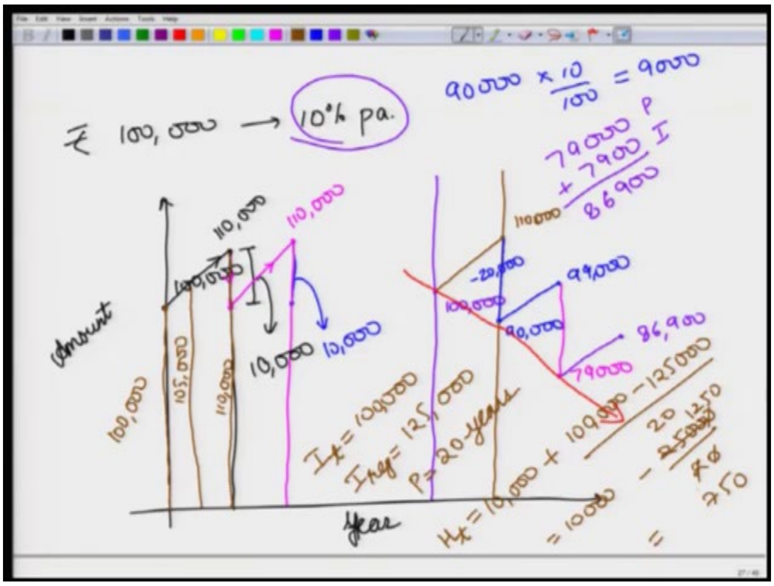

If so, let us look at the second scenario; so, we began with 100000 rupees and at the end of the first year, the amount increased to 110000, but then in place of extracting 10000 rupees suppose you extracted 20000 rupees. So, what is the situation now?

Now, in place of 110000, you will only be left with 90000 rupees, because you have extracted 20000. Now, at the end of this year; at the end of the second year, what is the amount of interest that you will get? Now the interest that you will get is on 90000 rupees only; you are not getting the interest on 100000 rupees.

So, the interest here will be 90000 into 10 by 100 is 9000. So, at the end of this year, you are getting a sum of 90000 plus 9000 is 99000. Now, suppose you extracted 20000 again from here. So, now you are getting down to 79000 and at the end of the third year this 79000 will give you an amount of 79000 plus 7900 which is the interest so, this is the principle this is the interest is 86900.

So, what we are observing here is that, year after year, the amount is going down. So, year after year the amount is going down; so, this is not a sustained yield. Now, when we look at the meaning of yield where we say what is the amount that can be extracted per unit time every year this is what we are talking about.

What is the amount that you can you can take out of your bank, such that at the end of the year, you will be at the same situation as it was at the beginning of the year. Now, the second meaning is what is the amount that you have in your bank. So, if we ask the question at this point of time, the amount that you have in the bank is 100000 rupees.

So, if you were to clear cut the forest; if you were to extract all the amount that was there in your bank account, what would it be? So, this scenario is saying that the amount will be 100000 rupees. At this point of time, the amount is 110000 rupees. At some other point in between, probably it is 105000 rupees and so on.

So, this is what this the second meaning of yield talks about. If you were to clear cut the forest, what is the total amount of timber that you will have? Now, this sort of a forestry when we talk about a sustained yield. It began in Europe, because there were land owners who wanted to have a regular supply of income through their forests.

So, the question they were asking was what is the maximum amount of timber that, I can extract or rather I should extract every year to maximize my income, in such a manner that every year I should be getting this source of income. So, this is where this scientific forestry began.

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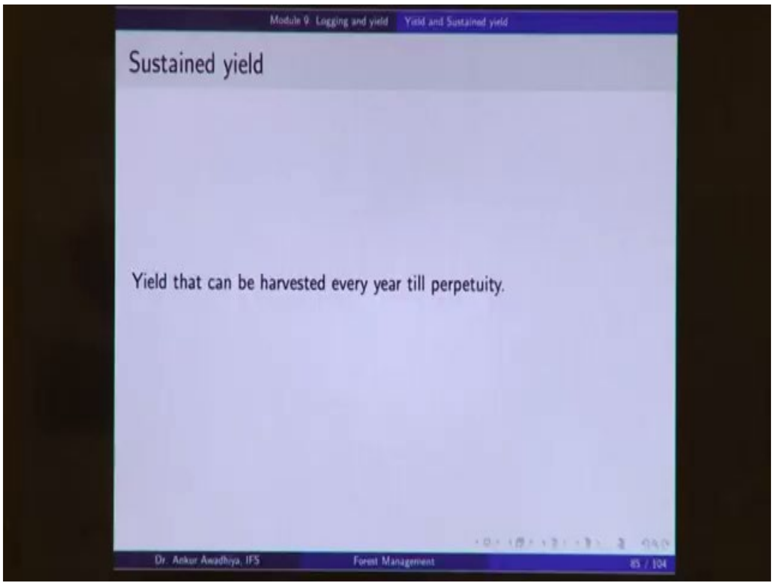

So, sustained yield is the yield that can be harvested every year till perpetuity; this is what they were asking. How much amount can I extract every year in such a manner that this extraction can be done till infinity, till perpetuity.

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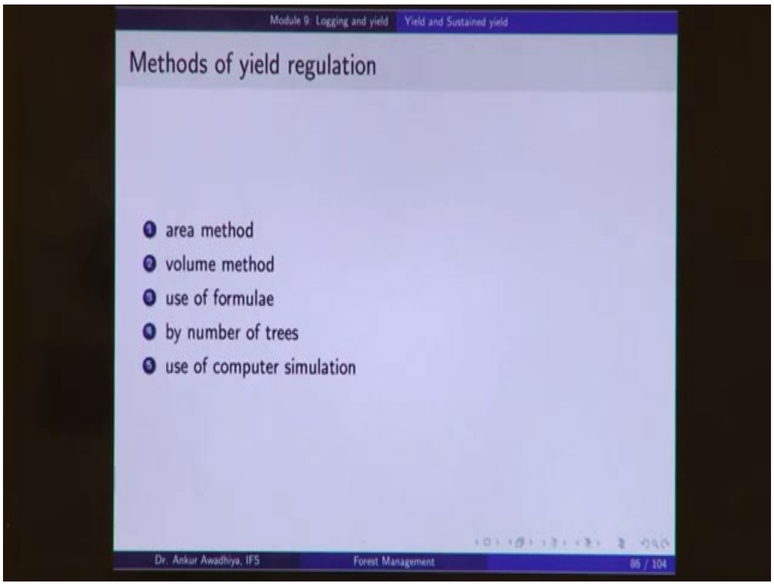

So, to answer this question a number of methods were developed to regulate the yield. Now, in the case of our bank example, it is easy to compute things because we know this rate of interest. But, in the case of a forest and especially in the case of a forest that is an irregular forest or a selection forest, how do you get the rate of interest or the rate of increment is the next question.

