Introduction to Ancient Indian Technology
Professor D. P. Mishra
Department of Aerospace Engineering
Indian Institute of Technology Kanpur
Module 04
Lecture No 19

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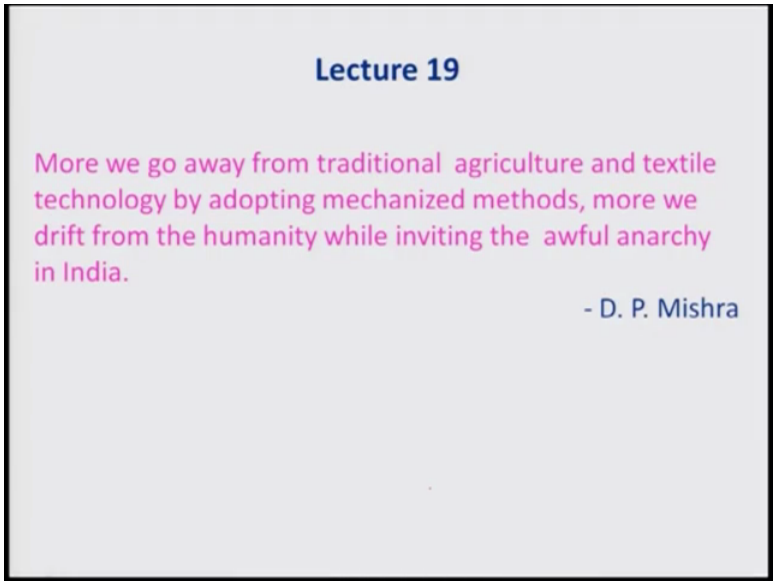

Let us start this lecture with a thought process that is more we go away from this traditional agriculture and textile technology by adopting mechanized methods, more we drift from the humanity while inviting awful anarchy in India. Of course you might be thinking why it is so? Because this is will give you peace of mind also sense of achievements by doing it. And the body and the mind will be balanced and also will be self- independent right? So, therefore and it will also give employment to the populous country like India. So, therefore it is important to keep our traditional technology may be little bit improvised person but the basic philosophy of staying with the Mother Nature will be on the back of all these developments.

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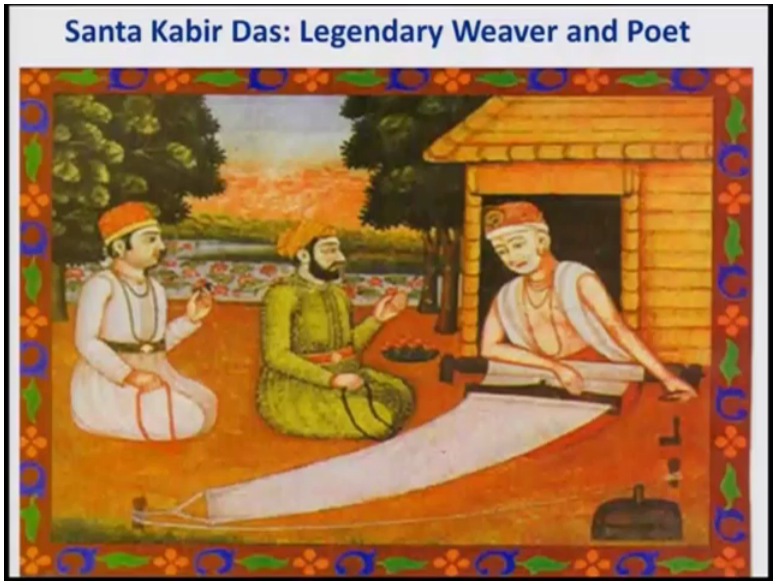

So, let us start this lecture with Santa Kabir Das most of you will know he is a legendary weaver and a great poet and whose Doha's are still popular. And he was a weaver by profession and if you look at this is the loom what it was having and unfortunately I didn't get details about this loom which I have shown here. If you look at these are the warps and these will be cloth and kind of things. This is quite interesting there are several looms people were having earlier days but those are gone with the passage of time due to the blatant use of the modern power looms.

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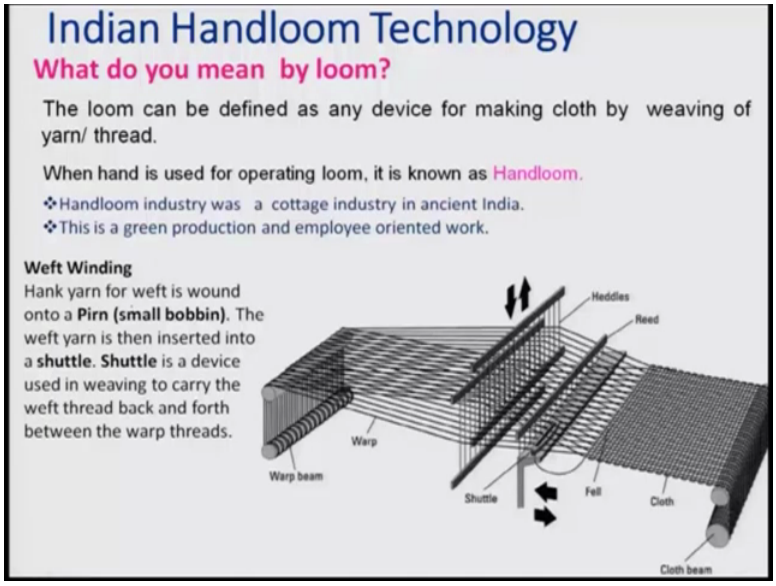

