Farm Machinery
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Lecture – 15
Equipment for Seeding and Planting

Well, students we discussed about the various types of furrow opening devices, the covering devices and devices for pressing of the seeds when it is sown. Now, let us go to the big machines, actually what are those equipment which are available for seeding and planting. You know we had discussed in the previous lecture that seeding and planting are two things.

When we are talking of bulk seeding we are seeding in continuous and when you are talking of planting precision planting, where meaning that there should be a distance between the plant to plant. Of course, row to row will be maintained in seeding as well, but we will maintain plant to plant in case of planters. So, we will talk of the different equipment for seeding and planting today.

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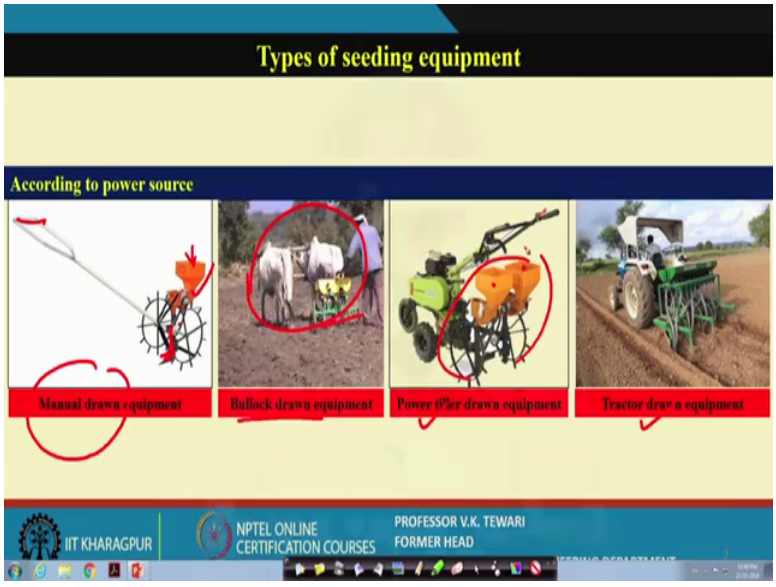

Types of seeding equipment, well on the basis because it is very essential although one may think that why we are talking of such small and primitive equipment, but, it is worth understanding as to what were there long back when things are today something is different, but what were there 50-60 years back. It as a student you must have a look at it,

maybe you will get an idea from there if you look at that and from there you can get some idea and design or device machine which will be easier which will be good for effective operation and which will be cheaper who knows. So, it is what sowing what was there. So, that is why on the basis of the power source we will talk of this seeding equipment.

See on the basis of the manual drawn, see initially when nothing was there manual drawn equipment were there; manual drawn equipment see this manual drawn. So, here the person holds here and then the seed is over here and these this is for opener here and these are the 2 transport wheels. So, he is in a position to put this and from the transport wheels power is taken and this power so, that the seed will fall from here into the tubes.

These are definitely when you can see that manual power is employed; that means, the definitely the output of this will be very less. But, then these are good for small areas and you know that the 60 percent of area in this country is less than 1 hectare or so. Lot of marginal farmers are there, all farmers are there so, from that point of view if people are available then why not you can use a device like this. So, I we have shown you that there is a manual drawn device. Then bullock drawn yes, ancient devices which are in fact, there what we do is to prepare the land as well as seeding also using the block the block power, the animal power used. So, we have using the animal power there are equipment which is there.

This equipment is a single row, may be a this equipment will be 2 row or 3 row, depending on what is the size of your bullock because, then size of the bullocks are very important. See they will be in a position to give you that much of pulling strength the power availability. So, power of this pair of bullocks varies depending on the weight of that it varies from as low as 0.6 horse power to as high as about 1 1 or 1.2 horse power of bigger bullocks. So, depending upon their horse power you may have these, but since it is simple opening of this after the prepared soil it may be you can have 2 row or 3 row such devices of bullock drawn.

Then power tiller drawn these are the power tiller drawn and tractor drawn units of course, we will have a look at these in subsequent discussions. We will have a look at this under field conditions, but yes power tiller drawn this is a chipper unit and then may be 2 2 row unit where these are the hoppers here and just like power tiller you have seen

operation at power tiller. So, behind power tiller this is a equipment which is which is attached. So, if you see this types of seeding equipment on the basic of power source the manual bullock drawn and then this power tiller and tractor as the power source increase. So, depending upon the capacity of the person depending about the land area he has he can choose anyone of these and complete the task.

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According to metering unit yes, on the basic may be me metering unit also will all tell you the different types of the equipment whether seeding or fertilizer equipment. See seed comfort as a (Refer Time: 05:09) the metering unit. What is the metering unit here? If you have a planter what is the metering unit here or the transplanter then you will have the unit you will have the type of according to metering unit here. That according to metering unit if it is a fluted roller type or a you can say a pneumatic type or a single belt type whatever may be the case, this is a planter.

