Farm Machinery
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Lecture - 17
Equipment for Paddy Transplanting

Welcome students, we will now talk of Transplanting. You recall in my previous lecture I said that we are talking of equipment for seeding, planting and then transplanting. I give a reference brief reference while talking there of planting. So, transplanting is that we are planting certain level of seedlings at one location and then we will remove from there and then put in a bigger field, where in certain amount we want we do not want them in groups of 10, 12, 15 like that. But, we want in certain good maybe 2 or 3 seedlings to be put at certain spacing's that is what is known as transplanting. Let us see what is the equipment available, how do we prepare these seedlings.

What are the different processes of that? What are the different equipment available? Well, you must it may not be that um technical in the sense that you may think that there is no calculation and equation, but lot of scientific methodologies involved in preparing the seed seedlings at a in the nursery because, the nursery is where you are growing everything. For example, nursery is the place for the children, when in the nursery if they are not taking care of well then they do not grow up a better human being in the later parts of their career. So, here if you take clue from there the nursery of the seeds also must be there and the seedlings must be taken very very carefully when they are taken from there and then put some words. So, what are the processes involved?

We will go into details of that you might have some of you those who are aware of this might have seen, but I would like to put them together. Because, in this lecture of farm machinery it is very imperative, it is very essential that designer an engineer must have details of all aspects. And, that is why in my lectures you will find so, far and then even later that I have tried to encompass everything which is from a basics to the high level and high technology which will give you a gamut of information to the designers, to the manufacturers and people who are interested in really designing and contributing in the design of farm machinery for betterment of crop field and things like that. So, let us go through this transplanting and learn about the various aspects of this transplanting.

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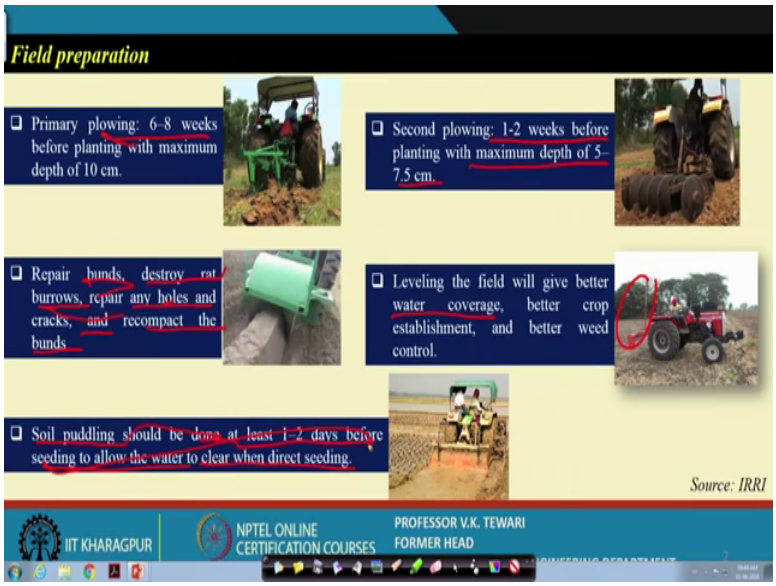

Field preparation very important, what sort of field preparation you should have when you want the transplanting. Primary plowing is essential no need to tell you so, details 6 to 8 weeks it should be done. Secondary plowing 1 to 2 weeks before yes because, now it is nearer you would like to do it, makes planting will maximum depth of 5 to 7 centimetres. See we would like when we are talking of this seed field preparation about 5 to 7.5 centimetre depth the soil must be probably well prepared. The bunds etcetera, destroy rat burrows, repair holes, cracks quarry compared the burns etcetera. These are important because, when we are talking of field preparation we must talk of the proper field.

So, what are the other details? Leveling the field will give better water coverage, the needless to explain that I have already talked of this particularly equipment which is a laser line leveller. And hence, this is very important. Soil puddling now, when we are talking of transplanting particularly with respect to paddy we are talking of puddling soil puddling which should be done at least 1 to 2 days before seedling ok. Now, this is very important when we should be doing this because took well allow the water to clear when direct seeding. Allow the water to clear and direct seedling, when you could be doing direct seeding.

In fact, there are when I explained the different equipment for transfer or paddy I had shown you it syndrome cedar also, where we are talking about direct seeding bloomers. I

mean small germinated seeds were there and then drums were there in which we had talked of that. Now, transplanting when we are talking of growing seedlings and doing; so, when we prepare the field well preparation of the soil after that we maintain that there should be puddling, churning of the soil with a certain standing of water. Now, what is this?