So, Indian handlooms if you look at technology are a very important one and then let us ask a question what do mean by a loom? Of course by this time you will be aware but that loom is basically a device for making cloth by weaving or knitting of yarn and thread right. That is you can define that way and whenever you use a hand for operating this loom, we call it as a Handloom. And Handloom industry was a cottage industry in ancient India. And it was a part and parcel of most of the people, not only most of the people, not only in rural areas even in urban areas earlier days, but today it is not the case. And this is a green production and the employee you know the employment oriented work can be done and by this so there in other words it produces lot of employment, as I told you also and given you data earlier.

So, Weft winding is a very important one and generally the Hank yarn for weft is wound into a pirn or a small bobbin, bobbin kind of things which are I have shown you earlier. And this weft yarn is then inserted into a shuttle if you look at this is a typical loom and this is the shuttle which will be carrying this small bobbin right for the weft. And this device you know is basically moving like in these directions and coming back in the other directions and that will be by which the weft will be wrapping up the warp and then you can make a cloth out of it.

So, if you look at this is a typical one loom what I have shown consisting of various parts to start with the Warp beam and which will be having these are the warps right and these are the threads, yarns and being placed properly and this will be separated if we look at this is known as heddle and there will be holes here right in this heddles right and this wire will be going through that like. And there are two heddles here which will be going up and down and depending on the some threads or the warp will be going up corresponding to this and this is the lower one right and it can be operated by hand these heddles and it can be operated by the leg also. And this is your reed and this is the beater this portion is the beater also they call it as sword this you call it as a beater or this is beater or is called sword also.

So, and it is having these are the what you call weft will be moving through with the help of shuttle as I told you earlier it can move towards from left side if it is left side here to right and from the right to left whenever this heddles will be down, so that this warp which is on the bottom will go to the top. And the cloth is being formed and the cloth is being warmed to the cloth beam here.

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So if we look at let us look at this process of weaving here with the help of this a video. So, if you look at here these are the beater or the sword which is moving and this is the reed and through which this is the what do you call the shuttle is moving up and whenever is moving the hand towards the left it is the moving towards the left side the shuttle and when it is on the right side it is moving to the what you call right. If you look at the leg here, leg is will be making the heddle to move up and down and that will make the thread to go up and down. In between this there is a weft here through that shuttle will be moving so that the weft will be going through the warps. So, and then of course you will have to press it towards your side so that cloth will be made and this is the process by which it is being done.

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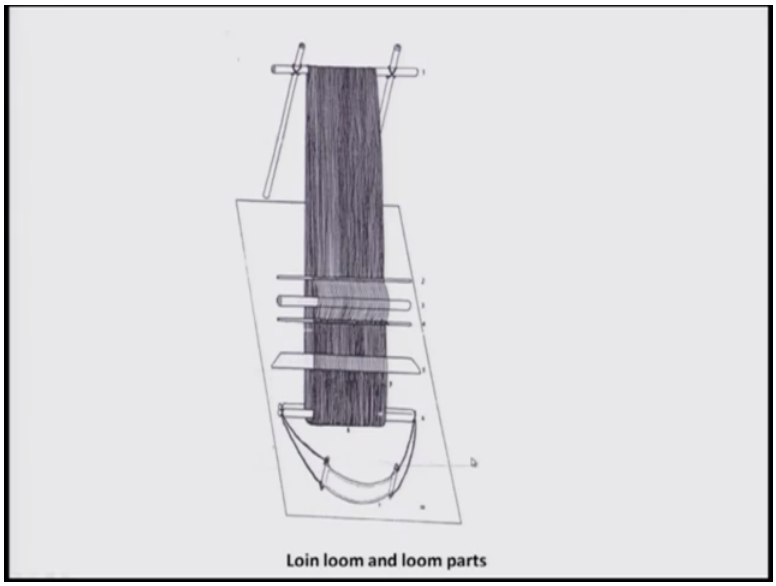

And let us look at another loom that is known as Loin loom and loom parts. And this is having various parts I have shown in number that is the one is Bamboo, serves as a same purpose as a warp beam in the horizontal loom and 2 is the thin bamboo rod acts a lease rod which will make it to you know lift it sometimes whenever required and this bamboo shod which will be making you know for shedding this warps kind of thing separating this warps which you call shedding. And the bamboo heddle sticks which will be help going through this loops that it will be separated out. And this is the wooden beater which is being used for after the weft being passing through the warp to bring this closer to the cloth that wooden beater is being used.

And the wooden rod this thing serves the same purpose as a cloth beam in the horizontal loom. And this is the leather back which has to be giving little you know what you call tension over the whole thing and that will on the back of the weavers which will adjust. And this is a continuous warp which is there here and this is the woven fabric what it is will be having. And this is the Mat spread on which the weaver will be sitting and this is kind of things are being used very much, let us look at how it will be working.

