Organic Farming for Sustainable Agricultural Production

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Lecture - 09
Organic Farming and Climate Change

So I welcome you for this subjects Organic Farming for Sustainable Agricultural Productions. So today's lecture 9 Organic Farming and Climate Change. So, in this lecture we will be explaining the impact of climate change on food grain production in general and particularly for the countries located in tropical and subtropical wealth like Indian condition and the next lecture we will discuss the how organic farming can be factorized to mitigate the climate change or as an adaptation to climate change.

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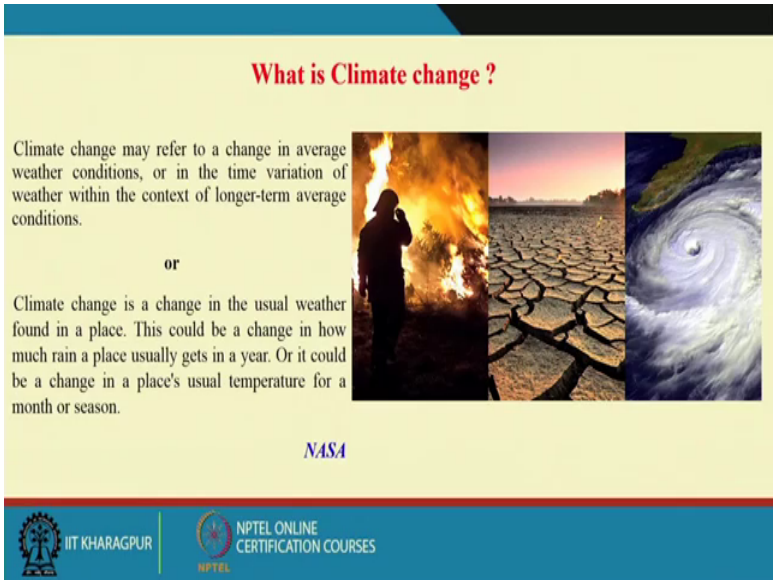

So, if you see the climate change, what is climate change? This climate change may refer to a change in average weather condition or in the time variations of weather within the context of longer term average condition or you can say climate change is change in the usual weather found in a place.

This could be a change in how much rain a place usually gets in a year or it could be a change in place usual temperature for a month or season.

So, as you see so there is a rising temperature due to rising concentration of carbon dioxides and other greenhouse gases in the atmosphere.

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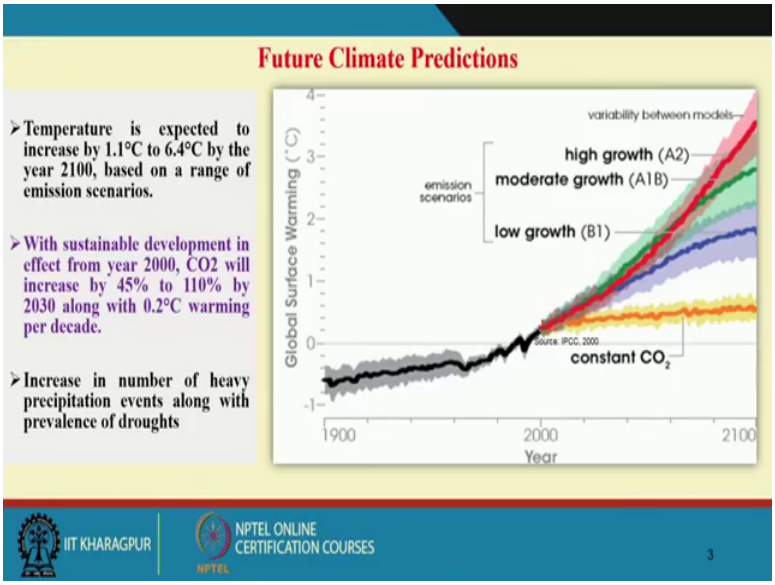

If you see the how temperate rising past years from 1900 as the project up to 2100 and you can see here there is a constraint rising in temperature and this is the scenario for the constant carbon dioxide, if there is no increase in carbon dioxide level.

And these are the emission scenarios, either, the low growth; that is a B 1 scenario or the high growth that is A 2 scenario and the moderate growth A 1 B scenario based on the carbon dioxide emission.

