Farm Machinery
Prof. V. K. Tewari
Department of Agricultural and Food Engineering
Indian Institute of Technology, Kharagpur

Lecture – 12
Introduction of seeding operation

Dear students, so far we have discussed about the different implements and their design, their operation in the field, we have also talk of the various mechanics of the implement with respect to the soil and so on and so forth. Now, we will talk of the use of this soil, which is the most important part when you are talking of farm machinery in the whole gamut of crop production. We will follow the slides which are there.

So, the lecture which I have planned today is simply a Introduction of Seed Operation. Now, you see it is very essential to know, how this operation is done. And what are the various aspects of this? What I have planned is that in a very basic way we will follow the slides and then over the period of the length of the course, we will come to the higher level of machines and equipment which are designed. And, what are the unique features which are there in these machines.

(Refer Slide Time: 01:21)

Well, sowing of seeds well you must have seen that, if you want to sow a seed even your mothers might have done in the kitchen garden. If you see the seeds of tomato or potato or brinjal or something when you throw it, simply it grows. So, that is one way that

anything which we sow or it will simply grow. But there are certain aspects of this sowing, because we want an organized amount of crop to be taken out of a certain area of the field.

So, seeding is in fact, is an art. Seeding or sowing is an art that is placing the seeds it is an art of placing the seeds, how should we place the seeds, where should you place the seeds? What should be location of this? What time it should be of the climate it should be placed and so on and so forth. So, that what we get is a good germination, because whatever has been sown need not be all germinated. There are many factors to that the condition of this soil, the moisture content of the soil, the orientation of the seed which has gone the type of the seed the condition of the seed itself the seed may not be a good quality seed. So, it may not germinate, if it we have not checked the viability of the seed then also there will be a problem

So, it is very important. So, this seeding is definitely an art to put the seeds in the soil in such a way, that a good germination takes place. And hence a good health of the crop this is what the important is. So, perfect seeding gives us what will it give; it will give certain aspects which we are looking for when we are too talking of a good crop.

Correct amount of seed per unit area: yes, we want that in an area certain amount of crop must be; a certain amount of seed must be thrown or must be sown, because we are interested to get a certain amount of total population in a given area. And, that is very important for the yield. And this has been researched toward various long period of time, where we have seen that in a particular area you definitely require a certain optimum amount of plant protection to get a good quality of yield or a total amount of yield which is required.

Moreover, depth at which the seeds will be placed in the soil: well it is not that we simply sow the seeds and throw the seeds on the surface. There has to be a location of this seed within the soil there could be various factors, if you are not looking at this. And, then sow the seeds definitely there were seeds may be taken away the birds etcetera or may be by wind etcetera, it may be flown blown to several other locations in the field and it will be very much haphazard.

So, what we want actually is that it should be placed to the proper depth. And, then spacing between the row to row and plant to plant, well this is also important when we

are talking that the seed should be placed at a certain depth in the soil, it should be also placed with respect to it is adjacent seed, where should be placed because when you keep the seeds together 2 3 4 seeds together, they will grow. But, they may not get enough nutrients to grow and flourish when the till rings etcetera when they come you will find that there is a competition between these, and these will then not give a good health of the plant overall.

So, we would like that what is the location it has to be sown? How, what spacing we have to maintain? And, how much to be sown, this is very important?

(Refer Slide Time: 04:58)

Methods of sowing well, as I told you that if we just throw the seeds definitely they will grow, but there are certain methods, certain procedures to be followed which will give you what you required earl earlier which I said that we will require a certain population. One is a very simple one it is shown over here.

