agMOOCs

GIS in Ag-Essentials and Applications

Modified Agriculture - Precision Agriculture

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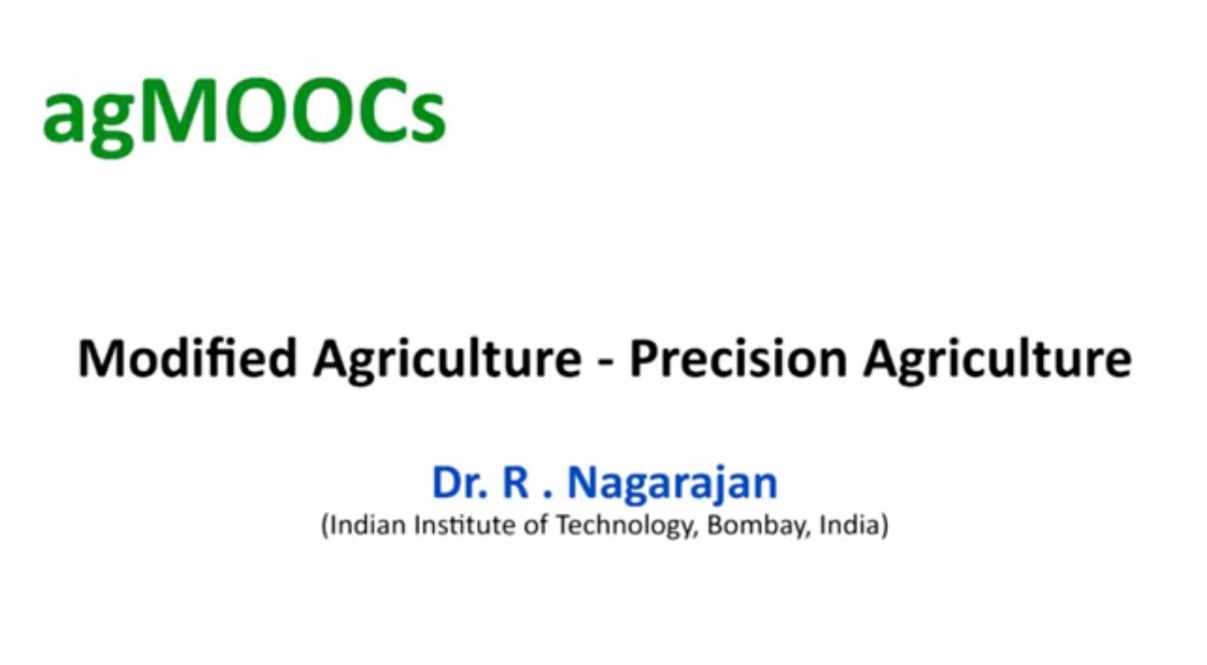

We have been talking about the practices, agriculture practices, which have been happening, which has been followed by our ancestors and our fathers and further what are we going to do is the big solution. For that only we were giving a assessment of what is going on.

Now what has in terms of food production we have just Green Revolutions and things like that. So now we have come into another type of activity is called a precision agriculture to tide over the crop yield deficiencies.