So, with this scenarios it is predicted the temperature is expected to increase by 1.1 to 6.4 degree Celsius by the year 2100 based on a range of emission scenarios; that is either the low growth or the high growth from B 1 to A 2 scenario. With sustainable development in effect from the year 2000, the carbon dioxide will increase by 45 percent to 110 percent by 2030 along with 0.2 degree Celsius warming per decayed.

Increase in number of heavy precipitation events along with prevalence of droughts as you know the climate change means. So, there is a rising temperature as you see the global surface temperature is increasing and the rainfall variability, we receive the increasing number of high precipitation events. So, that causes the soil erosion, soil digression and also the floods.

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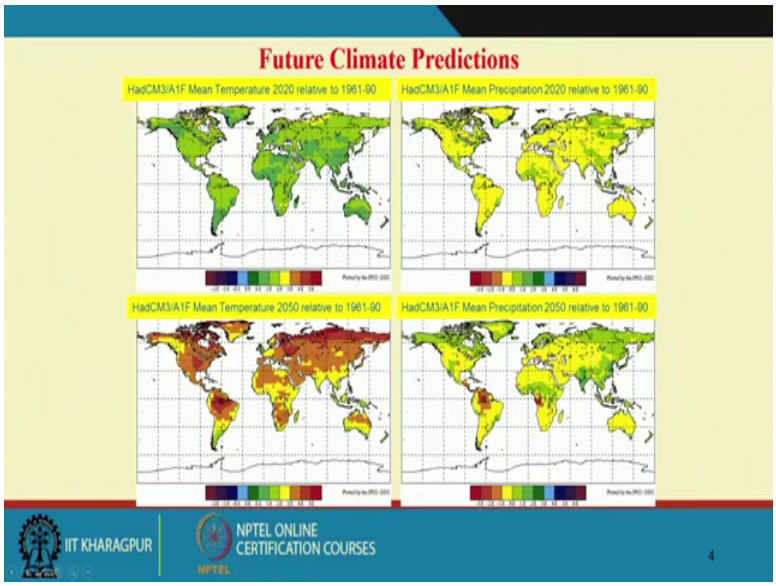

And to see the future climate predictions as compared to the base year 1961to 90, the rising temperature all over the globe is up to 1 degree Celsius in 2020 as compared to the base year 1961 to 90. If you see the rising temperature in 2050, this is more than 2 degree Celsius all over the world.

Similarly, there is variation in precipitations. So, in some locations there is increasing and some locations there is a decreasing precipitations there in 2020 or in same 2050. So, there is the rainfall variability is there from location to locations and temperature is rising in all locations in future years.

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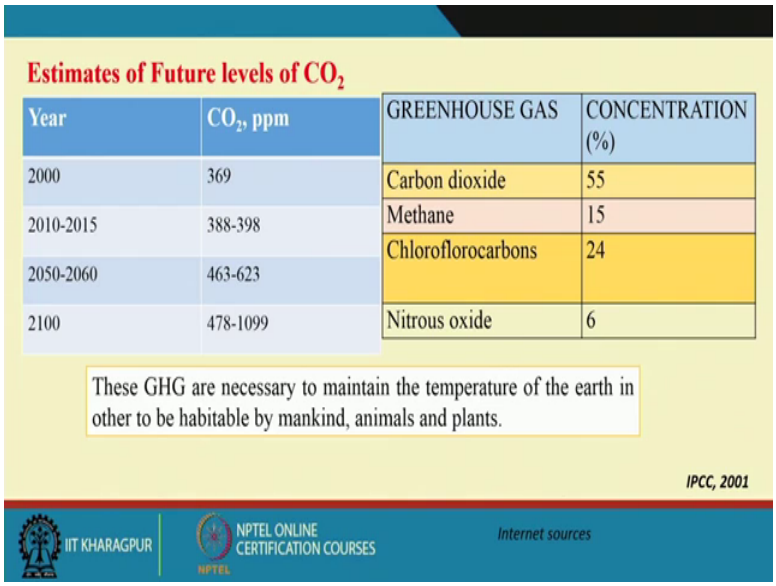

So, estimates of future levels of carbon dioxide that shows in the year 2000, it was about 370 ppm and year 2010 to 2015 to the around 388 to 398 ppm and 2050 to 2060 is projected is around 463 to 623 ppm, on 2100 it is around 478 to 1099 ppm. And if you see the global warming, due to the increase in greenhouse gas concentration atmosphere, so, among the greenhouse gases carbon dioxide is the major one.

