Organic Farming for Sustainable Agricultural Production

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Lecture – 07
Sustainable Agriculture

Ok so, now, we will come to the lecture 7 that is Sustainable Agriculture; so, as Organic Farming and Sustainable Agriculture. So, definitely organic farming leads to sustainable agriculture. So, in this lecture, we will discuss; what is sustainable agriculture and what are the approaches towards the sustainable agricultures.

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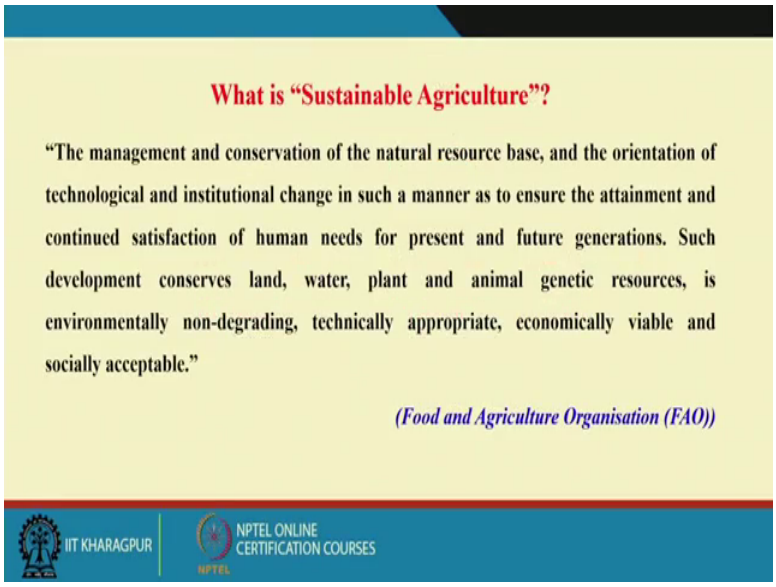

So, if you see the different definitions of sustainable agricultures so, given by food and agricultural organizations the management and conservation of natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs of present and future generation such development conserves land, water, plant and animal genetic resources is environmentally non degrading technically appropriates, economically viable and socially acceptable.

So, this definition given by FAO; so, the purpose of sustainable agriculture means you were the agricultural production practices should be such there it should meet the need of the present generation without degrading the resource base of the future generations; that

means, so, the practices that should meet the demand and also; how are the management practices should not degrade the natural resource base for the future generation. So, that is the definitions given by the FAO.

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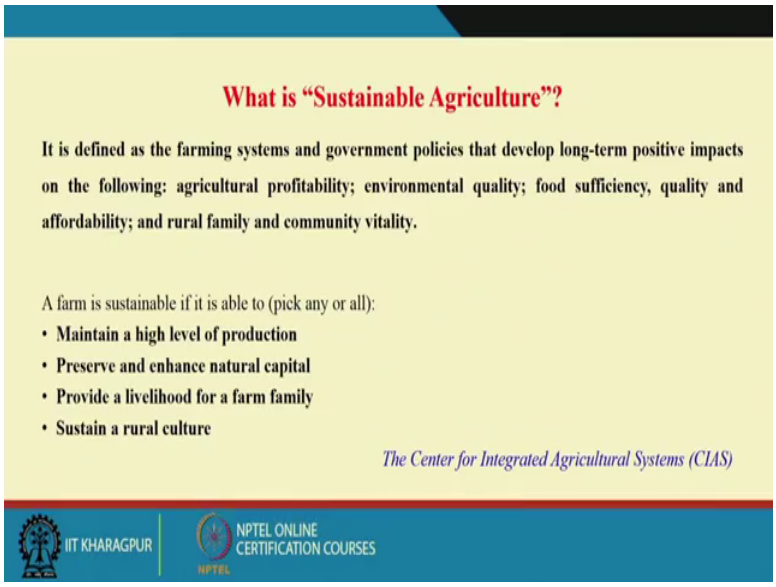

The other definition the center for integrated agricultural systems as for them sustainable agriculture is defined as the farming system and government policies that develop long term positive impacts on the followings like agricultural profitability, environmental quality, food sufficiency quality and affordability and rural family and community vitality.