Then again, not all the trees will be putting up increment at the same rate because trees that are very young or trees that are very old will probably not be putting up any significant increment, whereas, trees that are in the middle age, which are mature trees, they will be putting up increment at a very fast pace.

Now, when you are doing the extraction, you are typically removing the very old trees. But when you are removing the very old trees, then you are removing those trees that, but not putting up a large increment and, you are making space for those trees that can put up much more increment.

So, things tend to become a little more complicated as compared to the bank example, because we do not know the rate of increment, we do not know the interest rate, and finding out this interest rate is difficult. Now to solve this problem, these methods were developed. So, we have the area method, volume method, use of formulae, by number of trees, and these days we also make use of computer simulation. So, what do these methods talk about?

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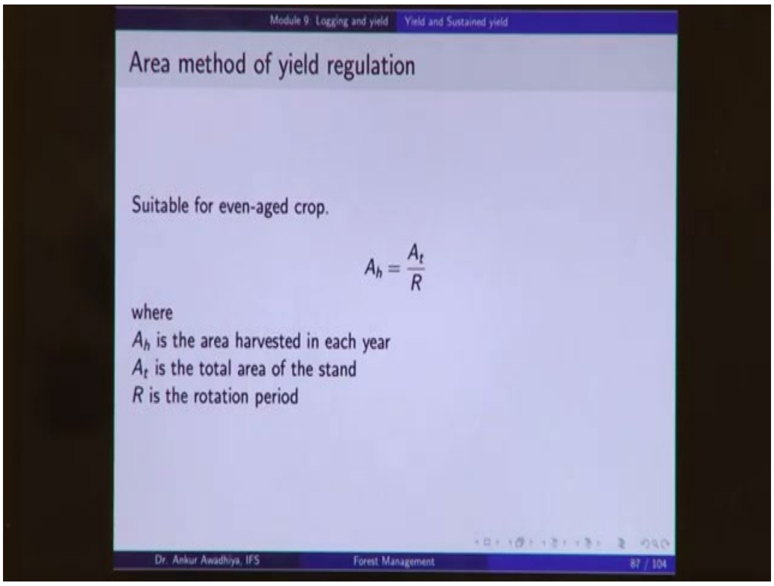

Let us begin with the area method of yield regulation. Now, the area method says that, in the case of an even aged forest, the area that should be harvested every year is equal to the total area divided by the rotation period. So, in the case of an even aged forest, this method says,

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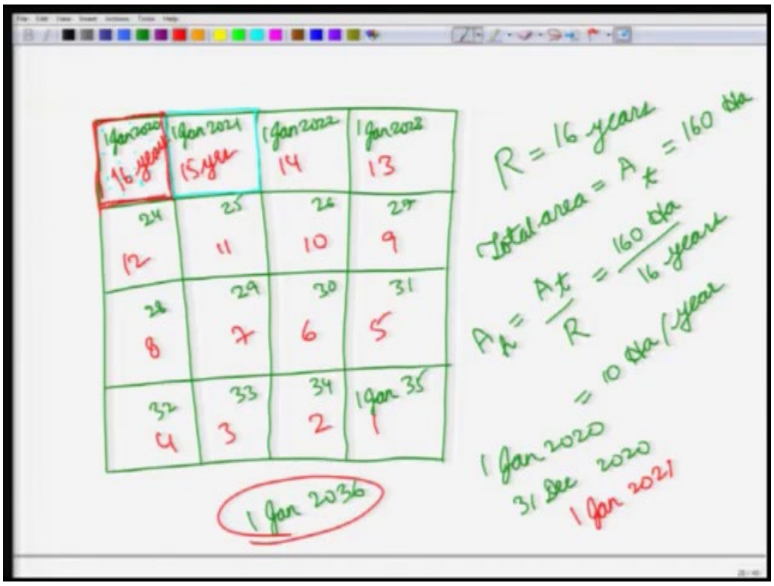

Let us suppose this is your forest and let us see the rotation age is 16 years. So, we are saying that R is 16 years, and the total area is equal to At, say for sake of simplicity that this is 160 hectares. Area to be harvest will be given by the total area divided by R which is 160 hectares divided by 16 years is, 10 hectare every year, about this method.

Now, suppose you have this forest and you do not know the age of different sections. Now this method, let us you convert this forest into an even aged forest, and ensure that it will be maintained as an as an even aged forest. So, let us say that on 1st of January you clear cut this section. So, let us say on 1st of January 2020, you cleared up this section. Now, you sold this timber in the market; you got some revenue, at the end of the first year, that is on 31st Jan 2020, this section has now completed 1 year.

So, any regeneration that was coming up is now of the age of 1 year. Now, on first on 31st December rather; Now, on 1st of January 2021 you cut up the next section.

So, let us say that this section was filled on 1 Jan 2020, this section was filled on 1st of Jan 2021, this one was felled on 1st of Jan 2022, 1st of Jan 2023 and so on. So, this is 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35. So, this section was felled on first of Jan 2035.

Now, if we carry on these operations, what will be the situation on 1st of Jan 2036? Now on 1st of Jan 2036, this section, the first section that we had felled on 1st of Jan 2020, this is now 16 years of age. This section that we felled on 1st of Jan 2031 is 15 years of age. This is 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2 and 1. Now, this is the situation on 1st of January 2036. So, what do you do on 1st of January 2036? You again clear fell this section.

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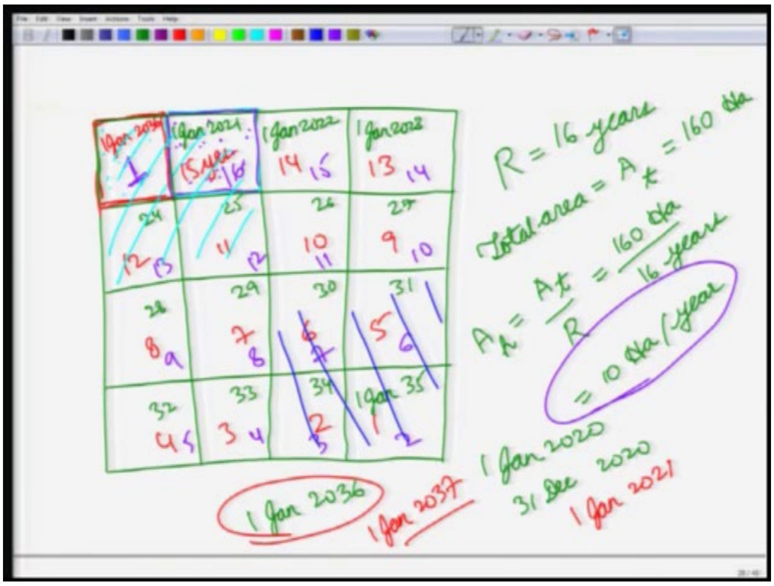

So, this date now changes to 1 Jan 2036. Now, let us look at the situation on 1st of Jan 2037. Now what is the situation on 1st of Jan 2037? This section that we had felled on 1st of Jan 2036 is 1 year of age. This section that we had felled on 1st of January 2021 is now 16 years of age. This is 14; this is 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2 and this one as 1. Now, on 1st of January 2037, what you do? You clear fell in this section.