The carbon dioxide is around 55 percent followed by chlorofluorocarbons that is a 25 percent, methane 15 percent and the nitrous oxide this is 6 percent. So, this greenhouse gases are necessary to maintain the temperature on the earth and to make the life possible on the earth due to the presents of our greenhouse gasses. So that receives the long wave radiations and makes the atmosphere warming and make the life and the plants human beings possible in the world.

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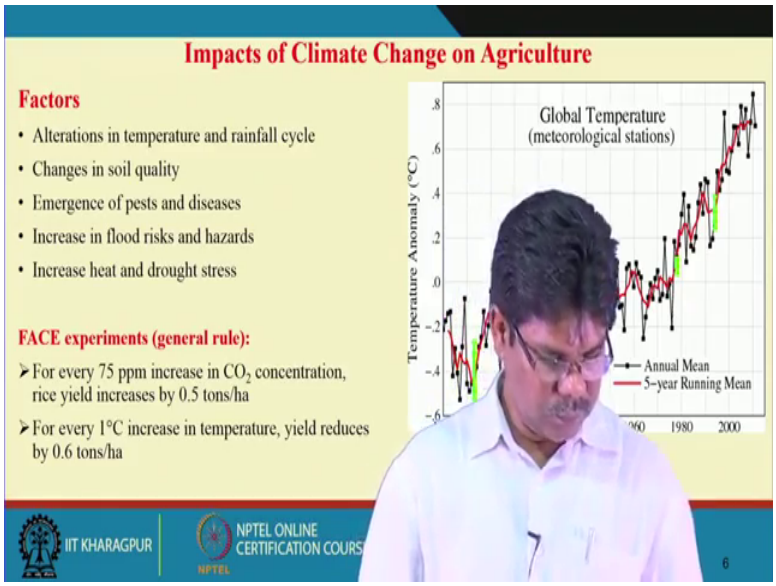

If we see there a rising temperature from 1880 beyond 2000 you can see; so, there is A constant increase in temperature from the past years and it expected to increase the future. And if you see last 100 years from 1906 to 2005 the temperature has increased by 0.6 to 0.9 degree Celsius.

And interestingly the rate of increasing temperature is almost double in the last 50 years and as there is a constant increasing temperature the global surface temperature, it will have the; it will affect the agricultural productions. So, how the temperature or the carbon dioxide or the variability rainfall is going to affect the agriculture?

So the factors that will be influence alternation temperature and rainfall cycle, it will have impact on soil quality. As you see because of the precipitations and the temperature and there is the increasing intensity of high precipitation events. So, that may cause the soil erosion or the soil digressions and loss of the soil quality. And moreover the increasing carbon dioxide concentration and the temperature may also influence soil chemical properties and the soil microbial population inside.

Of course, the emergence of pests and diseases; as the carbon dioxide content is increasing and consequent there is a rising temperature, so, that may influence the emergence of different pest and diseases and it is the problem is very severe in the tropical and the subtropical countries, where the temperatures already high and any

further rising temperature. That means, it is not only pests and disease of course, the weed population.

And increase in flood risk and the flood hazards; as we discussed now because of increasing number of high intensity precipitations. So, that may cause flood risks may cause the floods plus flood and sometimes there may be drought as well. So, that will have the heat stress and the drought stress on the plant body. And from the experimental observations as a face experiment that is a free air carbon dioxide enrichment experiment where we are injecting carbon dioxide to the atmosphere as per the rule.

So, for every 75 ppm increase in carbon dioxide concentration, rice yield is increases by 0.5 ton per hectare. At the same time for every 1 degree Celsius, increasing temperature rice yield is decreases by 0.6 ton per hectare.

So, that means the increasing yield with rising CO2 concentration and decreasing yield with rising temperature. That means the positive effect of carbon dioxide is nullified with the consequent rising temperature. And see the projected impact of global warming on food sector.