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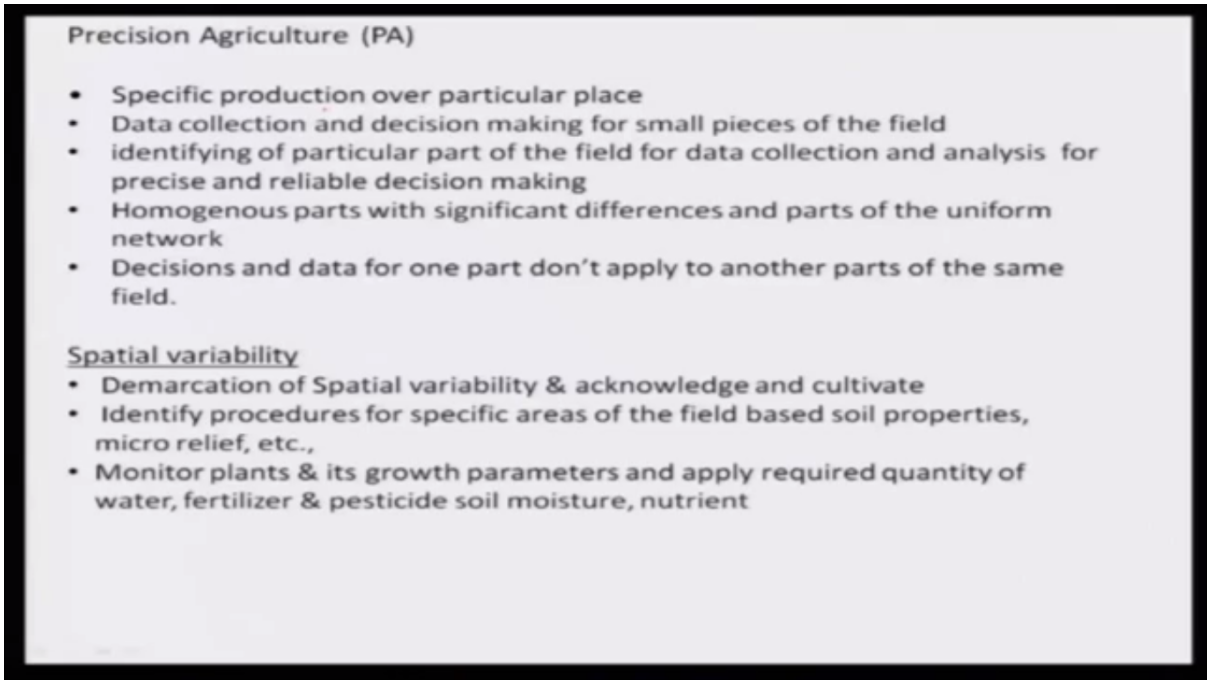

So what does it mean by precision agriculture? Agriculture previously we used to do it, we spray the seeds here and there, and then those things, they come up. And it is a mass scale fertilizer application, mass scale of pesticides. And we never bothered about the individual plants or a group of plants. And the people were feeling that because of the mass activity, it is like a sarvajanik activity. We are not able to get the more crop yield.

Now people have gone for specific activities. What we felt was that certain growth parameters are missing in some of the small, small patches within the agriculture fields. Because of that, they have gone for the precision agriculture?

What is the precision -- precise -- precision agriculture is nothing but you give -- offer uniform or a homogeneous soil conditions, homogenous water supply conditions so that the plant growth deficiency factors will be minimized in these areas so that the plants have to yield better. That is what is mean by precision agriculture. That is what it in terms of it is a specific production. I want this much of production. What is the alternatives or the supplements which I have to give? That I will give it to the plant so that that crop yield is accurate.

Now here what is needed is as we were talking about information, the data collection is the major issue here and the frequency is a major issue because if you do it continuously for a small part of the field, then your crop yield will be better. It is all done on a small areas.

Now then what we have is a field data collection as well as the analysis, and reliable decision making. The data collection is one thing and what is going on is another problem. Then we should be able to do a better decision making is nothing but either apply fertilizer, apply pesticide, apply water or whatever it is needed.

Now it is what we assume in by this way is every part of the agriculture plot is homogeneous in difference. But here the problem is if there is going to be a sudden change or a gradual change from one homogenous area to another homogeneous area, some of the decisions need not work successfully as it has worked, and our transition rate and transition intensity is not known by this type of activity.

