Ergonomics for beginners Industrial design Perspective

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Module No. # 09

Performance support and design intervention

Lecture No. # 39

Humanising design: Design and human compatibility, comfort and adaptability aspects

Welcome to the thirty-ninth session of ergonomics for beginners industrial design perspective.

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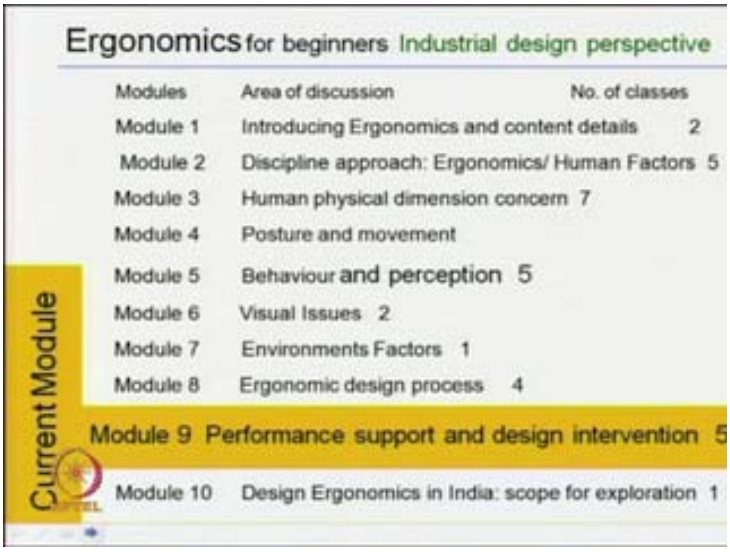

So, among tenth module, the current module is module number 9: Performance support and design intervention.

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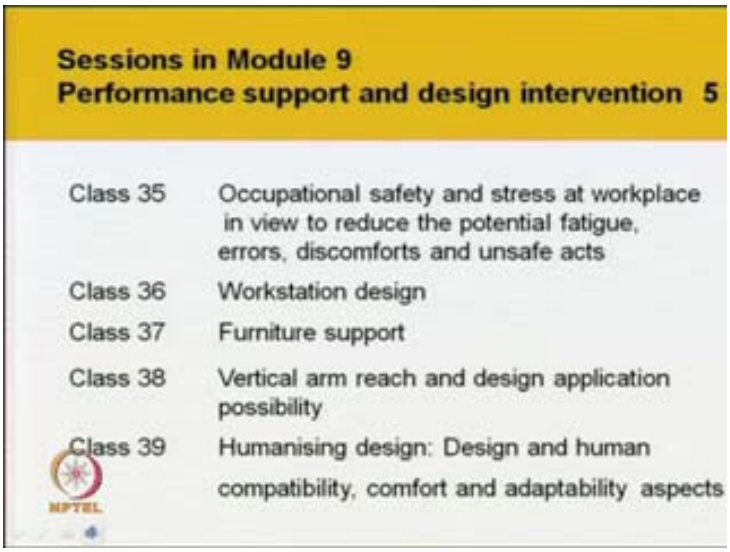

In this module, total 5 classes are there. Class 35: Occupational safety and stress at workplace in view to reduce the potential fatigue, errors, discomforts and unsafe acts Class 36: Workstation design and relevances, Class 37: Furniture support, Class 38: the last class; Vertical arm reaches and design application possibilities with workstation development in a craft sector was discussed and the thirty-ninth session is today: The humanizing design; Design and human compatibility, comfort and adaptability aspects.

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Here that is the today's session that is, a thirty-ninth session: Humanizing design; Design and human compatibility, comfort and adaptability aspects. Here, we are going to look into design intervention strategy, how we are making the strategy for development? Whether, it will be a small product, a system approach. Who will be implementing this for sustainability of the total development? Whether the responsibility lies on the user's itself or the providers or manufacturers or the law enforcement so, that type of strategy we will see here with few examples.