So; that means, the you should meet harmony with that should be the profitable productions and healthy environments and food should be available in sufficient quantity, quality and every people should have the access to the food there is a food affordability every people can have the access to the foods and there is a rural family and community, there should be a nurturing the healthy rural family.

So, that is say the a farm is sustainable, if it is able to maintain high level of production, preserve and enhance the natural capital, provide a livelihood for a farm family, sustain a rural culture that is what you say sustainability and the other definitions.

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You see the board of international food and agricultural development as for then the successful management of resource for agriculture to satisfy the changing human needs while maintaining and enhancing the natural resource base and avoiding environmental degradations so, that is what you say.

So, that the resource space that should meet the need of the present generations and the future generation too, then the next definition ability of an agricultural system to maintain production over time, in the face of social and economic pressure as you will be discussing because population is growing. Food demand is also growing with the increasing populations and there is a huge economic pressure; that means, there is a economic development.

So, I can maintaining the sustainability at the same time economic development. So, we are going the developing further this economic development has to go on at the same time we need to maintain sustainability. So, there is a challenge so, that is where the ability upon agricultural system if that can maintain the productions over time; that means, in future as per the need of the populations, it can maintain the populations in the face of social and economic pressures without harming the environment that we can say the sustainable agriculture.

And the last one say one that should conserve and protect natural resource and allow for long term economic growth by managing all exploited resources for sustainable yield.

So, these are the sustainable agriculture; there is a even sustainable development goals. So, there are these 17 so, that includes from every aspects energy productions, consumptions, climates. So, what are the below water, above water poverties or social aspects economic aspects and all aspects are taken by the sustainable development goals 7 aspects for the sustainability.

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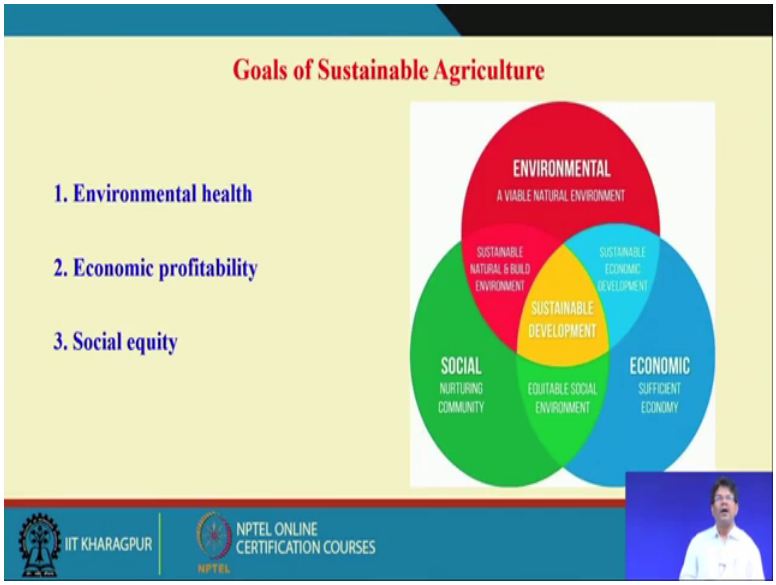

If you go for the goal of sustainable agriculture we can say 3 components let us say environmental health economic profitability and social equity.

So, these are the 3 components, if you want to achieve sustainable in agriculture, it should give a the agriculture impact on an environment. So, agricultural activity should protect the environment, should ensure a healthy environments and that that must give the economic profitable and the social equity.

So, what is say the 3 things are very important because when you when you say. So, many things to a general consumer all the public person it makes a confusions because environments, economy and social equity. So, the should be taken care when you go for the sustainable agriculture environment means if you only environments or the economic integration sustainable economic development.