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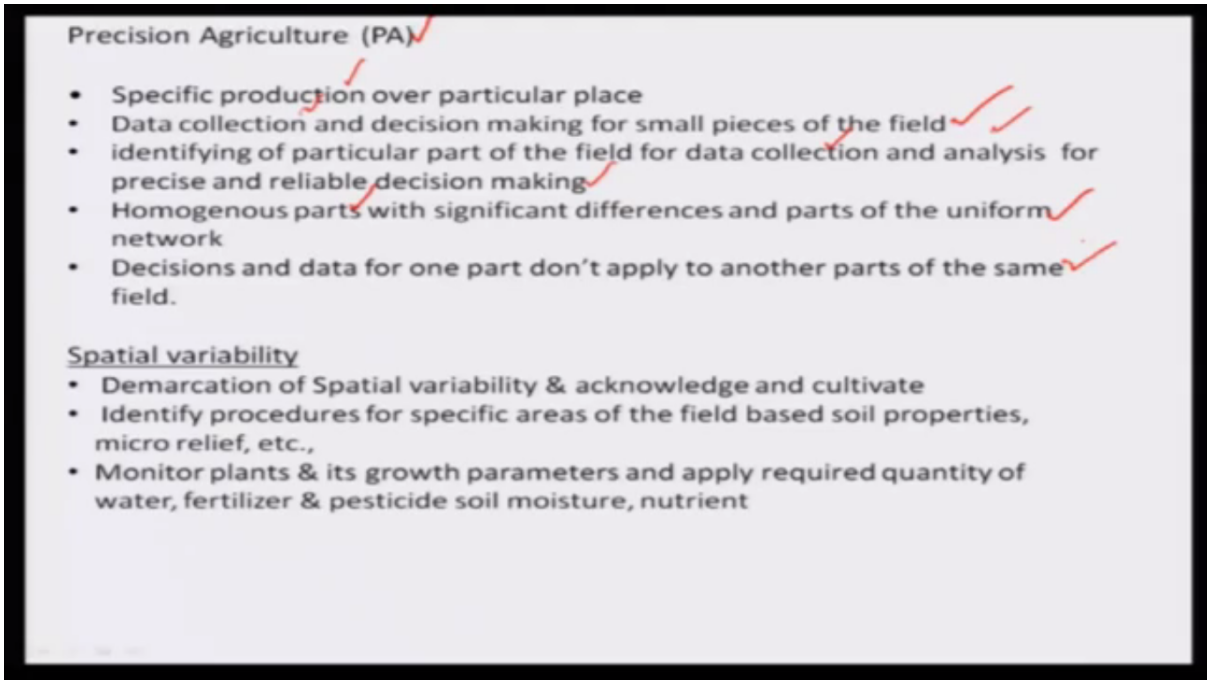

Now here what we are trying to understand is demarcation of spatial variability. Spatial variability is suppose if the soil has got potassium, sodium and all those elements in one percentage, in a uniform percentage, it is likely to be there throughout the area or throughout some part of the field, it is likely to be the same. And based on this knowledge, you go for a cultivation.

Then the procedures which you are going to follow, they are also identified with reference to the variability. Okay.

Then third thing is about the monitoring the plants. So this monitoring plants, sensors are effectively used. In addition to sensor, some micro level monitoring devices are also in place for that is the soil moisture, you have a soil moisture sensors at the root zone of the crop that will be able to tell you about weather how much is the soil moisture content, whether it is sufficient or whether it is getting reduced or leading to a yield point.

Fertilizers, this is nothing but what is the deficiency of elements in the soil so that these fertilizers they take care. Pesticides. Pesticides, what is the probability of a formation of a pathogens or virus in that particular area that is it needs moisture content, it need temperature and shadowness. So what all the nutrients which we have to give? What are all the pesticides which we have to give? That decides based on this type of monitoring surfaces.