So, the puller planters according to metering unit, seed cum fertilizer drill say planter which will in the planting pneumatic this is a pneumatic planter, but then you can have a belt type of device also for planting and maintaining distance to distance. And, transplanter well this is slightly away because transplanting is that once you have grown the seedinglings you have grown the seedinglings at some location you know you know that these are done for paddy you must have seen. So, these are grown at some location

and then these are transported in proper way and then you can put it in the right place where you want them to actually grow. So, that is why transplanting ok.

Planting at a location after removing from its original place where it is congested and it is simply grown and that grown length could be about 2 to 3 weeks maximum or depending upon the type of the device which we have used. So, the depending upon this you can say the unit whether it is a planter or a transplanter or a seed or a seed cum fertilizer drill seed drill well.

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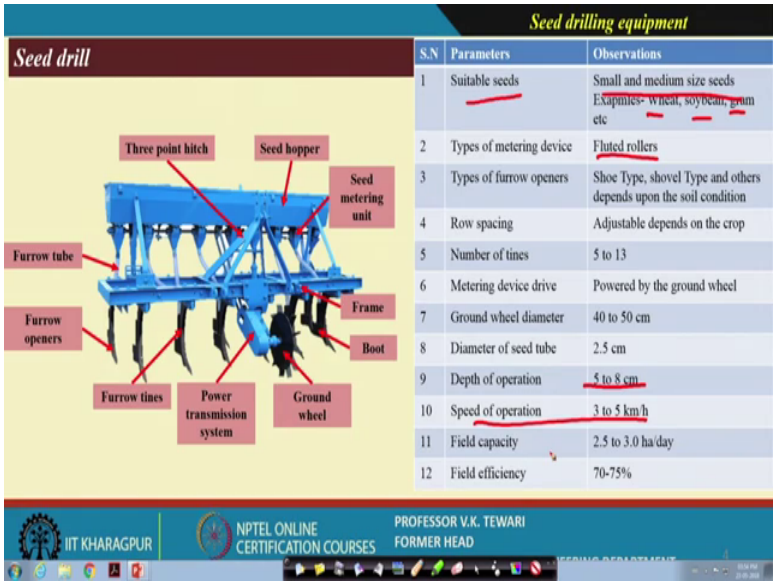

I think this is already discussed to you, shown to you earlier that what are the different components of this and the we just like to give some specifications, which are you must have a look at this and remember or to try to appreciate that suitable seeds. These are suitable for small and medium size seed say wheat, soybean, gram etcetera seed cum seed drills. The types of metering devices fluted roller one which is very widely used. In fact, new plastic ones were coming up where the seed damage is minimum.

Then types of furrow openers we have discussed about these, then row spacing where the just row spacing depends agronomist I have already told that is about what should be the row spacing. So, accordingly you can from your knowledge of agronomy you should be able to pickup that. The number of tines well depends on the equipment, depends on the power source that you want to have you want to have a smaller one, may be 5 tine then 7 tine, 9 tine, 11 tine, 13 tine, may be 17 tine it is like that.

Metering in a metering device well we are always taking power from the ground wheel. So, this need to be looked into now, we may discuss advanced technology which is in fact, replacing this part. So, that we do not have any losses of power or we are in a position to seed as much as we required; so, precision seeding. So, in that case you we will show you that we do not have power taken from the ground wheel, we will have some other elements. The diameter is seed tube, depth of the operation or these you can have a look at it, it want to give any specification of what drilling equipment is.

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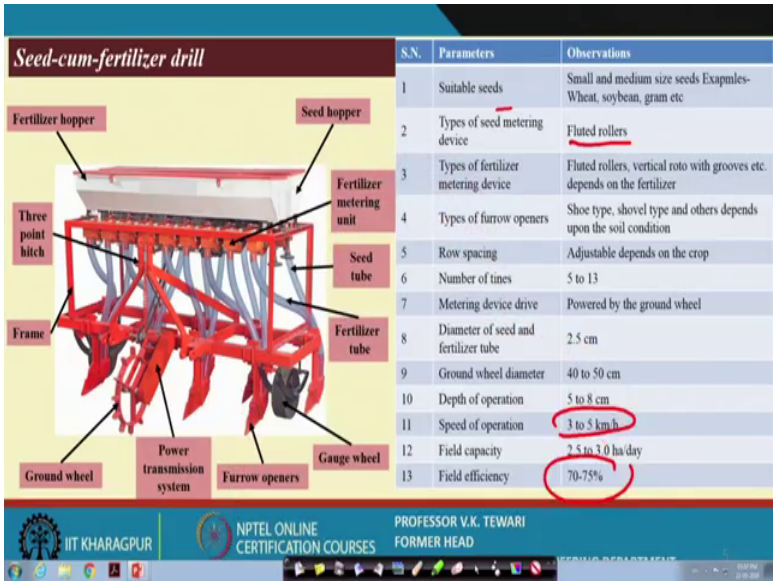

