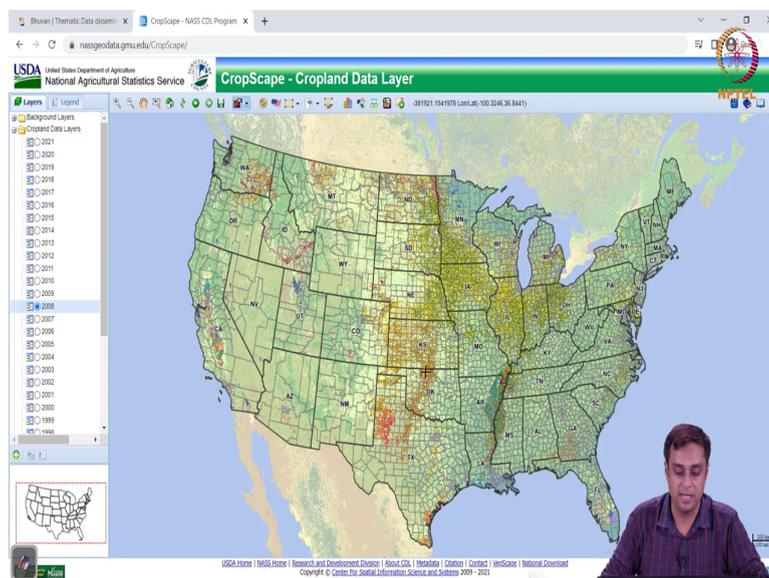


**Spatial Statistics and Spatial Econometrics**  
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**Lecture - 04**  
**A short exercise: Land Use Land Cover Analysis**

So, the next, you know, accessible data set is the US Department of Agriculture, you know, National Agricultural Statistical Services Cropland Data Layers that is in front of your screen, its called CropScape.

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And this data set, as you as you can see right away, on you know, on the left panel, you have different years for which you can you know display or visualize this data set. What is on this data set? It says CropScape. So, as the name suggests it is mostly you know its utility is supposed to be the cropland you know distribution across the United States.

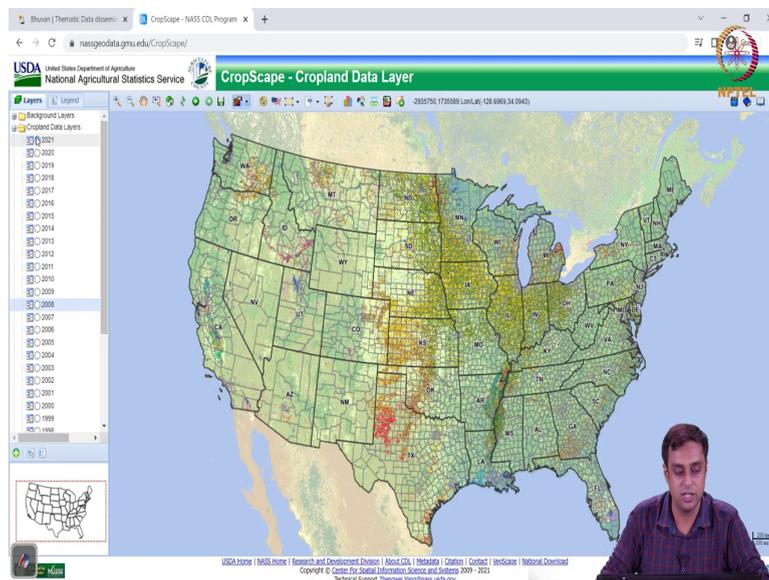
So, when we look at this region where my pointer is when we look at this region where you have these yellow and green concentrations my pointer is moving its going from North Dakota to South Dakota to North to Nebraska, Iowa, Illinois, Indiana, Ohio coming back Wisconsin, Minnesota this is called as the Corn Belt.

This is a significant agricultural region in the world and it is very important to understand how land use decisions are being taken in this world. So, in this area and so you know these

data set have a very high utility. They are highly cited, highly used. Interested students can find thousands of papers you know which use CropScape and given that CropScape was launched only in 2012-13. So, we have only had a decade of you know the existence of CropScape.

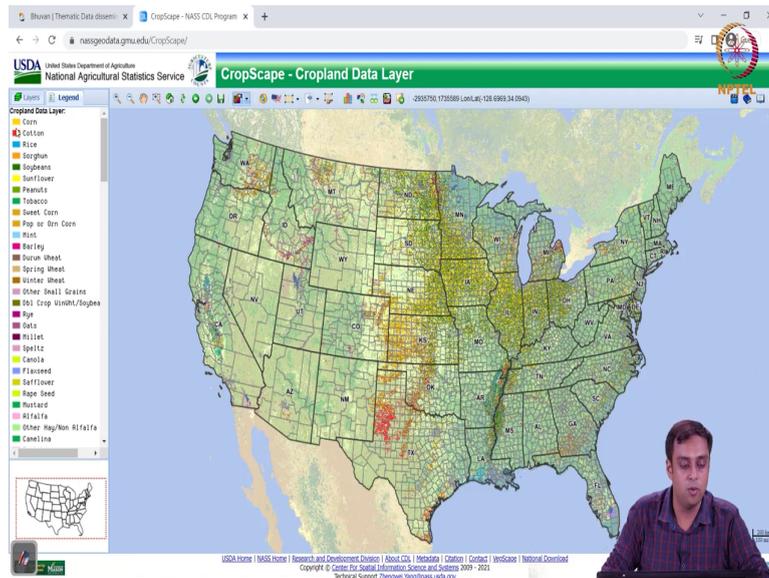
Cropscape is quite you know, updates itself quite you know frequently. So, we have the 2021 data set already available. So, what we can do here is that if I click on 2021 on this radio, I get the land use distribution for the year 2021.

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So, if I go back to 2028 (Gaurav said “2028” but meant 2008) I have you know I see that around the Kansas region you had a lot of these brown pixels or the brownish shade which disappears or changes in 2021 right. So, that is interesting right so ok. So, how does this layer then help us understand the data better?

