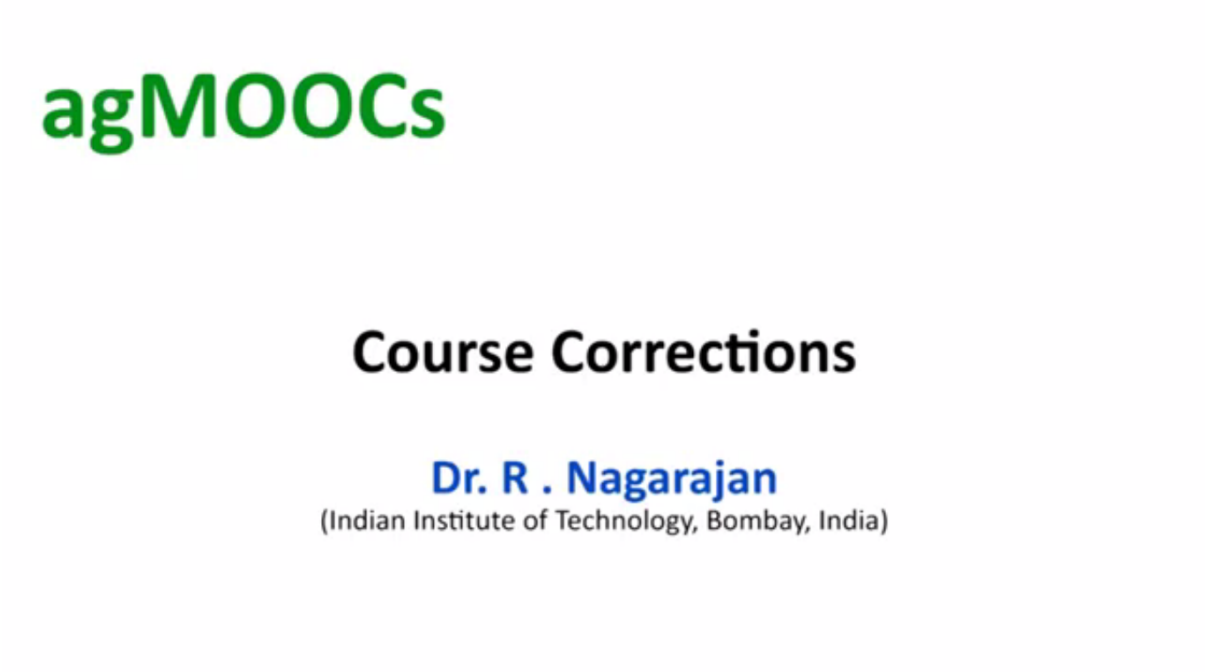
agMOOCs

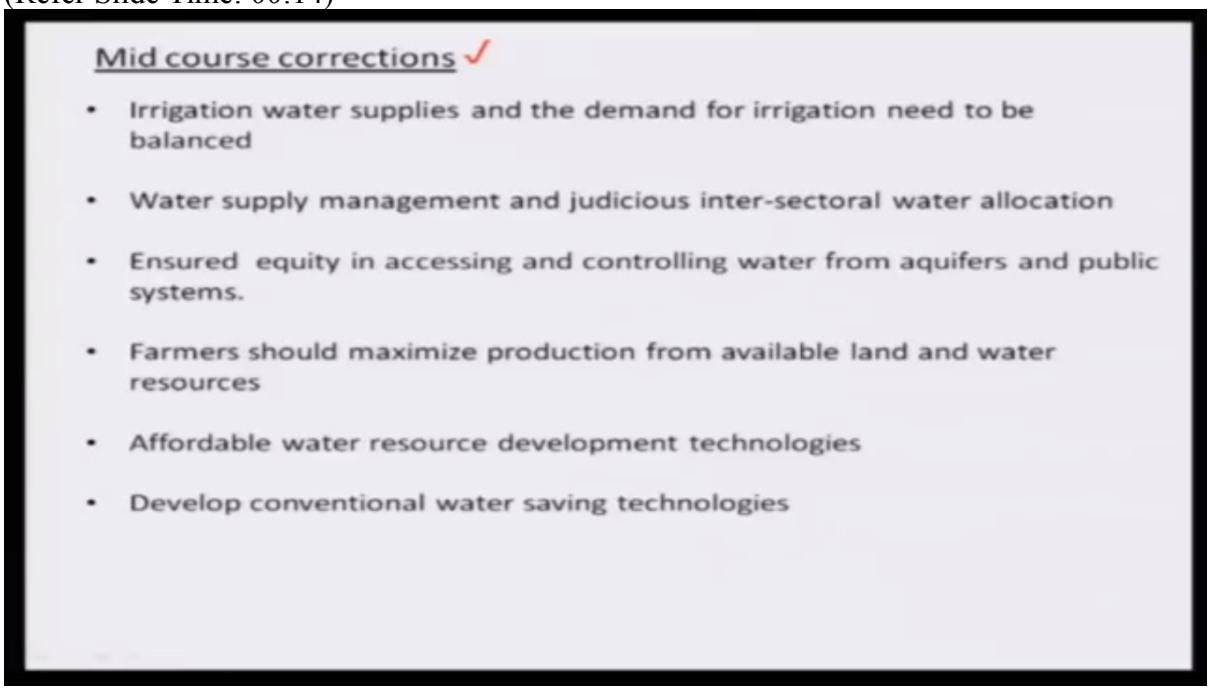
GIS in Ag-Essentials and Applications

Course Corrections

Dr. R. Nagarajan
(Indian Institute of Technology, Bombay, India)

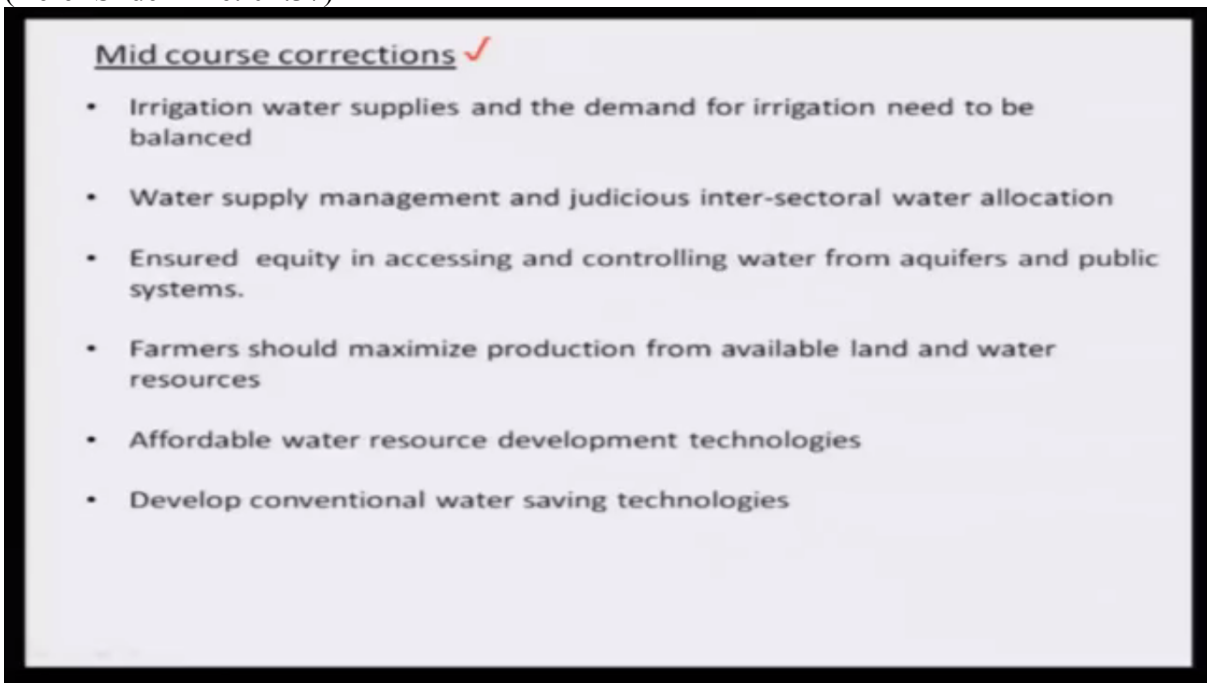


We have been talking about what are all the traditional practices that agriculture we are doing it and is there a -- and assessment and what are the mid-course correction means.
(Refer Slide Time: 00:14)



Now what with any activity when you do it, you plan it in such a way that everything will be smooth. When you are executing it, somewhere in the middle of your execution, you find that

there are certain parameters, certain activities, which you have to correct yourself and so that you will get the full fruit of that particular activity.
Now here our agriculture practices have left to salinity and other land degradation problems. Now we are likely to have some set of water shortages because of the climate change as well as we may likely to get some extreme weather conditions. So under assuming these conditions are going to happen, so what are the corrections in our practices which you have to do? One way of doing it, it's there is a flood irrigation which is very prevalent in the agriculture practices.
Now water shortages have come up. How do you feed the plant? This is one simple thing which we can talk about it. So that is what we are talking about as a mid course corrections. The water supplies and the demand need to be balanced. That means the irrigation water should be always available or based on the availability of the irrigation and your water, your irrigation quantity should be balanced. That is what I wanted to say in this page.
(Refer Slide Time: 01:37)