So, what we are seeing here is that every year you can fell one section that is of the age of 16 years, and at the end of the year or rather the beginning of the next year; on 1st of January of the next year, you will again have one section of equal area, the area is 10 hectares. So, all of these sections are 10 hectares.

So, on 1st of January of every year, you will be having an area of 10 hectares that you can fell on that day, and this can continue till infinity. So, you can you can perpetually extract this forest of area of 10 hectares every year.

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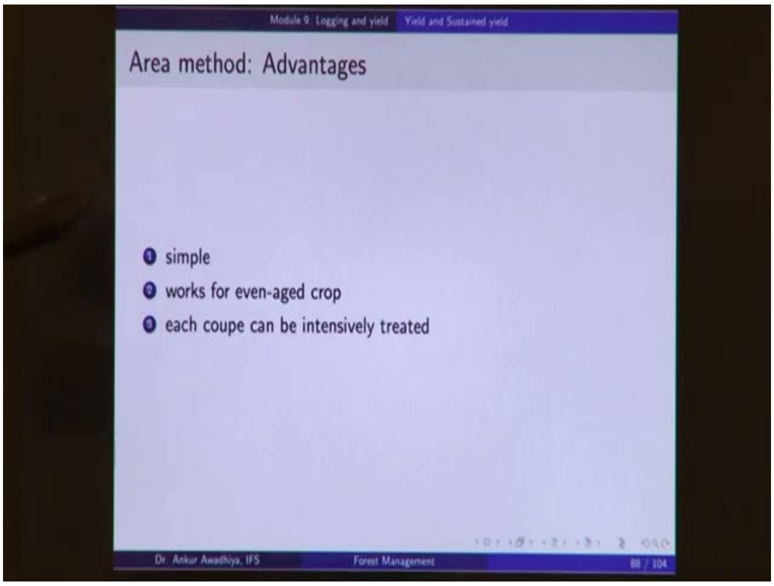

So, this is the area method. Now, a very clear advantage of this method is that ,it is a very simple method, because you just divide area by the number of years and rotation, and you get the area that needs to be felled every year.

It works for any even aged crop, and for most of our landlords in Europe in the seventeenth and eighteenth centuries, they used to prefer the even aged crops. Because those were not the days of biodiversity; those were the beginning of the days of production forestry and each coupe can be intensively treated, because on 1st of January of every year, you are clear felling the coupe, and then you have the one full year to work only on that coupe.

So, the coupes that are felt can be intensively treated and even the other coupes can be very easily tended because, all of them are of the same age. However, this method has disadvantages.

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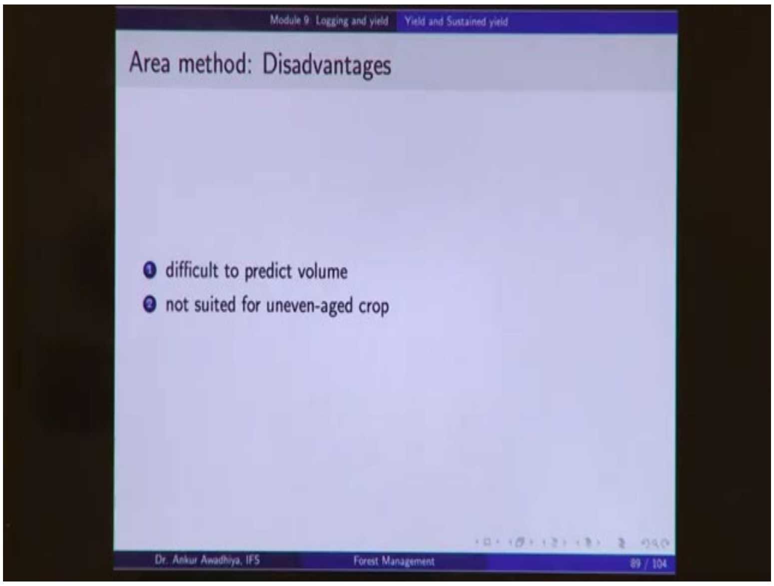

One; it is difficult to predict the volume, because nowhere we have talked about volume. So, if the landowner were to ask you what is the amount of timber that I will be getting every year, we cannot say. What is the amount of revenue that I will be generating every year? Well, we cannot say. Then, it is not suited for an uneven aged crop. Because you need to convert your forest into an even aged forest, then only you will be able to use this method. And then, it also does not take into account other entry cases such as differences in the site quality.

So, it is possible, for instance, that this portion of your forest is having more fertility and this portion of the forest is, let us say, infertile. Now, this method will say that so much of the area has to be felled every year, but then it belongs to a better site quality and then there will be more amount of timber that the landowner will get in that year. If the area is infertile, we will be getting less amount of timber.

So, when we talked about that that we wanted to have an equal yield in every year, then the system will fail. So, it only talks about a homogeneous forest, in or rather an even aged forest in an in a homogenous situation, in a homogenous piece of land. So, every portion or every parcel of the land is having the same fertility; it is having the same amount of water availability and so on.

So, this is a very simple method, but it as it is own disadvantages the.

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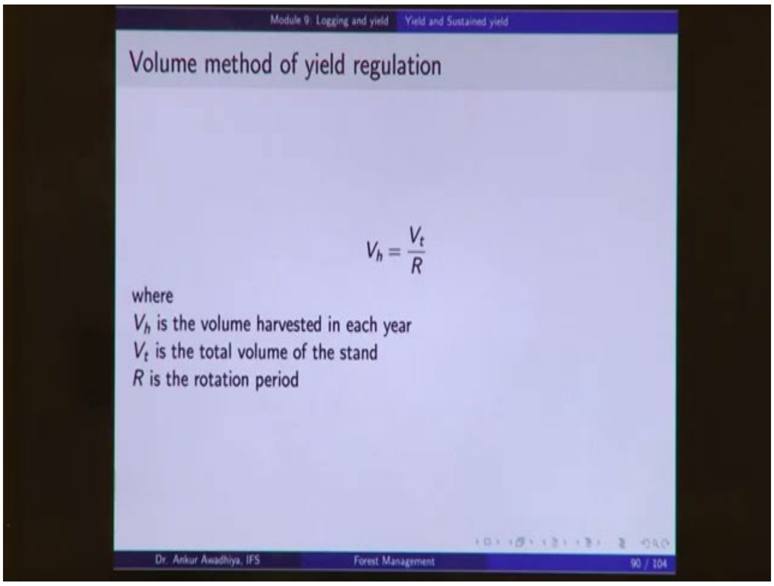

Now, another method of yield regulation is the volume method. Now, volume method is a slight improvement of the area method. It says that the volume that should be harvested every year is equal to the total volume divided by the rotation period.