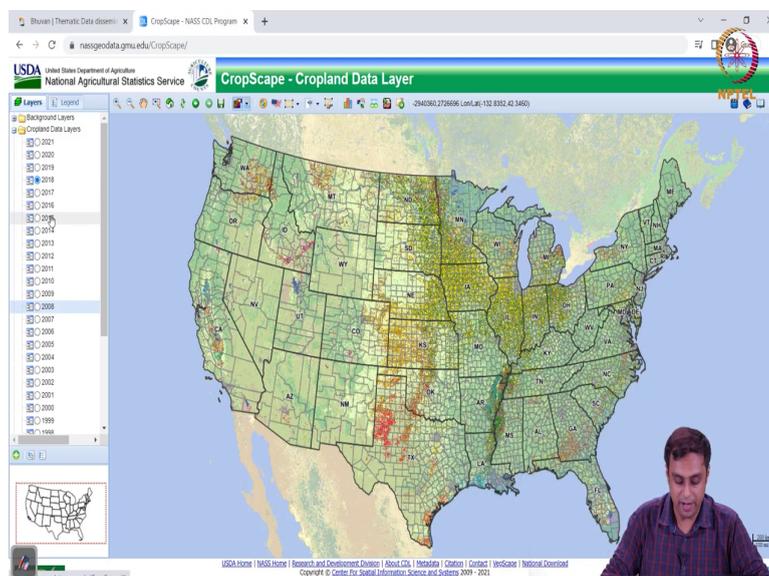
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So, it also provides us a legend. So, legend is that corn is yellow. You have reds which are cotton, you see around Texas area you see a lot of cotton. So, you see some kind of a regional specialization happening in the United States as far as their agriculture is concerned rice they right. So, they have rice, I see some rice around here in California right. Then I see some sorghum and soybeans are dark greens. There are lot of soybeans around here right ah.

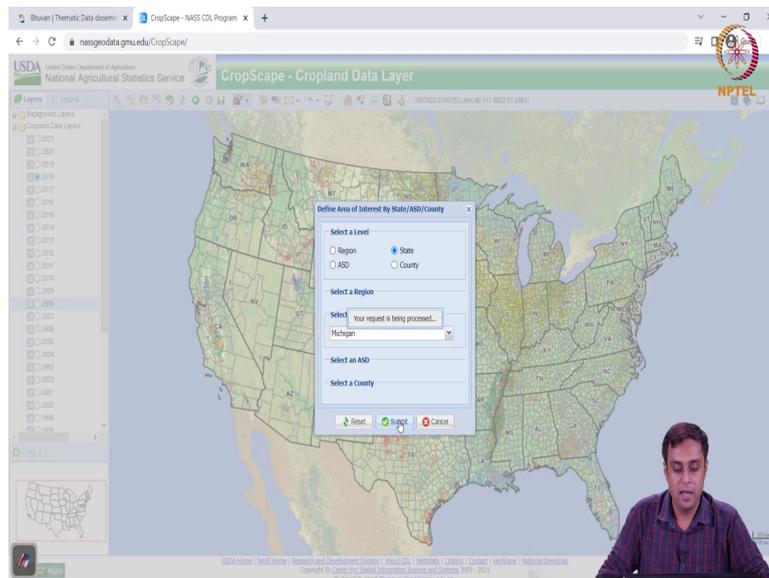
The sorghum is sort of here, the orange shade is here, right. So, we can see we can toggle you know across different years.

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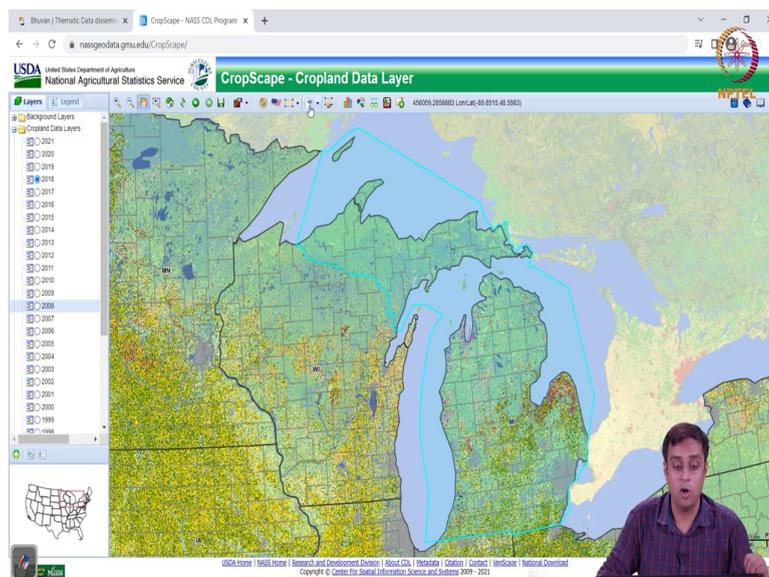
And this data set may take a little bit to load. So, stay patient with it alright. So, we can do that and just like in the Bhuvan data set that we saw in the previous lecture you know we can also delineate a area of interest.

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So, you can see that I can select a state. I am going to just select any state let us say I select Michigan and I say submit.

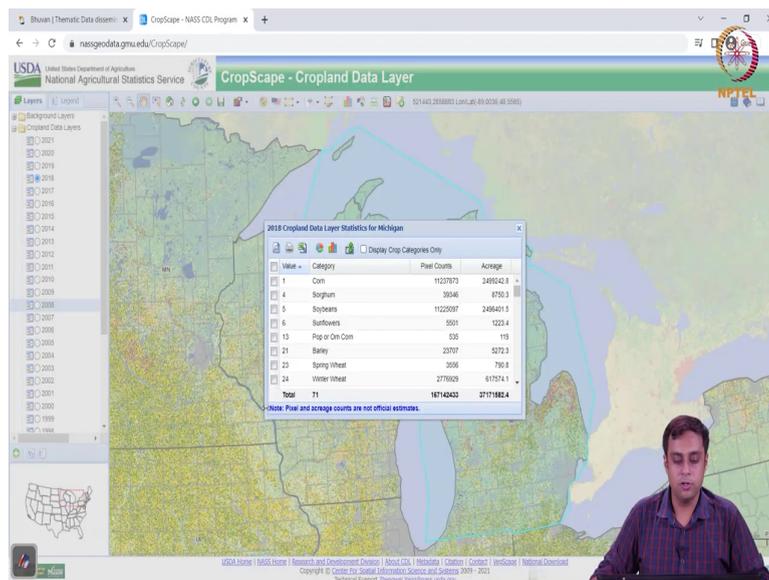
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And this will then draw a area of interest for me by itself. So, this is all happening online on your personal computers you can you know as I am doing it you can do it as well right. So, it takes a little bit to load, but what it really is doing is its creating this area of interest for me for analysis. So, you have different buttons here, you can define your own area of interest just like we had in case of the Bhuvan data set that we saw previously. We can also import an area of interest right.