If you got economics and social integrations does a equitable social environments look for environments and the social integration sustainable natural environments and to 3

integration; 3 intersections are 3 that is a sustainable development where the environment economic and social equity plays a combined role, if say this environment how the environmental health environment society and economy.

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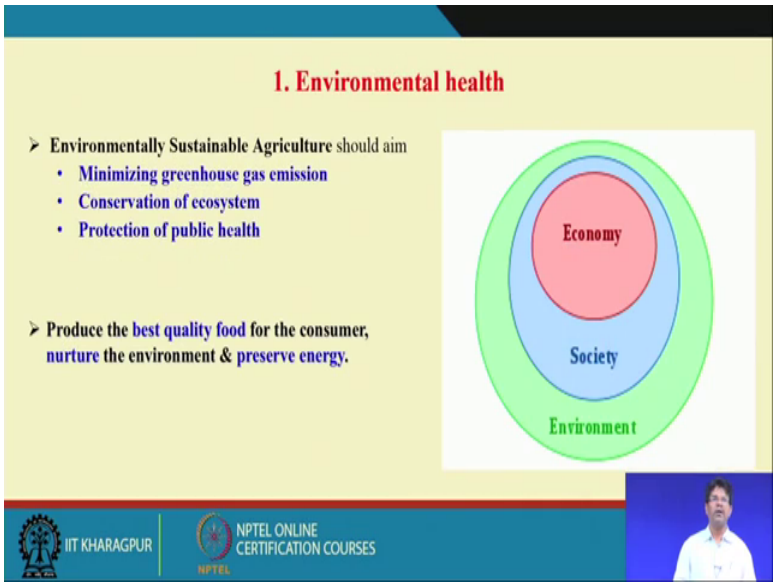

The environmental is sustainable agriculture should aim discuss minimizing greenhouse gas emission as we discussing how because, the organic farm is a key for minimizing greenhouse gas emission to the atmosphere. So, that is a environmentally sustainable agriculture less emission less harm to environment and conservation of ecosystems. So, sustainable agricultures there should conserve ecosystem in soil now you see that is a soil depletion soil erosion soil lost year by year how to protect this soil because soil is that provides the crop growth that support a crop growth that helps a neutron glitch part on that helps neuronobtake and the crop production systems.

So, the conservation of ecosystem how we can protect this soil how we can protect this, soil fertility, how we can maintain the soil moisture; that is the one of the issues and there should be maintained through the sustainable agriculture then finally, the protection of public health human health. So, this you should provide the food quality better product in the produce the best quality of food for the consumer nurture the environment and preserve energy; that means, sustainable agriculture that consumes less energy as compared to conventional agriculture.

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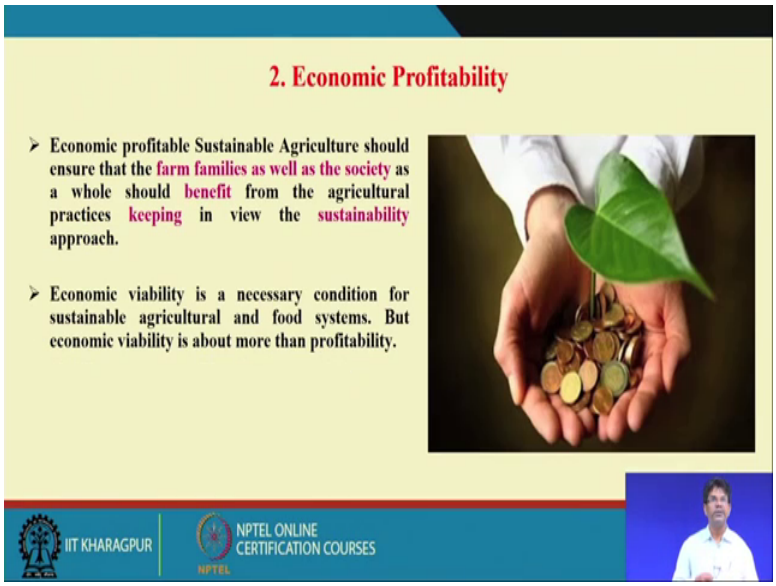