So, what this method is saying is that you figure out what is the total volume of timber, that you have, that is what is the growing stock, that you have divided by the rotation period, and you will reach a point where you can say that this is the amount of timber that I should be extracting every year.

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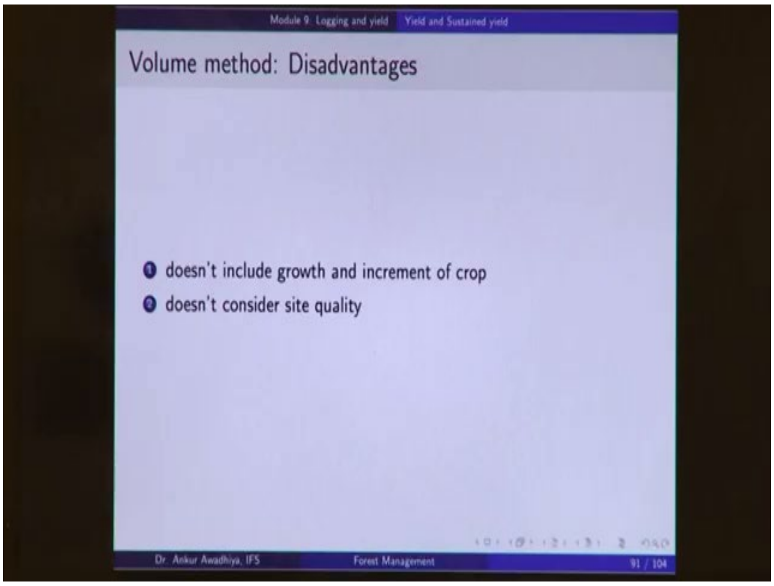

Now, here again, this is a very simplified way of putting things. It does not include growth and increment of crop, because whenever you are doing these failing operations, they take time. And, throughout this rotation period, the crop will also be putting up growth; it will also be putting up increment. But this volume method does not talk about that, and here again, it does not talk about the site quality.

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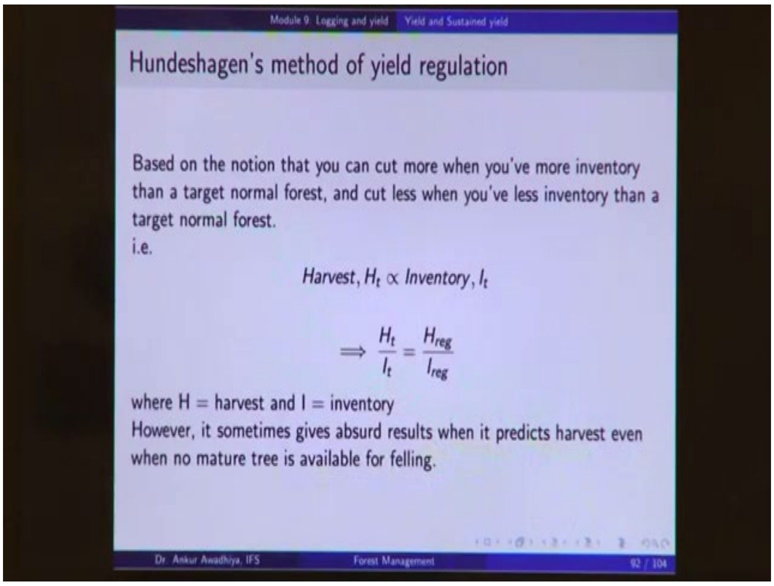

Now, let us look at some more intricate methods. So, this is the Hundeshagen's method of yield regulation. Now, this is a much better and a much more scientifically sound method. It is, say it is based on the notion that you can cut more when you have more inventory than a target normal forest, and you can cut less when you have less inventory than a target normal forest.

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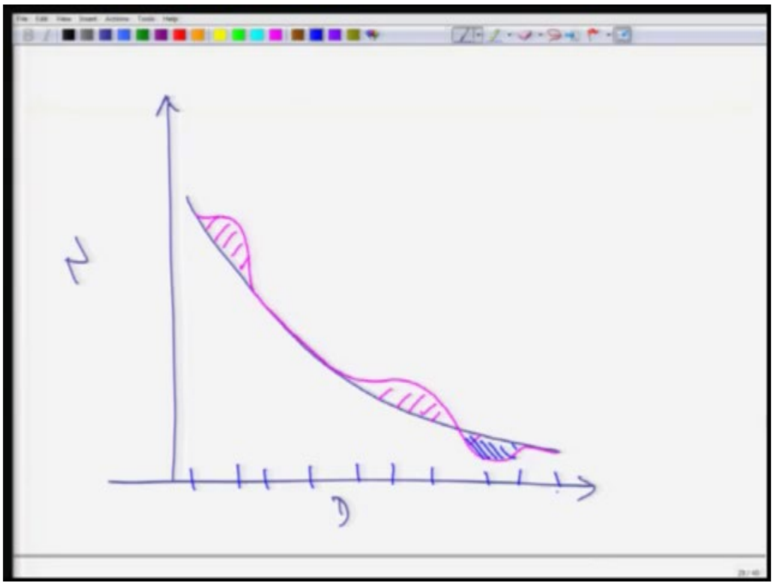

Now, what is it saying, we saw in the case of a selection forest that a selection forest has N and D, ND curve that looks like this. So, it is an inverse J, ND curve. Now, if this is a normal forest, then if you have trees that are, if the actual forest looks like this, then probably you can cut these sections, and in this section and in this section, you should not be doing the felling.

So, that your forest turns into a normal forest, and it goes on like this for perpetuity. Now, this method says that when you have more inventory. Now, in the case of our selection forest, we are looking at inventory in different diameter classes or age classes. But then, in the case of Hundeshagen's method, they only talk about the total inventory; the total volume of timber that is available in your forest.

Now, if you have a target, or rather if you know what a normal forest is, or how an ideal forest should look like, if you know what is the total volume of timber that you have in an ideal forest, and then, if you compute the amount of timber that is there in your forest. And, if there is any discrepancies, then you should do more amount of cutting, more amount of harvesting, if your total inventory is greater than and than the ideal stage. You should do less amount of harvesting, if your total inventory is less than the ideal state.