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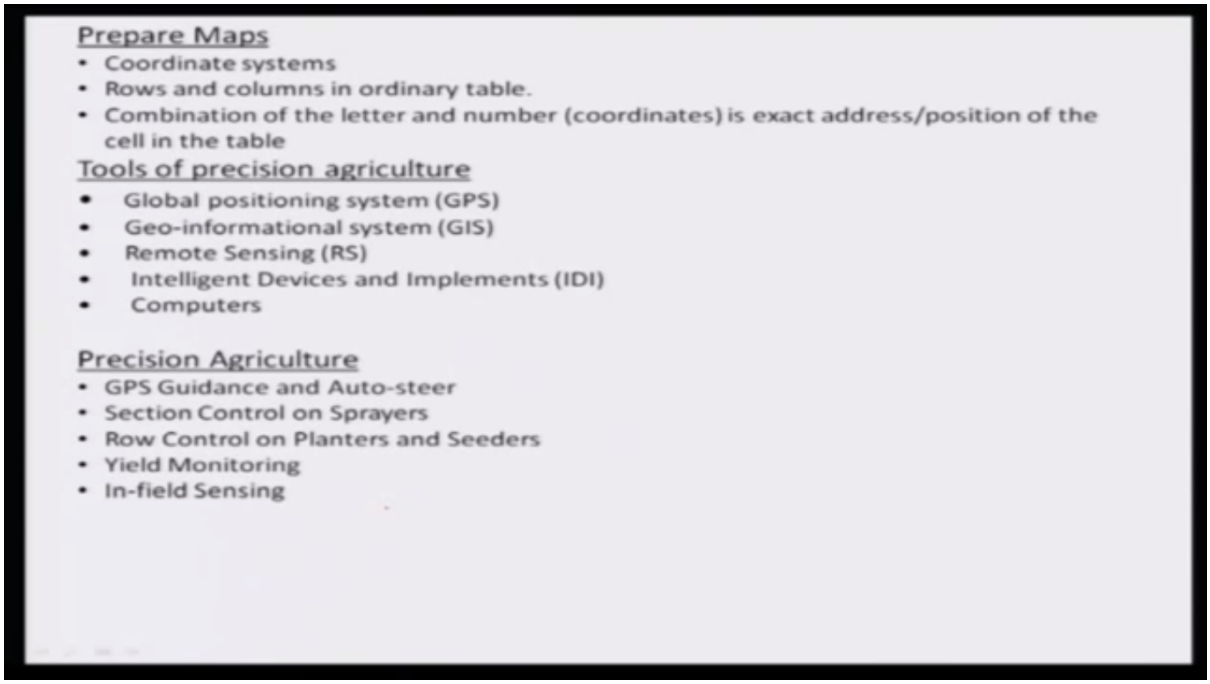

What do they do? Next one is they try to prepare the maps. Maps is one way of representing a field to anybody or it can be taken over, passed to them. So it is based on the coordinate system. This coordinate system all of us are aware with reference to one specific point how far it is XY coordinates when you want to do it. From the zero, how much it is there in the x-axis and how much it is there on the y axis. So that is where we try to make use of these coordinates, and these coordinates are known as it is in the table the rows and columns. These rows and columns some places we address it by the coordinates. Coordinates are, again, it is related to longitude and latitude so that it is globally it is geo reference.

Now this is what everybody tries to prefer before going for a precision agriculture of a small part of the area. Now what is it that which I -- what is it that they have got which I do not have is one thing is the precise map. Precise map of that particular field is missing. What do they have in the precision agriculture? What type of tools they use is Global Positioning System. This Global Positioning Systems, it comes up with a precise Global Positioning Systems are coming up even point 0.1 meter up to meter or 20 meters it is like the precision comes out. Accuracy comes out. So this Global Positioning System, which these people they try to use it, so it should coincide with the group of plants or a plant in question.

Second thing is the geographical information or a geo information system. It is related to Lat, Lon, things like that.

Then remote sensing. What is a remote sensing is without touching, without going nearer to that and you tell about the properties of a particular object, that is what the remote sensing it does it. So it could be a reflectance base or it could be a some property base or it could be anything depending upon what is needed.

Now here many of our think chlorophyll content is better revealed by the green mass of that particular plant. So we try to do the satellite remote sensing, the visible as well as near-infrared which will tell you about the what is the healthiness of the particular plant. The intelligent devices and the implements which are their part and parcel of it and a dedicated computer system or online network system with these field-based sensors, field-based measurements units, they are the main reason for this. They are attached to this computer so

that what is happening, what has been recorded by the sensor, you will be able to immediately see it on the screen, and you can take immediate decisions.

Now based on this type of information, whether it is a excess or it is less, in some aspect growth parameters, the precision agriculture is carried out.