So, this is the environment then economic profitability see economic profitable sustainable agriculture should ensure that the farm families as well as the society as a whole should benefit from the agricultural practice keeping in view this sustainability approach. And economic viability is a necessary conditions for sustainable agriculturals and food system, but economic viability is about more than profitability. So, this should be profitable and if you say economic viability is a long term the practice, it should give profit and should be economically viable.

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Social equity; if we see the Adam Smith; the father of contemporary economics said no society can surely be flourishing and happy of which the far greater part of members as poor and miserable hence for an approach to be literally sustainable it should look into the feasibility and social justice first. Because every peoples should have equal access to food they where access to food they should live have social equity they have this see education equal education for all, this may be a difficult, but this is social equity every child must get the same educations.

So, this social equity this can be achieved by supporting farmers who are committed to protecting the natural environment and helping to make ecologically sound food and fiber systems and economical viables. Our responsibility to help build food and a farming systems that they are socially acceptable then generating employment equity for farmers farm workers and other employed in the systems then ensuring adequate food clothing and shelter for all people.

So, that type of the social equity is also integral part of the sustainable agricultural development; so, organic for you go for sustainable. So, it should give the definitely the environmental impact, they should have protect the environment at the same time they should be profitable and they should have the social equity and should be acceptable.

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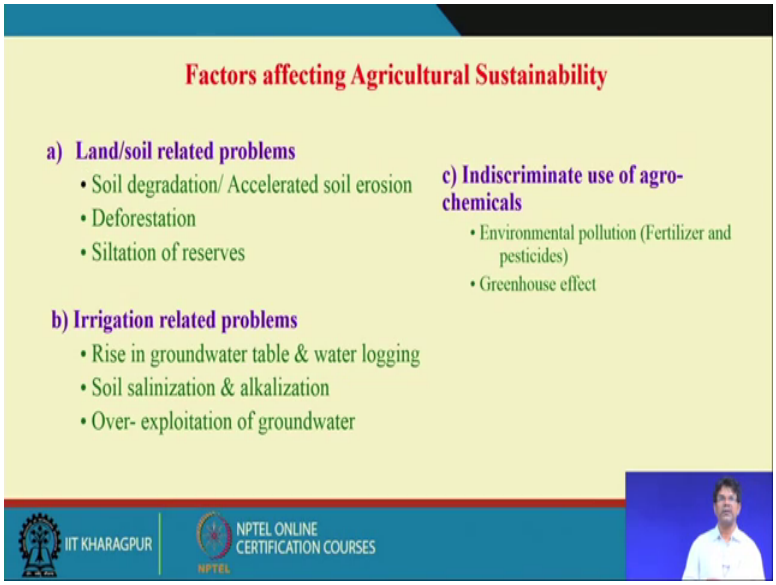

So, now we will discuss with factors affecting agricultural sustainability if you say; what are the factors that leads to sustainable agriculture. So, you have 3 factors as a

technological point of view that say land and soil related problems. That means, the as you discussing the soil degradations, soil erosions, deforestations and siltation of reserves so, that is we say. So, that makes the soil quality degrades soil health degraded because soil health should be protected soil fertility should be enhanced should be maintain long term basis. So, that it can provide nutrients to the crops as per the need to give the proper yield to have a better yield.

And second indicatorize irrigation related problems. So, that that leads to sustainability means the rise in groundwater and water logging that is say sea water inclusion also that makes the soil salinity and also there is a problem soil alkalizations then over exploitation of groundwater. So, due to because now as due to climate change the apply to water for the agricultural production is going to limited.