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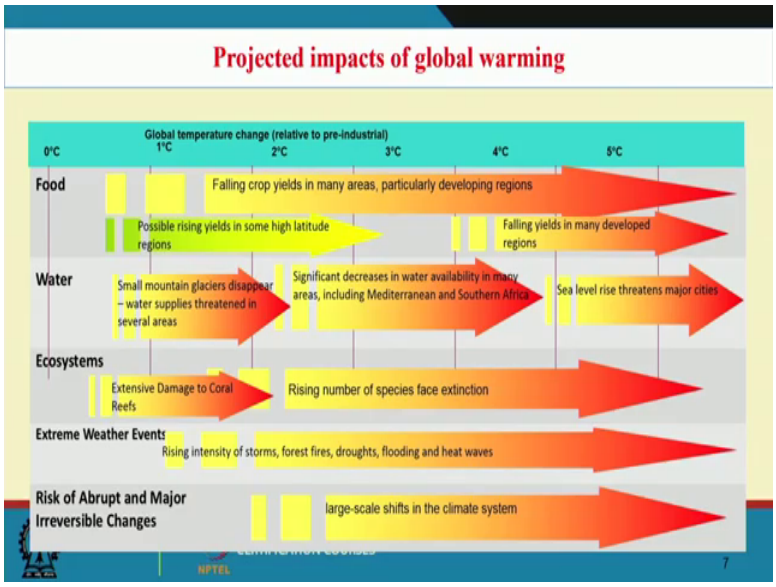

So, the food productions or the agricultural productivity is likely to be reduced in tropical and the subtropical countries for even 1 degree Celsius rise in temperature. That means, the tropical and subtropical countries, the crops are grown with under the high

temperature. So, if there is any increase in temperature even for 1 degree the agricultural productivity is likely to be affected.

And the most of the countries located in tropical and subtropical belts are developing countries; they have the less adaptive capacity to climate change. On the other hand, the temperate climates and the countries located in high latitude; for those countries they may experience the benefits of the high temperature. The yield may increase if the temperature increases up to 2 degree Celsius.

However, the further rise in temperature beyond 2 degrees Celsius is likely to have detrimental effects or the adverse effect on crop yield of those countries. Similarly, if you see the water there is a significant decrease in water availability in many areas and of course, there is sea level rise and that threaten many cities and also that brings the salinization of the coastal area and degradation of this land quality.

An ecosystem, so, there is a damage to a coral reef. So, rising number of species extinction from the oceans, then extreme weather events. So, there may be forest fire, droughts and floods. So, we are also facing in Indian continent same problem because in some in some seasons we may have the long dry spell that brings drought specially for the rice crops which is grown during the monsoon periods, southwest monsoon during July to December.

So, if there is a dry spells even for 1 week or 10 days, the crop is really likely to be effected and sometimes there is flood because of the high intensity precipitations. So, the flood also that mesh damage to the crop. And there is a logical shift in the climate systems as we see.

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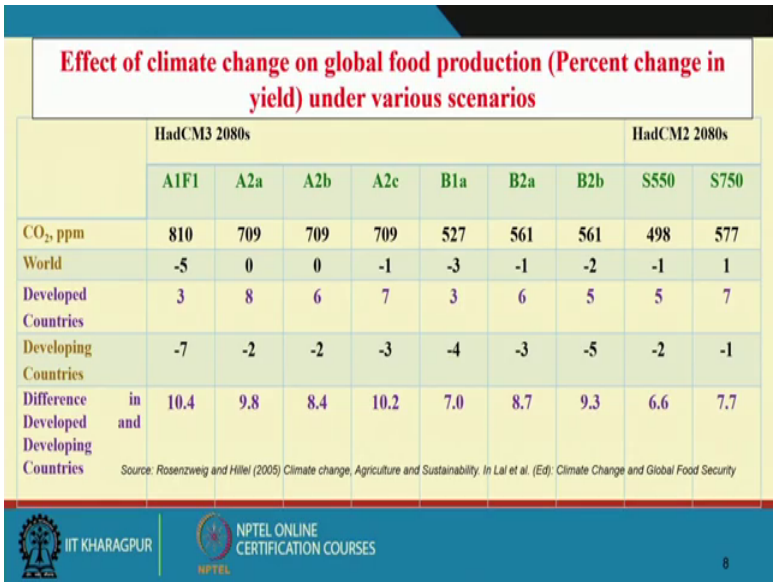

So, if you see the effect of climate change as forecasted using different scenarios of climate change on food and production of the world. So, different CO2 concentration that is either the 810 ppm, 709, 527 that is based on different scenarios. And from this table you can see that yield of the developed country that is expected to increase in future climate scenarios that increase may be up to 8 percent.