So, essentially what it says is that the amount of harvesting that you should do should be proportional to the inventory that you have. The inventory is another term for growing stock. So, so the total volume of timber that you have; if it increases, you should do more harvesting; if it decreases, then you should do less amount of harvesting.

So, H is proportional to I, which means that H t by I t is equal to H of a regular forest divided by I of a regular forest. So, H is the harvest, I is the inventory. So, this is what it says. H divided by I should be a constant, and how do you get to this constant? Through, say numerical computations, or through setting up of a research plot.

However, this method also gives absolute results, when it predicts harvest even with no mature trees available felling. So, suppose you have an area where you did a clear-felling, and now, you have planted the young seedlings. And, when you put your area into this equation, you will get that some amount of felling needs to be done even though your plants are only 1 or 2 years of age. So, this method can give you certain absurd results.

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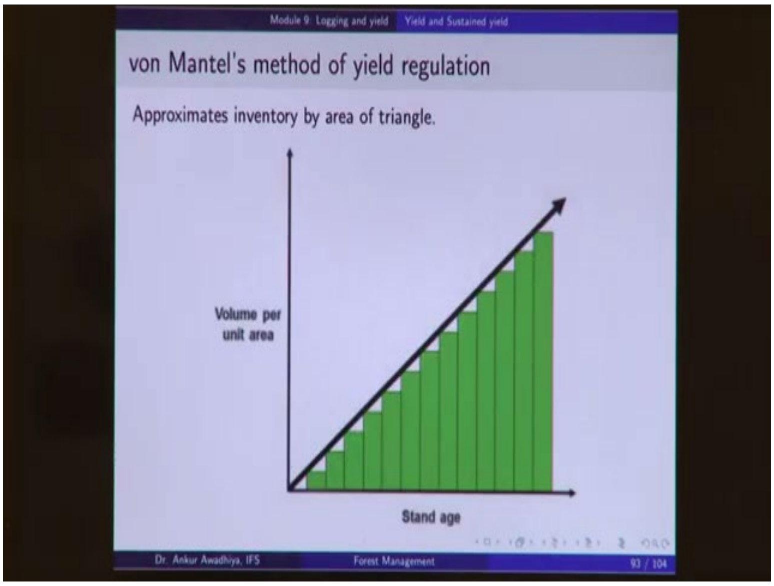

Next, we come to von Mantel's method of yield regulation. This is one of the most highly used methods. It approximates the inventory by the area of triangle. So, what it says is that, if we look at the stand age for an even aged forest and if we look at volume per unit area; so, if this age of the stand is more, then these trees have been have gotten much more time to put up increment and so, their volume is more. On the other hand, if there is a stand that is of 0 years of age; so, the plants have not put up any increment, the total volume is 0.

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So, essentially what it says is that, if we plotted volume per unit area versus the stand age, we will get a curve like this. So, for a higher stand age; let us say 20 years, the volume per unit area is more, whereas for a lesser age; say 7 years, the volume per unit area in the stand is lesser. Then, it says what is the inventory of a regular forest.

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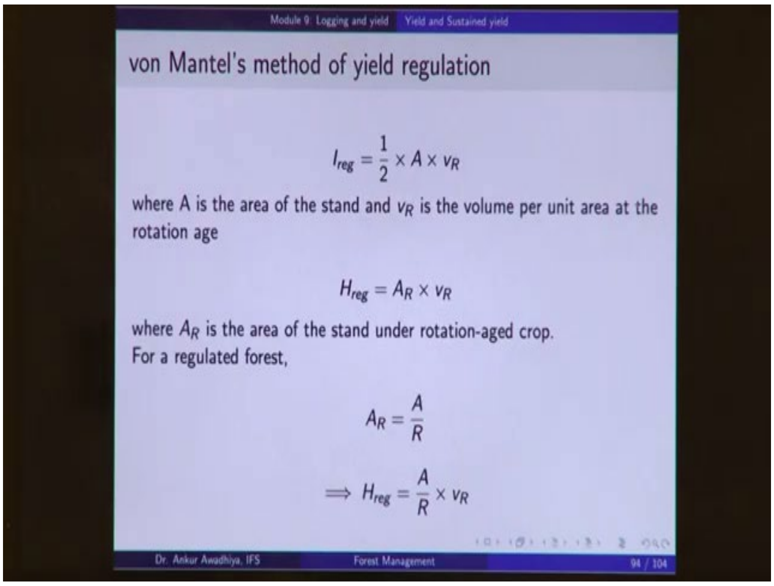

Now, this method is now trying to build upon on the Hundeshagen's method and it says what is the invent.

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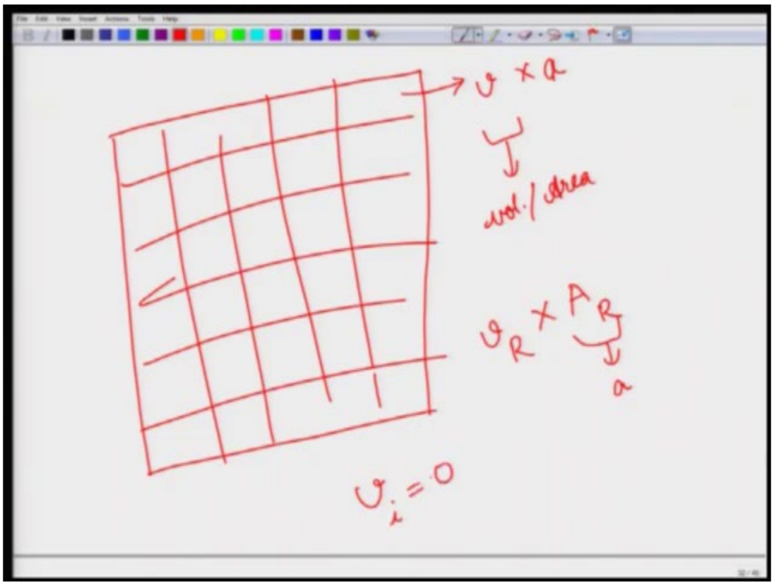

Now, the forest is divided into a number of sections, and every year we will be working on one particular portion, which is the coupe. Now, the volume of each of these will be given by v R which is the volume per unit area multiplied by the area of this particular section.

Now, in all of these sections, the volume per unit area is different. But, the area of each section is constant. So, there will be a section which is near to the rotation age. So, we can say that the volume per unit area, in that particular section or in that particular coupe, will be written as v small R.