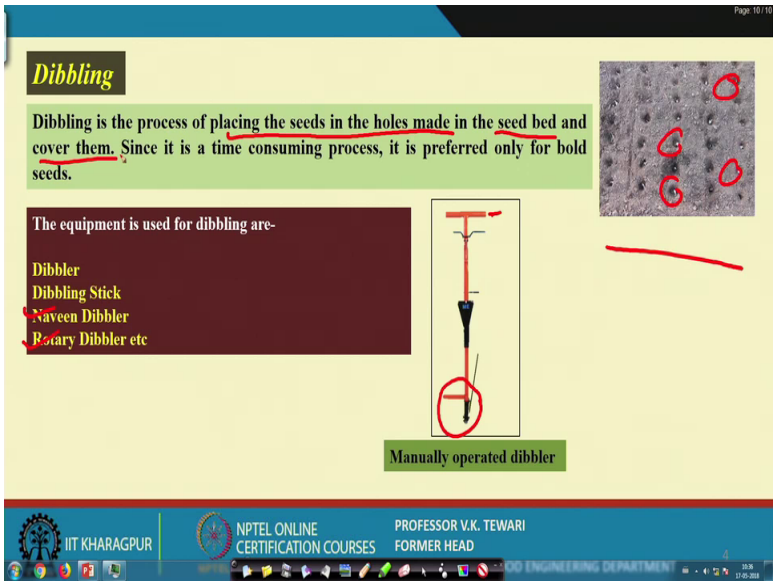
Broadcasting: you simply throw the seeds somebody takes the seeds in the bucket or a basket and then goes all over the field and throws the seeds. This is known as broadcasting. Which is random scattering of the seeds, which means random scattering of the seeds on the surface and the seedbed, maybe it can be done manually it could be done mechanically also. And in fact, if you see maybe about 80 100 years back or so, when they were simple plows many seeds were simply broadcasted for the swing.

Now, what are the disadvantage of that? In fact, it will have the same disadvantage which we talked of the advantage in the previous slide, higher seed rate definitely you will not know how much to be sown where, and what exactly should be the optimum value of the seed rate which should be sown? So, you will put somewhere more somewhere less, because it is all manual and random which has been thrown. Then there therefore, there will be loss of the seeds unnecessary seeds, if you are throwing fertilizer along with that that will be also a loss, in production there will be will production loss, then higher weed growth yes this is another important thing which must be looked into look.

See we are sowing a certain crop seed, but then along with that we get that other unwanted crop grows up. We have not shown, and with in fact what we did once I had tried in one of my area to so, only the weeds and we found that the weeds did not grow, but some other kind of crop grow. So, it is very important to know that along with the weeds which are there, there are certain unwanted weed comes and that has to be removed. And this will happen in this case. So, since you have thrown it like this haphazardly, randomly, you would like that there should be a minimum competition of the nutrients of the soil to the particular required plant and not the not required plant. So, there is a need for removing of those unwanted plants.

So, you would definitely like to have inter-culture operation or we would like that this should be the weed should be removed or the growth of weed should be minimized this is what we would like to do?

(Refer Slide Time: 07:44)



What are other methods: one we talk them another is dibbling. This is very old method and practiced by our ancestors when they wanted the seeds to be put at some location in the field. It used to be I had seen it used to be about the quadrant in which the um actually pointers are put and the person can simply operate it. And the holes will be met and in those holes you can you say for example, it is given over here, see here. See these are the different holes which are made and these holes are made by the dabbler or dabbling equipment here is it manually operated dibbler.

You can see here that this is the cone which will enter, there is a seed here and this is I mean there is there is location by which we can using this handle we can make the seeds drilled over there or you can make a hole and drill later, but these are some of the ones which are being used. Different names are given depending upon the situation, depending on people who have designed these. So, you can say Naveen dibbler rotary dibbler sometimes depending upon the design.

Fact remains that, they simply wanted that placing these seeds in the holes made in the seed bed and cover them that was the aim. The so, that individual seeds could be very precisely kept at the required depth. And so, they will get the nutrients from the soil and then grow with a sufficient amount of spacing between the seed to seed um. So, that the both the seeds are all the seeds around the process around the location will grow and give a good crop.

(Refer Slide Time: 09:40)

Drilling now: we have talked of random we have talked of giving seeds through a single seeds through um dribbling, now drilling is also process of dropping seeds. It is set here it is a process of dropping seeds in the furrow lines in a continuous flow and covering them by the soil this is drilling. We must have heard of several seed drills, because we are drilling here also we are not maintaining any spacing between the seeds. So, you can say there is also a randomness here in this case as well, because here we are drilling continuously is we have written continuously. But, one way if this is very helpful for achieving proper depth proper spacing and proper amount of seed may be sown between soils.