At the same time the yield of developing countries that is expected to decrease with in future scenarios and the decrease maybe up to 7 percent. So, there is a difference in the yield in developed and the developing world and if you see the world food productions that ultimately decreases by 5 percent because of the difference in the developed and the developing country food production.

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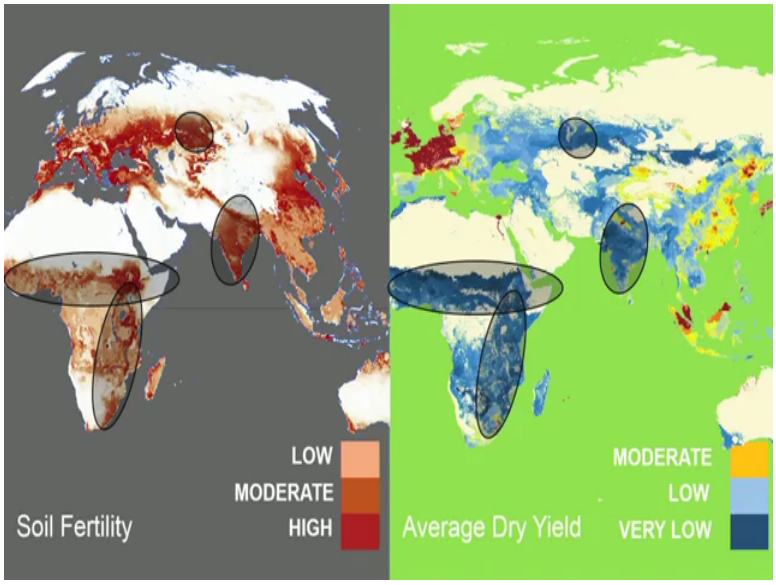

If see the land utilizations, the soil fertility and you see all over the world the soil fertility is moderate range; either moderate or high. But, you see the agricultural yield in India and this African countries, is very very low in spite of the moderate soil fertility. So, this indicates there is no proper utilization of the land.

Land utilization is the issue, as you see the yield is very very low in those countries like Indian continents or the African continents, though this soil fertility are moderate level. So, that indicates that that says about the proper land utilizations that means, proper managements of the soils could be done to enhance the production level.

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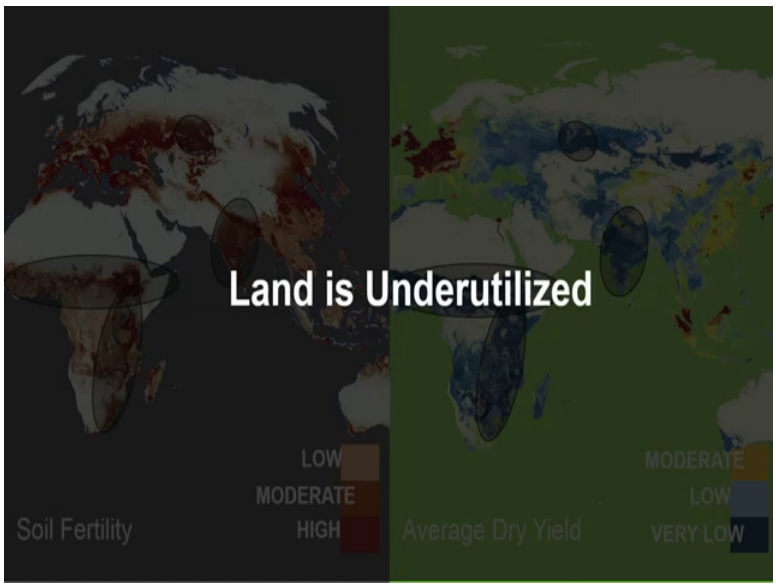