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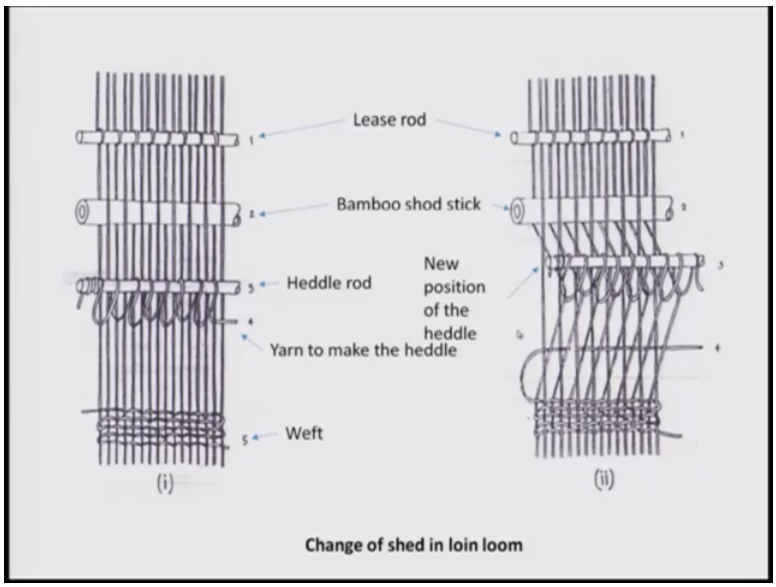

So, if look at this is the Lease rod through which this warp will be wounded, let us say this is the odd yarn or the thread or the string whatever you call and this is going down right, this is on the up and this is going down right and then these are all being done in a systematic way odd and even order for all the warps. And bamboo shod stick will be there will be separating both the both this odd and even yarn or the warp this. And this is the heddle rod which will be

using you will have to lift it up and down and there is a loop through which this wire will be going that is the your warp will be passing through and this is the yarn to make the heddle right, these are the ends there. This will making a loop here and this is the weft which will be knit to be done with this process and if you look at this is the similar one only thing is that in this case the bamboo shod is being separating out but the heddle rod is lifted. As a result it has been the space is created separation between this the even warp and the odd warp is made and then so that weft can be passing through it. Right, again this is going from left to the right side and again you will have to take this heddle position down and then it will be going from right to left and making a group like that. So, this is the process how it is being done with this Loin loom and basic process remains same and now we will look at a video right and so that it will be clear how it is functioning.

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I am ready towards the shed that is controlled here by the shed stick. So, then I am going to place my sword or my beater in the shed, tight out here the beater keep my sword on the side more leaning back and the shed will pop open. Keep my hand inside this and then rotate my hand with the beater and beat. Now I can pass the weft taking the weft firmly in the shod leading a loop, taking the side drawing the weft and gently till it just touches the last warp. Now, I am going to earthen the heddle shape ok, I place my hand like this against the heddle hook my thumb over the top and I am going to roll the heddle forward and at the same time taking tension of the warp by laying forward. Then you can take the shape with earthening, and there is a rainy sticky work here or just wave them off with my thumb the stick has earthened very cleanly. Place my sword or beater inside and draw the warp down to the weaving line, take the weft thinking drawing the weft in.

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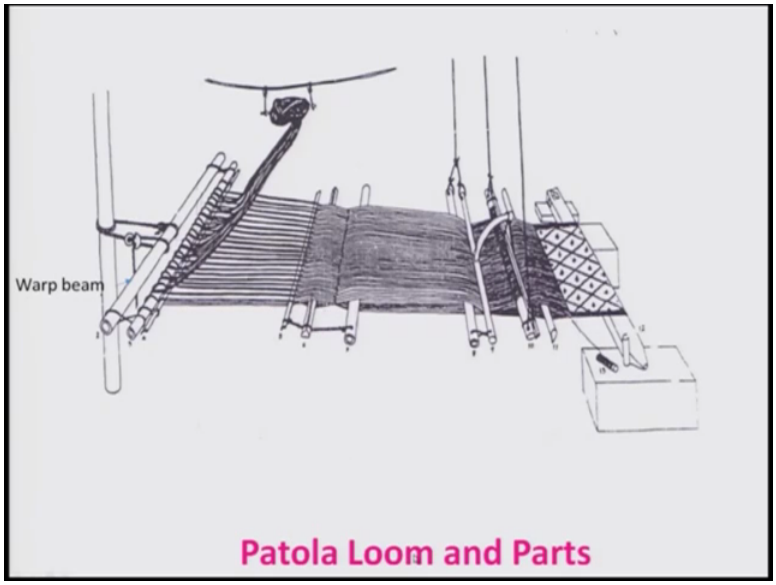

So, let us look at another loom that is the Patola loom and various parts if look at this is the warp beam and this is the ditto of that same one like and this is the stick which is being warp to this wound to the this warps and cross mechanism with indented stick these three are and this is the shed rod which will be helpful to make this separation of this warps. And this is the pressure bar, this one is the pressure bar and this is the handle, right. And this is the heddle rod mechanism which will be helpful to separate and this is the sword which is being used for used as a beater so that the warp will be coming closer to the cloth. And this is the shuttle which will be passing through this V-shape of the warps between the warps it will be passing through and this is the of course the breast beam.