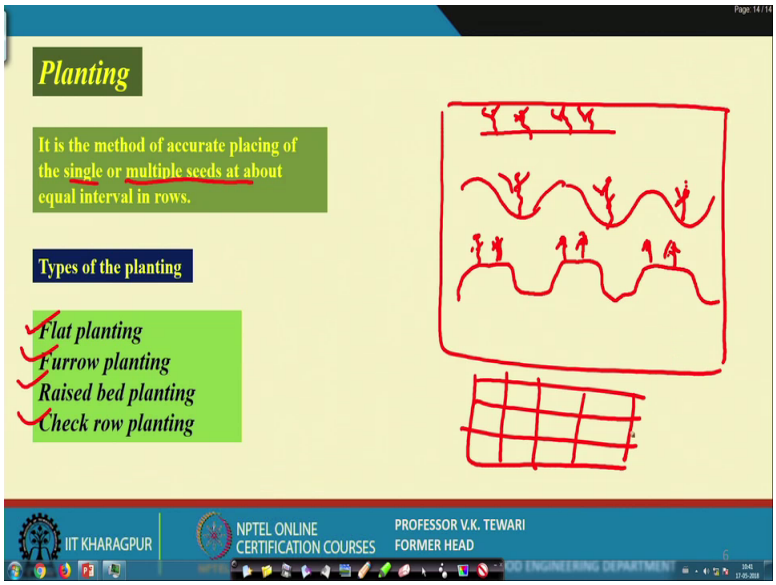
Well, proper spacing may not be a achieved as such, but we definitely see that when we have a drilling machine, some sort of scattering will take place. And then you may not be in a position to maintain that until unless you are talking of a very precise equipment by which you are in a position to put the seeds at exact location. But then differently it can put at your proper place or proper depth of these seeds very important. Because, proper depth is very important, because it must get a congenial atmosphere a environment it must be at this seed must get a congenial atmosphere. So, that we are in a position to give this and allow the seed to grow.

There are various methods which are all these methods, it is imperative for you to have a look at it, because as the first course on see seeding operation; you must know what are

the traditional ones, what are the future ones, and what are the methods which people have been using in various parts of the country? So, you can see here that this sowing by sowing by um this behind the plough, then manual drawn seed drill, then block drawn here and then of course, the power sources which are very important. And, now definitely these are going to help us in time in timeliness of operations and do the operation in short duration of time, and give us more yield and say that we can solve the problem of shortage of labour and things like that it will also economize on the total operation.

So, inputs will be also minimized.

(Refer Slide Time: 12:21)



So, this and this planting well we have chapter of drilling throwing the seeds etcetera, now we are talking of planting. Here slight accuracy is maintained; when we are talking of planting we are trying to maintain certain level of accuracy of the seeds, placement of the seeds. We would like that the seed should be placed at certain position with respect to the next seed and a certain number as well. And, this could be that seed could be there it could be a group of seeds or maybe we can have some of the crops. For example, lettuce or other vegetable crops you would like to put them into seedlings and then this could be planted it is possible.

So, multiple seeds, single seeds or multiple seeds, and then what are the different methods planting methods the flat planting furrow planting raised bed planting check

row. Now, which way planting could be done you can see that same this is a field over here, and in this field you can have all these types it is a flat planting. Say these plants could be there on to the flat land like this for op,you can have these. So, maybe plants are on into this, yes this is the furrow raised bed right you can have the like this, you can have here plants maybe 1 or 2.

Check row planting, we will see check row that we will we here check row we will try to maintain a certain um row to row plant to plant distance it could be also put into like this. And, here you will maintain a certain this way and then this way maybe then we will be in a position to use the check row, we will go to the next slide to have a look at this more, flat planting.

(Refer Slide Time: 14:40)

I have said there that planting could be of various types and various ways by which we do this planting. In this say flat planting methods seeds are sown on the flat surface; as I have sown that example is given over here. And the irrigation is applied on the field through either through flood irrigation, sprinkler irrigation, or drip irrigation.

Now, it is very important also that when you have sown this seeds and you have taken care of their environment of depth of operation, maybe if the fertilizer will be used you should location of the fertilizer etcetera. And then you have also taken care of the places. So, that you can do into the culture operation through that, but now you should also think of how you will irrigate that. Because a time will require will be there when you would

like to irrigate the plants and give a certain amount of water to that. So, this type of planting will help you in giving the irrigation whatever we want a flood way sprinkler or whatever.

Generally predominants a natural moisture conditions are predominant. Flat planting, yes flat planting definitely we want where the moisture content is not a problem and it is already there. So, we would prefer flat planting, but some locations we have other situations like you have to maintain the moisture or you do not have to or you have to have certain drainage or in those conditions you will have to have furrows and then we have the raised bed which will be required.