So, let us say if you have if you want to study a given national park right. For example, in India we have the Jim Corbett National Park. If we have a, you know, shape file or a file which we can then import online onto this website it will then draw it for us you know a pre drawn polygon that we can source from somewhere else right. We can clear this you know if I click I can clear this defined area of interest.

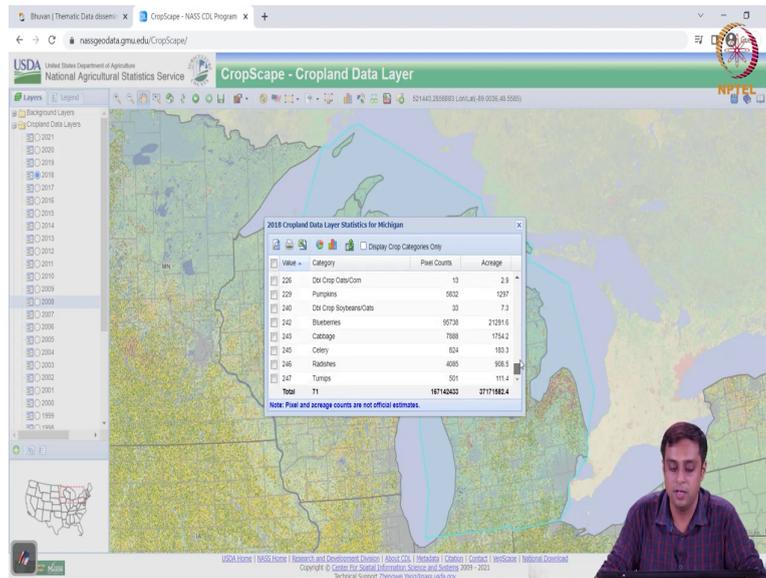
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But, what is very interesting is I can then you know just like in Bhuvan I can actually you know click and get you know the statistics for different crop types or different land use types for my area of interest. So, I have corn with value 1 which is yellow right is pixel count this penny and acreage this much. Then you have sorghum not so, much acreage, then soybeans quite a bit of acreage.

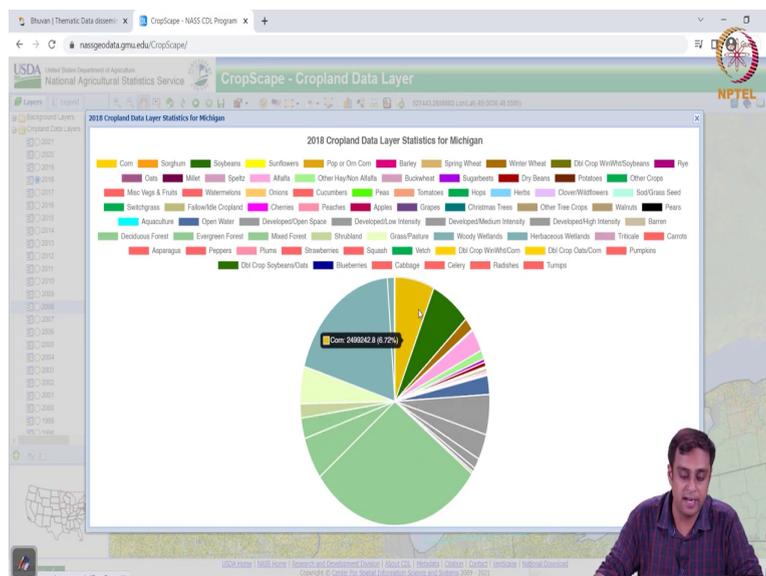
So, clearly in Michigan you have a lot of corn and soybeans and not so much by the way of sorghum, you also have a lot of winter wheat.

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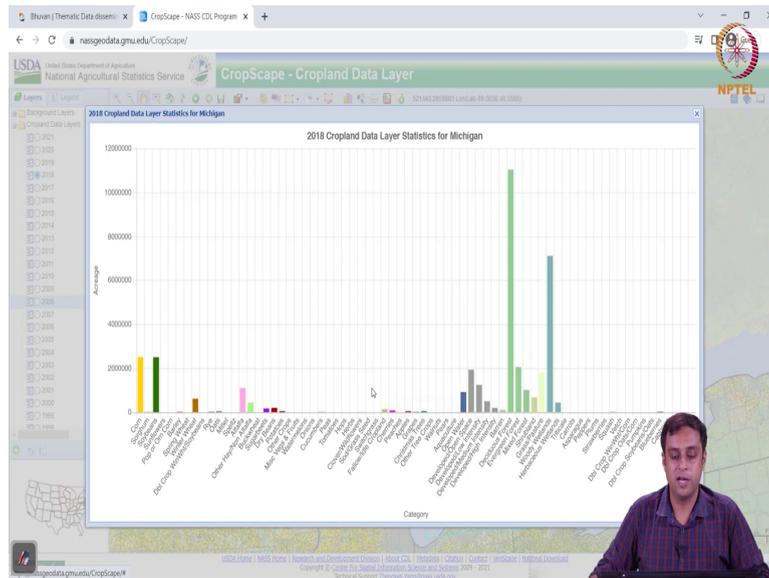
So, you can figure out; you can figure out the spread of different land use types by area, right. You can also download these as a dot CSV file right. So, this is a very nice utility you can actually bring this to excel sheet. You can then bring it back to the image, you can study the image from the excel sheet. So, it is it gives you a very nice you know functionality.