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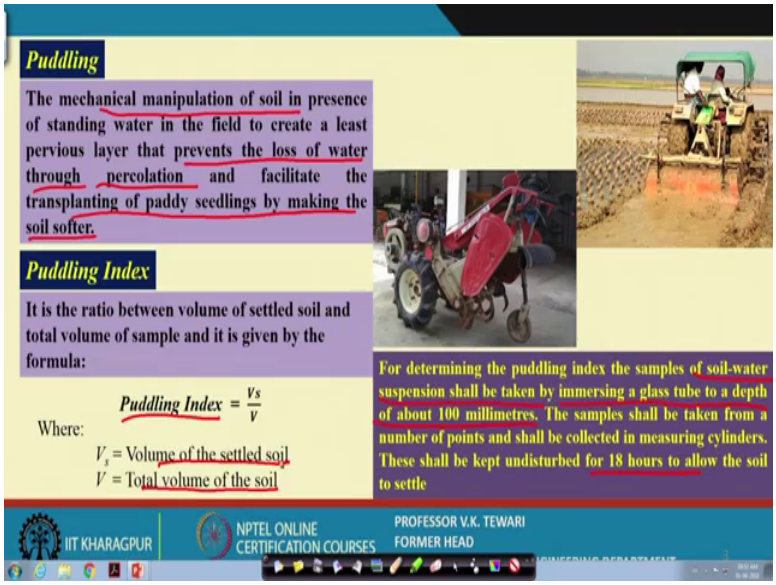

Puddling, this puddling is make mechanical manipulation mechanical manipulation of the soil in presence of standing water very important. So, that it prevents loss of water through percolation. This is the main aim of churning the puddling and facilitate the transplanting a paddy seedlings by making this soil softer. So, while we puddle churn the soil and then we create a certain layer of soil and it is softer; so, that when the seedlings are put in, they will be standing over there.

Now, what should be the quality of puddle? If this is a question which is asked many times people have done lot of work on that and they say what is the level of puddling, we should be having? Now, if you see the process by which is done; sample of a soil water suspension sample of soil water suspension shall be taken by immersing a glass tube to a depth of about 100 millimetres. The sample should be taken from a number of points, it should be taken from number of points and then it should be in the vertical there.

In fact, you should be put in a vertical direction and then take it inside and take the sample, it is not that from out from the top you should take like this. So, if the cylinder is

there is just put it like this, takes it first inside the water and then take the amount of material. And, then that material is allowed to settle down for about 18 hours, you can see about 18 hours then that will settle down. So, the puddling index is then given as the volume of the soil settled and total volume of the soil. So, what is the settled soil for the total volume of the soil? This is the puddling index; the quality of this will talk of the quality of puddle.

Now, see the operation being done here by this power tiller by these rotary we do the operation. So, quality of puddling generally if my experience and we have seen that about 60 to 65 percentage of puddling index or 0.5, 0.66, 0.65 value puddling index will be acceptable to us; if you talk of the condition in which the seedling should beplanted.

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Nursery preparation very important, as I discussed earlier nursery um preparation; how do you prepare that nursery? There could be a nursery bed preparation. Now, a process is shown here process is shown here 100 square meter for a hectare required in nursery. Now, these are some thumb rules that how much of area required for 1 hectare, if you have to sow 1 hectare of area with paddy then what is the area required for preparation of the seedlings industry seedlings. So, it is about 100 square meters for this, nursery bed preparation. Now, there are aspects of bed preparation, you can see these are explained over here. Select a level area near the water source with sufficient efficient drainage system, very important.

Because, then the surface should be covered with banana leaves with need rib removed or polyethylene seats prevent seedling roots from penetrating through this bottom soil layer. Now, these are some of the important things which the person must do and if you go to the farmers and now, they have also come across various methodologies and various ways by which they do it. This is a general way that we are talking of seedbed preparation. But then they give um the fertilizer also some level of fertilizer also there and give some organic fertilizer maybe they will give so, that the seedlings are grown in time.

Now, it dapog or mat dapog here we talk without soil. So, these calls we also grown in the um trees and without any soil. Now, this is another method of growing in the nursery. But, then for that you need to have another infrastructure and the different level of infrastructure for creating that dapog necessary, but is another type of nursery format preparation.