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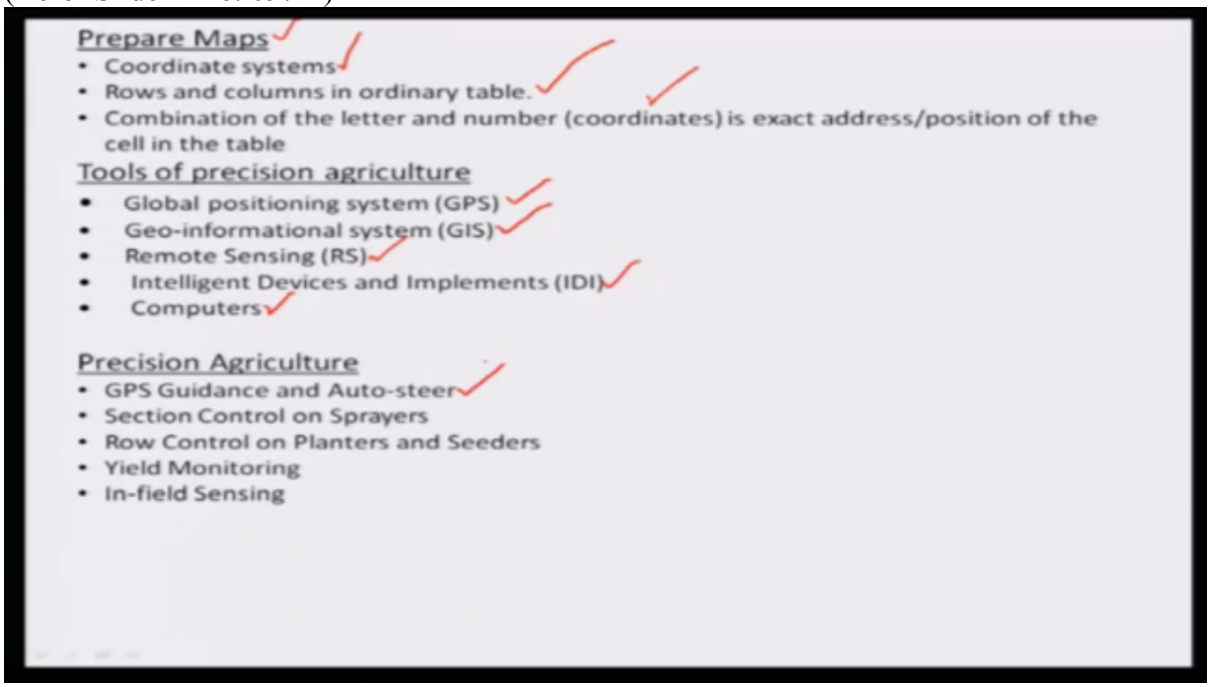

Now the GPS Guidance and auto-steer. the GPS will tell you about which plants are there under stress of what kind of stress it is, what is needed? It is knowledge-based information systems which they have got. So it will tell you about how much is the fertilizer which we have to add or how much is the water which is needed by that particular plant.

The sprayers. The sprayers are guided by the location base and it -- GPS guided and it will be able to control the amount of spray which it gets is to these plants. Otherwise, in the manual way, in the regular practice, the amount of spray or amount of water yield which you are give -- water which you are giving it to the plant, it does not have a controlling systems.

Now yield monitoring is another thing that means when it is the fruits, when they come up, the type of fruits, the type of flowering, type of leaves, based on that, the yield monitoring is done continuously so that you are sure about how much I have expected about a X tons of yield from this area, but am I come back closer to that or am I likely to get more? That is what the thing. I should not get anything less than what I have expected because my support to the plant is the maximum. My surveillance is the maximum. I am able to see, look on every day and then try to attach things.

And also we have in-field sensing that means the sensors are not -- are throughout the field. It gives a representative look of the field and a sense of the field so that they will be able to monitor and give things.

Now having done what are all the other if when you -- when you do certain things, there will be a positive aspect as well as a negative aspect.