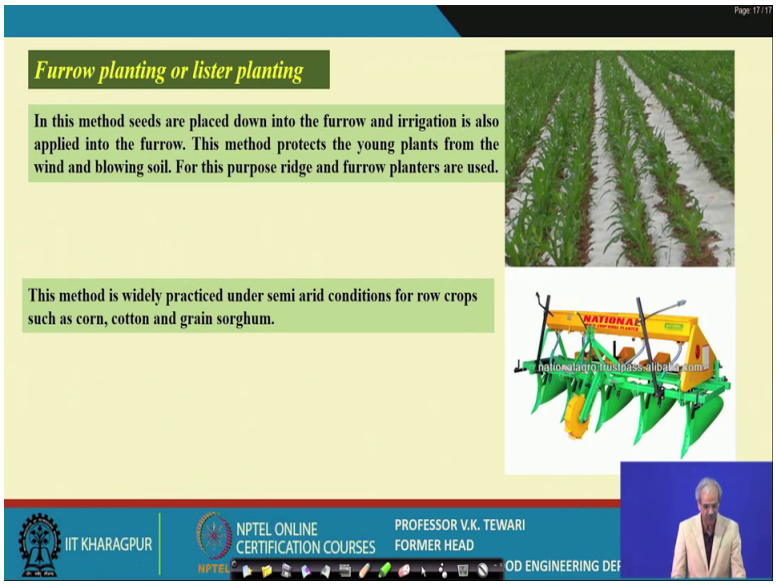
Now, machines for flat planting, now what are the different machines for flat planting? What they are? And how do you they behave? What they how they are designed? This is a this is one aspect which as a designer as an engineer you would like to make the changes in the design, and see that the operation is smooth operation is efficient and it is as accurate as possible as you required for the precision application of that particular seed or the fertilizer whatever you are looking for.

So, horizontal plate planter, vertical plate planter, inclined printer. There is there are 3 types of these planters are there, because this actually means that the seeding plate or which is going to deliver the seed from the seed hopper, there will be a seed hopper, there will be a seed hopper for the seeds onto this.

Now, from this seed hopper ultimately onto the ground when you want the seeds to be here? What are the methodology you should apply from this? What should you do whether, you should have a simple opening, it could be a simple opening by which you can open you can leave it. And then the seeds will fall or you can have a horizontal plate in which the seeds are taken and then they are delivered at a certain location, and they go at to this in the soil or you can have a plate which is vertical. aAd then, that vertical plate is moving inside the seed hopper itself, picks up the seeds on it is periphery and then this discharge of the seeds or you can have inclined plate.

Now, these are the different types which are used as per the crops, depending upon the design of the whole planter and design of the type of the seed which we have taken. So, it is very important to use all these.

(Refer Slide Time: 18:14)



Furrow planting and lister planting where I just discussed earlier that this, what we should do in furrow? And, why you should do furrow and irrigation is applied into the furrow? This is very good that, because in this seed we need the irrigation to be the furrow. Well, this method is generally used in semi-arid areas where you the moisture is one problem and we need to get into this.

(Refer Slide Time: 18:44)

Bed planting well, as shown earlier, in the slides I have shown you that raised bed, you would like to have bed planting where, you have clear information and clear cut spaces

left for these the other operations to be carried. Whether it is irrigation or intercultural operation and enough space for the crops to grow this is there. These are generally done in high rainfall areas, because you require certain drainage, because these are on the beds and the drainage. If it is there through the depression or the furrow the water could be drained and you get a good quality of the plant. And hence the field; so furrow planting raised bed planters are used.

(Refer Slide Time: 19:32)

Transplanting well, it these are one ones we are talking of seeds where we are talking a broadcasting of see we are talking of putting the seeds together and then we are now talking of seeds, for any type of crop. Now, it may also happen that in some cases particularly in vegetables and other we would like that certain amount of seedling is raised and that seedling should be used for that for planting. So, when this is done that a certain location, we grow the seedlings of a particular seed and then pick up those seedlings and then transplant at other locations this process is called transplanting.