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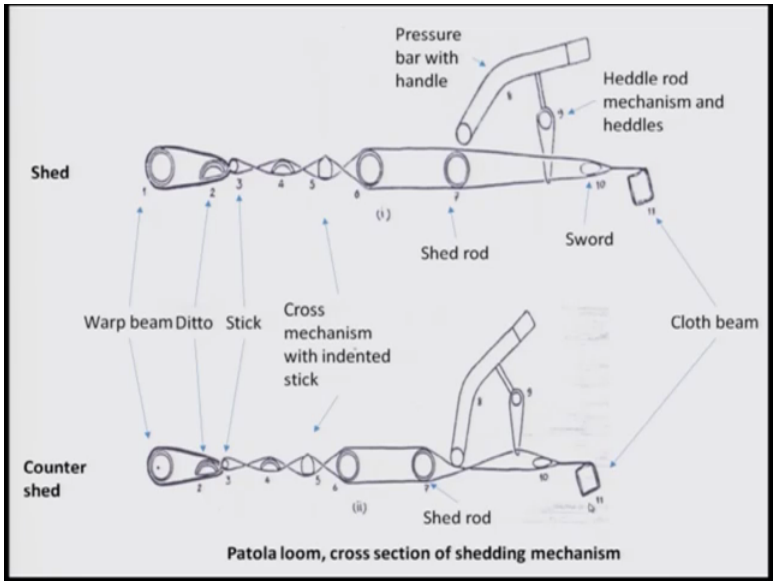

And if you look at this is the same thing what we have seen from the side views. And this is the warp beam and this is the ditto same as that. And then this is the stick which is being used to separate this thread and this is the cross mechanism with indented stick and mainly it will give a tension so that this will be separated out and this is the shed rod and this one is the pressure bar with the handle it will be giving the pressure so that this will go down I will show in the next one. And this is the heddle rod mechanism which will be helping to actuate with the help of this hand and this is the sword which will be pushing this weft to the cloth side and this is the cloth beam. So if you look at now it is like this and when you keep a pressure with the help of this heddle, this heddle will be pulled out to the lower string to the up and then this will be going down because this is the pressure is there so, it will go down.

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And this through which you know like this if you look at the warp will be passing through and with the help of the sword it will be brought closer to the cloth. So, and this is of course the cloth beam. And these are the same thing whatever over here so, let us look at how does a Patola loom works and it is and it is basically from Gujurat and also other places it will be there. And this is the handle which is using here and this heddle is coming out and this is the design which is coming that this is the what you call beater which is coming closer, this is the beater which he is using the hand for pushing the beater. And this is the shuttle which moves by that way and this design is a quite beat you know and then it is very useful. Of course two persons are doing but a single man can also handle this.

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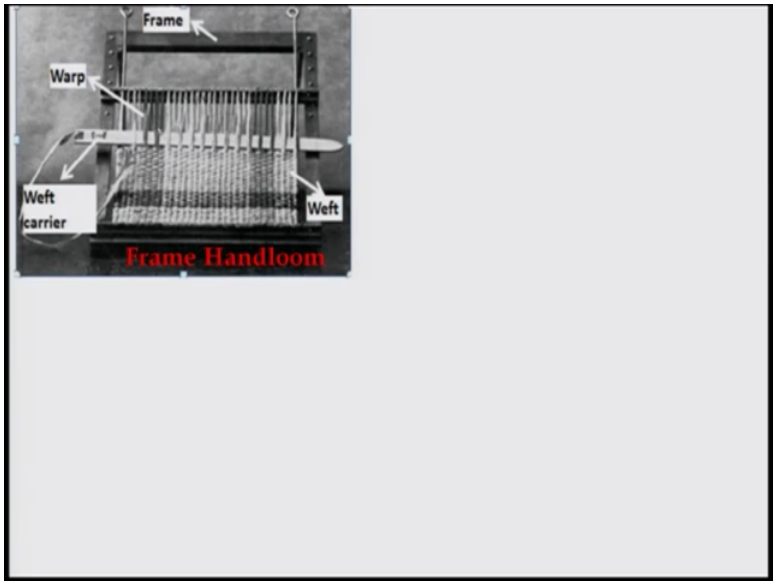

So, that is another frame handlooms which is very easier the same principle it will be having warps here and then with this weft carriers it will be going this side left to right and again it will going to left to sorry right to left, of course there is a things which will be changing this the warps orientations so that it will be moving one over the other. So this is the same principle what but it is the hand one and is a very simple one even you can design in your home and then do that.