Seed cum fertilizer drill, as I said that if it is only seed then seed and if it is if there are there is another box long along the side of the seed, then you will seed cum fertilizer. That means, both these things are being applied or put in the soil along with the seed. So, seed cum fertilizer they and the various parameters are given over here. These are suitable for again similar seeds, types of metering fluted roller, then furrow openers we again discuss I have told you the furrow openers; number of tines same diameter of seed to the fertilizer tube, depth of operation, speed of operation where generally this is important 3 to 5 kilometers per hour. Generally, if we do not go very high because we have a certain seed rate and we also know that how much area to be operated. So, accordingly a certain seed to in order to maintain certain seed rate and in order that the placements are proper and not haphazard and thrown away, we maintain a certain speed of operation.

Where field efficiency, a field efficiency of such machines they will found to be 70-75 percent. Now, here you must have a question as to why this efficiency about 70-75 percent only. Well, we know that such big machines so, there will be head length; there will be time losses at the headlands. There could be filling of the hoppers so, for filling of the hoppers you will integrate some there is down time. So, need to fill up those hoppers and sometimes there could be clogging in the seeds or the fertilizer tube. So, there will be time loss because of that so, when you take the totality in totality about actual time.

So, actual area covered and what should it should have covered, then you find that this is the where you have the actual field efficient field efficiency comes. Because, actual field covered and the theoretical field cover these will be two different and accordingly when we consider all these factors you will find that field efficiency comes to be something of this order.

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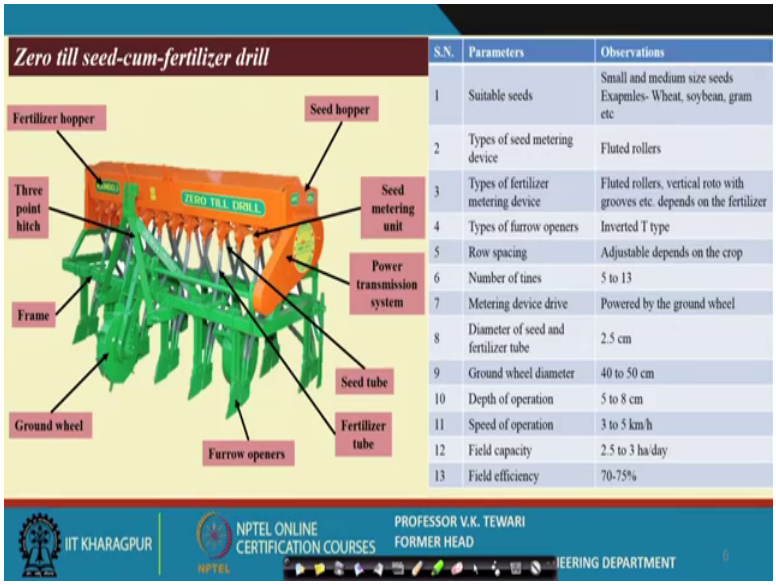

Zero till seed cum drill, I discussed this earlier already and what we what we can show is the detailed details of its specifications or the different parameters. And, what are the values which change about the each and every component of it. I think you can have a look at this because, I have dealt with this z seed zero till seed cum fertilizer drill and I said that this is a bone to the farmers for the last 15 years or so, where we are u used using this for zero virtually zero tilling. That means, we are conserving the moisture of

the soil immediately after harvest you can operate this and save time. So, this is the uniqueness of this.

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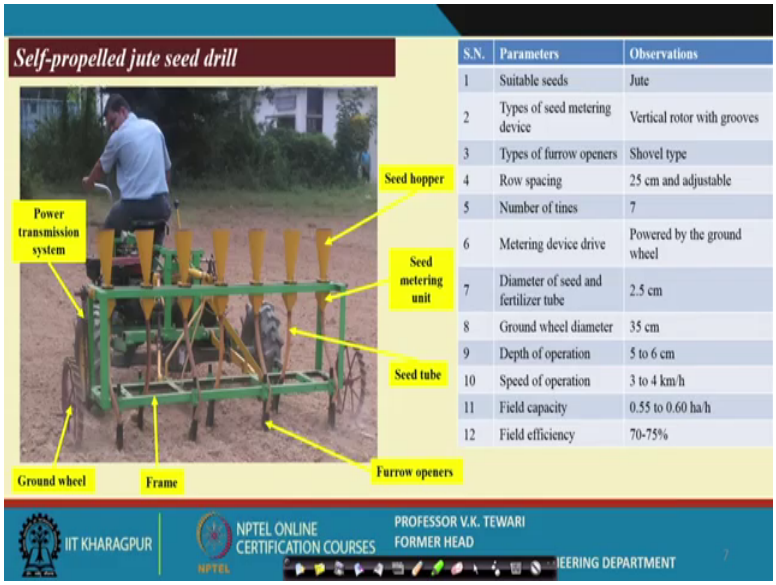