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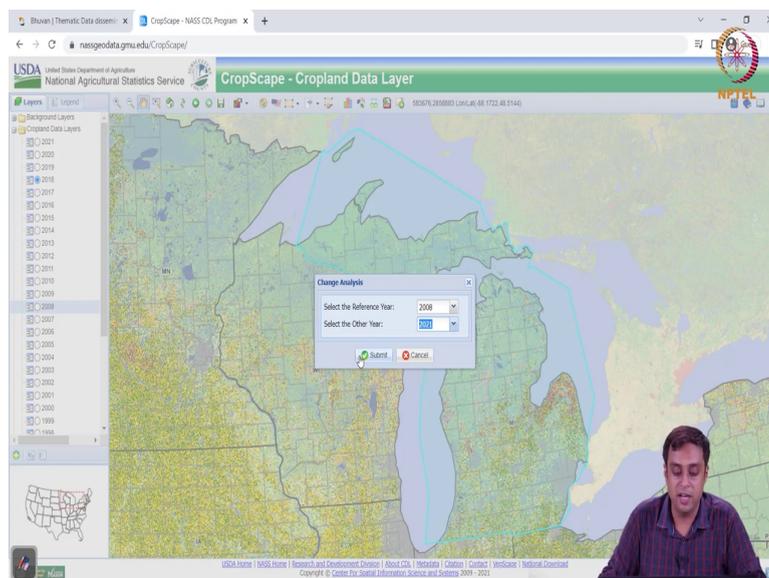
We can also draw a pie chart its much more sort of elaborate here. I can the pie chart is dynamic, I can actually go over different regions and it will tell me what is the percentage, what is the crop type, what is the area, what is the percentage and so on and so forth.

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Similarly, I can also draw a bar chart which gives me an understanding of what is the area coverage across different types from a pie chart to a bar chart. Similar understanding, but here is another functionality alright. Another very nice, you know, functionality that CropScape provides is what is called as the “change analysis”.

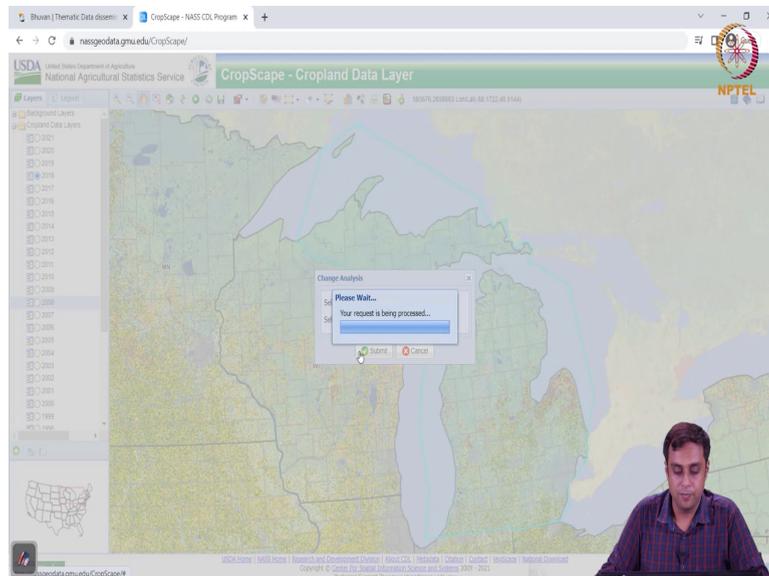
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And change analysis for my area of interest which is the Michigan you know state of Michigan in the United States. I can choose or select a reference here let us say the reference

here was 2008 and I can choose another year. I am going to choose the latest one, let us say 2021.

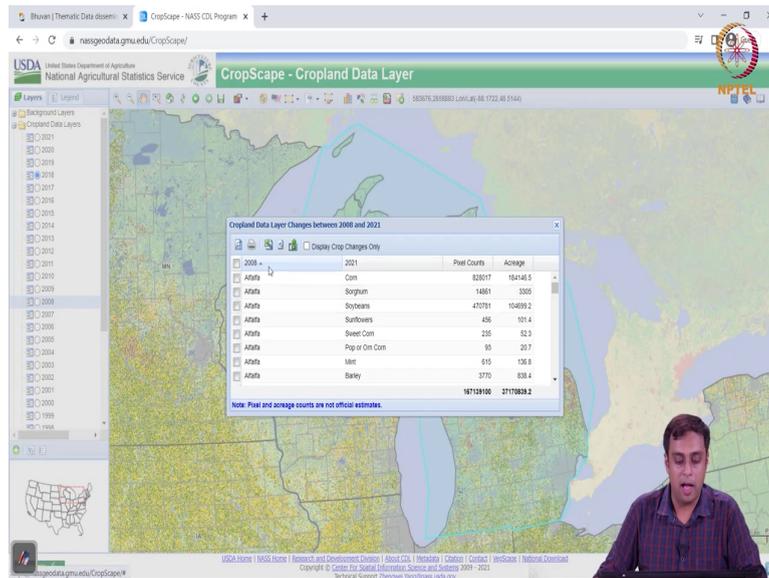
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And this functionality when I click on submit will do a change analysis for me. Let us see how about this change analysis looks like. We will wait for a minute till it works out the statistic that we are trying to calculate, and by the way, all these statistics all these functionalities that we are seeing the website do we will learn to do on a software.

So, none of these you know things that we are doing here we have to be restricted by a website, but this is just a starting point where I am just trying to sort of show you what is possible you know just by going on a website and studying a data set right. So, what is the extent that is possible ok.

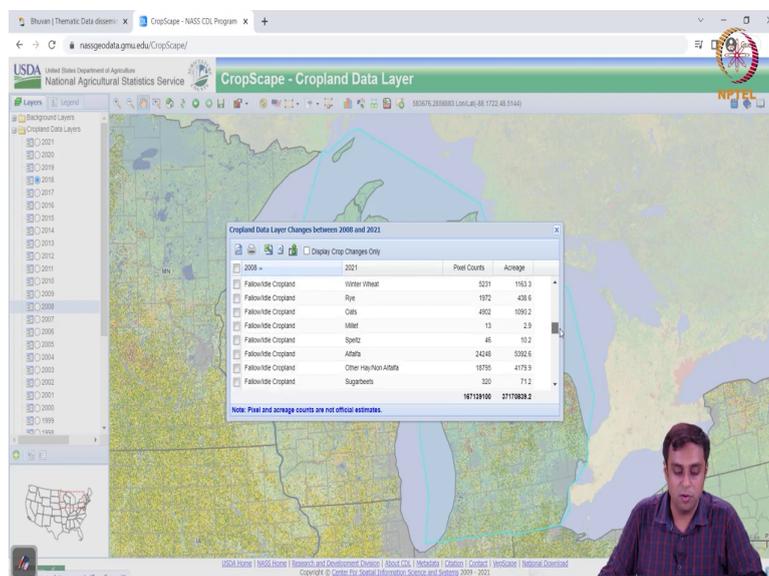
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So, now I have a column which is called 2008 on the left and a column on 2021 on the right and we have a pixel count. So, number of pixels in each category of change and then acreage. So, what is showing me is that alfalfa, which is a crop type is going to corn is conversion from alfalfa to corn on 184146 acres 184146.5 acres have converted from alfalfa to corn from 2008 to you know 2021, which is a really interesting statistic.