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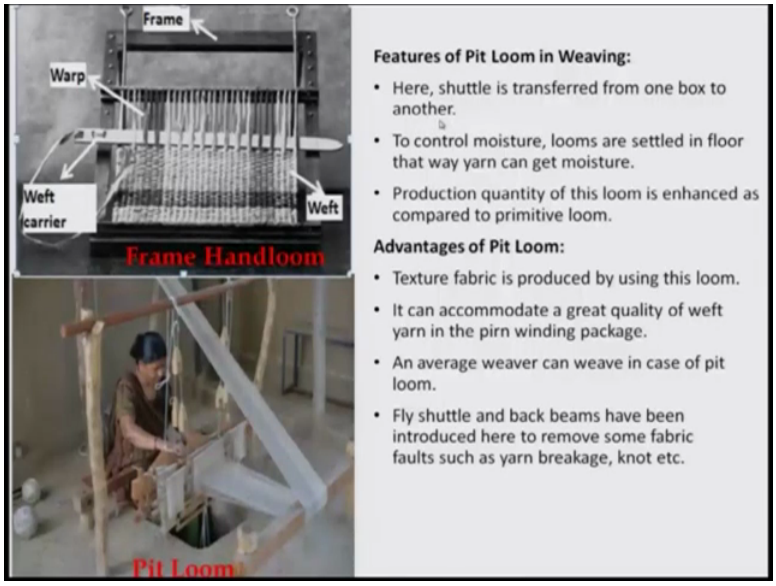

There is another one which is known as pit loom it has been used in several parts of our country. And the Pit is being produced here and these are the heddles which are having and

you can use these heddles and these are the warps going on and the cloth being produced and certainly this transform from one box to another these are the main features, and people claim that to control moisture, looms are settled in the floor that may yarn get you know get moisture kind of thing. This I do not know how the moisture control takes place and what will be the size of the Pit. I could manage to get data. And production quantity of this loom enhanced as compared to primitive loom so, therefore it is having advantage therefore people have used this Pit, one has to explore how and why it is?

And the advantages of Pit Loom are basically texture fabric can be produced by this loom. And it can accommodate a great quality of weft yarn in the winding package. And average weaver can weave in case of pit loom like it is not because of it is not that you need to have a balance between the leg and the hand. It is little easier because all is being done may be by the hand itself So because their coordination is very essential. And Fly shuttle and back beams have been introduced here to remove some fabric faults such as yarn breakage and knot, because this fly this thing shuttle will be done by the again with the help of hand, and which is easier to do that, so these are the advantages of the pit looms.

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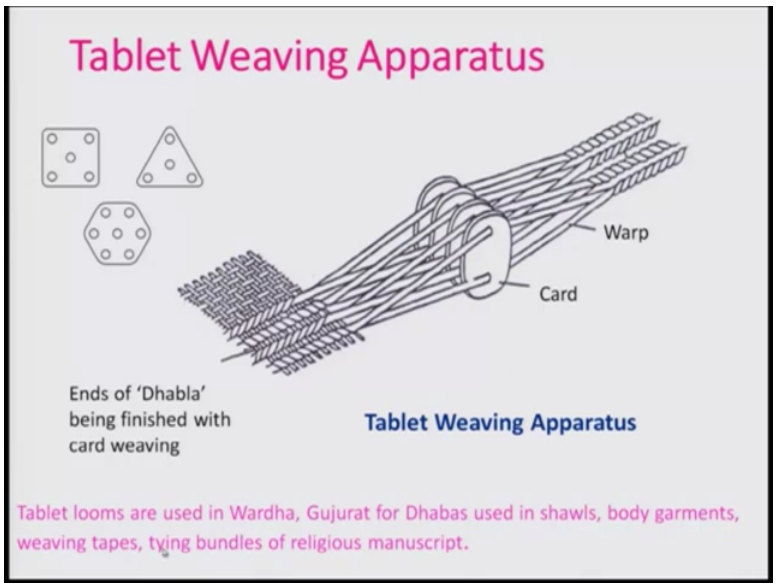

And let us look at another very interesting thing a Tablet Weaving Apparatus like which looks like a this things like it will be having this the card which having here in of course it is a two holes there might be several four holes, this is the warp tight. And it is a very simple systems and this is the ends of `Dhabla' being finished with the card weaving. This is the product what will be getting out of it and this card can be of various designs, it can be five holes, it

can be four holes like triangular, it can be hexagonal kind of things saves you can design your own and depending on the design.

And these Tablet Looms are still used in Wardha, Gujurat for making Dhabas, in shawls or body garments or weaving tapes or tying bundles of religious manuscripts because not very big cloth can be made out of this but strips can be made very easily. And is still used in even if you want you can you know make yourself this thing with the help of a even small wood and this thing you can do yourself in your home, it is very easy to do that.

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Let me also show you that how does it work with the help of a video so that you will be you will be you will appreciate the how easy it is and this is the card which is being used and these are the threads and so, this is the weft which is passing through you can look at it. Like it is a very easy of course easy few sheds you can rotate this card so that this some portion the warps the one set of warp will go up and down and then you know like that way it will create a space in between through which the weft can go from left to right and right to left that way. Right, and this itself is you know where this yarn weft can use as a beater. Lot of functionalities being embedded into the same single sort what is carrying in the hand right. So, that is the beauty of this simple system, and which is known as Tablet Weaving. And you can design differently and the design of the fabric will be depend on the card design or the number of holes under the things what you can manage.