S.N.	Parameters	Observations
1	Suitable seeds	Jute
2	Types of seed metering device	Vertical rotor with grooves
3	Types of furrow openers	Shovel type
4	Row spacing	25 cm and adjustable
5	Number of tines	7
6	Metering device drive	Powered by the ground wheel
7	Diameter of seed and fertilizer tube	2.5 cm
8	Ground wheel diameter	35 cm
9	Depth of operation	5 to 6 cm
10	Speed of operation	3 to 4 km/h
11	Field capacity	0.55 to 0.60 ha/h
12	Field efficiency	70-75%

Self-propelled jute seed drill. In fact, I must tell you that there are small single row manual operated jute seed drills are available in various locations and institutions. So, the jute corporation of India they wanted us to developed a self propelled machines. So, we have developed at IIT, Kharagpur a jute seed comfort seed jute seed drill which is a 7 row unit. And, I will well I explain you the different components we will also show you the working of this in the field.

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You know the jute seeds are very small seeds and the quantity which is required per hectare for sowing is about 5 to 7 kg only. We have developed a unit which is a 7 row unit and the mixing mechanism is a very simple one, which I have explained to you earlier. Now, have a look at this the seeds are there in the hopper here. Once, they are put in the hopper these are the location where the seeds are mentangled and they are kept inside. When this rotates they will go and then fall into the seed tube.

So, you can we can see that minimum amount of seeds may be 1 or 2 seeds only will fall into this and we can meter. Because, this is a precision seed drill with a we want a certain amount of seeds only to go otherwise we will be losing so much of power. We are taking power from the ground wheel and this unit since, it is a since it is a large unit and it is difficult to handle to handle. So, we have the hydraulic system for lifting and lowering because, this is not connected to a power tractor, but it is connected to a self-propelled unit which we have a small engine. And, then we have the hydraulic system for lifting and lower we this is the hydraulic tank here.

Then the pump is here and then through the de different arrangements for the hydraulic system, we are in a position to lift and lower this and maintain the position of this while, transport unit. And, this has been a very light machine by the manufacture particularly the jute manufacturers and they want this material machine to be manufactured and

multiplied in different for giving into the farmers and for larger scale sowing of jute particularly in this area. We will see we will have a look at this machine shortly.

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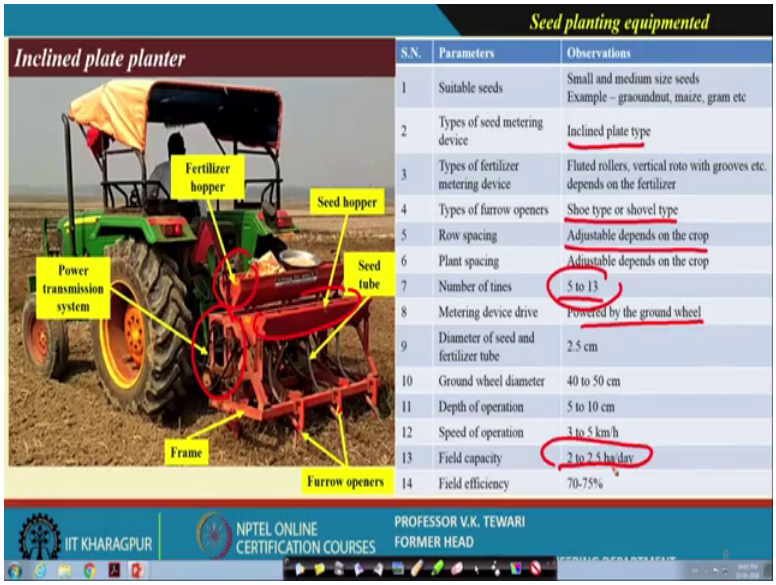

Incline plate planter, well inclined plate planter is another device which is very much used particularly for groundnut crop. This is the one which is used for groundnut crop, the various components the power transmission well power transmission from here; that the fertilizer hopper here. The seed hopper over here, the seed tubes sown and then the furrow openers; these are this is the main frame of this unit.

The other observations of this you can say that is suitable for small, medium size seeds. Then metering inclined plate the plate of which is inclined you would see in the operation of this, that why it remains inclined and such inclined plates depending upon the seed you can change that, shoe type or shovel type of furrow opener is used. Adjustable de the row spacing is adjustable, number of times it also varies you can have depending upon what type of the device. This is the one which is a I mean, you can have 5 to 13 times.

Metering device power by the ground wheel, then the field capacity slightly higher field capacity of this because we are operating at about 3 to 5 kilometers, but we do get slightly higher field capacity of this because seeding is faster in this case. So, you are in a position to get and field efficiency of in fact, for all these more or less in the same range

of 70 to 75 percent. Let us have a look at its operation actually in the field and some more details of the parts and components.