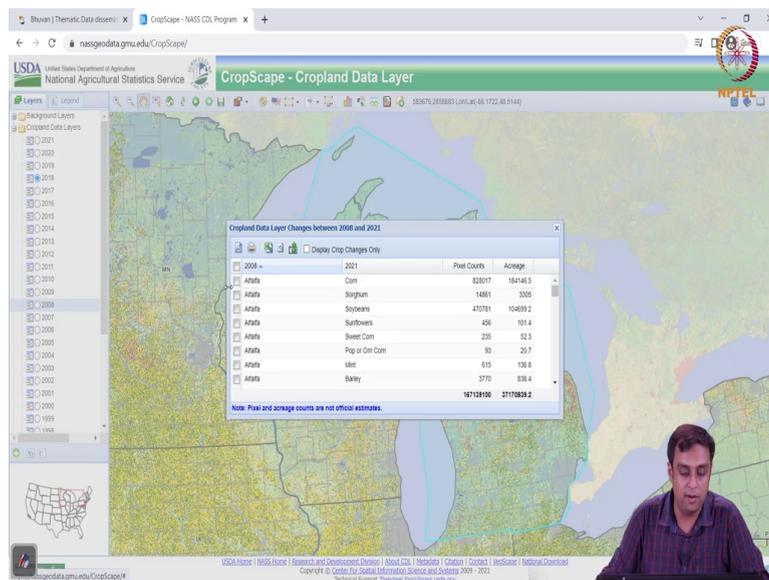
This tells you the dynamics of how decisions are happening in this region right. And then you know we can figure out some other important you know land use change categories.

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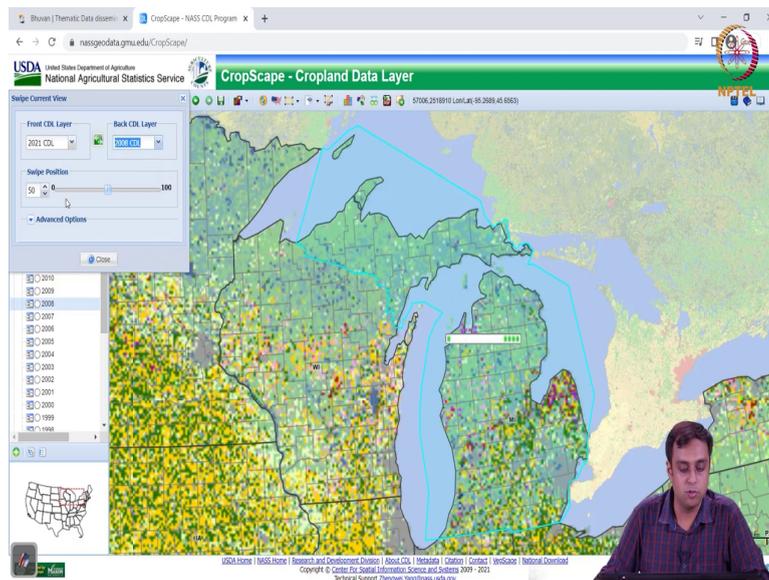
So, for example, we can look at you know we see that some fallow or idle land in 2008 went into growing winter wheat and about 1163 acres went from fallow or idle cropland to winter wheat right. So, this is a very sort of interesting analysis which you can download. Again as a CSV file you can study it you can take it to a statistical software or study just you know draw these bar graphs pie charts on excel and then you know you can then also export it for a selected crop change.

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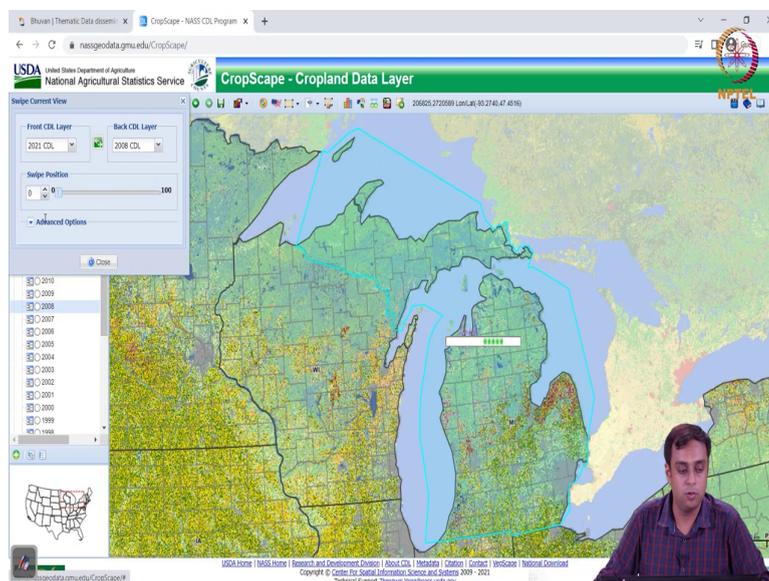
So, I can actually select, I could have selected you know alfalfa and then exported that you know only. These are very interesting functionalities. So, I am going to; I am going to let you sort of, you know, work with these functionalities.

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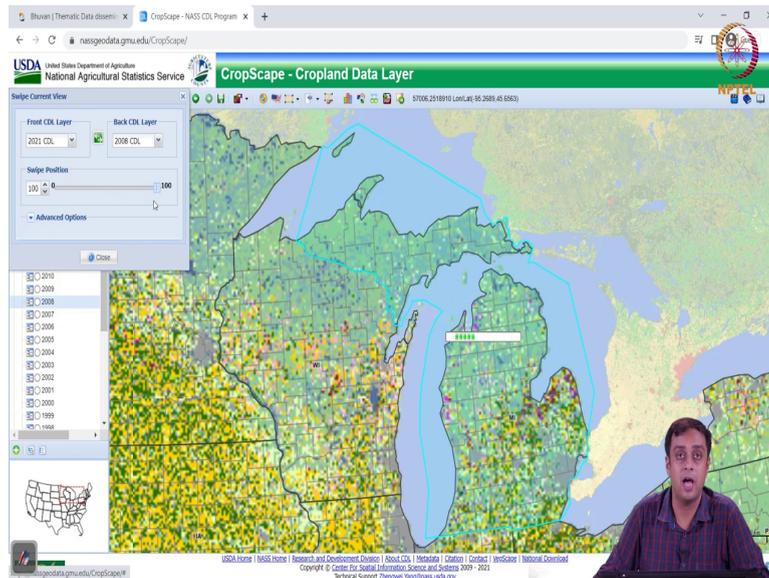


You can also swipe these. So, you can have you know 2021 and 2008 and you can start to sort of swipe them over each other.