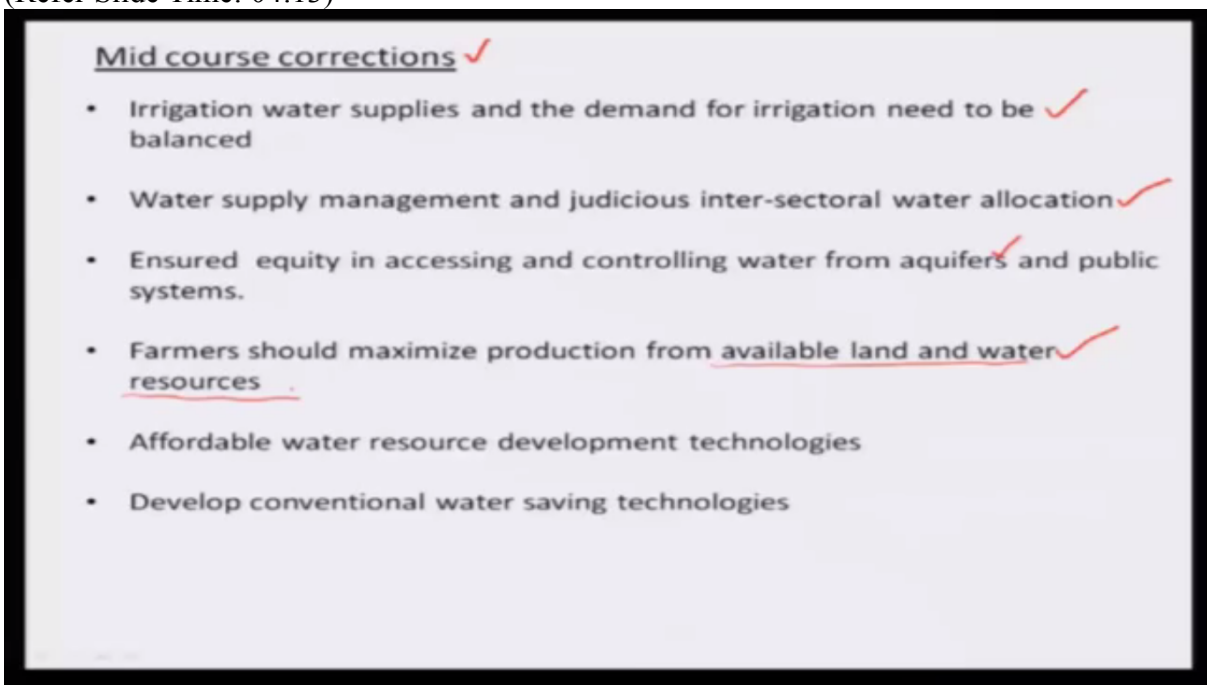


Now the second one is or the other one is water supply management and the inter-sectoral water allocation. What is that mean? Whenever we construct largely survivors and many of them in the initial stages of '60s, they were there only for irrigation and power supply. Over the period what has happened is for a water supply also, they have been included from the same reservoirs. So this type of allocation for agriculture, allocation for drinking water, allocation for environmental issues, allocation for industries, they need to be balanced. So depending upon the growth, depending upon the -- depending upon the sectoral allocation, we have to manage the existing water resources available in the reservoir. That is what is mean by allocations.
Then we have been talking about aquifers. Aquifers, they are the sources for the ground water. What is happening right now is if I don't get a surface water for my agriculture, what I try to do is I will go for a borewell and then try to tap the ground water from the aquifers. And this aquifer withdrawal is so heavy the water level is coming up in a big way. Water level movement is going -- coming up in a big way. There are certain aquifers or areas where

it has been totally it is dry and this recharges for this aquifers takes lot of time. That may be more than 7 years or 10 years, and these type of aquifers need to be conserved so that the future generation could make use of the groundwater. Otherwise, the groundwater will be completely depleted.

Then another thing is we may have to try to think. We have been going about short period crops, high-yielding variety crops. Now we have to think on one more problem is available land and water. Based on that only, we should be able to grow our food. That means maximize the yield from the same area, which we are done. And many times you might have seen in and around the urban areas, the local agriculture lands, they have been converted into settlement problem. This way what is happening is we are losing our potential agriculture area from our system. Okay.

(Refer Slide Time: 04:13)



Now another thing is about water resources development technology. This technology may be a delivery technology or it could be a technology which could capture reuse and then reuse it for the same purpose. So you may have to create some affordable technology. It should not be more of a costly technology so that we will not be able to offer to that.

Now what -- when we are talking about the innovation for the future, what we have left out is our traditional technologies like a roof water harvesting, harvesting technology, storage technology which have been adopted and time-tested things are available in many parts of the Asia including India, those things need to be looked into whether it can be rehabilitated that yes, that is the one which we can do that, because we cannot afford to have a new reservoirs in many of our areas because already urban sprawl has come up.