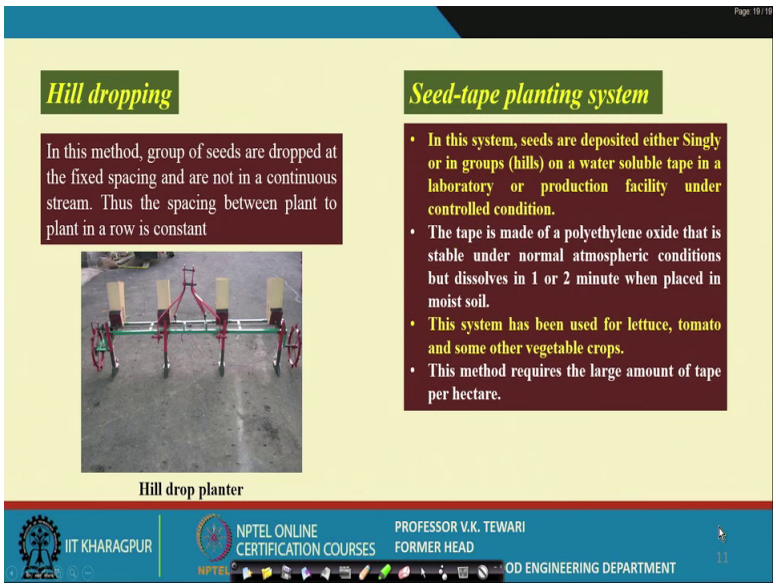
A see transplanting is a preparing seedling's in nursery. The locations where we prepare we call that as a nursery or a location. And, then and then planting these seedlings in the prepared field, in the field in which actually we want. And that may definitely we say lot of the total amount of seed we save here, it is mostly followed for paddy very largely you might have seen; although, you have not read this course; but if you have seen in your area and around, how the seedlings are then particularly for paddy.

Similarly, vegetables and flowers also the seedlings are grown and then they are grown into actual location of the field. And, the places where they are grown they are known as nursery. So, we call nursery raising of the seedlings and then transplanting removing than from their location and then putting in the right field, where they are to be actually done. Here, some of the operations which are done manually you can see that mostly the separation of um planting, these are manually here and mostly these ladies are done the most difficult part and this is given to the ladies.

This is a nursery here and some of the equipment this is the equipment which is very largely used here, in self-propelled transplanter it is very effective and for the last 10 15 years. In fact, this has become a bone to the transplanting operation. And, well cost could be a factor for a small farmers, but then on a custom hiring basis such machines are being used on large scale in several parts of the country. We have also shown you manually operated device here, manually operated device about 2 rows or so.

So, this device has been developed which we think that if the person is operating in key instead of this bend posture, if he operates in a standing posture over here. So, maybe you will find that it is easier for him. So, from safety point of view it is easier if he operates this.

(Refer Slide Time: 22:33)



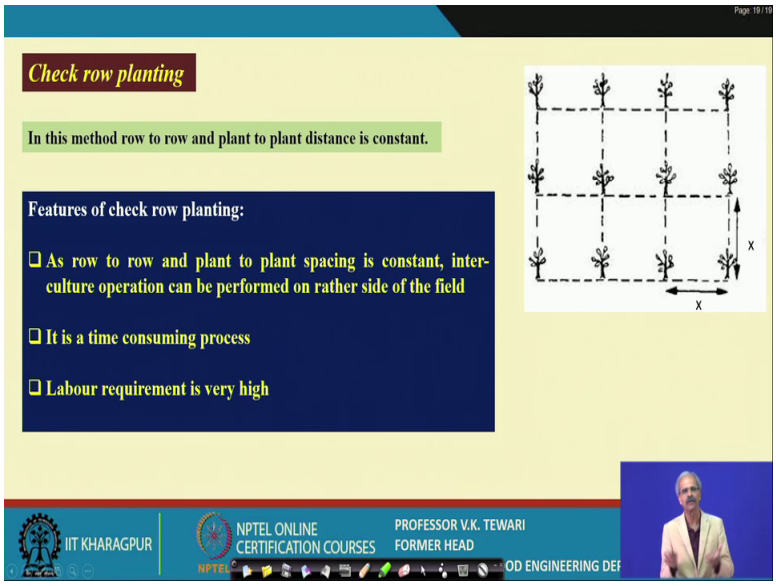
Hill dropping well, sometimes we can drop the seeds a group of seeds into hills and better way of locating the seeds in the environment. This is another way of doing this

work has been done at IIT Kharagpur and we are trying to do this job precisely, precisely in the using this in this operation.

Another system which has been long there in the literature you will find tape seeding; that means, the seeds are put in a water soluble tape. And, that is spread into this soil and maybe what within 2 3 minutes, the soil this tape. Actually, decomposes and the seeds are the beauty of this is that you maintain certain seed to seed spreading spacing, there is no problem even if it is a irregular shape of the seed you can use it, but yes, if you want to change the spacing there is a problem, you will have to decide the spacing initially and then only you put the seeds at the tapes.