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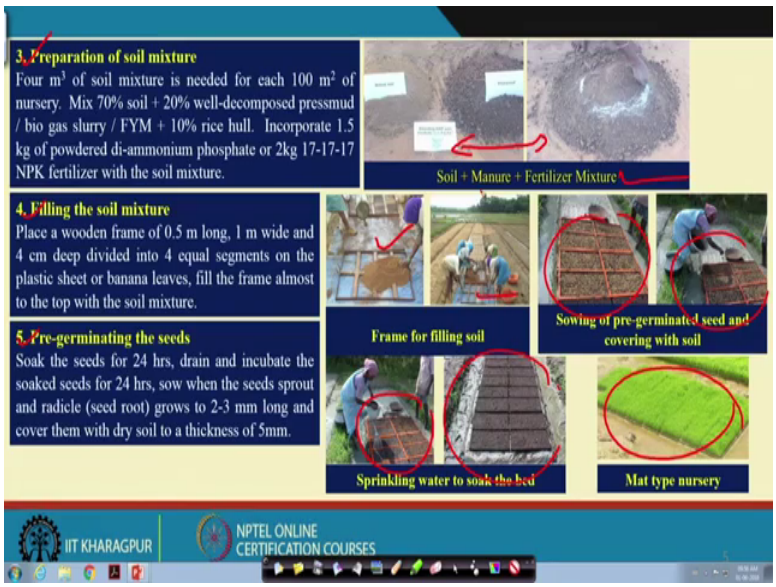

Preparation of this soil, see the details are all given here; you can if you go through the details, you will find that what we do the preparation of the soil mixture. What how is the soil prepared? It is very we have explained over here. In the filling the soil mixture, how do you feel this while mixture each aspect pre germinating. As seeds soak the seeds for 24 hours drain and incubate. Now, each aspect sees mixing the soil manure fertilizer.

Now, you can see that this is what we have tried to do. Then the frame for filling soil now, these are the frames which are filling the soil.

How the filling is taking place and then the sowing of pre germinated seeds and covering the soil. Now, you see how they have done this part of it and how they are trying to cover. Frame for filling soil now, there should be frame for filling of this soil what the frame has been created, sprinkling water to soak the bed. Yes, some water must be there so, that bed is and mat type nursery.

So, this is how the nursery will be available to you. So, if you follow these aspects of preparation, filling and the pre germination as per these aspects which we have explained, it is a very self explanatory in the slide which we have met for you to understand the whole process. And if you follow in fact, the farmers follow these practice several locations we have taken from them. And we have in fact, seen that there is hardly any deviation from one location to other. These are the standards by which even all over the world people follow.

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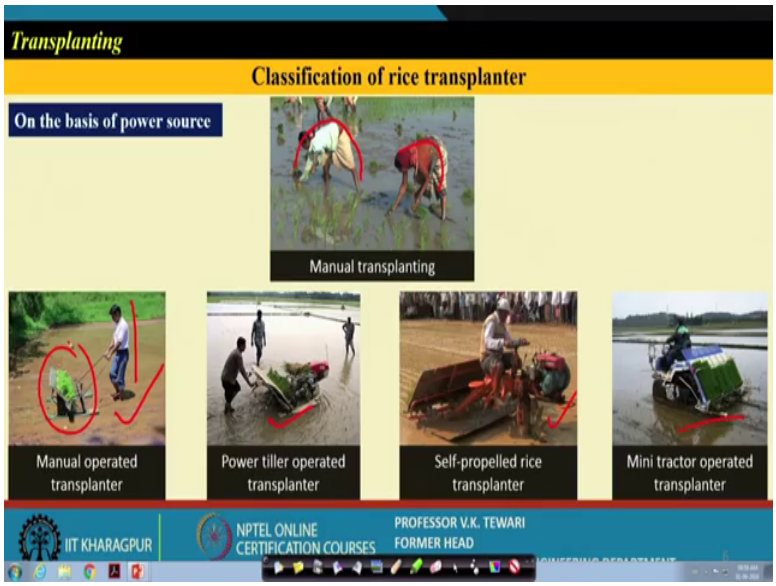

Well, transplanting well needless to say I have told you that the classification of trans planters. So, manual definitely we discussed earlier which is mostly done by the ladies. Then you have several devices have come up manual manually operated transplanters some have come here. We have to go backward then, some of the power tiller ones which are also there. And, then self propelled ones which are very popular in all these countries

particularly Asian countries very much popular. Then mini tractor operated transplanter is also there. In fact, you we will also show you may be in NICS due course will show you the operation of this. But, then on the basis of the power source what are all these things.