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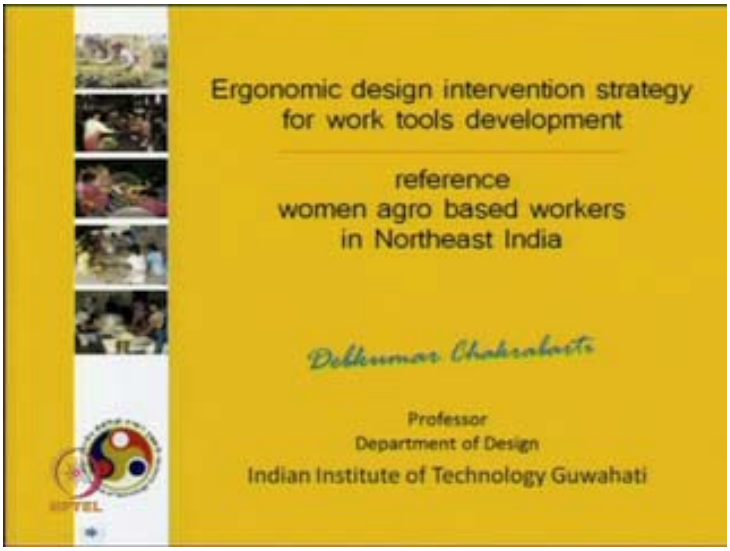

This topic, we are going to discuss under this heading that, Ergonomic design intervention strategy for work tools development, reference women agro-based workers in North-east India, within this we we will be discussing two specific aspects that is, tea plucking and fruit processing industrial requirements.

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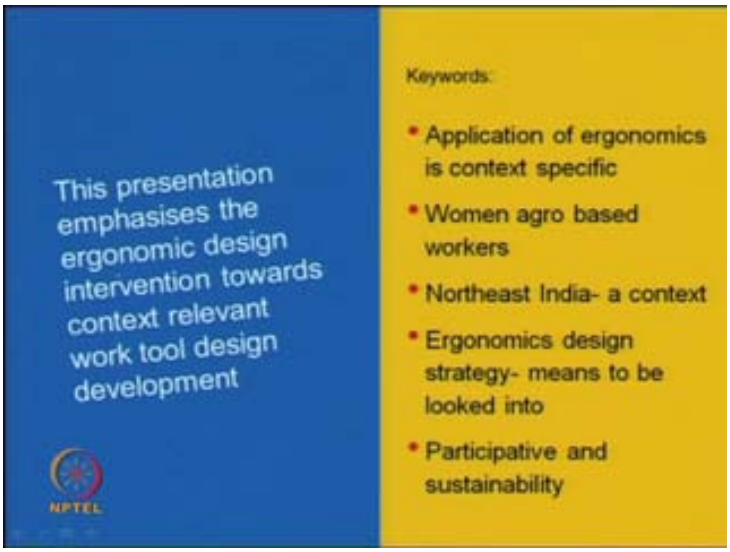

This presentation emphasizes the ergonomic design intervention towards context relevant work tool design development, the keywords of this discussion goes with: Application of ergonomics is context specific, Women agro-based workers, North-east India a context, Ergonomics design strategy- means to be looked into and Participative and sustainability issues. With these key aspects, we are going to discuss the strategy requirement for design development specifically, for hand tools or work tools.

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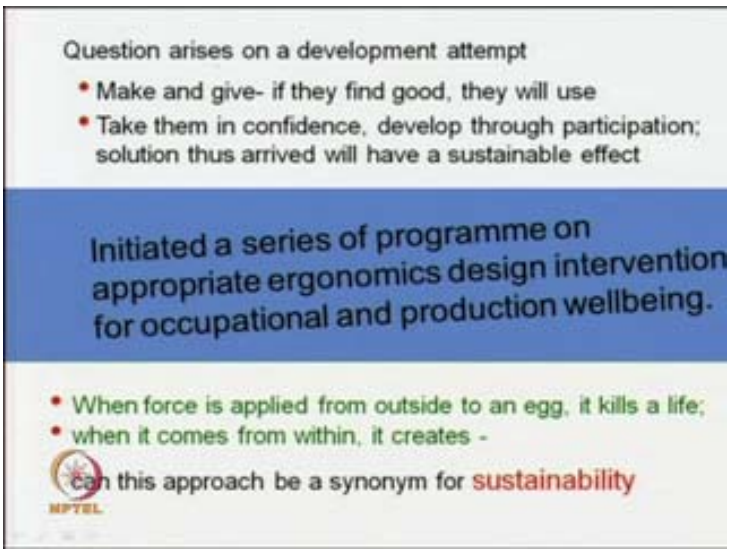