So, it should use the water very efficiently and economically and third one this is indiscriminate use of agro chemicals that causes pollutions that is environmental pollutions either use to fertilizers and pesticides and the greenhouse effect because of the agricultural activity the intensive use of chemical fertilizers and pesticides.

So, there is a greenhouse gas emissions high CO 2 content or they can say the tillage operations if you go for the conventional tillage more opening of this has more carbon dioxide emission to atmospheres. So, that causes greenhouse effect and the global warming and the agriculture also contribute to the global warming due to this the activities as a conventional farming.

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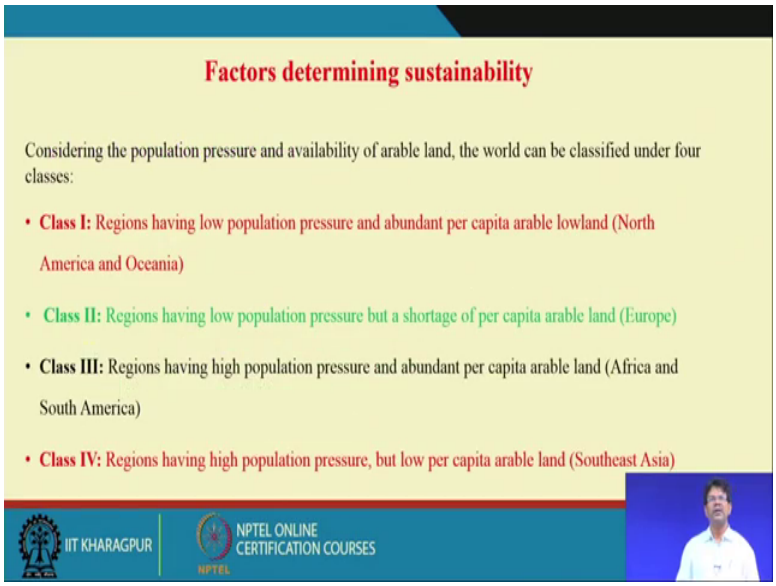

Then you; what are the factors determining the sustainability if see considering the population pressure and availability of arable land the world is classified under four categories the class I; region having low population pressure and abundant per capita arable land that is a North America and Oceania and the class II regions having low population pressure, but shortage of per capita arable land; that is Europe; class III regions having high population pressure and high per capita arable land that is a Africa and South America and IV ones where these South Asian continents where do belong regions having high population pressure, but low per capita arable land.

So, you look for the sustainable agricultural production for the four regions the approaches towards sustainability may not be same for all cases the approach for class I having the low population pressure, but high per capita arable land and see a class IV having high population pressure, but low per capita arable land, they are different. We can have a same approach for class I and class IV in order to have a sustainable agricultural production.

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So, how sustainable agriculture how can achieve because there is a big, but a question before us how can the world adequately feed more than 9 billion people by 2050 in a manner that advances economic development and reduce are the pressure on the environment. So, we want the economic development should go on, we should have the progress through economic development at the same time we want to protect the environments.

So, there is a big question how to achieve this, how to increase the production to meet the demand of the growing populations in a sustainable environments without degrading environments so, that is a questions before us. So, answering it requires a great balancing act of the 3 needs which must be made simultaneously.

So, what are these the first act is the world needs to close the yield gap or the production gap between the food available today and that needed by 2050. So, if we want to meet the 9 billion populations by 2050. So, we must see what is what is the gap of food productions what is a available today and what is needed by 2050 and how we can close the gap and second the world needs agriculture to contribute to inclusive economic and social development agriculture because contribution agriculture to economic development and social development is a must.

And third one the world needs to reduce agricultural impact on the environment; that means, the 3 the balancing act you know. So, in order to have a sustainable agricultural

production; that means, to feed the growing populations by 2050 you can say nine billion population 2050 and in a sustainable agricultural production sustainable way. So, this 3 approach that should be parallely go ahead; that means we have to increase the productions in order to meet the growing demand of the ever increasing populations at the same time.