At one place you will be in a position to understand to see that what are the methodologies, what are the equipment available. So, this particular slide I feel is very beneficial to you to have a look at all these aspects at one go and at one location. If you want to make any changes, if you want to think that why a particular posture is adopted there are many options, many locations where you can put some design aspect and make it better. Say for example, you have seen here the ladies this is the posture they are they are mentoring. So, it has become essential that there should be a standing posture.

So, from ergonomics point of view this is a posture which is better then, but then this is being pulled in the backward direction. So, this is another aspect that if I go in the forward direction I can do a better job, then when I go in the backward direction, but then there are aspects of this job being done. So, we have to think of this. Then what is the rate at which this the seedlings are being picked up. And what are the types of seedlings and what are the mechanisms of picking the seedlings from the mat we will see in the later slides.

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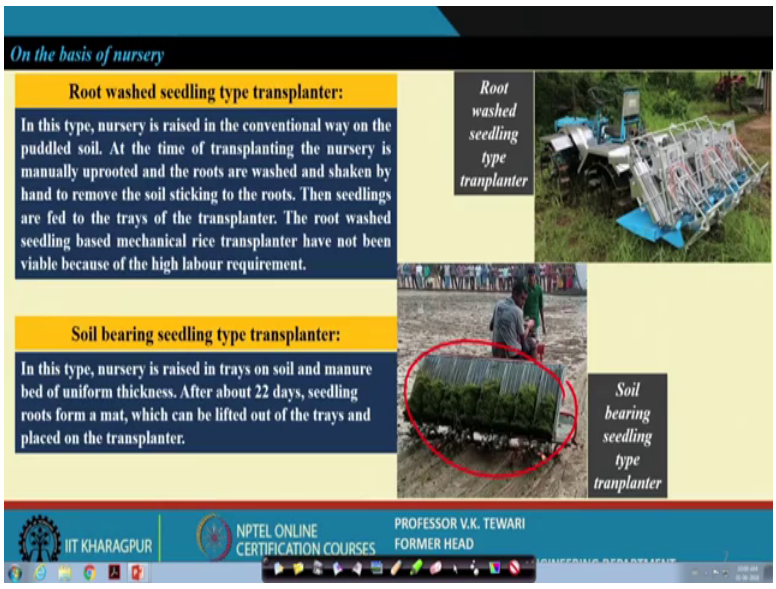

Well there are two types of seedlings, yes if you have seen earlier and maybe the ones which are being used about 20-30 years back mostly the transplanting means, from the nursery they are picked up or then bundled small bundles are made by the ladies in most of the cases. And, they these bundles are then transported on their head and go to the location where it has to be transplanted. So, they will stand in row a row and maintain generally maintain a certain distance of 20 centimetre or so, and then put 2-3 seedlings and this is what they used to do.

Now, that that type of sibling is known in root wash type; that means, we uproot them, wash their roots and then transplant them fresh in the location where do you want. Now, another one where I discussed about in the previous slide that we have mats created and those mats now are kept into the system the equipment which I showed you earlier. For example, here see here this is these mats which are kept here soil bearing seedling type mats now, they call it soil bearing. Now, there are the root was type and this type two types are there and since the people are very much familiar with the root wash type, they would like to have equipment for that.

So, many people have come up with the equipment for root was type also, but you can see the details of such equipment which has been designed. And, some other manual drawn equipment or also seen in literature you will find. But, then one has to appreciate the efficiency of the operation to be completely because, that is the essence. We do not want to prolong for a long duration of time, you get very short duration for doing this operation. So, choosing this and then planning has to be well in advance and should be done properly.