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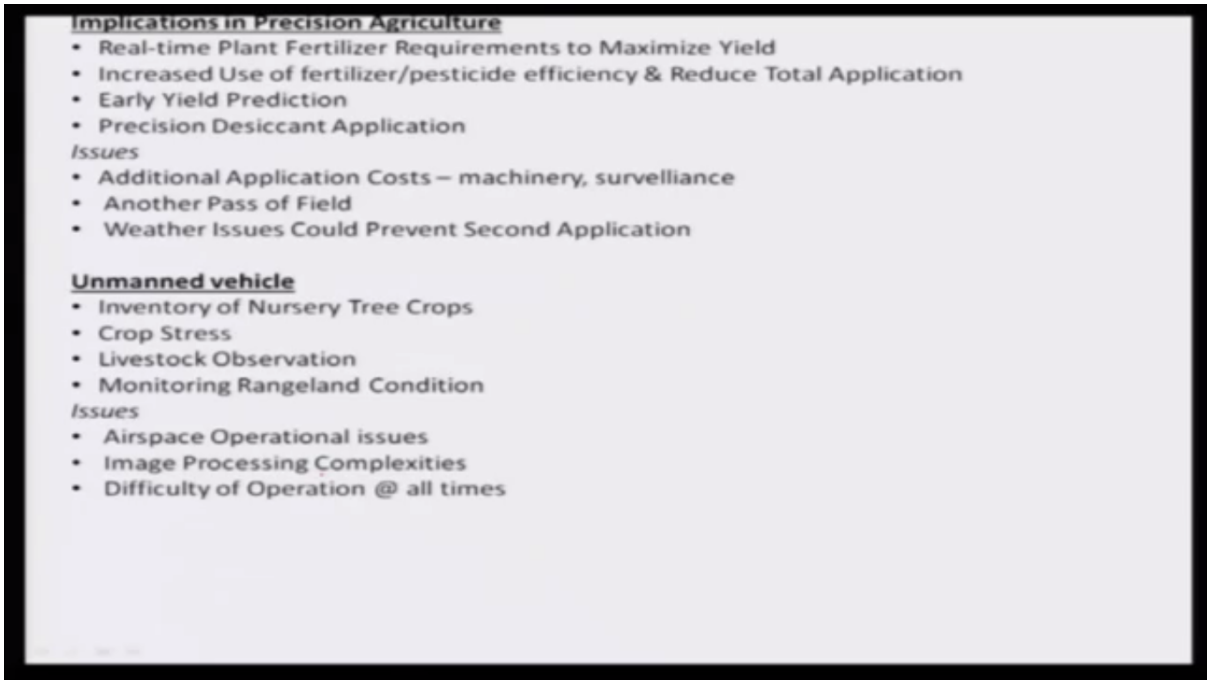

What are the implications? There are implications in the precision agriculture is there is a fertilizer requirement, which is needed immediately if it is to grow. If you delay it, then there is a probability. That means you have to have a stock, which is ready for a delivery purpose. Then you have to have efficiency in using of fertilizer as well as pesticides. If you use, reduce the total applications, that means you are reducing the amount of fertilizer or pesticide, which will get washed off, which will be removed from the higher elevation areas to the lower elevation areas. All these things are yield to -- it is for the early yield prediction, which is normally used in the commercial purposes. I will be able to give you this much of tons of crop yield of a particular variety. So then trading will be very easy by this way.

Now the issues are in this is additional cost, which you are doing it in terms of machinery, in terms of surveillance. This cost is added to the cost of the production. Now another weather issues you may control yourself. You may have your own umbrella when during the rainy days. But weather is likely to change, and you are not able to control them. Depending upon the forthcoming weather, once the weather, once the heavy rainfall comes, again, you may have to do all the surveys, and then get your database ready and then start applying it. If there is going to be high wind, then if the plants are going to be off flat, then you -- you cannot do anything for that. So this is the major issue about the weather issues cannot be trade off in this type of thing.