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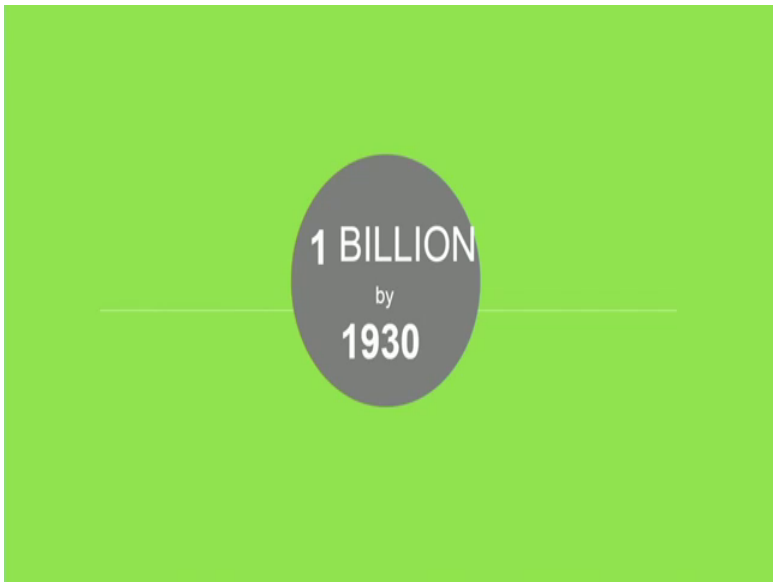

So, land is underutilized. At the same time, as you are discussed in the earlier classes there is rising populations so, there as 1 billion populations in 1930.

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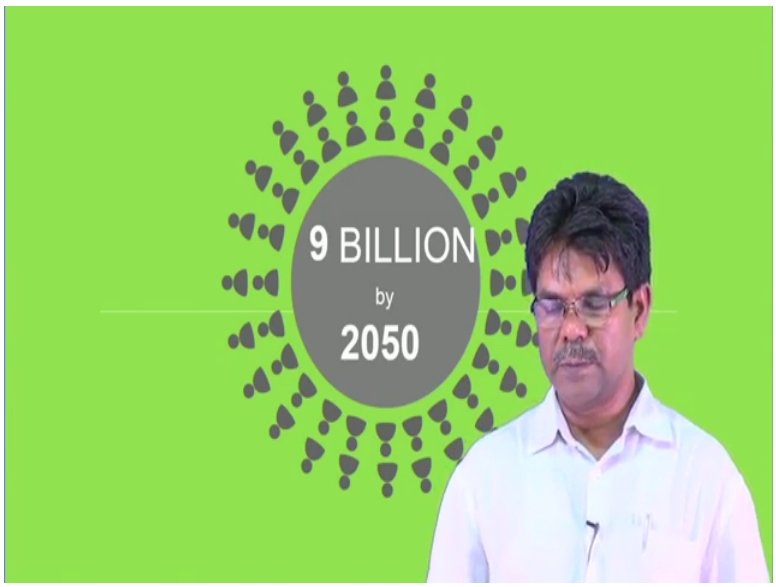

So, the population is rising with time and we can expect around 9 billion population by 2050. So, this is a great challenge how to feed the growing population in a sustainable environment.

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So, that means, the food security is a issue in the future climate scenarios. If you see of the food security of the climate change and the food security, food security has 4 major components.

That is food availability through production and trade, stability of food suppliers, access to food and actual food utilization. So, these are the 4 major components of food security. If the 4 may components are satisfied then you can say the globe or the nation is secure in the food. So that means, why is a food availability means food availability depends upon the production.

There should be sufficient productions to meet the demand of the populations that is the food availability. Stability in of food supplier; that means, the food should be there is a international trade the suppose some locations there is a deficit in food production and some locations produce more of rice, some location may produce more of wheat. So, there should be a supply of food from the high producing area to the low producing area depending upon the demand.

So, that is a stability of food supply should be there and third one access to food; that means, every person should have access to food, they can get the food even now you can find some locations, in Africa can say, in India also people have no access to food.

They do not get a square mill also; that means, so, that is a even though even though we have we are sufficient in food grain productions, but many people they are deprived and they are living in hunger. So that means, access to food should be there and the fourth one food utilization that is very very important.

Even though if you are satisfied the all 3 there is food productions; that means, availability, there is food supply and there is everybody is access to food. Then what is the food utilizations? Food utilization means, how the foods utilized in your body in human body; that means, it needs a balanced diet.