But, the question arises, on a development attempt like: there are two types of development attempts, possible 1 is that: Make and give- if they find good in the users they will use it, means make the product, give them, put them in the market or give them to work or to use it. The second one is that: Take them in confidence, the users develop through participation; what they need, according to their need, solutions thus arrived will have a sustainable effect for a design development. It can be initiated a series of program on appropriate ergonomics design intervention for occupational and production well being.

Why we require to develop a work tool? So that, workers can perform the task well without any physical discomfort or any health problem but, the aim is to increase the productivity. So, the design development should be or should aim (Refer Slide Time: 04:12) at production as well as occupational well being, health well being, health well being.

Now, to make it sustainable, the issue comes with these two, what we discussed. Make and give or take users in confidence. It can be said that when force is applied from outside to an egg, it kills a life. When the force comes from within it creates, after hatching, with inside inner force the egg breaks, and a life is created and it remains. But, when an egg is broken from outside force, it kills a life; can this approach be a synonym (Refer Slide Time: 04:12) for sustainability? Then, always make the product, give them for using, it may not be sustainable. Who will continue the supply, if they can develop their own, they can modify their own, they can reuse the product the way people can feel. It gives the longevity of that product, it will sustain.

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Now see, what can be done? The the context is that, a large portion of women workforce of Northeast region of India is engaged in a range of upcoming agro-based mostly private small scale units of food processing as well as being engaged in tea leaf plucking in corporate sectors of tea industries. Tea leaf plucking under the corporate sector, and the food processing involvement, in private small scale units mostly. Appropriate strategy for work tool development has become a crucial issue in occupational wellness and productivity.

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How to handle it? In both the sectors, the activities involve numerous combinations of arm and finger movements and their use varies with the skill, experience and degree of fatigue of the worker. That left hand top figure says that; a typical tea leaf plucking, that is, the apex part of the tea leaf, a tea branch, tea suite, ideally two leafs and a bard to be plucked using nails or fingers. (Refer Slide Time: 08:27) And this is the pineapple and the ginger, these three we are going to discuss. For improved productivity and occupational well being work tool development was found essential to attempt.

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A typical tea garden, the women workers mostly they work with the lanes and inside the garden here and they pluck the leafs. The problem is that, if they stand here, they have to stretch their arms the problem comes, ergonomics risks of any work is that posture for that they have to bend always to pluck the the leafs, always bending posture carrying a load at the back after plucking they do not only store like this so, the load at the back, It is hanged either from a strip, from the head forehead or the shoulder, the posture the force in that position when they lean forward to reach the max the end part of the tea bush.

The stretching, and in the plucking like this, always they do not pluck the tool leave and bark that system they pluck some bigger leafs also, that they require some force to snatch it like this and frequency. Frequency means, normally they seem that, if it is not possible

to tear in a single movement they sometimes, they make multiple movements like this and sometime it is seen that like barbers use that scissors while cutting hair like they make some false movements, they also make some false movements, while selecting the leaf to pluck. Some false movements are also there.

So here, what happens is that, the total effect is that posture force application and the frequency. If we can reduce the the total thing, how it can be? After study It is found that, if we can had easier way to pluck without any problem it then, the time to bend will be reduced, stretching time to bend will be reduced, false movement may be reduced, thinking these and attempt to us made for developing a thimble type of special cutter device so that it eases to pluck.

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Now, I am going to discuss the process of development and what it goes behind this thought. Here, the typical garden was is shown where the workers are going for working now then, they are carrying baskets using the umbrella.