Now, the total volume of timber in that particular coupe will be given by, vR into AR, where AR, is your small a, or the area of that particular coupe. Now then, if you look at this forest, there will be one particular section where the v of that section, v i is equal to 0. Because, it is a very young section; you have just harvested this section and so, there are no plants or there are plants with a total area of roughly equal to 0, and if we plotted that the volume.

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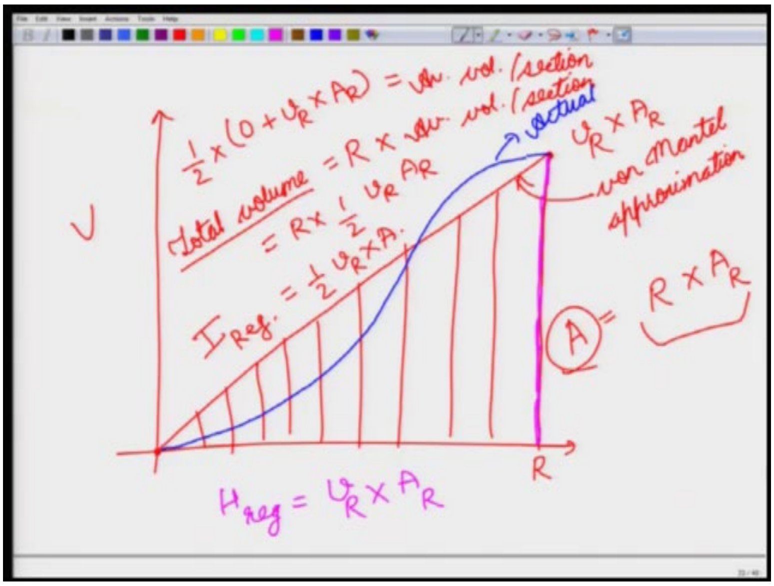

So, there is one coupe which is having a volume of 0, and there is one coupe at the rotation point which has a volume of vR. And, the total number of sections that we have is equal to capital R. Now this now, total number of sections is capital R which is equal to the age of rotation. And, we can say that the total area of the forest is given by total number of sections into the area of one section.

Now, you can draw a straight line as an approximation and say that different sections are having these different volumes, and total number of sections are R. So, what is the average volume in one section. So, that will be given by half into, let us take the 2 extremes 0 plus v R into AR, is the average volume per section. Total number of sections is R.

So, the total volume is given by total number of sections into the average volume per section is equal to R into half of v R into AR. Now capital R into AR, is the number of section into the area of each section, is equal to capital A, which is the area of the forest. So, here we get half of v R into A.

So, this is what the von Mantel formula is saying, that the total inventory in a regular forest, because this is an ideal situation; because in practice this will not form a triangle, it is possible that here the volumes will be less. And here, the volumes will be more than that of more than that what the von Mantel's approximation is predicting.

Because, earlier the growth rate is very slow. As we saw earlier, in the case of a sigma ideal curve or a logistic growth equation that in the early phases, the growth is very slow and in the later phases, the growth increases till a maximum; till it reaches a maximum value, and then it again goes down to 0.

So, this is how the actual curve will look. The blue one is the actual curve and the red one is a von Mantel approximation. Now here, this total volume is the ideal volume or the volume of a regular forest. Now, H in a regular forest or the amount of harvesting that you will be doing in the regular forest will be given by the by the coupe that has reached it is maturity.

Now, in when it is reached it is maturity, though we are talking about this final coupe. So, in this year, what is the amount that you will be harvesting? The amount that you will be harvesting in the regular forest is given by vR, which is the volume per unit area in the in the rotation, H multiplied by AR, which is the area of this particular coupe. So, it says that H in a regular forest or ideal forest is AR into v R.

Now, for a regulated forest AR is equal to capital A divided by R, because we have divided the forest into equal area sections. So, now, we can say that H regular is equal to AR which is A by R into v R.

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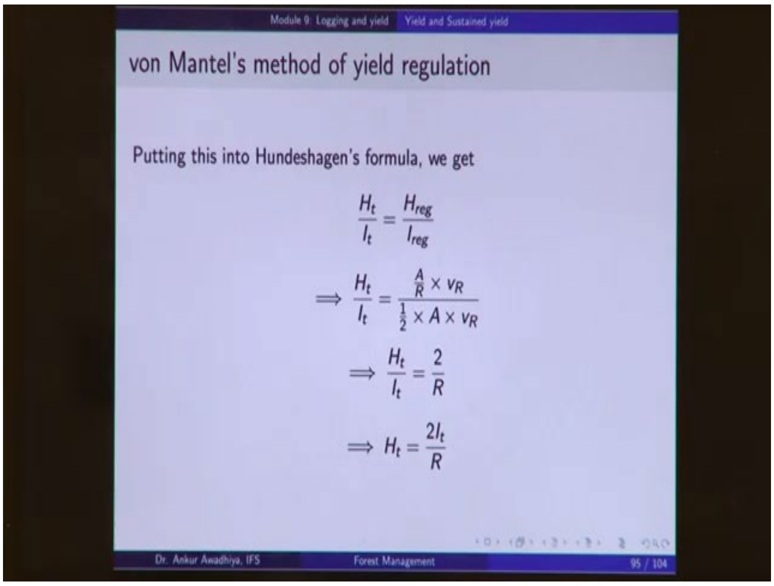

Now, putting this into the Hundeshagen's formula, we get H t by I t that is harvesting at time t divided by the inventory at time t is given by H of an ideal forest divided by I of the ideal forest.

Now, H of the ideal forest is what we saw here A by R into v R. So, we put it here A by R into v R.

I of a regulated forest is given by half of A into v R.

So, we put that here half of A into vR. Now A and A get cancelled, vR and vR get cancelled. So, this comes to be 2 by R. So, H by I is equal to 2 by R or H is given by 2 into I by R.

So, this is the formula given by von Mental, which tells us the amount of harvesting that we can do in a sustained manner. So, that will be given by 2 times of the growing stock divided by the rotation period. So, this is different from what we had seen in the volume method. Now, in the volume approximation, we said the amount that can be harvested every year is the growing stock divided by R, but here we are saying that it is actually 2 times the growing stock divided by R. Now, why are we getting this 2 time? Because, this forest is not a static forest, and each section is putting up increments.