What is disadvantages that see you require about 20 kilometers of this theoretical length of reels made of those seed tape rules and then per hectare. So, in 1 hectare area you will have to have about 20 kilometers of this length of tape tapes prepared and then carry. So, and the cost is also involved. So, these are some of the disadvantage of course, these are not very much in vogue in any part of the world, but then they were designed earlier.

(Refer Slide Time: 24:14)

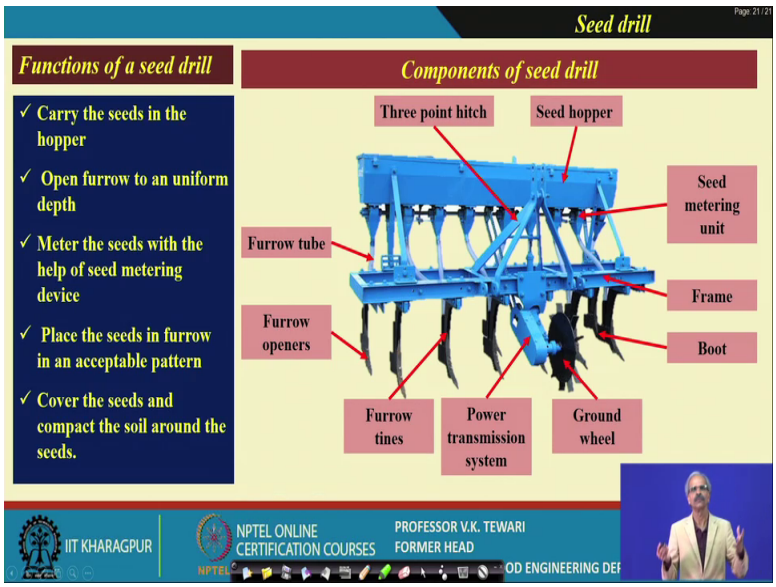


Check row planting I have already said, that what is this check row planting? And, how we are in a position to grow the seeds we maintain a certain distance between the plants have a look at this. You can see here, that we maintain the same distance here.

And, it depends on the type of the crop it depends on which it has several other advantages although you say that features of this is that it is time consuming and labour requirement is very high. Well these are in fact, the operations field operations definitely require labour and time consuming anyway, whether you were talking of a machine or you are talking of this. Because of the viscoelastic material which is your soil, and you are not aware of the quality of the soil you are not aware of the actual what is the seedbed after 15 centimeter below the soil? What is the hard pan which is there you do not know?

So, many complications lead us to say that definitely these operations are time consume, time consuming. And then these operations are also labour intensive, but then within these limitations we are trying to see, that how much we can, how much we can maintain this and say that well? These operations could be contained in well within the time.

(Refer Slide Time: 25:45)



A seed drill now, we just talked of the various aspects what do you do? You have to have a location where you keep a seed, then after that the seed has to be metered, then you need different types of a metering mechanism, then this metering mechanism should be in a position to place the seeds at a certain location.

Now, if this equipment has to be created, what will be the various components? Those are shown over here, I will just go through this you can always have a look at it because this particular slide is self-explanatory. And, all the components are given in here, but

then I will just look hurriedly into this the seed hopper will be there. Then the connection with the 3 point linkage of the tractor, the furrow tube the furrow openers which are there, the furrow times which are here, then the transmission system because you have a transmission system, which is taken from the ground wheel here. And then it will help in operation of the seeding metering see unit which is over here then the frame. And of course, boot here it helps is maintaining and so, that you get the seed properly and have cover of that and these are the functions of the seed.

Definitely it will carry the seeds in the hopper, open the furrow the meter the seeds place the seeds at the real depth and then operates in fact, you should see that the seed is definitely pressed and then loose covered, because it has been also seen in literature that you need about 34 to about 69 a kilo Pascal of pressing of the seeds, in the soil people have done this research on the various aspects of the soil, cohesion and the other aspects of soil. And found out that you require such because for emergence of this that is called the mechanical impedance of the seed to come out you require a certain thrust. So, the seed thrust is important and that is why we should have.

In fact, it should not be very heavy if it is very heavy then also there will be problem of emergence. So, we need to look into and people have given these values. So, I think these talks of the particular device. And there will be various types of these devices various um electronics use devices have come up, so that we can economize on the type of seed mechanism etcetera which we will cover in other classes.

Thank you.