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But, the thing is that, when working they cannot use umbrella. So, the direct sun and other environmental effect is there. Sometimes people use this type of small plant made [fl]- this is the working. So now here, now you can say that, the stretching to reach the this end part of the bush, so this is a bush. In this case, tea leaf hand plucking where, work method and use of work accessories are decided by the corporate decision with large scale implication, Any development here either process or in a specific equipment to be used for these tea leaf harvesting, it depends on the corporate decision.

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What type of products can be developed? The thing is that, either when it is a labor intensive task or when the more tea leafs are there but, the supply of people are not that much. A problem comes how to harvest? And there, many systems people try to develop which mechanized system harvesting.

So, the concept perhaps, has come from that. After a certain period or season, the tea bushes needs to be polished, to be shaped. So, using a (Refer Slide Time: 14:22) sickle type of device, they cut the upper part of the tea bush so that, in next session a new good tea leaf and branches suites can come up.(Refer Slide Time: 14:22) Varieties of mechanized system also developed for harvesting.

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But, all the developments are found, not suitable to work in this type of gardens, because it does not have a single surface.

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So, a development trial was made if, a shear type of device can be developed. In some other places or countries, it was introduced and seeing that for fast harvesting, a shear device was developed with relevant ergonomic considerations by nationalist of design at Ahmadabad.

Now, what is developed? Now here we can see that, this a box type of thing where, it is a flat, so this is a two scissors like so it is it has a two blade, with this blade one: is that, flat and here, is the main basket main basket so, when it cuts cuts that ah if the tea leafs are here and it cuts, after cutting the cut tea leafs falls inside the basket this is and then, the length, breadth, angle and etcetera it was all developed. And holding easiness with ergonomics handles requirement criteria etcetera was made and it was made in such an angle so that, while cutting it or while holding it, the palm should not touch or should not get rubbed with the hard suites here after plucking.

Then if a cut like this way, (Refer Slide Time: 15:55) Then whatever, the leafs collected cannot be placed over the shoulder to the basket. So, a special basket was developed here, that is sack with a ring here with a ring to keep this face open so that instead of putting like this, they can cut it like this and they can simply download here and again download like this way. This is the system well developed system. (Refer Slide Time: 15:55) But, it was not found usable or used in North-east region. Why?

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Work tool design for quality and quantity production that is necessary. Harvesting quality tea-leaf, hand plucking is preferred and practiced till today. Mechanization is a constant search for development. In this case, the shear harvesting does not match quantity tea leafs harvesting and quality, only match with the quantity but, quality harvesting is not there.

So, the development strategy was taken to make a thimble type of device, this device can be put on a finger with a cutting grease here so that, with these sticks suites, it can be simply put and with less pressure with this cutting edge, it can be easily plucked. This development was done and this strategy was taken.

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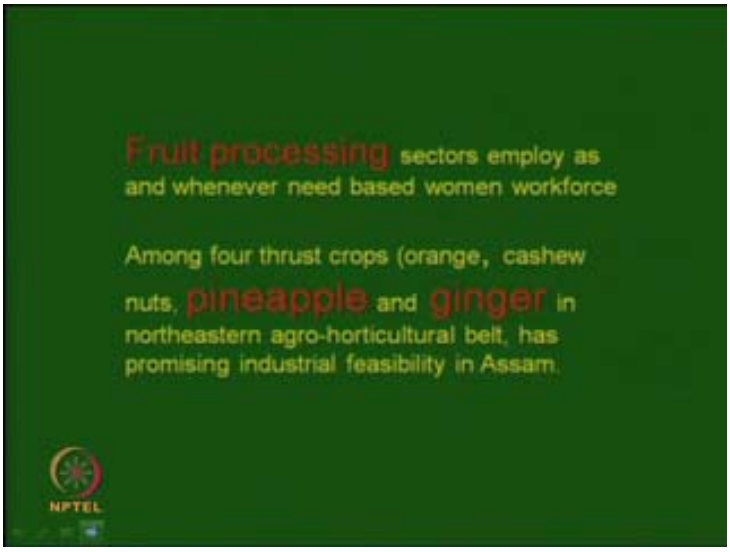

Now let us, shift to the fruit processing industries. What type of development they may require? Fruit processing sectors employ as and whenever need based women workforce but, in tea it is a regular employment kind of thing. Among four thrust crops in North-east specify the plain Assam; orange, cashew nuts, pineapple and ginger in northeastern agro-horticulture belt, has promising industrial feasibility in Assam. So, the pineapple and ginger, these two items were selected for study.