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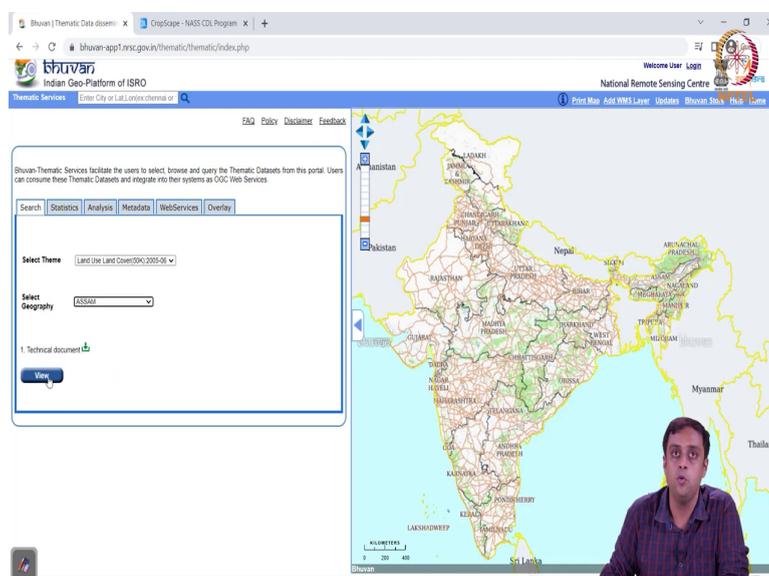
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You can start to swipe them you can see the change across space. So, of course, you have a tabular understanding that I showed you previously it takes a bit of time to load, but you can see that you can actually swipe you know 2021. You can see what 2008 was and how 2021 looks right. So, you can you should be able to see a lot of alfalfa which is pink becoming yellow which is corn which is what the tabular understanding gave us.

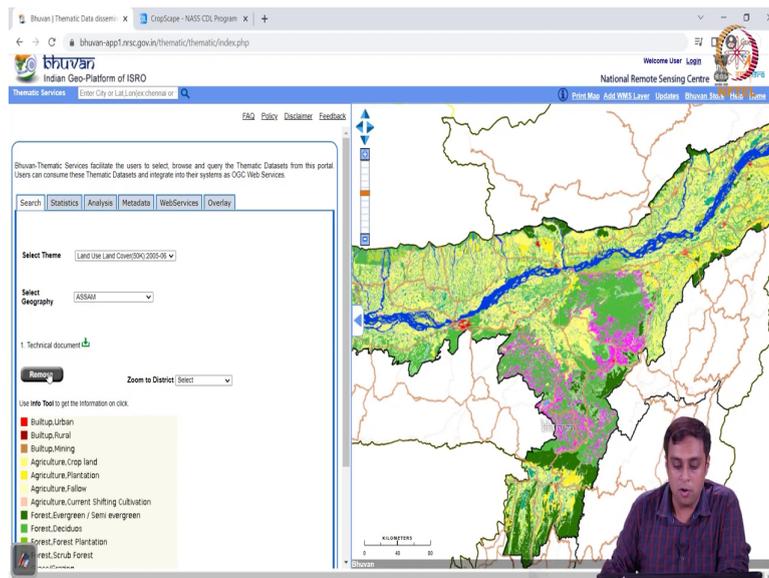
So, I invite you to go ahead and play with these features on this website and do your analysis for yourself some analysis for yourself right, ok.

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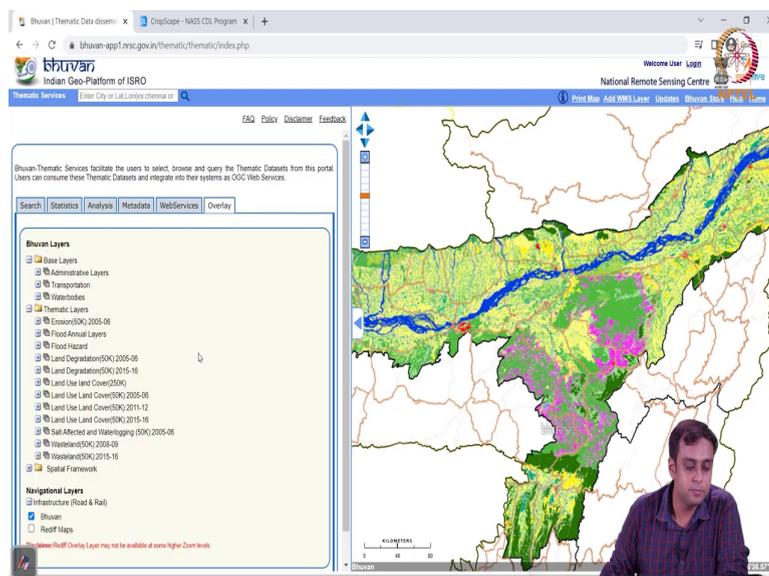
So, let us go back to a little exercise that we had given ourselves which is to analyze in an area of interest around the Guwahati metropolitan area. Let us go back to the Bhuvan you know land use land cover data set. So, I am going to again sort of look for land use land cover 2056 and in geography because I need to go study Guwahati I know that it is in Assam. So, I am going to I am going to select Assam and I am going to say view.