(Refer Slide Time: 05:20)

Now in total or to sum up, sustainable agriculture growth is the way for food security. That means we should not already some amount of damages have happened to the lands as well as to some amount of water quality has been deteriorated and water availability is less. So keeping all these in mind, the agriculture sector has to do the livelihood and another thing is many of them, many of our people, they depend on agriculture for their livelihood. So that needs to be understood. That needs to be maintained.

Now another one is about the large growth in projected population expected to be in the agriculture economical areas. Now you might have heard that the lot of suicides and lot of activities are coming up -- coming on the human front and that is because the poor -- the -- we have to increase the income for the poor farmers so that they have access to the food and they have access to the livelihood too.

(Refer Slide Time: 06:37)

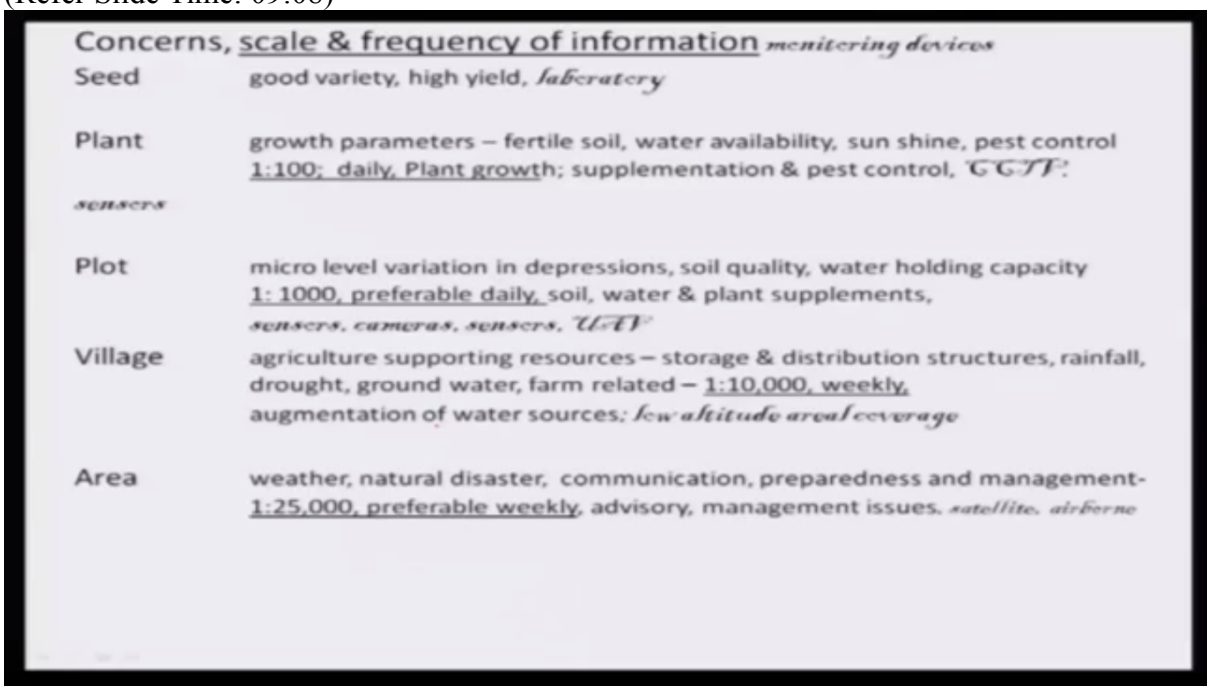
Now what is the technical support which we can do for this type of activities are now as initially I said it is about our entire agriculture practices is oral. Generation to generation it has been passed down from -- from the elderly people to the younger one, younger one to the youngest one. That is the way which have been followed.

Now with this digital world, there are lot of data, lot of knowledge from a different parts of the unreal climatic zones, they are all available. At the same time, they do have how to get away with the vulnerability assessment and the adaptation of the existing or the forthcoming situations need to be ready. We have to be ready for the vulnerability of the forthcoming future with this type of knowledge and information whether it is available from the nearby area or it is from a faraway area.

Another concept is sustainable and climate-smart management. This is for land, water and biodiversity. What does it mean is we know smartness that means with the existing material, existing resources, you -- you go for a cropping and you get the maximum yield. This maximum yield that is what the sustainable agriculture means whereas the sustainable agriculture should take into consideration what are all the climate changes which are possible in the area of your interest or in the geographical area of your interest. So that needs to be done in terms of the land, in terms of water and in terms of biodiversity.

Now we may have to use technologies, technology in the sense water delivery technology, the pests and other things, as well as the practices how we do that. Ploughing is one thing. Then water giving that is a irrigation is another thing, and these are all the small small small areas where in we will be able to change our practices little bit so that we will be able to get a good food crops as well as to take care of the food security.

(Refer Slide Time: 09:08)



Now this is a general thing. Okay. You are talking about a general. What about me? What about the globe? Why should I bother about it or what type of things which can happen? That is the next question, which we have, which you will be asking, and which I have to answer you.