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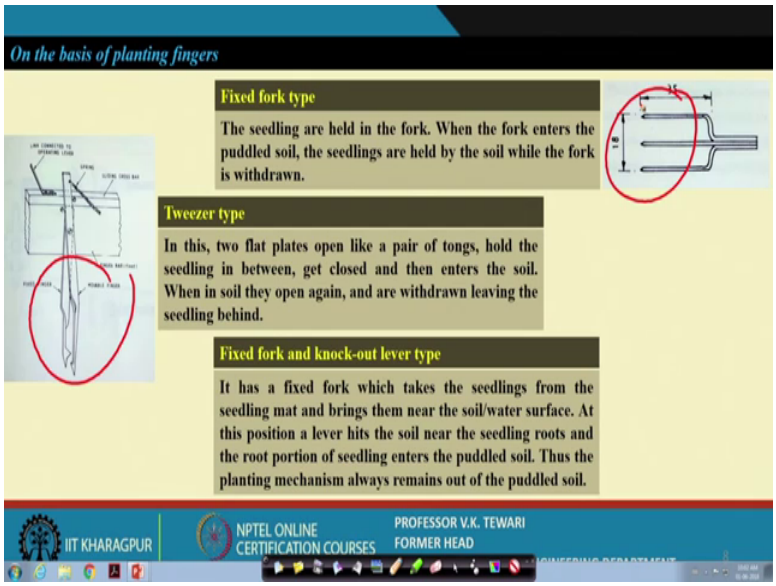

Now, we in the trans in the transplant is particularly hand filled transplanters, if you know that how the seedlings when from the mat how they are picked up. Definitely, if you have a hand like fingers like this you put your finger into a mass, if you want to put a finger into a mass then you can hold it and then bringing back and leave there in the soil and release. Now, this sort of action you can do. Same thing is being done by the fingers which are given, fingers which are there.

One is the tweezer type of seed and then is fixed fork type. Now, the different designers have given different types of these fingers. Now, here is your ingenuity you can think of a better design, there are several I will show you there are several ones. Now, which one is better for which condition, which condition of the soil and which gives you easier action, which gives you less amount of material required, which is very complicated, which is less complicated, which gives you approximate amount of the seedling that you want and things like that. You need to consider when you are thinking of the design.

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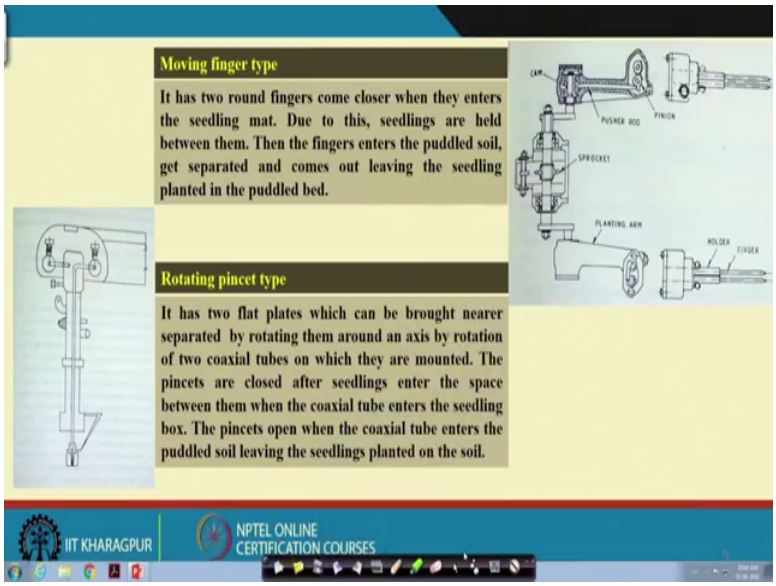

These are another type the moving finger type, rotating pincet type. Now, these details we have given, actually from the literature whatever is available from different locations we have given you. We want that you must have a look at this. Now, you will consider as a designer, you must consider the pros and cons of a particular design. Why a particular type of finger should be picked up? Why not the other type? What are the complications in the design? What is the material of construction? How will be the life of this? How much cost varies involved in this?

Because, you need to while you are talking of particular operation to be done precisely you must definitely decide about these types. There are these various types which have been given I mean I need not go more details into this because, it is already available. But, then I want to impress upon you that you must have a look at these and try to study before you want to think of a new one, which as a designer you must think of. You must see the cost involved, material of construction, their placement etcetera with respect to the power source. What is the size of the power source which you are taking? What is the speed at which you want to do and things like that.