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Well students we had seen the earlier machine which was seed drill and planter both combined into one. This is a planter a inclined plate planter which a also meant for several seeds, particularly the plant where it will maintain certain plant to plant distance or seed to seed distance between the consecutive seeds when it is planted. Now, this is the inclined plate which is there and this is particularly made for groundnuts. So, we have kept groundnut here in each one of this, this is a 6 row planter. There is a fertilizer unit also here and if you want to maintain the seed rate we have to only change the speed of operation, we cannot maintain.

But in case you have a different seed then this plate has to be changed. This is the difference between the units which we have seen earlier because, in that unit there was a fluted roller type; where if the serial crops are kept then by exposing the length or changing the length of exposure of the fluted rolls we can change the seed rate. Here that does not exist and hence it is only planter or it can be also a multi crop planter and by changing this plate we can achieve the seed rate what want or the panting which we want.

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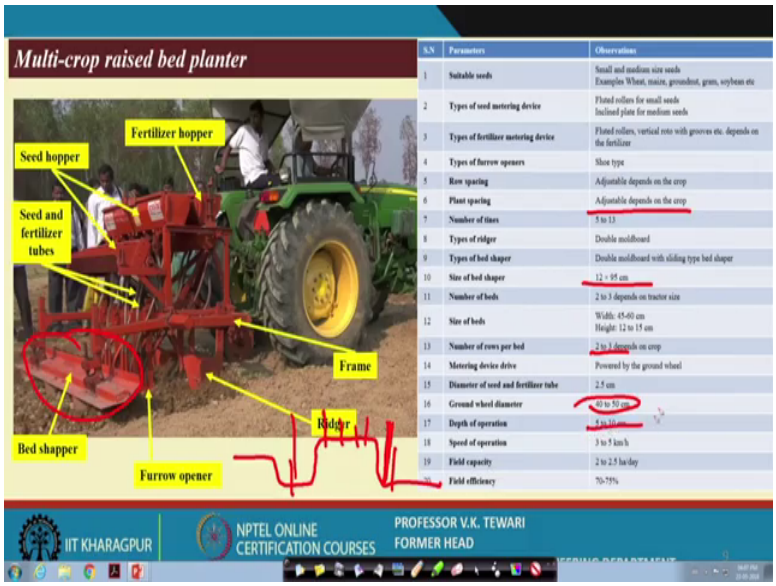

Multi-crop raised bed planter. This is another planter, as I said there is a difference between seed drill and planter. See planter we are maintaining seed to seed distance and in seed drill we are having virtually a stream of seeds which are falling may not be maintaining actual seed to seed distance, but then in planter we do maintain this. So, this is a multi crop raised bed planter and generally depending upon the condition these are such equipment or in a position to prepare beds raised beds. I will show you what it means, see like you can have say like this. So, these are the raised bed, here you can you can have these are the furrows and these are the bed.

So, this particular equipment this multi crop raised bed planter, this planter creates such there will be one furrow o furrow opener here, another furrow opener and in between is the ranges which are created. And, that on those ranges you can have those crops because, actually the seed and fertilizer will fall appropriately at those locations. And, then you can have 1 row or 2 rows depending upon what type of equipment you have, which seed you are taking and the some details of this are also given here, suitable for seed, small and medium size.

Then type of metering mechanism: fluted roller type, inclined plate type. Yes, it could be a fluted roller type, it could be inclined plate type depending upon which one you have taken. Then fertilizer metering devices: fluted roller type. Yes, it could be there vertical rotor with groups, we have already seen this fertilizer metering devices what were there.

So, anyone of these could be there. Then plant spacing adjustable depends on the crops well, depending on the crops this plant spacing can be adjusted and the number of rows also. So, row spacing how many rows you want on to the raised bed.

The number of time when varies depending upon which type of equipment, how big is the equipment, what is the horse power to which it is connected those things will vary. Then bed size of bed shaper well whatever, is the bed shaper see this is one bed shaper here. What does it does? What is what does it do? In fact, this is one which gives needs a clean bed prepared after the whole equipment has moved. You will see in the operation of this under the field condition how it cre how it performs and the size of this is about this. The number of rows per bed you can have 2 to 3, as I said depending upon what you want, what is the type etcetera.

Ground wheel diameter 40 to 50 centimeter, ground wheel diameter; yhese are in fact, important with respect to the size of the equipment. Remember that whenever you are designing, you must have a an idea about what should be the size and length breadth or dimensions of the different components. Because, there has to be some compatibility, there must have been some aesthetic sense onto the whole equipment that we were designing. It is not that you have a 14 row unit with all 14 ma spread over, but if you have a 13 row may be 6 in the front 7 back then it comes within the width of the tractor. And, that is how in fact the design of such a cultivators or design of the seed drills are done.