So, agriculture should grow; that means, more production you should contribute to economic development this should give employment generations and economic and the social development at the same time, we will say that, no, it should not harm the environments, it should protect the environments; that means, we need to increase productions in a sustainable environments.

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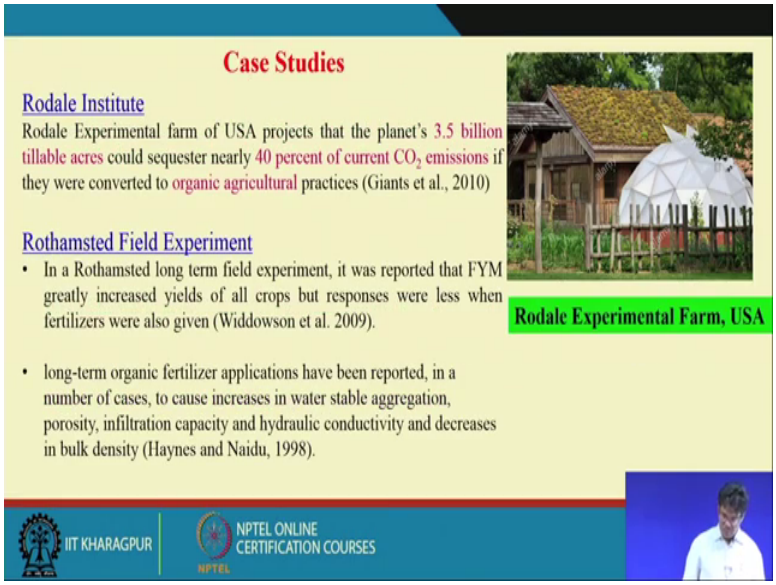

So, if we give some case studies of sustainable agricultures there is a as Rodale Institute so, that in US; so, as per the project that the planets 3.5 billion the arrival area the tillable acres could sequester nearly 40 percent of current carbon dioxide emission if they were converted to organic agricultural practice. So, that means, as you saying if you go for organic farming and the proper tillage operations, proper input managements then the carbon it needs a increasing carbon dioxide sequestrations.

So, the carbon dioxide release from the practices should be minimized by this organic farming approach a case study from the Rodale Institute and the Rothamsted experimentations they have reported that use of FYM farm a manure that greatly

increased yields of all crops, but responses were less when fertilizers were also given because if you if you apply the chemical fertilizers and the organic togethers, so, we may not get a good response of the organics with chemical fertilizers that is for reason.

And the same sites Rothamsted a long term experiment the option that organic fertilizer applications have been reported a number of cases to cause increase in water stable aggregations porosity, infiltration capacity and hydraulic conductivity and decrease in bulk density of soil. So, due to organic farming there is a water stable aggregates means that if there is more water the better aggregates of soils increasing water stool aggregates that increases the water holding capacity of the soil and infiltration capacity of water means the storage capacity of water hydraulic conductivity and decrease bulk density means which of organic fertilizer organic manures say porous materials.

So, that decreases bulk density soil becomes porous and it facilitate better root growth better nutrient release fertilizer soils and so, also the better uptake of nutrients efficiency of nutrient class will be better in case of the organic input management by changing the soil physical properties.