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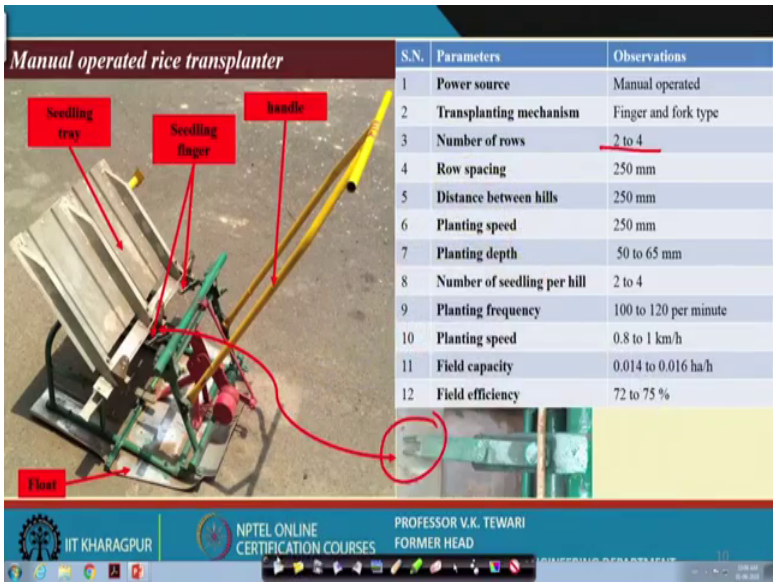

The manual operated rise transplanter, well I have shown you earlier also, but one of these we have just shown you where a fixed type of seedling finger is there; this is this is what it is. So, we have just shown you one which is available and generally this is a 2 row 1. And, number of rows 2 to 4, 2 to 4 actually you can have 2 to 4, but we have seen that particularly for more than 2, it is it becomes very difficult for walking inside the mud muddy field or inside the puddle field.

It has become very our own experiences people have tried 4, but the output will be very very less. But, if you want that this should be operated faster and output is more, then even within 2 and 3 there is a debate and 2 is one which is acceptable even the ladies can use this machine. And, particularly for lady this is 2 and maybe for a male person 3 is ok. People have tried 4 rows, but then one has a designer if you go to the field and actual operation if you see, then you will realize that how much is the time the person is in position to operate.

Because, the ergonomics which I understand that always we must think of the drudgery of the person when you are thinking of design of equipment so, that is important. So, we have just given you here so, that you have a look at the one which is a device where for small farms. If the people are talking in small forms so, a small farmer can have this 2 row unit or a unit or a 3 row unit and is available with the farmers or the manufacturers.

So, it is cheaper and you can use it, you can create a small nursery if he has small field for transplanting.

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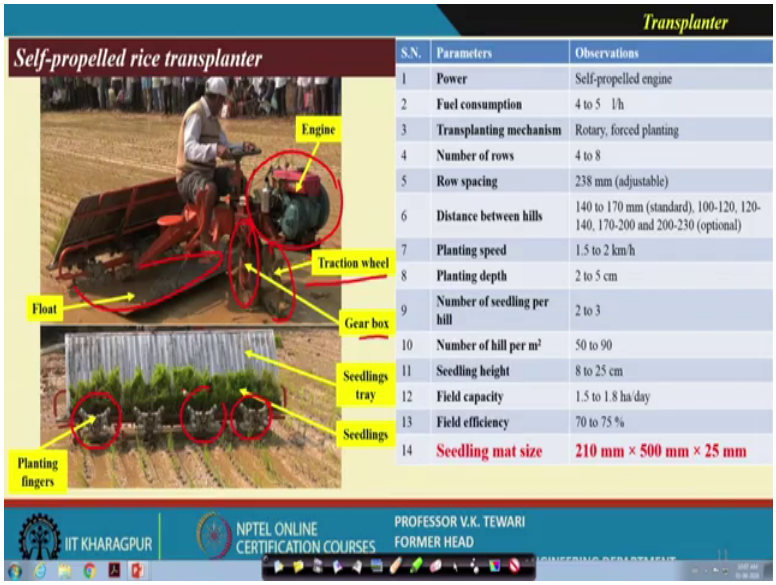

Self propelled rice transplanter, well this is the one which I said that we will be talking of I will be showing you a video also in the actual field conditions. I will just go through the details of that I have shown you, but then it is it is very proper for me to have a look have a look at it and show you what are the details of that. You should have appreciate this point, see the engine the power source which is there we call self propelled. So, it is this is the engine which is giving the power to this. There is a traction wheel which will take, this is a traction wheel here which will take of the traction while it is moving in the puddle soil condition.

Then, there is a gearbox we when we are taking power from the gearbox power from the soil; I mean power from the unit for operation of the fingers as well as movement of the seed tray etcetera. Then there is a float here yes float because, that float will allow you to allow the whole machine to float on the puddle soil, it is very important. Remember if you have a faulty float, then you have a hell of problem and then the machine will not operate, you should not operate by the way. Then planting fingers of course, it is a planting fingers are shown here just for your knowledge and what is the type of fingers planting fingers, you can we have discussed a lot about these. So, we will see a small field operation of this particular device.