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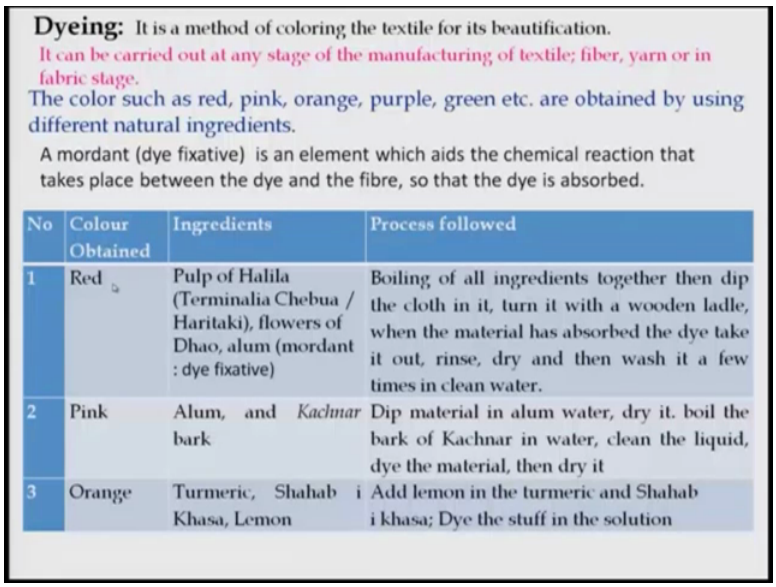

So, let us look at the dyeing process which is you know basically a method of coloring the text for its beautification and it can be done in during the manufacturing of textile itself sorry it can be done at any stage of manufacturing textile, it can be fiber, it can be yarn or it can be in the fabric stage itself. So, the colour such as red, pink, orange, purple, green etc are obtained by using different natural ingredients and particularly in ancient India, people were using the natural one not only in ancient India in other parts of the world also they might me using earlier days the natural pigments for the coloring and besides this a mordant which is also known as dye fixative was used and which aids in chemical reaction that takes place in between the dye and fiber, so that dye will be getting absorbed to the yarn or the fabric.

And we will look at some of these things what we use, what our ancestors were using Red if you look at for getting red; we look at the pulp of Halila that is the Terminalia Chebua or Haritaki. Haritaki is basically a Ayurvedic name you can and flower of Dhao or alum, alum is a basically mordant which is nothing but a Dye fixative. And what you need to do that you know the process will be like this, you will to boil all the ingredients together in a pan and then dip the cloth in it, turn it with a wooden ladle or some other things and when the material has absorbed all the dye take it out then you will have to rinse with the water and dried it and then wash it for few times in a clean water. And this is the usual process what will be. Let me tell you one thing that the Pulp of Halila is being used here but there might be several other kinds of natural flowers that this wood or even the seed can be utilized. I will be showing you the next light about you know what the varieties we can have are.

Let us say pink colour, for getting pink colour you get kachnar bark, the alum and again the same thing, dip the material in alum water right, and dry it that is a little different one and boil the bark of kachnar in water, clean the liquid, dye material and they dry it. This process is little different than the first one. At here, first the cloth has to be in the dip in the alum water and dry it and then you boil this one and put this cloth into that. And for getting orange of course you can use Turmeric, Shahab I khasa and lemon, another natural material and which of course is in Urdu. Add a lemon in the turmeric right and Shahab I khasa and dye the stuff in the solution, I think lemon here it will be use as a dye fixative may be right, I guess.

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4	Purple	Pulp of Halila, Hirakasis, flowers of Dhao	Boil the Halila in sulfate of iron, clean it, dip the material in the liquid, dry it, boil alum in water, dip the material, dry it, mix well the flower of dhao and all together, boil it in water, dip the material in the boiling liquid, keep in turning it with a wooden ladle so that it does not burn and the dye is evenly absorbed by the whole piece. take the material out, rinse it, wash it four times in pure clean water, dry it and then beat it into smoothness.
5	Blue	Nil (Indigo) Shahab i Khasa, sour lemon	First colour the material in indigo and water solution. Add sour lemon in shahab I khasa, then dye the material in this solution
6	Green	Kabuli madder (red), rind (outer skin) of pomegranate, alum	All to be mix together, then boiled. Strain the liquid, dye the material, dry it.
7	Off white	Vermillion, saffron, starch	Pound the vermillion with water, dye the material dry it. Boil saffron in water, strain it, colour the material in the liquid, dry it. Add starch in the same liquid, dip the material, dry it.

So, for getting purple colour, pulp of Halila is to be taken and Hirakasis AND flowers of Dhao and you will have to boil the Halila in the sulphate of Iron, this is use as a basically may be like a mordant, clean it, leave the material in the liquid, dry it ok and subsequently boil alum in water of course the alum also is being used. Dip the material, dry it, mix well of the flower of Dhao and all together. This process is a little complex, boil it in water, and dip the material in boiling liquid keep in turning it with a wooden ladle, so that it does not burn and the dye is evenly absorbed by the whole piece. And you will have to take the material out, rinse it, wash it four times in pure clean water, dry it and then beat it into smoothness. So, if you look at this process is given and then you know like one can also find out their own way of you know by heat and trial.