Not only carbohydrates, suppose everybody gets carbohydrate rice plenty of rice or plenty of wheat. So, you may not have a healthy human being having only carbohydrate; that means, you need carbohydrate, you need protein, you need minerals, vitamins. So, this is a combinations of food or the balanced diet can make a healthy body that is what we say food utilization. If you if a child takes only carbohydrate the carbohydrate may not be utilized in the body.

For proper utilizations, you need some proportion of proteins, some proportion of vitamins and minerals; then the carbohydrate can be utilized in the body. So, that is what a actual food utilizations. So, for this you need a balanced diet. This is what say food security. So, the climate change is likely to influence, we likely to have impact on food security.

Then besides climate change the factors may cause food security problems are regional conflicts and the change in international trade agreement and policy because government policy and it may happens, there may be the disease outbreaks infectious disease or other social factors they may influence the food security in long run.

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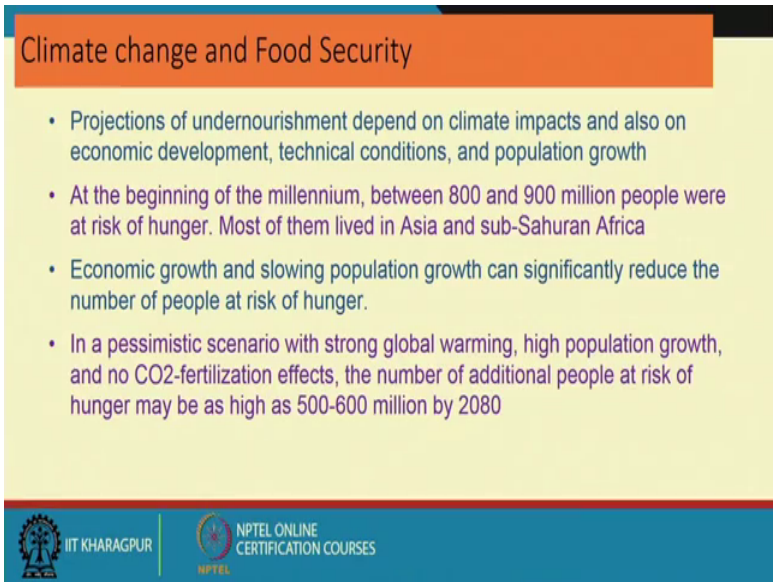

So, how the climate change? That may impact food security. The projections of undernourishment depend on climate impacts and also on economic development, technical conditions and population growth.

So, the report from the UN says that at the beginning of the millennium between 800 and 900 million people were at a risk hunger and most of the people lived in Asia and sub-Sahuran Africa. Economic growth and slowing population growth can significantly reduce the number of people at risk of hunger.

However, in a pessimistic scenario with strong global warming, high population growth and no carbon dioxide fertilization effects, the number of additional people at risk of hunger may be as high as 500 to 600 million by 2080. So, this is highly alarming.

So, to decrease the number of people hunger in the pace of the in the view of the climate change and the population growth, so, you need to have the technology, the technological interventions, you need to have the adaptation strategies; how to minimize the adverse impact of climate change on food grain production.

At the same time, agriculture is also contributing to climate change. We can say there is the 2 way; agriculture is a victim of climate change as well as cause of climate change. So, being a victim of climate change, we need to have adaptation technologies.

How to minimize the adverse impact of the climate on agricultural production? At the same time we should have the technological interventions or the breakthrough technologies how to mitigate the climate change as we discussing organic farming is a candidate which can mitigate the climate change that can reduce the emission of greenhouse gases to the atmosphere.

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So, with this, so, there are many challenges before the farmers. So, being a farmers working in the field in harsh climate, so, he faces a lot of challenge. That means, to have a better production or to have a quality production you can say you can say organic farming that gives better quality.

There are several other factor also, those influence quality in the field level management you can say. So, what time you are the weather parameters also if there is high solar radiations are also below solar radiations that also influence the crop productions as well as quality. So, the Newton managements, the atmospheric weather parameters and the weather parameter also time of planting or the time of swing of the crop that also indicates the role of the weather parameters.