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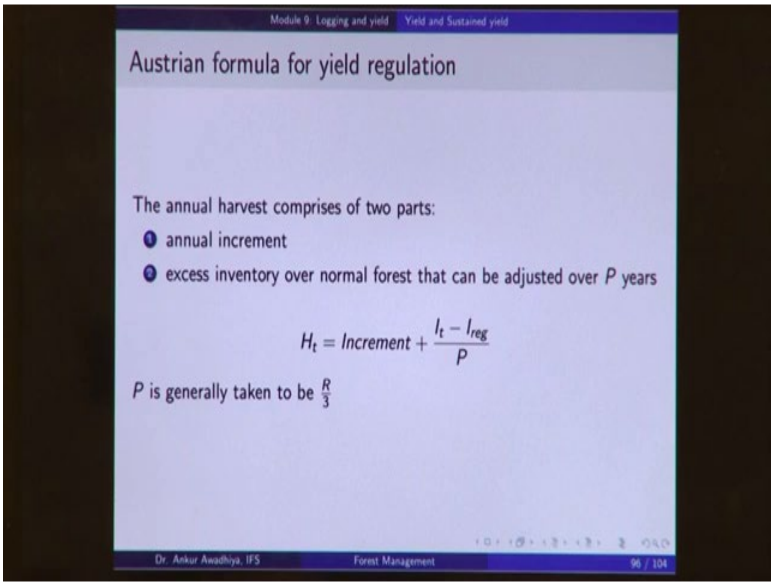

Another method of yield regulation; is the Austrian formula. Now, the Austrian formula says that, if you consider any forest and your forest is not an ideal forest, one; your forest is putting up a natural increment every year, and whatever increment it is putting is something that you can be easily extract.

So, essentially, coming back to our example of the bank, the increment that you are getting every year which is 10000 rupees is something that you can very easily extract from the bank; so, this is given. However, you can also look at a projected value of how much amount do you actually need in your bank.

So, suppose, you decide that I want to have say 50 say only 50000 rupees in my bank, and I want to bring these 100000 rupees to 50000 rupees over a period of say 20 years. So, then in each of these 20 years, you can take out some extra money, because at the end of 20 years you only require 50000 rupees, or else you can even say that no I am these 100000 rupees is not sufficient for me. At the end of 20 years, I want to have 100 and 50000 rupees.

So, the Austrian formula looks at a very similar situation. It says that you can always take out the increment, but this increment will be modulated by what is your current scenario, and what is the ideal scenario that you want. So, it says that the amount of harvesting is equal to increment plus I t minus I reg, divided by P. So, I t is the inventory that you have at time t, I reg is the inventory that you want in a regular forest or that is the ideal forest, divided by a time period P, over which you want to bring your forest to a state of the regulated forest.

So, suppose in this example, if you wanted to put these values, we have I t is equal to 100000 rupees, I reg suppose I want to have more amount of money in my forest in my bank account. Suppose, I want to have 125000 rupees and I want to change this 100000 to 125000 over a period of say 20 years.

So, the Austrian formula would say that the amount that I can extract out every year is equal to the increment which is 10000 plus I t which is 100000 minus 125000 divided by 20. So, this is 10000 minus 25000 divided by 20 is 8750 rupees. So, what this formula is predicting is that I should take out not 10000 rupees, but 8750 rupees so that, every year I am adding to the increment.

So, the increment is large, but I am taking out a small portion. So, that at the end of 20 years, my bank account gets to a level of 125000 rupees. So, similarly, if you look at a forest, you can take out the increment, but it will be modulated by what you want to have at the end of P years.

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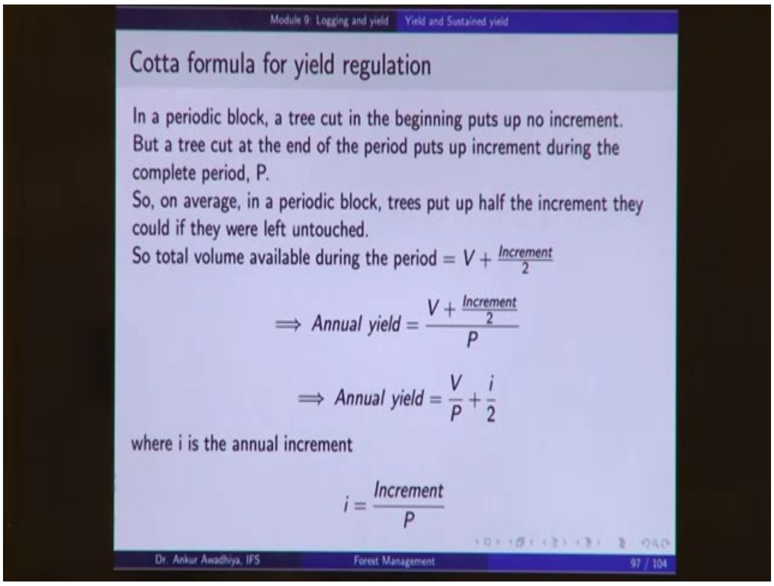

Next is the Cotta formula. Now, the Cotta formula says that in a periodic block, a tree cut in the beginning puts up no increment, because this tree is gone. So, if there is no tree, there will not be any increment. So, a tree that is cut at the beginning is putting up no increment, whereas a tree that is cut that is getting cut at the end of the period is getting the whole period of P years, to put up the increment. So, it puts up the complete increment that is possible for it.

So, on average in a periodic block, the trees will put up half the increment they could, if they were left untouched. So, here again, we are looking at the average values there are some trees that are putting up increment for all the P years. There are some trees that are putting up increment only for 0 years or rather no increment. So, on an average we can say that the trees will be able to put up half the increment over P years or full increment over P by 2 year.

So, in this case the total volume that is available during the period is equal to the volume that you have in the stand plus the possible increment divided by 2. You are taking this half because some trees will be cut during the beginning of the periodic drop period and some trees will be cut at the end of it.

Now, the annual yield will be given by this volume divided by period P; so, this comes to be V by P plus i by 2. Where small 'I' is given as the annual increment which is this total increment divided by P. So, this total increment was coming up in P years. So, you have V by P plus i by 2 as the annual yield.

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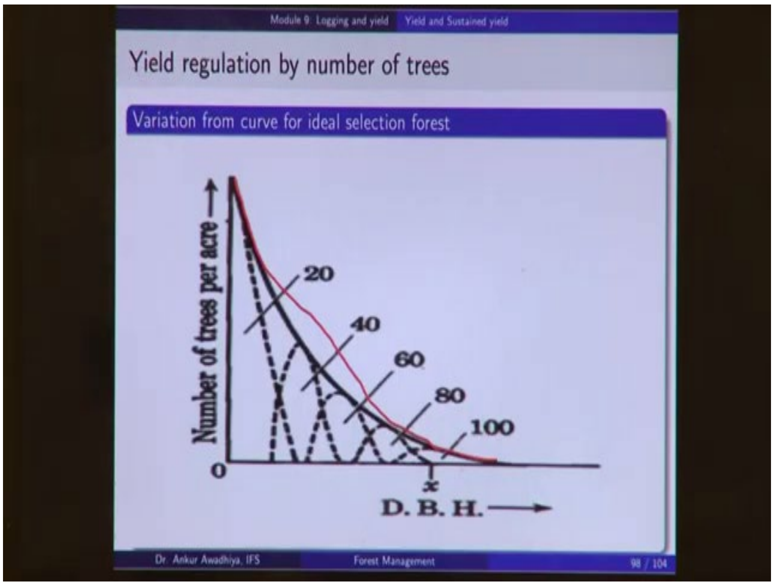

Another method is yield regulation by the number of trees. So, here again as we saw earlier, if we plot the ND curve and if the actual forest is coming at a deviation to the ND curve, then the yield regulation by the number of trees - we will say that, for this DBH, you can cut these many number of trees. For this DBH, you can cut these many number of trees.

