**Soil and Water Conservation Engineering**
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Lecture - 53
Land Capability Classification

Hi, so, this is week 12 of the course Soil and Water Conservation Engineering. So, in this course what we are going to learn is the first the Land Capability Classification. And then sedimentation, sediment transportation erosion and then I mean transportation mechanism so, all these things and how to measure sedimentation and how to measure erosion, I mean the sample collection.

So, different ways of for collecting sediment samples, I mean at different depths. So, all these things we are going to discuss in the week number 12 so, here the lecture number 1 specifically for land capability classification.

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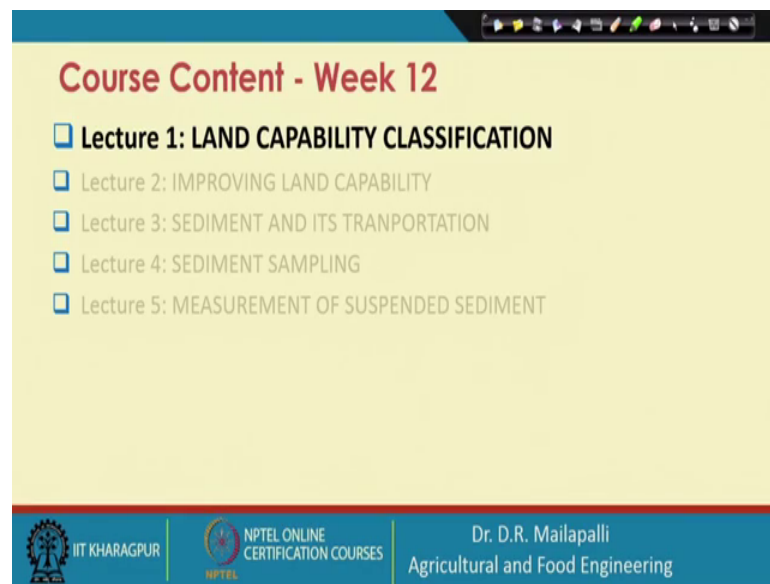
And the lecture number 2 will be focusing on improving how to improve the land I mean capability. Especially, if you are talking about land capability so, that means, we are talking about how it can be used efficiently for crop production.

So, then the lecture number 3, we are going to talk about the sediment and it is transportation. And lecture number 4 will be sediment sampling, 5 measurement of suspended sediment.

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So, the first one is the land capability classification so, as I said our intention of using the term capability. So, definitely that refers to the production of a crop production. So, how well we can use the land for producing another crop and then here so, basically the what is land capability?

So, it is a system of grouping soils so, basically it is a system of grouping soils ok. So, primarily on the basis of the capability to produce you know the common cultivated crops and pasture plants without deteriorating the cover over a long period of time. So, this is basically the what the land capability classification means? So basically what we do? So, we are going to classify the lands based on whether we will be able to you know, use the land for crop production or not or degree of wellness you can say.

So, and the suppose basically the common cultivated crops ok and also the pasture land when we are talking about you know the fodder, crops and all other things. And the land capability classification is subdivided into you know capability class and capability subclasses. So, we are going to see how we can divide these classification divide these capabilities into main classes and subclasses ok. So, if you see basically the overall you know land divisions if you see.

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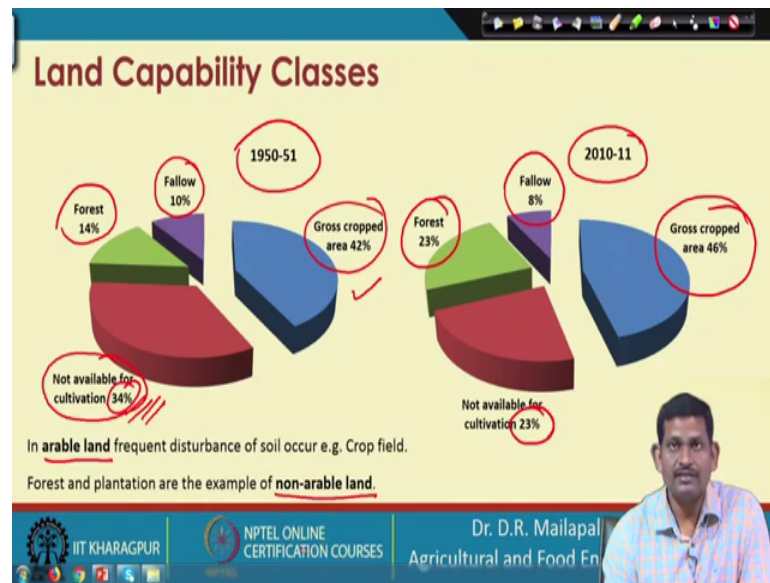
So, in 1950 and 51 so, the overall the whole the lands available in the world has been classified like, a forest about a 14 percent is the forest and fallow 10 percent and the grass crops area is 42 percent. And the land which is not available cultific for cultivation is the 34 percent. So, the mostly here the grass crop area the 42 percent, I will use for cultivation and then in 2010 and 11 the scenario is much improved if you compare the not available for cultivation.