And if look at the blue colour we can get from Indigo that is a nil which is a basically from India. And the Shahab I khasa and sour lemon and of course lot of research has to be also done and might be there also, so you will have to look at it that what makes this each

constituent you know, what are the roles been played by each constituents has to be we look at, what can be done here first colour the material in Indigo and water solution. Add sour lemon in the Shahab I khasa and then dye the material in this solution. So, that means different procedure is given for the different kind of things one has to appreciate that. And for the another colour green, you can say Kabuli madder which is a red and rind means you will take the outer skin of the pomegranate, you know pomegranate we use particularly in winter season it comes and that can be utilized for the as a part of colour, and you will have to use alum which is nothing but the mordant. All are mixed together then boil and strain the liquid, dye the material and dry it subsequently.

Off white is a vermillion which is being used and saffron starch which is also being used. And pound the vermillion with water, dye the material and dry it, boil the saffron in water and strain it. And colour the material in the liquid and again dry it then after that add the starch in the same liquid, dip the material and dry it right. And this is the procedure which has been laid out of course one can you know find out it and trial and then see that is the optimum method of doing it or there might be better method and people have used therefore it has been quoted in the literature, which I have used one paper and I have taken from that.

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Sources of different colored dyes and mordants

Colour	Botanical Name	Parts used	Mordant
Red dye			
Safflower	Cartganus tinctorius L.	Flower	-
Caesalpinia	Caesalpinia sappan L.	Wood	Alum
Madder	Rubia tinctorium L.	Wood	Alum
Log wood	Haenatoxylon campechianum L.	Wood	-
Khat palak	Rumex dentatus L.	Wood	Alum
Indian mulberry	Morinda tinctoria L.	Wood	Alum
Kamala	Mallotus philippinensis Muell.	Flower	Alum
Lac	Coccus lacca Kerr.	Insect	Stannic chloride (Tin tetrachloride : S_nCl_4)

And as I was telling that sources of different coloured dyes and mordants can be several of them. In the last table what I showed you one of each of them. But for example, for the getting Red dye, we can use Safflower, Caesalpinia, Madder, Log wood, Khat palak, Indian mulberry, Kamala and Lac. And if you look at these are the parts to be used like Flower,

Wood, Wood and Flower, even insect right that also can be utilized as a colour. And different mordant mostly is alum but there is a last mordant is the Tin Tetrachloride which is commonly known as Stannic chloride right? And similar things will be there for other colours also. I am having those data but I think I will not load you with this so many data and if you want you can really utilize it.

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So, let us look at Printing. Because it is very much you know were used in earlier times, even today also it is being used. And basically it is a localized dyeing which is undertaken manually on the cloth itself by different methods and we will be discussing about them and we will be discussing about this two methods, one is block printing and the other is kalamkari printing. And block printing if you look at wooden is generally used and the wooden block or you know is the simplest one and which was used in earlier time and it is of course one of the slowest method of textile printing. And even the stone can be utilized and some other material, let me show you that this is the block which is made out of wood and you can make a design by engraving it you know and then you can have various design.

And block of different shapes and sizes are made by cutting the wood or engraving it right, depending upon your design. And top of the block has a handle like if look at this is your handle for printer to grasp it or hold it. And each block has two or three cylindrical holes which is not shown here right, is not shown here. These holes, cylindrical holes are used for the passage of air so that it can really help to dry the things and also it will allow excess dye to squeeze out during the printing. Like there is a two purposes will be there, one is of course for passage of air and also to squeeze out dye which will be given for the printing. So,

printing is carried out generally from left to right by dipping the block in a dye first and then presses into it on to the fabrics. And of course this is a practice one has to do and lot of concentration is required for doing that because if you make some error then you know it will be spoiling the whole fabric or the cloth.

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So, let us look at now you know how does this hand printing work by looking at a video. So, if look at this one he is trying to make a design out of wood by you know engraving it and then it is pressing it by the this is the handle and these are the various design what is been shown here and this design you know can be utilized here.

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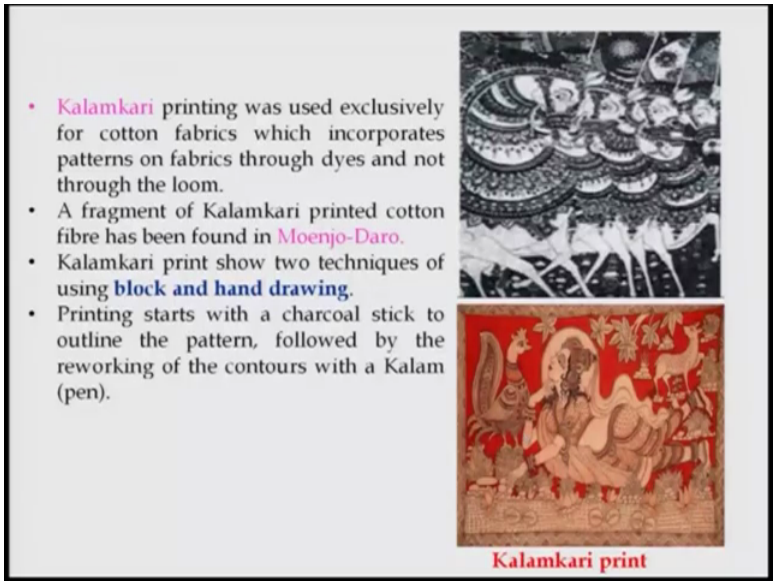