If you show a right time, the crop may get the optimum weather parameters for a better growth and the quality. If there is delay in time planting time either the early planting or the late planting not only a it not only affects the production, but also affect the product quality. The product quality get deteriorated due to the environmental parameters. So, for

a farmer, the input that should be available on time, but unfortunately the farm the in our conditions, so, many of the locations the input means the seeds, fertilizers or the materials input materials are not available on time to the farmers.

And good quality inputs, good quality seeds, the seeds having the high production capacity under stress conditions (Refer Time: 25:36) and the seeds that is resistant to many pests and diseases, those type of quality seeds should be available to farmers on time. Then of course, the climate change. As you see the climate change that is one of the threats to agricultural productions.

So, how a more than climate change the climate variability; because, if you see the rainfall we will we received almost similar amount of rainfalls in every years, but there is a uneven distribution; sometime there are may be flood, sometimes there may be drought. So, we should have a technology to manage or to contract the climate variability and to manage the food grain productions in adverse weather condition.

Then of course, there is a other factors shrinking farmland, soil erosion and degradations as you discussed pests and disease outbreak due to climate change, drought, floods and frost this also associated with the climate change and the farmers are very poor farmers they have taken debts, loans and mortgages. So, they do commit suicide, so, in case there is a crop failure and there is unpredictable rainfalls, natural calamities.

So, these are the some of the conditions perhaps the external conditions which influence the production or the firm levels and most of them are the driven by the climate and at the climate and the climate variability or the climate change.

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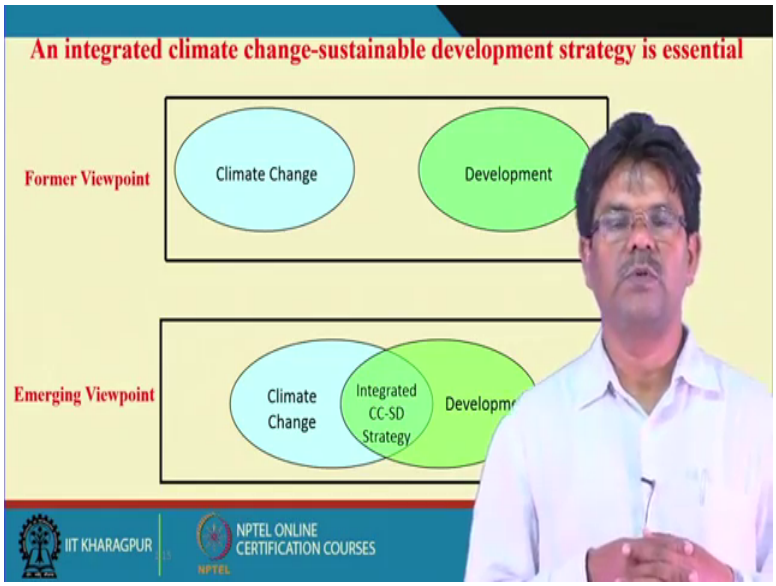

So, that if you have a balance; so, we need the economic development should go on. So, we cannot sacrifice the economic development that should progress and at; so, because of development and there is climate change, so, they are linked. So, because of the economic progress development that brings the emission of greenhouse gases and that brings climate change. So, we cannot see them as a independent for a sustainable growth for a sustainable productions for a sustainable society that is a emerging view. It should together climate change and development should go parallely because climate change there is change climate or the climate variability and the development has to come up because we also we cannot stop development.

So, development should progress. So, at the same time we should look for the integrated climate change and sustainable development strategy. So that means there is climate change and there is sustainable developments. So, looking at as you are discussing earlier classes also, so, how we can bring our package at the production package at the production technology, so, that we can go on increasing productions evenly under the pressure of the climate change even though there is a rising temperature or production level should go on increasing we cannot sacrifice yield.

At the same time we need a better quality of the foods for a healthy living, we need to the in healthy society healthy living. So, that that talks about sustainable so, friends; so, this is about the climate change impacts on food productions.

And as you see, so, it indicates, so, there is a negative impacts, climate change is affecting the food production adversely, but we need to come out we need to have the technology to minimize the adverse impact of climate change and food production. At the same time in the we will discuss in the next lecture how organic farming plays a role in as a climate change mitigation.

Thank you.