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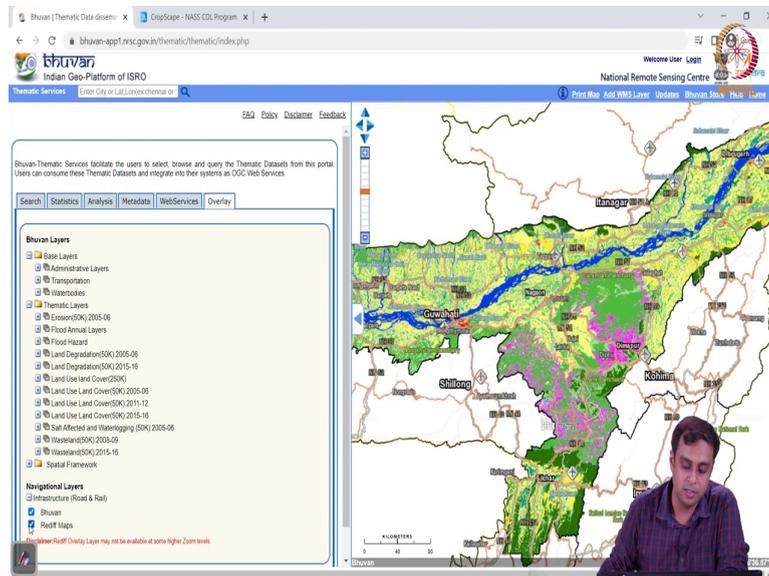
So, I am going to narrow down my interest to the area of you know that I need to go and look at. So, now you know when I look at this map I can't really tell where is Guwahati.

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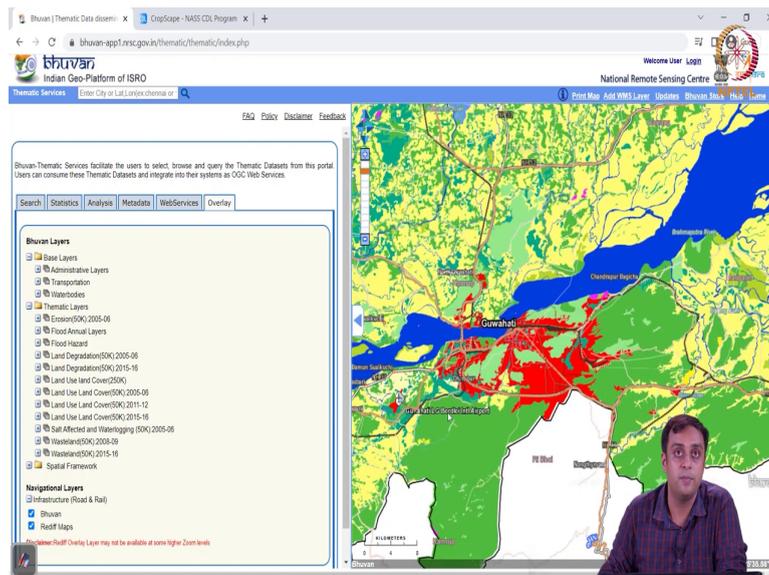
So, what I do is I go to my overlay function and I use under navigational layers what are called as Rediff Maps.

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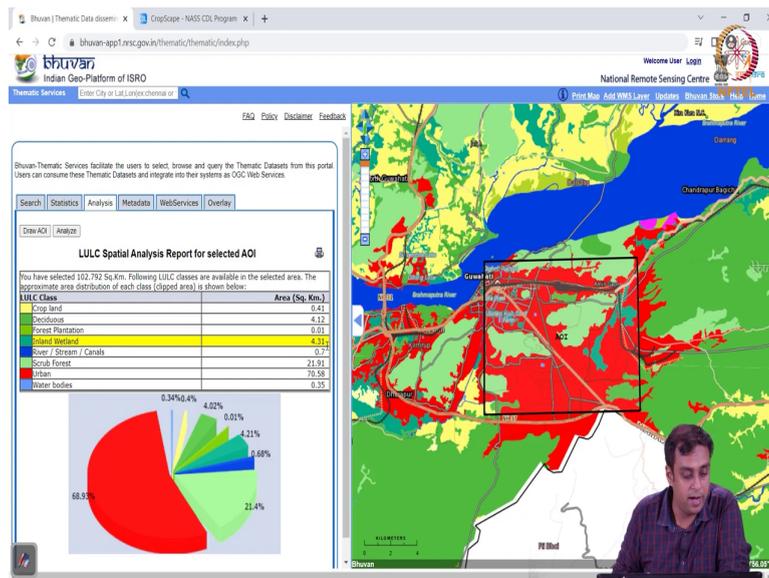
So, if you click on Rediff Maps you will see that we are able to identify a region where we can see Guwahati. We can zoom in a little bit and narrow down our search a little bit put further.

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So, here we go. So, on my screen now you see Guwahati coming out to be this red region which is encouraging because I know for a fact that Guwahati is a Metropolitan urban area. I have the you know this is the Brahmaputra River on which the city is located and on these red spots are really the good Guwahati Metropolitan area. So, I now next want to draw an area of interest and conduct an analysis on this area.

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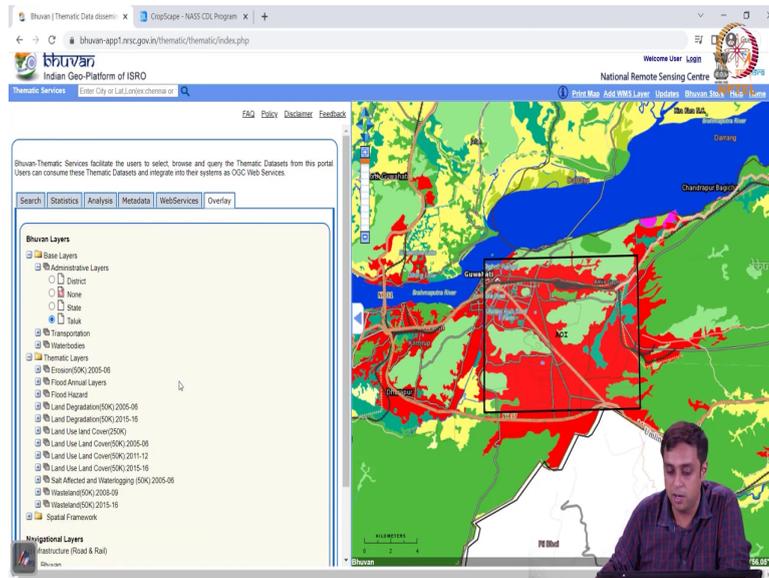


So, I go to analysis I say draw AOI area of interest and I am going to draw an AOI let us say on the central Guwahati. Once I have drawn my AOI I am going to click “Analyze” and you know it is going to load for a minute, but here we go. So, here is an analysis of the land use distribution in my area of interest for the Guwahati Metropolitan area.