Now what are all the unmanned vehicles which can do in this type of precision thing is it can take care of the inventory of the tree crops. The crop stress is nothing but it is the crop water stress or a crop stress, stress which -- it is exhibited by the leaves either by curling or it is becoming a gray or becoming a brown in colour. These are all the indicators. Suppose if these things are not properly exhibited by the stress conditions, then we are not able to do anything. The rangeland conditions also we can use with the unmanned condition.

The issues, the issues related to that is airspace operational issues. Even though the unmanned vehicles, drones and things like that, they fly at a low altitude, and they are able to monitor your field, but the regulatory aspects of using these unmanned vehicles is in some places or many of the Asian -- many of the places, they have some problems.

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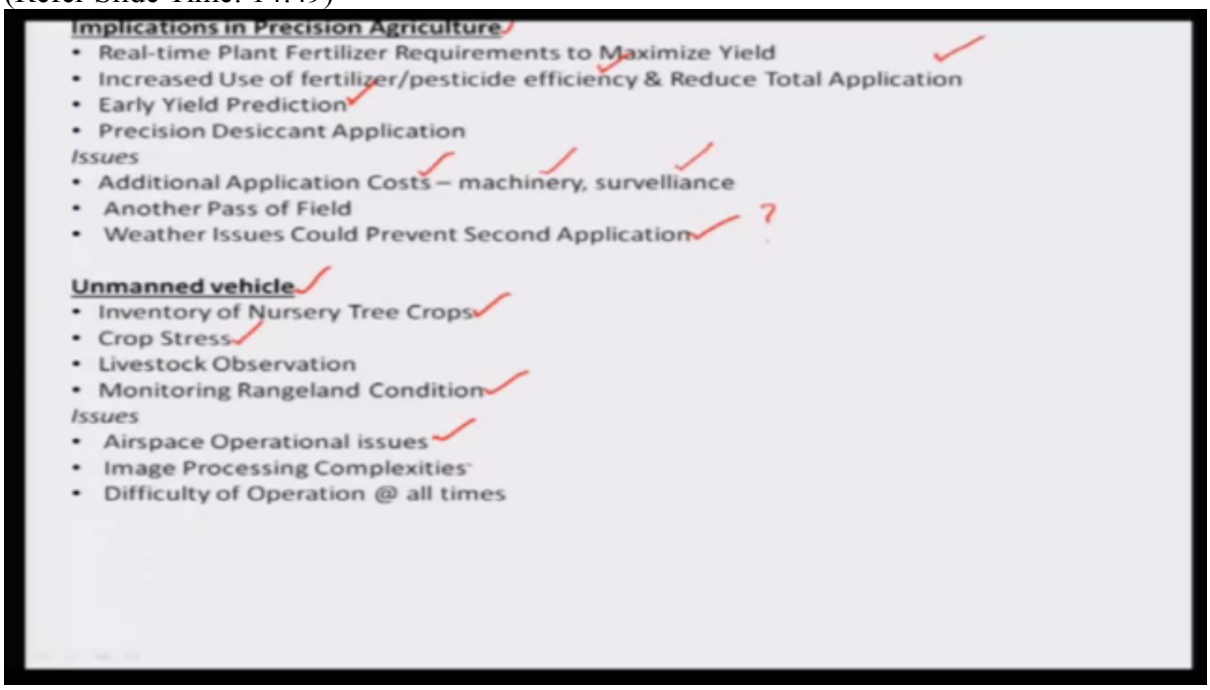

Now second thing is about the image processing all these sensors, all these -- all these image process -- image remote sensing datasets, it comes as a -- it comes as a image. That image in a digital format, that images, that needs to be processed. When you process a image, what it should do is it has to have a flat surface to the camera or to the sensors so that whatever the warping which is -- which it has produced because of during the flight conditions so that needs to be taken into consideration.

So in an orbital remote sensing because the height between the land and the system is high with few control points, regular control points we are able to do it properly whereas when it comes down to the low flying and the fielding level activities, the control points need to be on a higher side to process these images.