So, this is 34 percent where it is now it is 23 percent. So, it is reduced; that means, some not available for cultivation land is being used for you know afforestation. And then some fallow land also used for used in case of forest as well as you know the crop areas that is 46 percent so, 42 to 46 percent. So, mostly the cropland we called arable land and non-crop land is non arable lands ok so, let us see the classification now ok.

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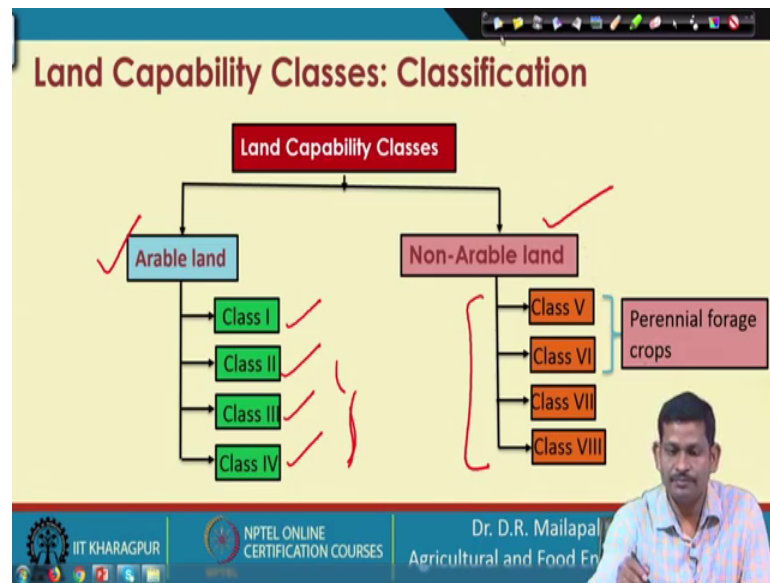
So, land capability classification so, it is basically in 2 groups; so, that is arable land and then non arable land. So, that means, the land used for cultivation and land used for non cultivation crops like you know the perennial forage crops something like there is arable class land class I, class II, class III and class IV. So, there are total 8 classes so, these are 4 classes here right and then 4 classes here. So, these non-arable land classes are classified as class V VI VII and VIII ok so, V and VI are used for perennial forage crops, that is a non-arable land but so, these classes of lands are being used for perennial forage cops.

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And then so, let us discuss one by one the land classification or lands. So, the first one is arable land they or the broader you know classification, under that class I. So, the class 1 as I said this is a very good land so, very fertile land, right and the slope is almost it is like a flat slope, 0 to 1 percent if you see here. So, this is the class I here so mostly this is the green color. So, dark green color so, that represents you know the class 1.

So, it is a I mean relatively flat and has deep soil. So, deep root zone, it has and the good the internal and good surface drainages so, the amount of water you just put on top. So, that drains very well so and that will be useful for the crop production. And then the land can be cropped every year without special practices to control erosion. So, you do not need to use any engineering practices for you know controlling erosion in this kind of lands. And this is best suitable for all agricultural crops.

So, since it is on a fertile land and flat land so, a well-drained land. So, this can be used for most of the crops to be grown and also deep soil depth definitely there will help in protecting the fertile land and also you know the crops which are in deep root they will be getting the you know fertile getting the nutrients from the deeper zones. And the this is not affected by any appreciable erosion, wetness and salinity. So, this is this kind of lands are not you know affected with salinity and drainage, I mean, water logging conditions. So, this is the class I is the good I mean very fertile land for crop production.

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And then the next class II is this is called a good land that is very good land and now it is class II is a good land. So, and the slope of the land varies between 1 to 3 percent. So, the class II land you can see here and that requires moderate attention to conservation practices. So, since it has a slope so, there is a possibility that the soil may you know runoff from the field.

So, you need at least some attention to control erosion and the generally the contour plowing and other easy to use practices will be used to reduce or control the erosion. And it has moderate soil depth in the light or heavy texture, gentle slope moderate soil fertility. And this is basically these lands are basically suitable for a permanent cultivation with some soil and water conservation practices. Since it is a slope it has some slope so, you need to I mean practice some conservation practices to control erosion in class II.