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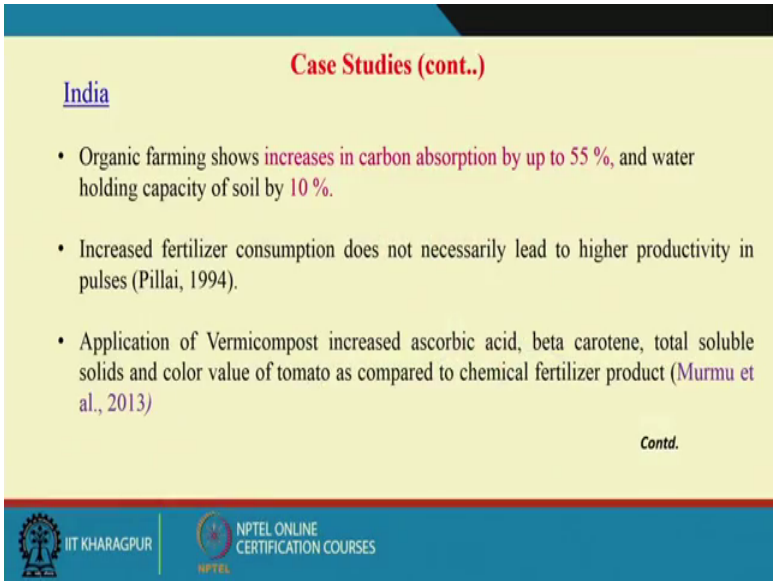

And in India, to see some strategy, they have shown that organic farming shows increase in carbon absorptions by up to 55 percent and water holding capacity of soil by 10 percent as. So, there are also several research can say because with using organic fertilizers or the organic manures it changes the soil rises peers because it increases the

microbial populations, it increases the root growth of the soils better root ramifications and as the rises where environment changes and neutron release of the soils and that makes the soil activity the porous that increases the water holding capacity because organic materials have the very low burden density of course.

And if we are adding to soils and that makes some changes chemical and the physical changes in the soil structures, soil properties and that increases that only capacity so; that means, if you are using organic you can minimize the water requirement or the water application to crops can be minimized through organic farming.

And increase for the other research of the Pillai; 1994 reported that increased fertilizer consumption does not necessarily lead to higher productivity in pulses because they say the pulses are the they are less responsive to nitrogen fertilizer applications they are somehow responsive to prosperity fertilizers. So, like the pulse crops high application of the chemical fertilizer he may not get the more response the yield response may not be high the fertilizer inputs.

So, that is I discussing were little discuss also when you go for the conversions or the two organic farms. So, the initial years the beginning years we need to go for the crops they are the less neutron demanding like less neutron demanding like pulse crops are better suited if we go for the initial the beginning year of organic farming.

So, the another research reported from this application of vermicompost increased ascorbic acid, beta carotene, total soluble solids and color value of tomato as compared to chemical fertilizer product. So, this is from our finding. So, one of my research class from through his PhD research. So, if we are applying vermicompost increase of sweet corns and the tomato cropping systems.

So, use of vermicompost the yield is as good are the chemical fertilizer you are using the vermicompost to lead the nitrogen fertilizer demand of the crops as in chemical fertilizer. So, you are applying the high quantity of vermicompost. So, in that case; so, though yield is maintained at the same time we see the better quality of the produce as the tomato. So, there is a increase in ascorbic acids that is a antioxidants contains and also beta carotenes total soluble solids and color value of tomato is higher in case of the vermicompost treated plots as compared to chemical fertilizer products.

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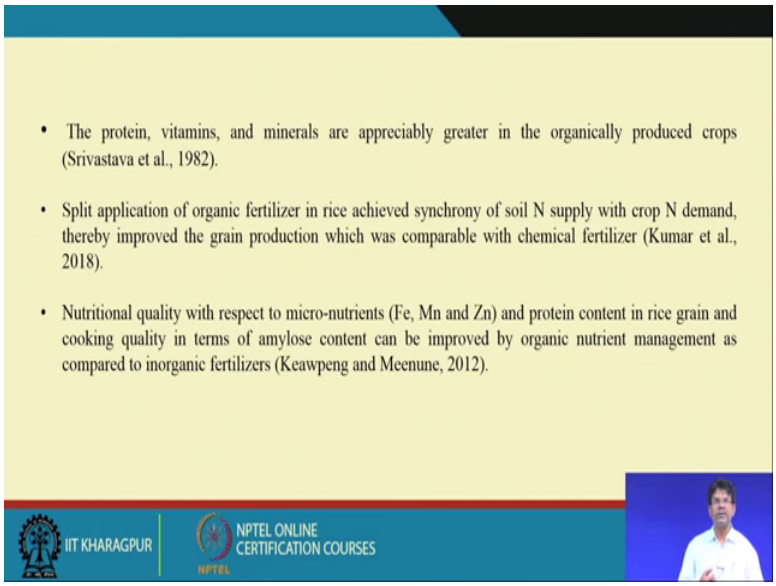