Now agriculture depends on seed, water and soil fertility. These are all the three major issues which affect the agriculture and pests to some extent. So what we have to do is so this is concerned of the people. Scale means area or how many people are there. Then frequency of information is how frequently this information is needed. What all the modern monitoring devices which we may have to have it for continuous monitoring and upgradation or correction courses?

Now let me start with the seed. I need a farmer's -- as a farmer, I need a good seed. Okay. So good seed, that means good variety should be there, as well as that it should yield a high variety. So what is the testing which I have to do is monitoring devices only in the laboratory before buying the seed you try to check it up or buy something which is tested and then given.

The next one is the seed need to be planted. The planting, there are growth factors need to be considered. One thing is the fertile soil. Second thing is about the water availability, sunshine, then pest control.

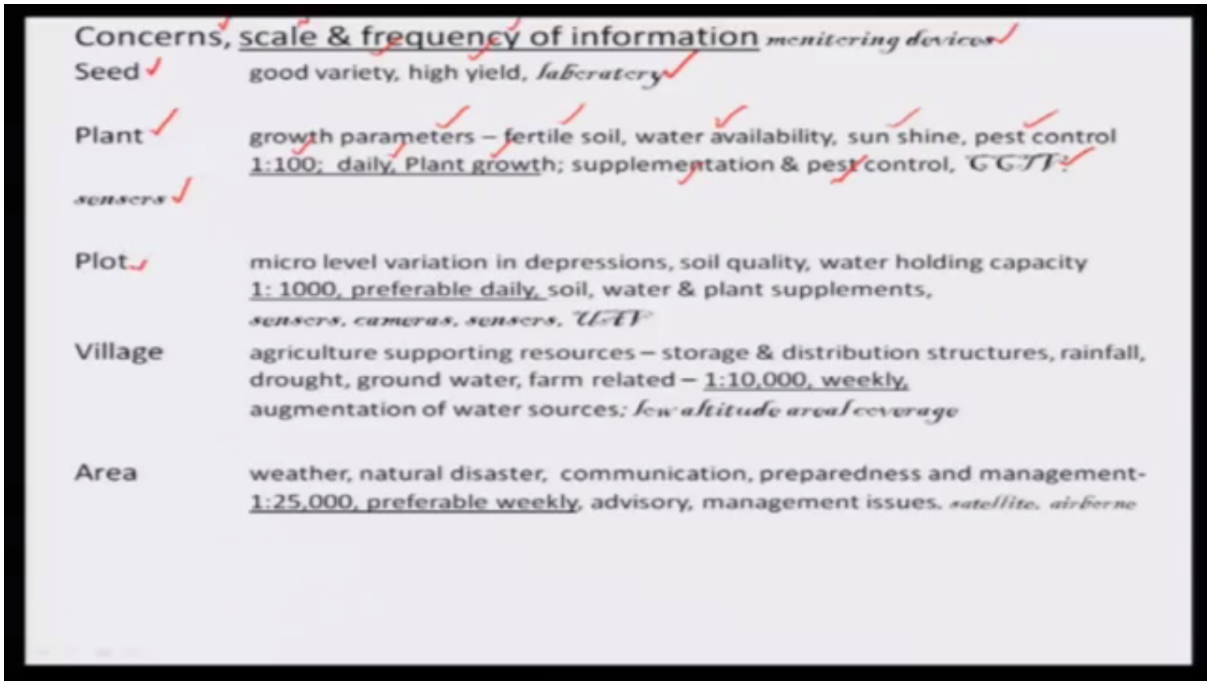
Now what we can do is sunshine, yes, that is left to the global activity. Pest control it is a seasonal thing. Then what we can do is we can talk about only the fertile soil as well as water availability we will be concentrating over here. Fertile soil, you can add fertilizers. You make the soil fertile. But the water availability, you may have to make sure where it is available, how it is available? These are all the things which we need to do that.

What is the scale of operation which we need is the information is 1:100 or 1:1000 is the scale that what -- what do you mean by scale? Scale means if on the ground if one centimetre is equivalent to 100 centimetres on the drawings, that is what the scale means. So what is the type of frequency of information which we need to do is daily to observe a plant growth. Right.

What is the another one which we want to do is supplementation and pest control so that you will be able to control the pest so that the crop growth or the fruits, they grow on -- on its own. What can I do for this is it is a CCTV. It is like or it is by a sensors. Okay. What these two instruments which do is they monitor the plant growth may be in one place or over a period of time with representative places you can have this and then monitor the growth.

So if there is going to be a difference in the growth pattern either as shown in the leaves or in the stems, then you will be able to do a corrective actually. It is not why we have to do this is I can go around my field and do that. So yes, you can do it all around the periphery, but you will not be able to see it in the centre of the things.