I have about 70 percent urban land which is clear in my squared area of interest. You know I see you know the red region is dominating, its about 70 percent of what is out. The second most you know dominant region is the Scrubland which are about 21 percent which is interesting. So, all these lands are Scrubland. There is also some river I have taken some river on the northwest corner of my area of interest. I have taken a patch of the river.

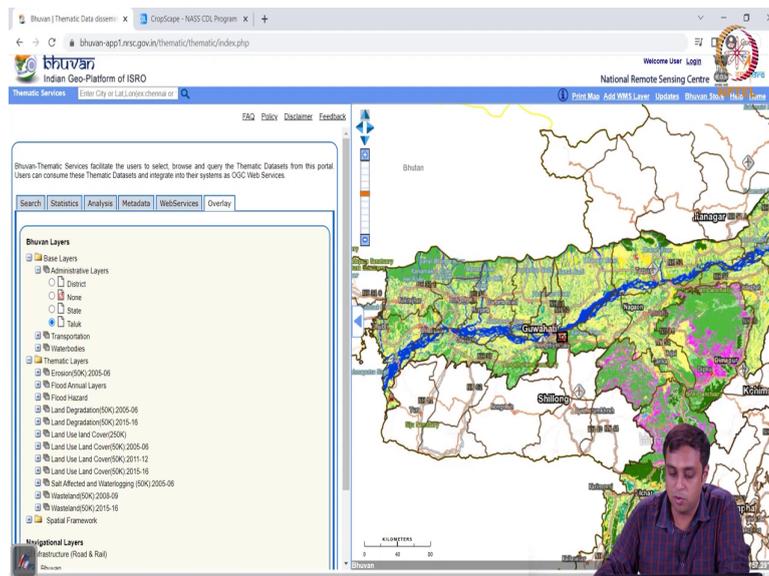
So, this patch is less than a percent of my area of interest. So, I am not looking at the river region for my study right. So, the study that I am conducting, I am going to conduct with this area of interest right. So, the total area of my polygon that I have drawn is 102.8 square kilometres and interestingly I can see all the different layers that I want to study.

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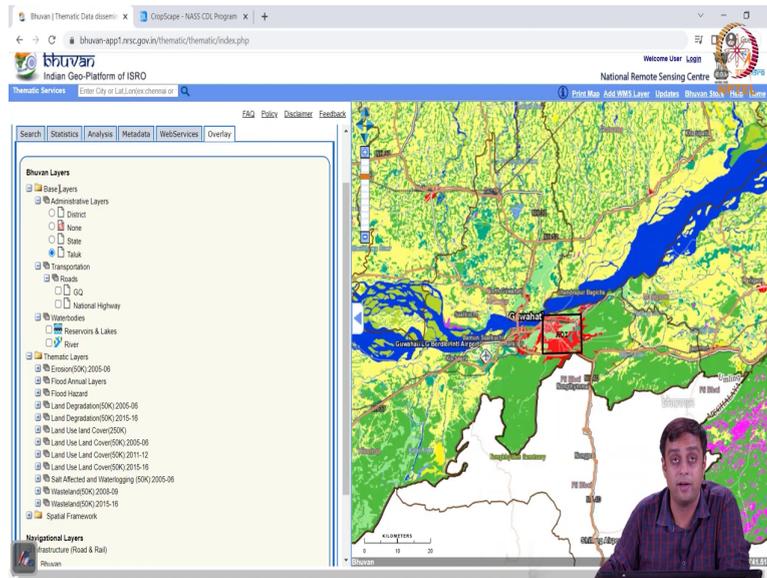
I can go back to the overlay function. I can also look at the taluks, if they are available I will be able to see if the Guwahati metropolitan area lies within a particular taluk right. So, you see to be able to see it further you know we will just zoom out a little bit and see if we can, you know, delineate different taluks.

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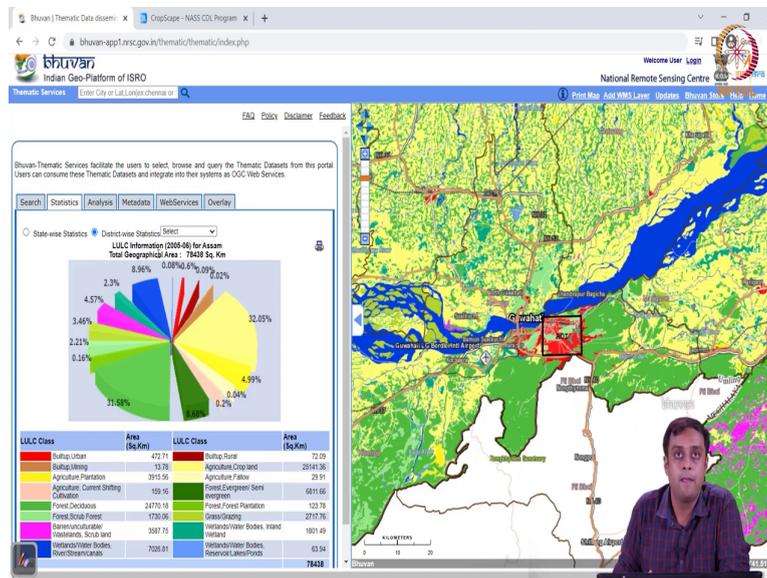
Yes we can. So, these are the boundaries of taluks and we see that are taluk these white lines are much bigger than the area of interest that I have drawn on this figure right.

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So, you can do different things you can look at water bodies, you can look at the roads, which roads are available. You can look at flood hazard in my area in our area of interest right.

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You can zoom in, zoom out. If you can change your area of interest you can go back refresh the screen and draw a new area of interest right. You can look at district wise statistics everything that we looked for you know we did for Uttar Pradesh is also possible for the state of Assam.

So, this you know Bhuvan data set provides you nice functionality all in all right and the CropScape data sets. These data sets provide you a very nice functionality to at least begin your analysis, you know, on this web based server even before you go ahead and do something extensive on, you know, on your software or you know anything else.

We will on the other hand actually learn to do these things by scratch right. We do not have to rely on this web server. We can take the data we can conduct we can create all these analysis and even more much much more if we learn how to do these you know on software like aag gis or r and so on and so forth ok.

So, thank you very much for your attention. Please you know work on these data, please you know visualize them you know use them for different purposes. So, that you have a an understanding of how you know the last data sets look like, what is a vector you know and so on and so forth, ok.

Thank you so much for your attention.