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So, then class III under arable land; so, this is moderately good land the slope will go between 3 to 5 percent. If you see here so, the class 3 so, land is here ok. And it has 3 to 5 percent slope and mostly it is found on gentle sloping hills right. So, the mostly this can be seen on it is not you know steep slope hills it is a gentle slope hills.

And the crops must be more careful be selected so, the plant cover should be maintained so, if you do not maintain the plant cover, because it is a sloppy. So, what happen there is a chance of you know soil erode from the fields. So, an increased attention must be given

to conservation practices because of the slope and mostly the terraces and strip cropping, and contour bunding and graded bunding will be practiced to control erosion.

And it can be productive with proper management by a producer. So, it will be if the producer has you know properly using the conservation practices on these kind of lands and even the I mean this could be a good arable land. And then the next class IV of this is the last class of this arable land so, there is a class number IV.

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So, in this class so, the mostly this is a fairly a good land and slope varies from 5 to 10 percent so, hilly lands mostly these lands are located on hills. And lowest performance for cultivated cultivation and requires special conservation management practices since it is lying on hills. And frequently subjected to erosion; so, gullies can be formed or gullies can be seen in these lands very easily.

Because so, if you see the class IV, the class IV is here so, the mostly now this is a hilly areas. And this is suitable only for occasional or limited cultivation ok. So, sometimes I mean if you see the hilly areas so, there you know oftenly you can see some cultivation be going on, because of the you know some moderate slopes or fairly good slopes. And definitely engineering measures are recommended here to control erosion.

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And then so, the next is non arable land so, other class I mean other group you can show so, the class V so, the class V this is unsuitable suitable for cultivation. So, I said this is non arable land so; definitely the slope will be you know wearing from 15 to 25 percent. So, class V can be seen here right so these classes or this is unsuitable for cultivation and used for pasture crops. The mostly for cattle grazing you know hay crops or you know tree farmings all those things will be done on these lands and this is often used for wildlife and recreational areas.

So, since so, this is you know less important for cultivation. So, those lands are being used for grazing you know cattle or you can establish or recreational purposes like the wildlife recreation area. So, the soil typically has good tilth and fertility, the soil has good tilth and also the fertility, but the thing is since it is sloppy area. So, the cultivation crops because requires lot of you know farming operations. So, that may lead to losing the soils and definitely that will increase the erosoil erosion. So, that is why and then have the potential to become class I, since it is a fertile and you know land it can be class 1, but due to particular problem like hazard.

They cannot be fulfill the characteristics of class I, because of the slope right. So, and also the shallow depths so, shallow depths so, definitely though the land top surface is fertile, this is not suitable for growing you know the regular cultivation crops. So, then class VI so, the class VI is definitely not suitable for row crops.

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And slope can vary from 25 to 33 percent so the class VI land is located here. So, mostly this is suitable for horticultural crops like mango, coffee and guava, cashew nut, etcetera. So, mostly the horticultural crops can be grown in this the grazing should be regulated preserve the plant cover. So, plant cover needs to be I mean preserved otherwise, if you allow you know free grazing, what happens the top surface will be open and that because of the high slope definitely that leads to erosion.
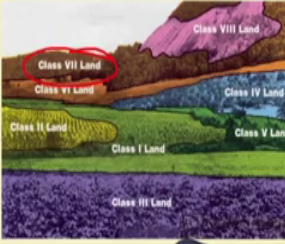
So, the soil may have fair productivity, if it has not been damaged by erosion so, just like in class as you know V. So, the class VI also it is a very good fertile land, but because of the shallow depth. And so and also the steep slope the definitely a I mean it is not suitable for you know regular crop cultivation. So, the gullies often quickly form if not carefully managed. So, the slopes here the steep slopes can definitely your result in forming gullies very easily.
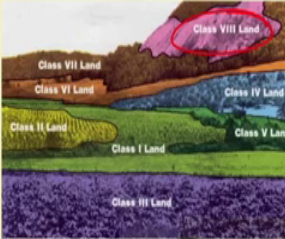
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And then the next class is the class number VII so, here the class number VII has slope between 33 to 50 percent. So, the class number VII is located here, if you see and highly unsuitable for cultivation, because the steep slope and best uses or permanent pasture or forestry and wildlife. So, the most of the land is being used for you know forestry, wild love wildlife and recreational purposes.