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Fruit processing work environment, it looks like this, where women and men also work as and whenever, they require and they engage in varieties of tasks.

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Here, I am just showing one pineapple processing matter, in pineapple and pickle processing; two issues have come to fore, one: Mechanization or semi-mechanization, which one is necessary. Two is that: Working hand tool development strategy; employee participation is necessary because, when the pineapple season is there, it is a very short lift season when production is more, immediately you require more people work on that.

After that season go then, that that much work force is not necessary so, some of them they get engaged with some other fruit materials as ginger and etcetera.

So, a specific product development, a hand tool development may not be used for all types of activities but, in tea industry if when you develop a small product that is a plucking device, it can be used throughout so here, we can say that, (Refer Slide Time: 20:35) when the pineapple comes like this, then it is trimmed and then, it goes to the people. They first peel it after peeling; they make it slice and then the core inside, that hard matter that they you remove it and then, it goes to team for processing or for packaging and then, it goes to the end users.

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Now, the process is that peeling, slicing, coring and packaging. There are two different types of system two system. First system: the process is that, first make the slices and peel it after that first make slices then peel it with knife, after that make core with this type of device make the core like this. This is also another type of peeling is taking out the center one and after that a small coring device is like this, with that pressure force, the center part can be removed and this then, it can be used and can be stored.

Another item, another system is that: first peel the whole pineapple and then, slice it and after slicing make the coring. So, these are this type of knifes are mostly used and then the coring and the slice and the other peeling device after slicing are like this.

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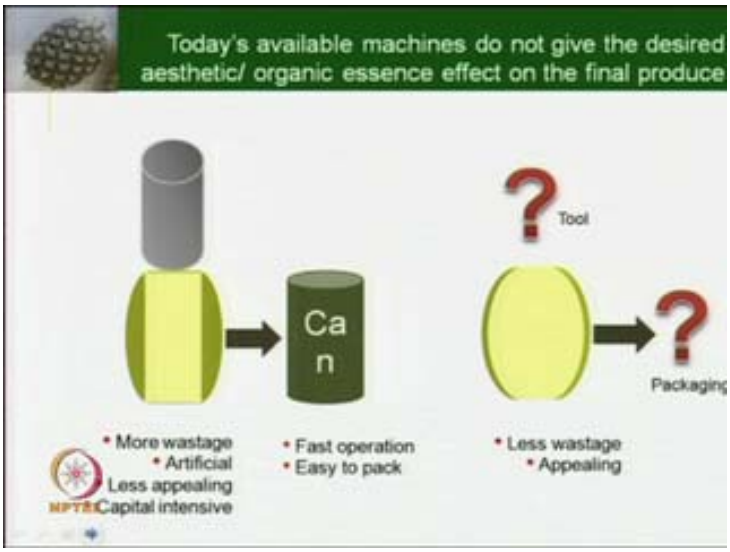

Concern comes what type of device, hand tool can be developed? When in a field, after harvesting fine, the pineapple is requested to send to industry, or to may be the city side or to some else market, at that time that front top bush area and the bottoms that strong stick area, it can be removed or may be some kind of peeling is possible, slicing is also possible and can be transported so, for that a special type of development is necessary, for a field requirement.

Another requirement is that, for the industry large machinery type of investment is necessary there and for the small venders: like juice shops and etcetera, there another type of product is necessary and tools when the end user at the home we buy raw pineapple from market and bring it to home at that time, only one or two pineapple to prepare it another type of product is necessary. Then, requirement is same for home use, for small business use, industrial use and filled requirement directly. But, what a single product cannot be developed to match all the requirements.