(Refer Slide Time: 12:27)



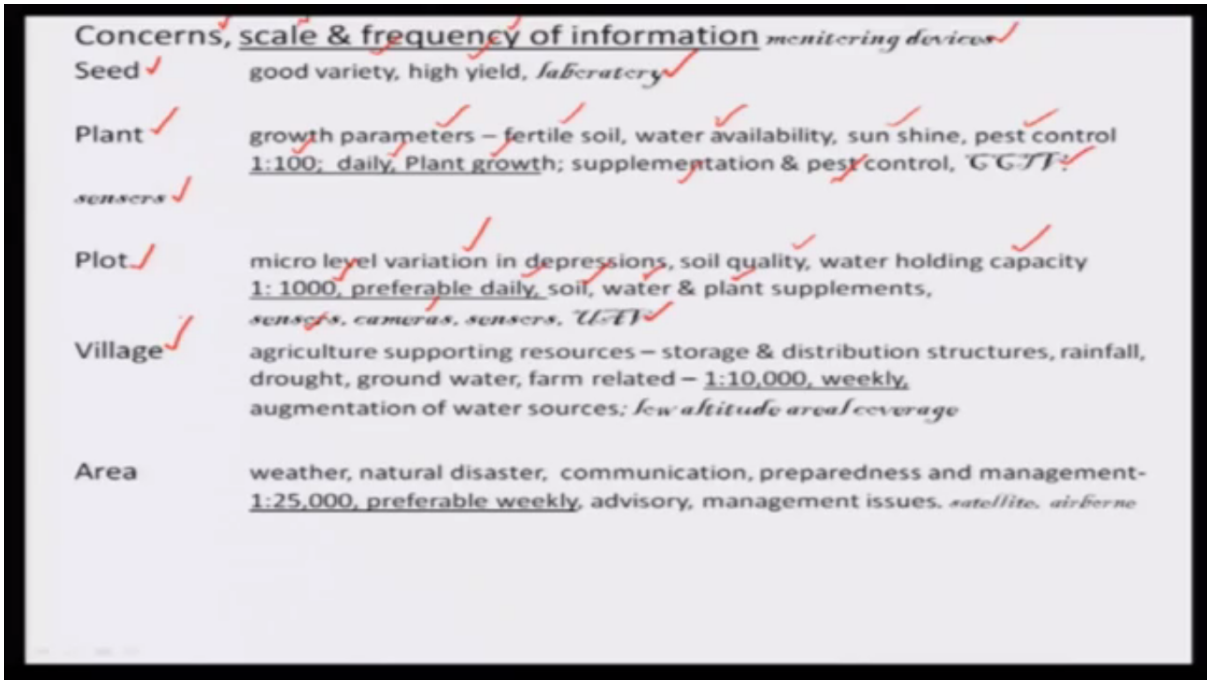
So there are other ways which are coming up is the plot size. This is regarding a plant. Plant growth and you have a CCTV as a sensor. It observes all the growth patterns. That is what is happening. Plot is nothing but agriculture area where you are doing it. So it is a first thing is micro level variation. Micro level variations are nothing but ups and downs which are there in the -- in the soil conditions. The soil quality is more important. If there is going to be ups and down depressions or ups and down variations, then there is a water stagnation is possible and other material, salt materials can get accumulated over there, and also the water holding capacity may increase in some places. Okay. This is what the concerns about the field.

Now what is the scale in which you want to apply, measure it is about 1:1000. Preferably, it is a daily or it is even if you do it in every two days, three days, that is fine. So what type of action which I have to take it is I have to take a supplements to soil, supplements to water that is a irrigation, plant supplements if anything is needed which we may have to do that.

So what type of monitoring instrument which I have to have is sensors as it is sensors are there for humidity, temperature and all other activities. The cameras. See the cameras here it has to be just focusing from the top or it has to be there on the sides so or it could be a unmanned aerial -- unmanned aerial vehicle. That is what we call it as a UAV or it is a drone type of activities which you can do that.

Am I not increasing my cost per production of -- cost of my crop production? Yes, definitely you are doing it. So how much you lose it if you lose the crop yield by different pests and other activities. So that economy needs to be worked out. This is regarding a plot wise.

(Refer Slide Time: 14:36)



What is it on a village wise? So this is we are coming down from the seed, plant, plot, villages. What happened is so it is a -- we are growing like a agriculture is everybody expect agriculture to be good. Food security should be there with us. So when it come down to the village level, the supporting resources, the supporting resources for this is the water and there should be a fertilizer available in the nearby area so that there will not be any problem in the distribution of pesticides as well as fertilizers.

Now in the water resources activity, the storages should be good. The storages, see you might have seen lot of tanks around the world or in the -- in India. So either they are all degraded or silted, and they are not able to store as much as water which they are supposed to store. So that way what happen is there is a reduction in the storages. When there is a reduction in storages, the quantity which is needed by the crops on the -- on the settlements are not able to get meted out by this way.