So, you must know why they are few in the front and the slightly one more in the back. Because, one it has to cover the clear soil zone at the same time ee it is compact and not going beyond that you will lose lot of headland time while taking a turn etcetera. So, it is important from that point of view this is how we have these units frame. So, depending upon the size of this seed drill and size of the wheel, which is there; so, depth operation yes, depth operation we do not want to go more than about two and a half inches also or about 10 centimeters. We do not want to go beyond that because; we want seeds to be at a particular location from very soft covering and then pressing of that.

So, that emergence etcetera are there, there is no loss of this birds lo loss of the seeds etcetera, because of the birds etcetera which is a menace many a times you will you

might have seen. The field insufficiencies well not in the same range as you have seen for others we can also have a working of this in the field.

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S.N.	Parameters	Observations
1	Suitable seeds	Small and medium size seeds Examples- maize, gram, soybean etc
2	Types of seed metering device	Belt type
3	Types of furrow openers	Shoe type
4	Row spacing	Adjustable depends on the crop
5	Plant spacing	Adjustable depends on the crop
6	Number of tines	5 to 13
7	Metering device drive	Powered by the ground wheel
8	Depth of operation	5 to 10 cm
9	Speed of operation	3 to 5 km/h
10	Field capacity	2.5 to 3 ha/day
11	Field efficiency	70-75%
12	Types of covering device	Drag chain type
13	Type of soil pressing device	Plain press wheel

Stanhay precision seed drill. This is one equipment which has been used long back and I am sure this has been used for vegetables and small seeds, it is a precision seed bed as I as the name itself says designed by Stanhay. So, the precision is that we want the proper amount of seed, the proper type of seed, proper size of the seed and proper location of the seed and proper number of the seed. All these we want, and that is why we are talking precision seeding.

Now, the in this one each one of this will have; see first I will have a look at the suitable seeds, there is small and medium size seeds like maize, gram, soybean. It is a belt types each one of these hoppers, this is one hopper and there is third fourth. These each one of the hopper is for in is serving the individual rows, it is serving the individual rows. It is a shoe type of furrow opener which has been used in this. Row spacing and plant spacing are adjustable, the way you the designer wants or the farmer wants to operate it.

Speed of operation is 3 to 5 kilometer per hour. Depth operation is 5 to 10 centimeter, like usual and better field capacity. Drag chain type, the type of covering device yes is the ka covering device here using it may not be seen here, but when you will see the operation of this in the field you will be able to appreciate that what is this drag chain type. And the plain press wheels, very plain we had seen different types of pressing

devices. So, some of them are 0 presser; that means lighter ones which are covered with rubber on the top of the periphery of the drum. But, these are the plain press with simple press wheels.

In fact, you can see that these are two both, there is one in the front and the other is the at the back. And, there is a scrapper also here to scrap the excessive soil so, that it does not become I mean covered with the whole soil etcetera. So, these are there these are press fields which are there individual press wheels. This has seeds now, beauty of this is that if you want to if you want to use one type of seed, if you want to use another type of seed. So, for each type of seed, each shape of seed we have belts and in that belt this particular side size of seed with go.

So, you must know that that particular size of seed will be suitable for a particular type of seed belt. So, a belt is suitable for a particular seed. So, depending upon the belt and seed type we will have to decide the metering mechanism and change the belts etcetera. Otherwise, and there is another arrangement here that in front of the in front of the operator there is a sensor in each one of them, which tells what is the condition of the seed; whether the seed is there or not whether there is a seed falling or not. So, this also talks of that. This is a very beautiful eq equipment and very precise equipment worth using by a tractor drawn unit.

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Well students now, we are looking at the operation of a precision seed drill which is which is very old one, but now a days it is not that much being used. But, then since we have this machine with us we would like to let you know as to what is this system of working. See this is the hopper, there are individual hoppers it is a 4 row machine which has individual hoppers. Now, you can see this is the hopper, this is the hopper here where this particular seed is kept. And, then this seeds comes here from this seed comes here and then falls into this.

And, then we have this endless belt; I have already told you that there is in the class now this is the endless belt which has holes made. Now, when the when this operates and you will find that these seeds come into this and at that point of time, now at this locations they start falling. So, the beauty is that this particular seed belt can be changed depending of all the type of seed. So, whatever is the type of seed you have to have just different belts this is the and in fact, it is a very accurate one; one beauty of this is very accurate one, but then made for a small seeds.

Now, it has also a small sensor ka used in this by which it will let the operator know, the sensor which will meas measure the measure which will measure which will which is connected here and which will measure which will measure here. In fact, there is a device which is connected to the to the display board of the operator and in front of the operator, which talks of what is the level of which level of the seed inside this. So, if there is any choking or if any other thing which happens then the operator will be in a position to know; he can stop the vehicle and then have cleared this and then we it can be operated. So, in each one of this is the system which operates.