Now difficulty of operation is related to the maintenance of the sensors, maintenance of the pumps, maintenance of the spray if the spray, if you don't -- if through the -- which is done through the nozzle, if the nozzles because of the non using, non usages for a time, it may get stuck with some solid over there. There may be a blocking which is possible.

Then machineries. Machineries you need to use it very frequently. These are all special vehicles, which can use only in those areas. We wish that these machineries need not be used at a regular interval. That is what the our cost-cutting activities.

So these are all the major issues of using different machineries in monitoring the agriculture land.

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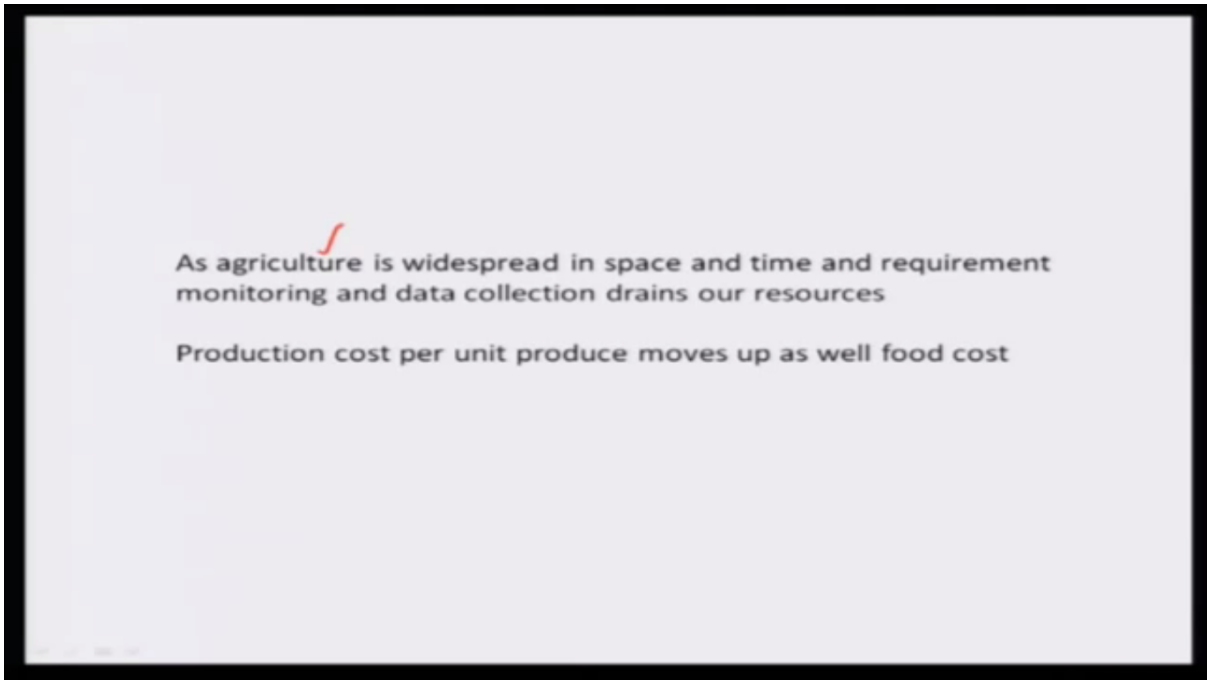

Now as agriculture is widespread, widespread the sense it has been globally people are growing crops, and they are having problems, and they are doing everything, but they are there in space across the globe or across the area, and they have been doing it for a long time. This type of precision agriculture is possible only a small area where your cost of per unit area of product is on a higher side. You may have to be on toes. There are practical difficulties are possible. This will drain out our resources in a big way.

So this type of precision agriculture is being followed on a large scale areas, not on a small scale areas. Large scale areas, as you increase the size of the area, then problems or heterogeneity goes on varying from one parameter to another parameter. In solving it, if you try to solve one problem, then the other problem comes up in the natural systems.

Now this type of production cost, precision agriculture grown food is likely to have more cost when compared to the normal type of things. If this is -- this type of precision agriculture is useful provided when we have reduced land as well as water and everything. We are not bothered about the cost per production.

Thank you.