Some studies that is some studies we have done, there what we found (Refer Slide Time: 23:44) today's available machines do not give the desired aesthetic and organic essence effect on the final produce like, there are some machines have been developed but, it was found that if this is a pineapple then, when the machine just core it then, they make it cylindrical type of piece. Where, this much of area it becomes wastage so, more wastage artificial look, because pineapple is a cylindrical but, it is oval type. But, if we make a

cylindrical then, it has a mechanical look so, it becomes artificial and less appealing and capital intensive because some losses are there.

(Refer Slide Time: 23:44) So, we require the pineapple, if it is like this way pineapple, first cut these two part and then, just peel only sides, so that the whole it will be original shape it retains but, for that what tool is available and after that packaging, in this less wastage and appealing shape. So, what would be the tool development for this?

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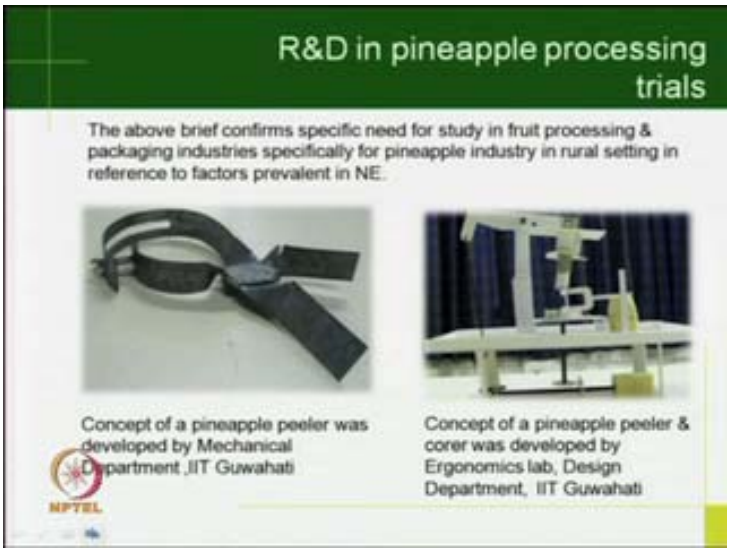

R and D in pineapple process trials are made. The above brief confirms specific need for study, in fruit processing and packaging industries specifically for pineapple industry in rural setting in reference to factors prevalent in North-east. It would hand tool was developed like this. Here what is happened, when you pull or push this one, increases in different size, it matches with the total shape of the pineapple. So, this concept of a pineapple peeler was developed by mechanical engineering department, IIT Guwahati.

Now, it's a semi mechanized version was made here, was made here that ergonomics laboratory of design of department I I T Guwahati. That concept of a pineapple peeler and corer was developed by ergonomics laboratory design department I I T Guwahati like this. Here what is happened, a platform is given, a machine like this where, the cut pieces of pineapple will be placed here and then, the sprays through that with that first it will it will peel with the rotating motion and it slice and at the same time this portion will make a core. So, together that portion will come and then finally, it will be stored in this

side and the juice if it is there, will be collected through a pipe. This type of development is must still in a pre-mature development stage the concept.

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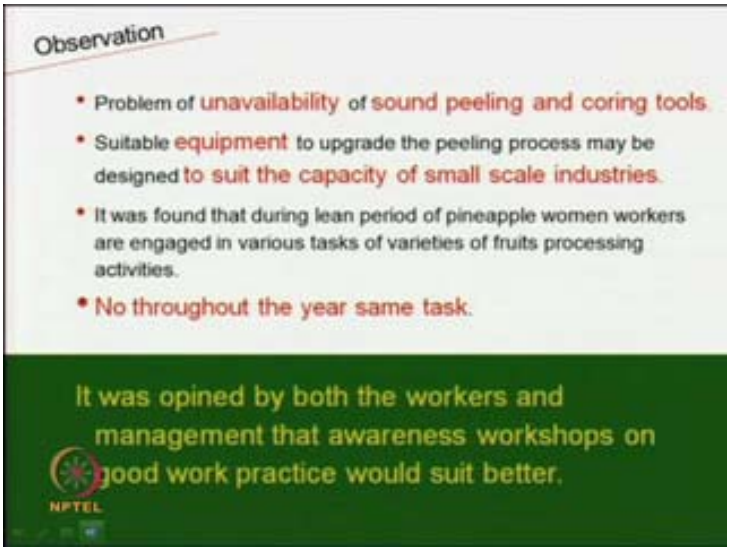