The beauty here I repeat is the belt which is having several different types of ma holes. So, if you have a different seed you take a different that type of seed that type of belt to be covered into this. Now, we will see the operation of this. Yeah, these are the pressed pressing wheels which press the soil after it has been covered and these are for covers. So, this covers as it goes it this covers the seed is has fallen. So, it will go and cover and then this will press because, we require a certain level of pressing as I told earlier for the seeds to remain. And then so that they will be germinating at later stage.

So, in each of these this covering the chain type of covering device and the pressing wheels are there in each one of this. This is a 4 row unit and it maintains the depth, you

can see in front wheel is maintaining the depth in. In fact, both of the maintaining the depth as well as it gives a clean you can say the surface with the front ones and then the furrow goes inside then the furrow is cut and then seeds are sown.

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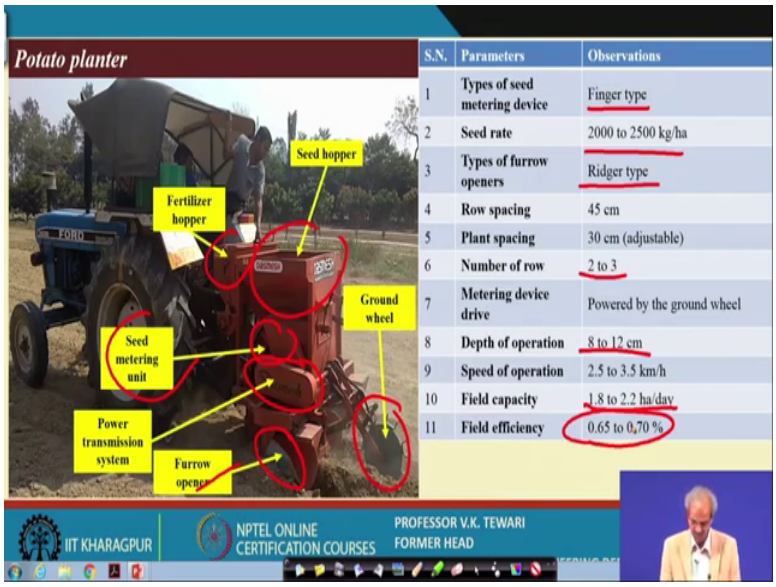

Potato plant, where potato is a crop which is which everybody eats and you would like to say that no vegetable you will make without potato. So, how potatoes are sown? These are sown in different ways actually, in some locations potatoes are in West Bengal and potatoes are cut and those are sown. In these potato seed hopper the whole potato is used for the as the unit and then these are sown into this. This is the ground wheel, this is the ground wheel here which helps in maintains the up the depth operation etcetera. This seed hopper, then the fertilizer unit side by the side.

Seed metering unit we have seen the seed metering unit here or transmission, this is the power transmission because power transmission has to be there if from the ground wheel and it should go to all the locations in the furrow opener. This is the type of furrow opener which I had shown you there, this type of furrow opener which is used and well some more details. And the types of seed metering device, the finger type of seed metering device. What is there in this may be that when you see the field operation you will actually appreciate, how the fingers are catching the small bulbs of potato and then releasing at one location.

So, you will be able to appreciate that seed rate of course, is very high seed rate. Type of furrow opener is a ridger type of furrow opener; I have already shown you there. Number of generally 2 to 3 rows there, metering device power from metering device a drive is definitely from the ground wheel. Depth operation we take about 10 to 8 to 12 centimeters, filed capacity is slightly lesser about you can say about 2 hectare per day and then field efficiency is also slightly lesser in this case. But then, since the operation and we need to have a look at this and the seeds many a times whole bulb is used. So, many a times this gets clogged. So, we need to waste some time or we need to look into this while the operation is going on; that is why the field efficiency is.

Yeah, students now let us see a if a potato planter. Now, this is a big problem and I am showing a machine in fact, these machines which I have shown you here except this stand here machine all the machines are being manufactured in the country. This is a planter where whole seed may be small size of whole potato seeds are sown and we know that these are sown on the ridges. We I have shown that region furrows are created in which some of the crops are sown in the furrows, some of the crops are sown on the ridge. So, these are the potatoes are sown on the ridges.

Now, how do we create these ridges? You can see that they are the furrowers one this will create one furrow, this is creating another furrow and this will cut another furrow. And, in between these two furrows there will be a ridge here, there will be ridge here. So, at these two ridges we will have this 2 rows of seeds planted. Now, this is the seed hopper for the potatoes which are taken and then when the potatoes are kept in this I have at the rotation you see here there is a device which is a finger type. In fact, this finger type of device you can see here that the seeds or the so, at these are attached to work here in pair.

And, the moment it comes at this location these are removed, these are the locations where this finger type just the finger is holding the seed, which is coming from the hopper to be held like this and the moment it comes here through the cut off device then it will be released. We will see the operation of this and there is a covering device; you can see that you can see that at one location this leaf and we will see the operation of this in the region which is made it is a tractor drawn unit.