And the other research see the protein vitamins and minerals are appreciable greater in organically produced crops as reported by Srivastava et al 1982 and one more research from our group that is a split application of organic fertilizer in rice achieved synchrony of soil n supply with crop n demand thereby, I improved the grain productions which was comparable with the chemical fertilizer. So, you know as I discussing some crops are less responsive to organic input managements.

So, rice is one of the examples as say because no these are the serial crops as you say none this is a determinant crops; that means, they are the growth phases are very sequence very specific, if we want to increase the productions get a higher production from rice crop. So, nutrient management was very specific far most usually apply the urea fertilizer as you say nitrogen fertilizers at particular growth stages, we do not apply all nitrogen at the very beginning at the basal.

The split applications to meet the specific requirement are the specific growth stages of the crops we apply at the time of showing at the planting of the crops and also we applied at the critical stages like pillaring stage and the panicle incision stage and some cases also sometimes you go on application flowering stage. So, in this case in for that regions the rice crop is highly responsive to n fertilizer because. So, as you are applying the nutrients are specific growth stages.

So, specific growth components are promoted are specific growth stages, if you apply nutrient of the pillaring there is more clear formations that is one of the components for the higher yield if you apply are the panicle incisions that that increases more number of grain formations and. So, that is why say gets higher yield in case of the what we did whether we can attain or maintain same yield as of chemical farming through organic farming we did split application of organic fertilizers. We applied a basal 50 percent and rest 50 percent.

So, during panicle incisions; so, through that applications what you see as compared to one time applications or two time applications of same those of organic fertilizers that has a better output as compared to one time. So, this is one of the that also published one of the field crop is general that also you have seen in case of the rice there is a improvement in the quality the nutrient value also higher in case of the organic fertilizer as compared to chemical fertilizer.

And the nutritional quality with respect to micro nutrients that is iron, manganese, zinc and protein content in rice grain and cooking quality in terms of amylose content can be improved by organic nutrient management as compared to inorganic fertilizers. So, this is a research from the Keawpeng and the Meenune 2012. So, other researchers; they have also reported with organic farming. So, there is a better micro nutrients content rice and also. So, cooking quality is higher amylose contents can be improved in organic nutrient management as compared to inorganic fertilizer.

So, what you say if go for the sustainable agricultures as we are we are looking for the productions we want to attain productions as of chemical fertilizer or we want to improve the productions as per the demand and at the same times we have we want to have a better quality the crop should be free from are the produced may be free from insecticides pesticides it should have higher secondary metabolites quality products like your ascorbic acids poly phenols and many carotenes are there.

So, should be reach in secondary metabolites at the same time we want to say that it should protect the environments, it should not harm the environments; that means, the agricultural practice that leading to higher productions that leading to better quality of the produce should not harm the environment at the same time you will see that the minimum damage or no damage to environments; that means, no emission of or less

emission of greenhouse gases we can say no emissions quarreling the greenhouse gases from the atmosphere at the same times higher sequestration of carbon dioxide in the soils building the soil fertility for the land from basis.

So, that is what you say sustainable agricultures. So, this is a great challenge as you discussed challenge for us how we can meet the food demand of the future; that means, the increasing food demands with a better quality food in a sustainable environments ok.

Thank you very much.