So, there is a Kalamkari is another printing was used extensively for cotton fabric in earlier days which incorporates the pattern on the fabric through the dyes, not through the loom right because it is of course a by the later on this you know pattern is being placed on the cotton later on by the Kalamkari. Kalamkari means Kalam basically is pen this thing and is an art form and a fragment of Kalamkari printed cotton fiber has been found in Moenjo-Daro which goes to the your what do you call Indus Valley Civilization something around may be 3500 BC. So, this is the one I have shown here the Kalamkari work in this place it will looks to be very intricating you know lot of patience is required.

Kalamkari prints two technique using of course block and other is hand drawing. And the what one has to do is that first to maybe you know print or make a line sketch on the cloth with the help of a charcoal stick or any other kind of colour pencil and followed by the reworking of the contours with the kalam or the pen. And this is another work which I am showing it is a very quite intricate and lot of work and patience is required to make this. So, and these are also being use today in our country because we are very good in you know even today we are having love for the art and then we are good in doing that so therefore we are still using it of course it is very lower intensive. Let me show you a video like how this Kalamkari printing carried out on cotton.

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And this is now all set for the best of the artist to begin by sketching the motives with dried charcoal sticks. The black colour obtained from processing iron, jaggery and salt water is applied first. Alum is used as a mordant to text the colour. Once the outline is complete, the details are filled in with a various colours all of which extracted from vegetables, roots and barks and marinate of natural sources. The different sues are layered in different stages and treated for fixing. The pictures come to life as pinks, yellows, greens and blues emerge, as they are applied and fixed with great care to prevent the colours merging with each other. Once the artist completes the work on the fabric it is left on the river bed with a right side to the sand. The river, sun and sand these are the final colours in their right intensity and the fabric meets the river for the final wash before begins its travel to tell the stories it carries.]

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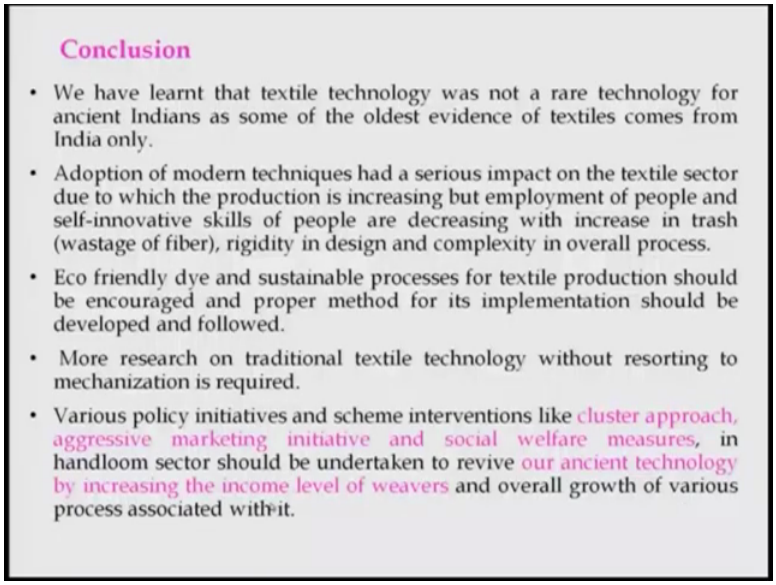

So, let me now conclude with few remarks this textile technology what we have seen. If you look at textile technology was not a rare technology for ancient Indians as some of the oldest evidence of textiles comes from India only. And adoption of modern technique had a serious impact on textile sector as we had seen and discussed due to which the production is increasing but the employment of people and self-innovative skills of people are decreasing with increase in trash or wastage of fibers, rigidity in design and complexity in over-all process. And also we are losing the creativity which is the innate nature of human being with our people because of adoption of these mechanized methods of textile production.

And eco-friendly dye and sustainable process for textile production should be encouraged which was a part of our ancient culture and proper method for its implementation should be developed and followed. And we should work it out, little bit mechanization may be we call for but not that we will be using you know electricity and other things and it will be very costly also. More research and traditional textile technology without resorting to the mechanization is the need of the hour and so that we can develop lot of employment and also keep our creativity and peace of mind and also the satisfaction level with us. So, various policy initiatives, scheme interventions like cluster approach, aggressive marketing initiative and social welfare measures, handloom sectors should be under taken to revive our ancient technology by increasing the income level of weavers and overall growth of various processes associated with this and this must be integrated with agriculture.

So, what I would like to suggest all of you that you should get experience in this by doing little bit this yourself because some of the things, loom technology you can develop yourself.

Like your card technology and then other things which are simpler one right so, which you can do like Tablet weaving apparatus and other things you can do very easily. And beside this I would suggest if you could visit some of the existing handlooms and make a video and also learn yourself and send us so that next time we are incorporating your videos in our course for the education purpose, Thank you very much.