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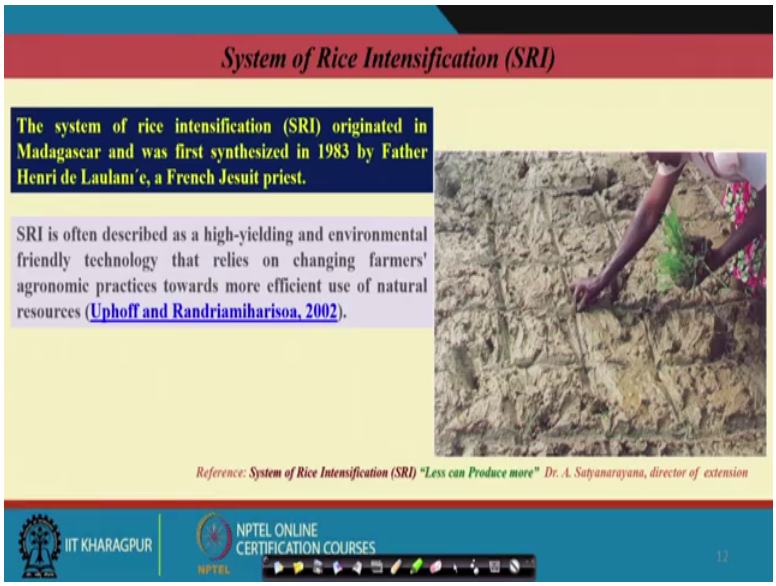

Another aspect of system of rice intensification; this is as people have been talking of this for a long time because; there are certain advantages of this.

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What we want is that, see depletion of water resources. We know that water is a source of scarce commodity which is going to happen. Now, rice productivity is also stagnating yes, it is stagnating we are not in a position to increase the rice yield for various regions. We I need not discuss that here, but yes you have seen over the years that the productivity is also stagnating, not a markable difference in the yield that we are getting

importance of organic and growing, importance of organic agriculture. Yes, when we are thinking of organic agriculture, organic everything because of the ill effect of the fertilizers pesticides etcetera; now people are thinking of the organic tea, organic everything.

So, organic agriculture is now going in importance. So, from that point of view also SRI this system for rice intensification gains lot of importance. Increasing production cost, increasing production cost the production cost is also increasing. So, we would also like to bring down this cost of production. We so, we need best utilization of family labour for a small marginal farmers. Now, exactly this if you have a small plot of land and you have less people to work with, system of rice intensification will definitely help you and it will give you better yield, comparatively a good yield.

Now, if you go back to the previous slide yes, now this you must know a little bit of a history I just told you what are the benefits of that and now you have a look at it. This SRI was first synthesized by a person Henri de Laulani e, from a French Jesuit priest he just thought of this. So, we have given you for knowing the history, you must have a look at these two you must know how it has come for. It is a in fact, SRI is often describes a high yielding and environment friendly technology. This is very important that we talk that relies on changing farmers agronomic practices. So, when we are talking of a changing practices, when we are talking of organic agriculture, when we are thinking of minimizing the cost of input etcetera; there is a system of rice intensification is a very relevant talks.

And, people are now even thinking of what sort of equipment we should decide. I think as a designer you must look into this, you may think of a redesigning the existing transplanter some of them and think of SRI equipment. Some people have made some effort in this line and so, as a designer you must think of this.

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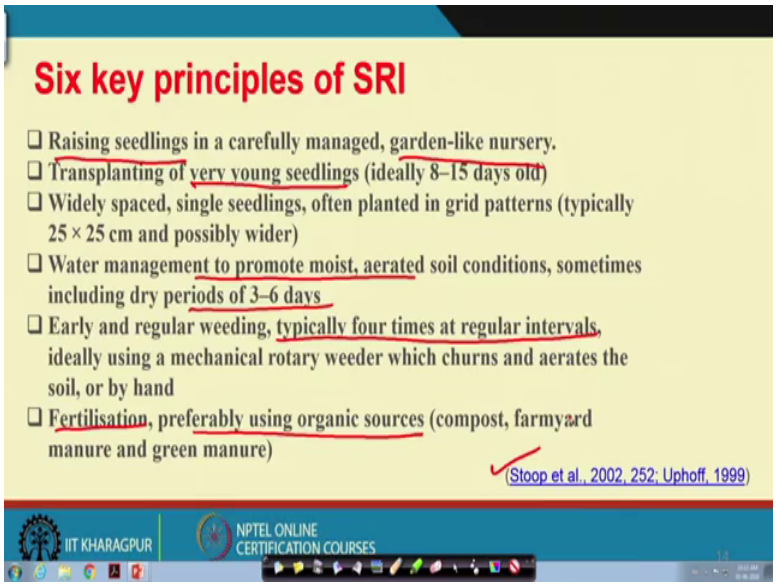