And generally lands are droughty and swampy having very deep slope, rough stony or very severely eroded or invested with gullies. So, this is kind of this lands are rough and you can see lot of undulations and lot of you know depressions lot of gullies, but can be used for you know pasture and forestry and wild lives and also this is generally seen in you know dry lands.

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So, the other category is class number VII, this is the last class of the land capability classification and the slopes are more than 50 percent. So, this is definitely unsuitable for plant production so, this is the class number VII here. And the soil may be wet and high in sand or clay, often used for you know waterfowl habitat. So, the most waterfowl have habitats those are the birds and I mean in this so, I mean since it is wet and that the soil type is a clay soils.

So, the water can be retained in you know small ponds and then the water fowl habit it can be maintained there. So, very rough and not suitable for woodland or grazing so, these this particular lands because the steep slope. So, this cannot be use suitable for woodland or grazing side. So, it is only like a rough land with some, you know, water I mean water storages and that can be used for waterfowl habitats ok.

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Land capability classification classes so, these we can also use some colors here. So, the deep green and the look at this the green color is been changing from deep to light and yellow. And then this is I mean yellow also and the red and then finally, you get the pink color. So, the arable lands here so, the mostly the green color so, because you can you know grow cultivation, you can start using it for cultivation purposes.

So, in the class I here have no significant limitations in using for cultivation. So, this is a good fertile land and I mean relatively flat slopes and deep soil depths. So, definitely no significant limitations for crop course so, this is very good. And then and followed by so, the limitations will increase if you go down from class I to you know class VIII these moderate limitations restrict the range of crops or require moderate conservation practices.

So, the conservation practices will increase when you go down from class I to class VII class VIII. And this is like non arable land will start from class V to class VIII and definitely class VIII is unsuitable for plant production. So, if you go from you know the top to bottom so, the limitations will increase. So, definitely in order to you know improve the land for cultivation in especially in case of arable land. You may have to use engineering you know soil conservation measures.

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And then so, the next is again the suitability of different land capability classes for land uses. So, if you see the land capability classes here I to VIII and very intense cultivation see this only class 1 is for very intense cultivation here and other classes are not supporting for very intense cultivation. And the second is intense cultivations only 1 and 2 classes are used for intense cultivation. And moderate cultivation you can go you can also the IIIrd class also supports and limited cultivation up to VI classes and intensive grazing.

So, up to you know V classes a moderate grazing so, grazing will start here from you know class number V to, because these are all you know non arable lands. And moderate grazing you can go up to VI class, limited grazing you know class 7 and forestry class VIII and wildlife also supports almost all classes wildlife. So, this way you can interpret this table and then the next is ok.

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Land classes is also based on soil texture so, soil classes textural classes like sandy, loamy sand, sandy loam. So, symbol generally for sandy you will use small s, loamy sand small ls and sandy loam sl. And land capability class so, this is the you know IVth class, sandy soils of IVth class.

And then IInd class loamy sand and Ist class look at this from here to here. So, the mostly the Ist class or from sandy loam to clay loam so, these are all very good for cultivation. And similarly sandy clay this is the IInd grade and silty clay IInd and clay IIIrd grade. So, this way based on the soil texture you can also put this different soil soils into land capability classification.

Similarly, in the next table if you see land classes based on the soil depth so, see the soil depths here. So, this is this deep you know deep soil depth or deep depths you can say. So, d 5 will put the d 5, but class I supports d 5 because the soil this is the deeper depths compared to the Vth class which has you know less than 7.5 centimeter. So, that is the soil depth which land capability classification of class V supports this. And we will use the these symbols so, thus definitely represents the different soil depths.

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So, the next is a land classification based on land slope. So, here the symbols we use A B C D E F G H I, these are all capital symbols. And then land slopes 0 to 1 percent the class I, because you can see the flatness will increase or sorry the flatness or the slope will increase from class I to class VIII and the slopes are here the mention here. So, but different slopes we already mentioned in the previous you know discussion, but only thing for different slopes we will give symbol along with the class.