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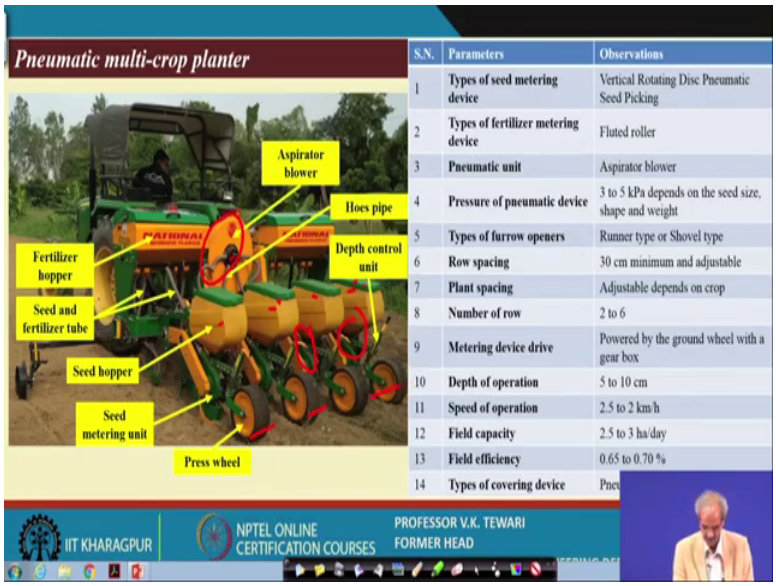

Pneumatic multi crop planter; this is a beautiful one which is another precision planting because, there we want that seeds must be placed at a proper position and at proper distance from this and small amount of seeds many a times. This has a more details of this of course, I will show you in the field operation as well, but then there is a there is a blower which is taking power from the PTO and through this blower then each of these units, these are the hoppers. And, then these hoppers you will find that at one location there is a seed plate and with each one of these there are these I mean the air is passed into a installed drum.

And, the drum is throwing the air from here at about 3 to 4 kilo Pascal of head pressor. And when the seed when that seed is moving in the seed hopper because, that is at atmospheric pressure. So, with a difference of the 4 kPa here and 100 kPa here, you will find that the seeds get attached and when they move at one location it is brushed out and sent back into the furrow. And, the depth control is done through this and these are the press wheels as we disused these are the in fact, the rubber ones; so, 0 press a wheels which are there.

Ah Dear students, today I will show you the actual operation of a pneumatic type seeder under field conditions. Before that, let us have a look at the various components of this particular seeder because, we know it is a precision seeder. Because, we are in a position to sow the seeds individually as I have told you in the previous lecture that this particular

pneumatic seeder has a central unit and this central unit is the hopper which is individual hopper has been given for each of the furrows. See for example, this is the hopper for this furrow, this is the hopper for this furrow and this is the hopper for this furrow and like that.

Now, these hoppers are having the seeds and then we have the fertilizers which are also given in this. So, this is a seed cum fertilizer pneumatic device. Now, what is done is that by taking power from the PTO, we are using a blower and through this blower now, air is air is pushed into a disc which is at the secondary level of the of the seed hopper here. Now, seeds here is thrown into this and the seeds are go going from here into this and there is a there is a rotator that rotator has.

So, here there is a rotor here where the these holes are there and this the seeds are attached here because, when continues here is being thrown inside this the secondary level. And, we are maintaining about a pressure about 4 kilo Pascals or so, and with that pressure when the seed is metered the seed the moment seed comes to this particular location, it is cut off. Because, this seed this particular disc is rotating and the seeds are attached because, of the air which is blowing inside this. The air is holding the seeds onto that and as and when it comes in near the seed hole the seeds are thrown into the furrow.

Well we have seen that the after the seeds are thrown into the furrow there must be a pushed inside the soil at certain pressure as well as there should be a device for covering this. And so, we have covering devices here. So, each one of these has a covering device, you can change the position of these covering devices; we can change also if you have different type of the seeds. So, we can have these plates could be changed depending, these plates could be changed depending upon the type of different seeds that we have.

Ah Then in order the change the speed of operation in fact, when we have the this is a this is a gear box by which we can change the a speed of operation; depending upon the crop if you want you can change the speed of operation. I can show you this open view a chain and a sprocket arrangement is kept into this and the pe power is taken from PTO as I told. So, we will have a look at the operation of this; may be with a we will not be in a position to see the actual seeds, but in some of the cases we will we will remove the soil and may be you will have a look at the seeds. So, let us see the operation of this in the field.

You can see the operation of the covering device which is properly covering and giving a certain amount of pressure onto the wheels. It is very essential because otherwise we will not be in a position to get proper germination; this is what is required. So, the seed these are doing a very good job at this point of time. We have the markers for maintaining the row to row spacing's on both sides.

Thank you.