Then another one is distribution structures. Distribution structures are nothing but it is a canal or it is small drainages which supplies water from the storage area to the agriculture plot. So we have seen over the years these canal, these structures, either they have caved in or they are blocked or there are some growths of weeds all along these structures, so by preventing the water from moving from one place to another place. Then that is storage.

Then another thing is about the rainfall. Rainfall whether in this every village or every group of villages, they should have a rainfall vary -- rain gauge measurements so that that the distribution of rainfall from one place to another place will be measured, and we will get a better idea when we are doing for the water runoff calculations.

Now another one is important is about the ground water level. Ground water level, either it you can do it on the open dug wells or you can do it on the borewells also. This type of information is needed at 1:10,000 scale or 1:5,000 scale. This is the scale on which village maps are being prepared so that maps can be used in the GIS mode to get a integrated approaches. So what is the frequency which we want to do these informations are it is about a weekly. So can we do that? Yes, you can do that if you are there in the local micro level village level basis, you will be able to do that, the assignment, so it can be collected from the

individual villages. Then it can be pyramid up and for that it will be used for the national level planning and progress.

Now argumentation of water resources. What does it mean by argumentation? Augmentation is if there is a possibility for increasing the storage is one thing, then possibility of having one more structure, local structure is also possible. So this is all the things to get a new storages, new quantum of water, additional quantum of water, which you can have it up.

Now what is the type of monitoring device you want to know is low altitude aerial coverages. So it can be a -- it can -- it need not be a drone. It can be a unmanned vehicle or it could be a low-flying aircraft information which you will be able to do that. So this is then what is the aerial extent? Areal extent means group of villagers, they form together. That is what I mean by aerial extent.

Here important aspects are whether that is temperature variations, rainfall variations and things like that. Then it is a natural disasters. See natural disasters, depending upon the physiographic condition, it could be drought. It could be rainfall. It could be anything.

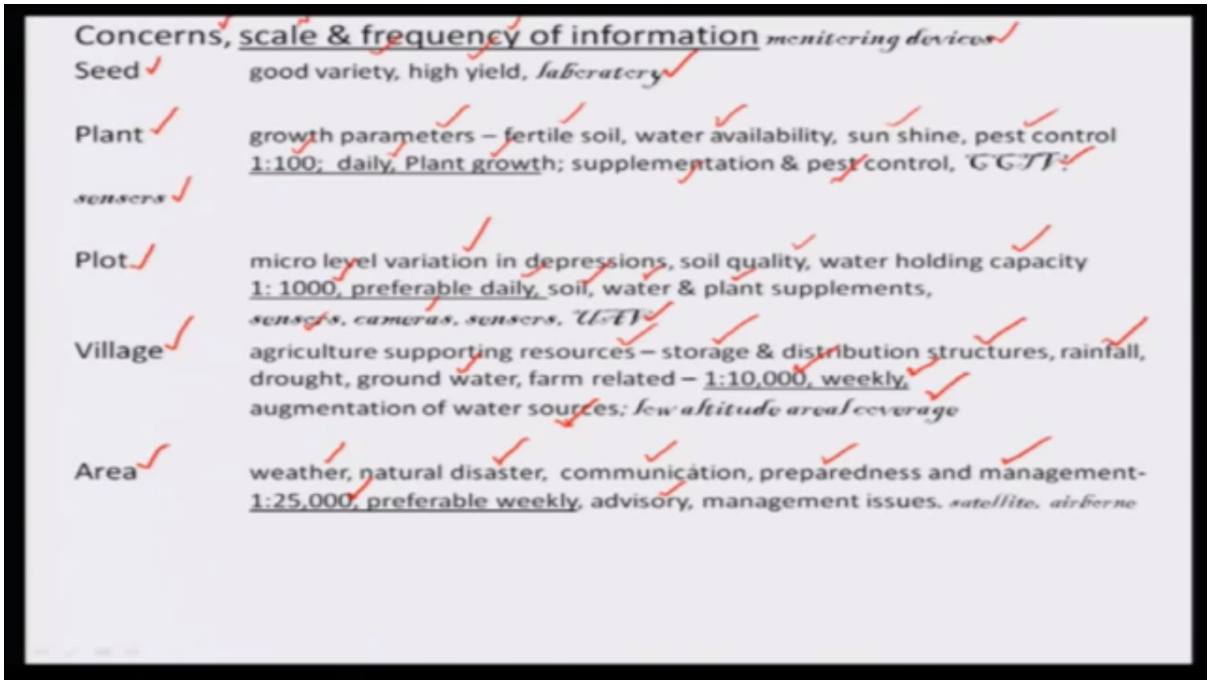
Now the communication should be -- communication between the village and the area, it should be pakka so that there will be a direct movement or communication can be done in case of positive activity events as well as for the negative events.