So, I A we will give class I and then land slope is 0 1 or 0 to 1. So, similarly identification of classes based on erosion status. So, here erosion status e1 to e4 so, e1 represents a negligible erosion, where up to 25 percent is of a horizon lost ok or it is a negligible erosion or 25 percent so, class I and class II can be I mean represented. And then e4 which is very severe erosion about 25 percent to 75 percent of B horizon lost, may include narrow and deep gullies so, this is the you know the last class VIth and VII classes are supporting this classification.
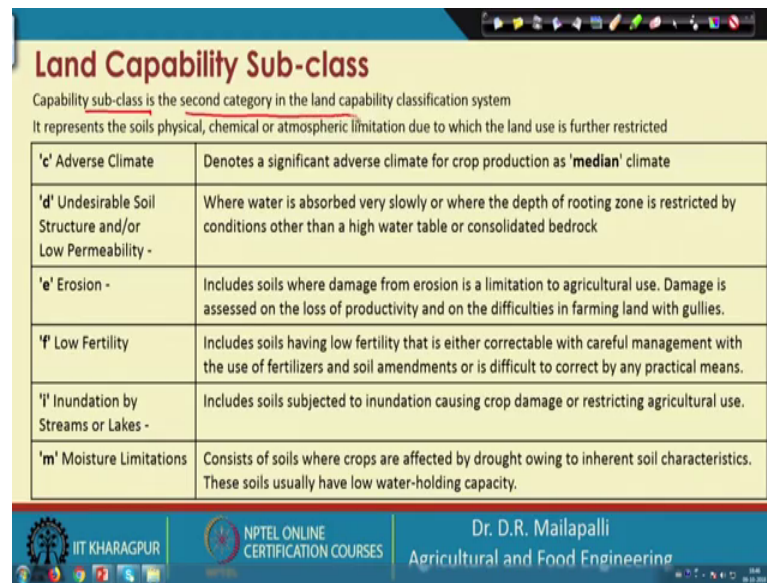
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So, in addition to that you also have subclasses. So, the subclasses basically the capability subclasses is the second category in the land capability classification system. And basically represent the soils physical chemical and atmospheric limitation due to which the land use is further restricted.

So, the previously we are only looking for a restriction of crop growth. But here the soil you know quality soil physical and chemical also the atmospheric limitations if you include and you can also clearly there. So, these things the limitations if you add that will be subclasses. So, c this is the adverse climate so, denotes a significant adverse climate for crop production as median climate.

So, if you put c as subclass this is a median and the d undesirable soil structure or low permeability. E for erosion right, f for low fertility, i for inundation and m for moisture limitation similarly, so, we can go through the description of individual you know sub classes.

And then if you see I mean it will continue so, that like n for salinity and p for stoniness, r for consolidated bedrock, s root zone limitation, t for typography and w excess water, x for you know. So, this sub class is comprised of soil having limitation resulted from the cumulative effects of two or more of the adverse characteristics. So, come if you put like n and p (Refer Time: 25:30) salinity and stoniness and you may have to put x. So, one or two I mean the combination of these two if you can represent with x.

And then so, the mapping unit is very important in order to or represent a land capability classification. For example, this mapping unit the information is collected for land capability classification is recorded and map unit as. So, the mapping unit is represented as soil series minus texture of the soil, minus effective soil depth divided by lands slope minus erosion hazard. So, how to get this you know number? So, that sub for example, here is example there is a parameter on column number one. For example, L for so, this is a small l, l loam right and d 5 is equal soil depth.

So, that represent greater than 90 centimeter and capital A land slopes are 0 to 1 percent, and e1 erosion hazard and c climate limitation this is subclass. So, if this is the parameter right and land capability class this is all you are talking about class I.

And mapping unit can be estimated like 1 as this is 1, because land capability class. So, soil series this is 1and the and then d 5 is the soil depth right. So, effective soil depth is d 5 ok and then A is land slope so, this is A and e this is erosion hazard e1 right this is erosion hazard e1 ok. And then the land capability class with subclass lc so, l is for loam and c is for climate limitation ok.

So, with this so, definitely we can represent the mapping unit in this form and then the land capability you know class with subclass can be represented with lc. L is for loam and c is for climating limitations. So, this way we can represent the whole land class I mean capability classification in using a mapping unit.

So, in this lecture we started with you know the broad classification of lands. So, arable land and non-arable land, again arable land is being classified into 4 classes and then non arable land is classified into I mean continuously other 4 classes.

You know so, the class number I to VIII this is the whole class that represents the land capability, classification is the capability we are talking about whether the particular land is used for you know, the cultivation or cultivating crops or not. And also there are other classes based on you know you know the erose I mean erosion, the slope and then and then soil texture ok and soil depth.

So, all different you know classes also we can get and then not only that there is a sub classes. So, based on the limitations or restrictions we can say based on the restrictions if you have restriction on you know, climatic condition restriction on soil physical and

chemical properties. So, definitely you need to add that subclass. So, and finally, the whole land capability classification is represented with a mapping unit so, the mapping we have seen an example on how to present the land capability classification using a map unit.

Thank you.