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So, essentially what we are trying to do here is that, this is ND curve; it looks like this, but the actual forest is showing something like this. So, these trees can be cut very easily and these trees should be, they should be ample amount of protection given. And, no cutting done, so that, after a while, when this the section moves towards the right, it will come back to the normal forest. So, this method is known as yield regulation by the number of trees.

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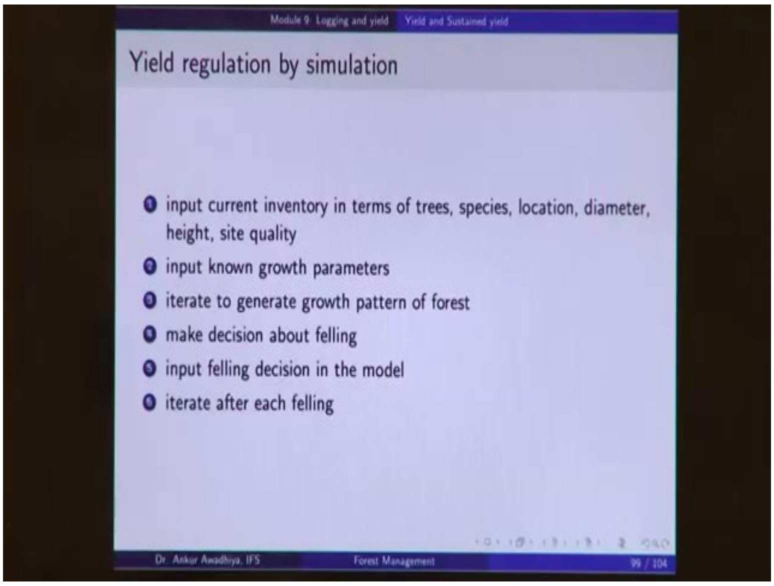

Next, we also have yield regulation by simulation that we make use of in these days. Now, yield regulation by simulation makes use of computer programs to do the number crunching. So, these are the steps; one, you input the current inventory in terms of trees, species, location, diameter, height and site quality. So, essentially you are modeling your forest.

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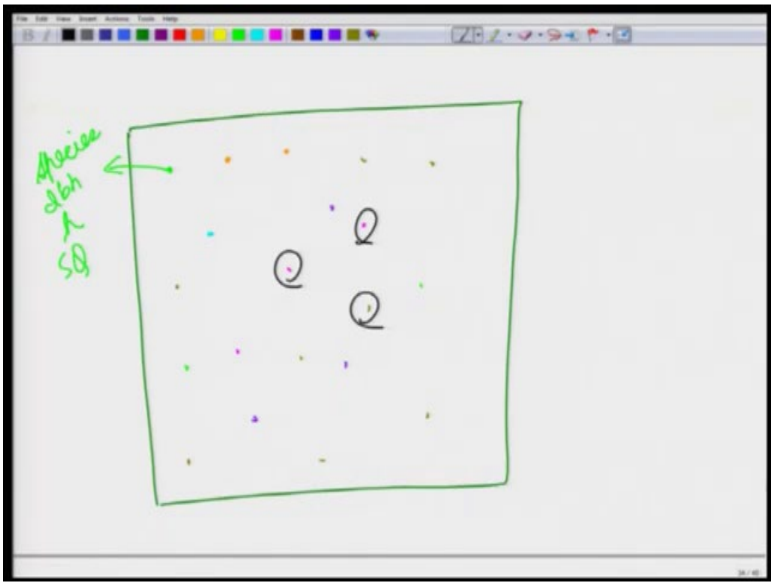

So, if this is your forest, you are telling the computer that at this point there is a tree of this particular species; of this DBH; of this height; at this site quality, and so on. Similarly, you are giving the information for this tree, you are giving an information for this tree, you are giving an information for this tree and so on.

Now, because we know how different trees grow at different site qualities over different age classes. So, now, you can ask your computer to simulate how this forest will grow, and how this forest will appear say at the end of 5 years. Now, if you can do these computations, you can also do another computation, which is that of a simulation. You can ask the computer that suppose out of all these trees I remove a few trees. So, at the end of 5 years, suppose I get to the conclusion that this tree is matured, this tree is mature, this tree is mature; and I remove these trees at the end of 5 years, then after 5 more years that is at the end of 10 years, how would this forest look like? What would be the situation? And at that point of time which is the other tree that I can remove.

So, you can do these iterations again and again to figure out which tree needs to be removed, and also what will be the volume that you will be getting out of this removal. So, essentially, this steps allow you simulate your forests in the computer, input the known growth parameters. So, you are telling the computer that for this particular site quality, for this species, for this DBH, and height class tree, what is the growth that normally such a tree shows?

So, you are putting the growth parameters. Then, you iterate it to generate the growth pattern of the forest how will the forest look after 1 year, after 2 years, after 3 years and so on. Then, you make a decision about felling. So, you can look at any snapshot of the forest, and you can say that, "these trees are now mature and I am going to remove them in these years." And, once these trees get removed next so, you put, you input this felling decision in the model, and then you do an iteration again. So, then you again tell you again ask the computer that these trees are now removed how will this forest again look like after 1 year, after 2 years, after 3 years and so on. And, by doing this, you can estimate which trees need to be felled, and what is the volume that you will be getting out of these fellings.

So, in this lecture, we looked at what is yield. So, yield can be defined in two ways; one you remove all the trees from your snapshot forest. And, two you remove trees in such a manner that every year; you are getting the same amount of timber which is known as a sustained yield.

Now, doing these computations are a bit intricate earlier. We went with the area method in which we said that for an equal that for an even aged forest; you just take total area divided by the number of years of rotation and that is the area that you are going to clear fell every year.

Now, that had its own disadvantages, because of which we met we went to the volume method, where we said that total volume divided by the number of years of rotation will give you the volume that you should be extracting every year. And then, we built on these concepts. And finally, these days we are making use of computer simulations to make an exact prediction of when what should be removed, and how much of the yield will be able to get. So, that is all for today.

Thank you for your attention [FL].