There are certain principles of SRI, certain important principles which we must know It is well worth mentioning here: raising seedling carefully, raising the seedlings carefully, garden like nursery, but we need we need to give a good environment for this because, we are talking of single seed a single plant single seedling planting. So, there is very careful attention has to be given. Very young seedlings are taken generally, for this we take about 3 to 4 weeks of seedlings are taken for transplanting, we have talked of that earlier.

But here it should not be within 8 to 15 days, you can imagine that as low as 8 days to 15 days. So, people will expect anywhere in between this so, that it gives you a good health when it is transplanted, when it goes to the other location it has a good health; water management to promote moist, aerated soil conditions, now including dry periods of 3 to 6 days. Now, it also needs certain actually care that care is that most water management to promote moist around the seedling. Early regular weeding, well these are very important things which needs to do typically four times during a regular interval maker with using whatever you can think of the device by which, if it is a large area you can think of mechanical. If it is a smaller area you can think of manually and all that, then fertilization preferably using organic sources.

This is what the source the source says that the 6 key principles of system of rice intensification are these. Well, these are this is what this gentlemen are these people they

reference from where I have taken. They are talking of once you go into details of this, once you are thinking of what sort of equipment you will design and what we see the size of this equipment, for whom it will be designed. How to apply the enough moisture there, how to apply water and how in fact, you should think of creating the nursery itself. And so, that this could be also taken and done. And, I think this is advanced knowledge which people are going into and designing the equipment. I think worth knowing about this therefore.

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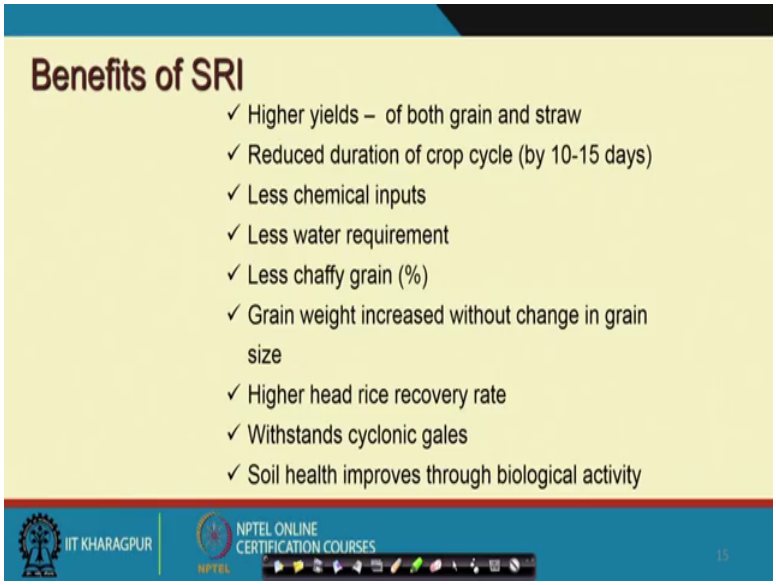

Benefits, well if you go back we have talked of what are the things which are required and if you talk of this then definitely benefits are tremendous, all are listed over here. They say that with higher yields sure, we are going to get higher yield, and we are going to get good quality of the grain and straw. Reduced duration of the crop cycle yes could be reduced direction of crop cycle this is very important. Less chemical inputs, yes we are not thinking of chemical inputs. In fact, we are advocating that there should be organic material which should be given.

Less water requirement, yes then less chaffy grain; that means, more of a solid grain you will you are likely to get. Higher head rice recovery, well these are the off suits of what you can get. So, SRI now every advantage is loaded towards system of rice intensification and as a designer you must look into this, you must think of this how best we can utilize this technique, because aim is to produce more. And, for this is a staple

food we must think of designing and we must think of contributing in the design of such equipment.

Thank you very much.