Now most important thing in any of the thing is preparedness and management. This preparedness is for the worst. So we -- what happen is always we think about positiveness. In case, in case if something happens, what are all the damages which are likely to happen? How do I come out of that? And how do I manage it? So either a positioning person, trained personnel or positioning the instruments or positioning the medical supply which can happen, these are all the preparedness and management activities, which you can do that.

The scale on which you want the information is 1:25,000. So this 1:25,000 scale information is available with the survey of India map so that the existing map can be used on a area basis, on a village level basis that is the cadastral maps which are there. Only thing is which we may not have is the plot wise information. If you create a plot wise information, then all these things can be integrated and it can be used in a better way.

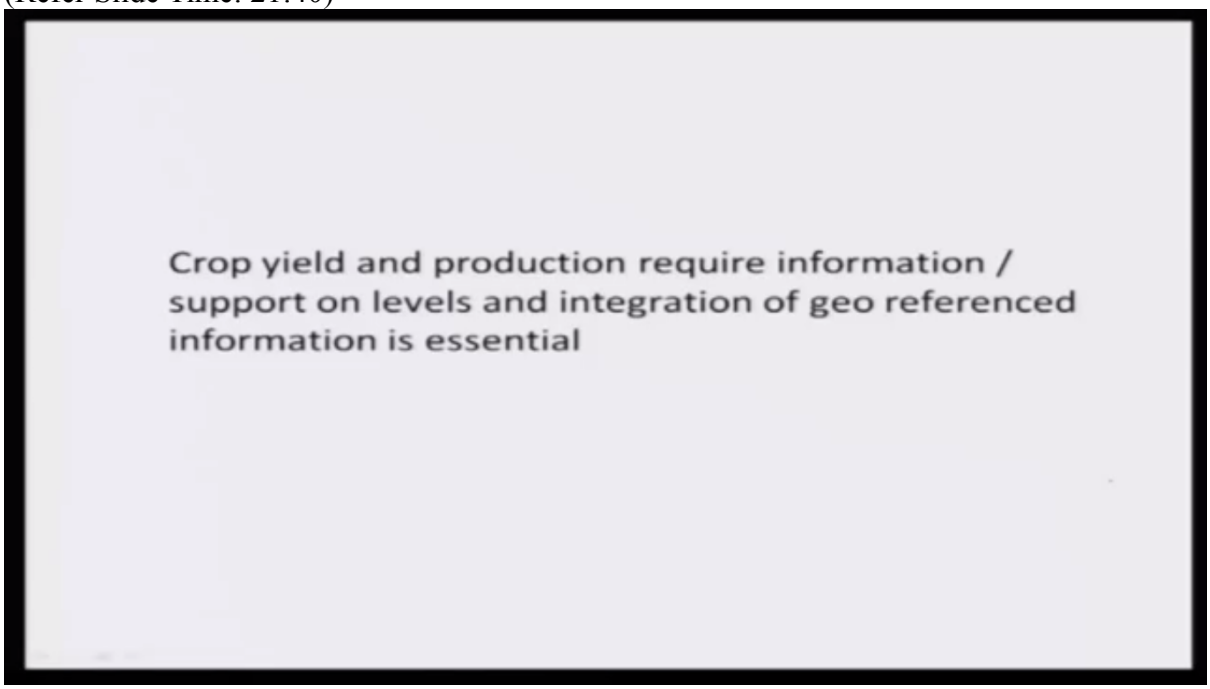
Now what is the activity which you want do it is advisories as well as the management issues. Advisories are sharing the information. Management issues are nothing but how did I come out of these activities.

(Refer Slide Time: 20:39)



Now the monitoring systems which we can think about is you can have a satellite images, as well as you can have a airborne images. So these images, they will give you about the surface conditions. These surface conditions can be synergized with the plot level so that agriculture growth or the crop growth can be monitored continuously if there is going to be a problem in terms of the growth parameters, we should be able to amend and get the maximum yield from that area. For this purpose we may have to -- it is normally area wise. It should not be village wise. It should be plot wise. All the people, the owners of the field, the owners of the mukhiya of that particular village, as well as the regional people all the people need to work together for a food security, as well as a crop production increase.

(Refer Slide Time: 21:40)



This is what we want to say in this lecture is crop yield and crop production, it is not that you leave a seed, and water it and come out. It is not that. It's like a baby growth. You need a

continuous monitoring, and if something happens, what you should be able to do it, this type of information are very essential, and it is not only in one place. It should be on all levels: plant, field as well as the village level.

And all these information, suppose if I am the person, I collect data. If I keep it with me, it is of no use to others. So this need to be integrated geo reference, what is -- what do you mean by geo reference? Geo referencing is nothing but the position of the measurements includes latitude and longitude with reference to the global conditions so that the global -- global information can be down scaled, and it can be used for our climate change impact assessment.

Thank you.