Now, its field trial is necessary, with all these things finally, we can say: what is the observation? Observation is that, problem of unavailability of sound peeling and coring tools are there, Suitable equipment to upgrade the peeling process may be designed to suit the capacity of small scale industries at these moment. It was found that during lean period of pineapple, women workers are engaged in various tasks of varieties of fruits processing activities, No throughout the year same tasks is there. It was opined by both the workers and management that awareness workshops on good work practice would suit better in this case.

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Now, work equipment development productivity now here, we are showing some other equal making processes like here. In this case, we can just one example: we can see in this area, a group of women in that same pineapple industry where we have studied, when working or peeling the pineapple sorry this ah or this ginger skins. Normally, they use a small plate type of knife with an handle most normally, it is some broken axe or some blade are used with special handle. They make it with a with some cloth cover or something like that and they use it.

Now, one day it goes like this, when we visited there (Refer Slide Time: 30:15) this lady, she was using we found a bamboo piece, a bamboo split with that then we enquired, why it is like that and finally what it came but, while using knifes, metal knife, the ginger to the small parts or small branches while peeling like this way it breaks so, loss is there.

In that the industry a special equipment was developed, it is found that a barrel kind of thing and inside a brass moving brass so, like washing machine type of thing. When the all the gingers put in and the machine was rotating then, under water flow is from bottom is given there so with that water and the movement thus skin removes but, too much loss of material is there so, it was not used. Mechanization is not used in this.

So, still today, they are using this hand tool is used. (Refer Slide Time: 30:15) Now, when we asked her, she said that, she finds good with this, no problem. Now, this gives an idea or an impression that whether, a ginger and etcetera is a organic system so

another organic tool blade can be used so then, it will be easier to peal, rubbing kind of thing and not chopping of, as it does with metal blades and now, this bamboo pieces are plenty available. Bamboo pieces can be used and after that, it also can be sharpen and can again be used like that. We can think in this line, it cannot be confirm that yes, this is the development procedure. It cannot be confirmed but, it gives a thought whether this type of development and we call it is sustainable development. So that, these work tool development, these workers they can make themselves, they can repair themselves, and if there is a loss or brake, not much cost effects.

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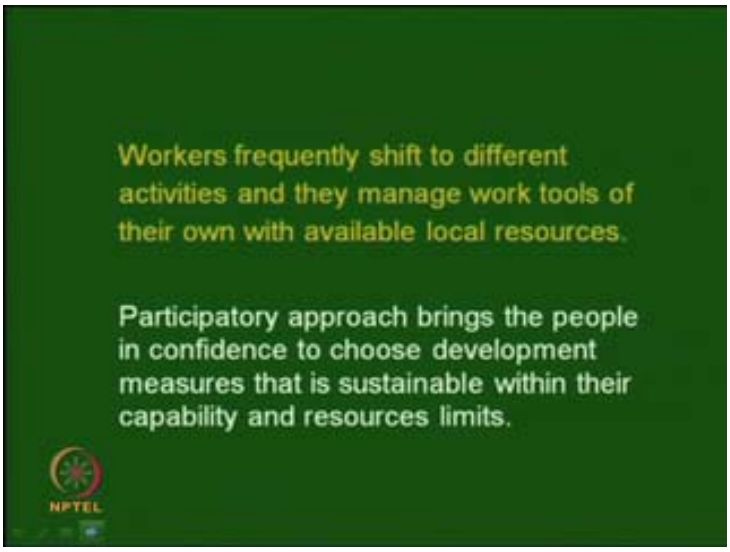

So with this, we can say that, workers frequently shift in this field workers frequently shift to different activities and they manage work tools of their own with available local resources. Work tools are not supplied like this tools and etcetera.

So in this case, the participatory approach brings the people in confidence to choose development measures that is sustainable within their capability and resources limits.

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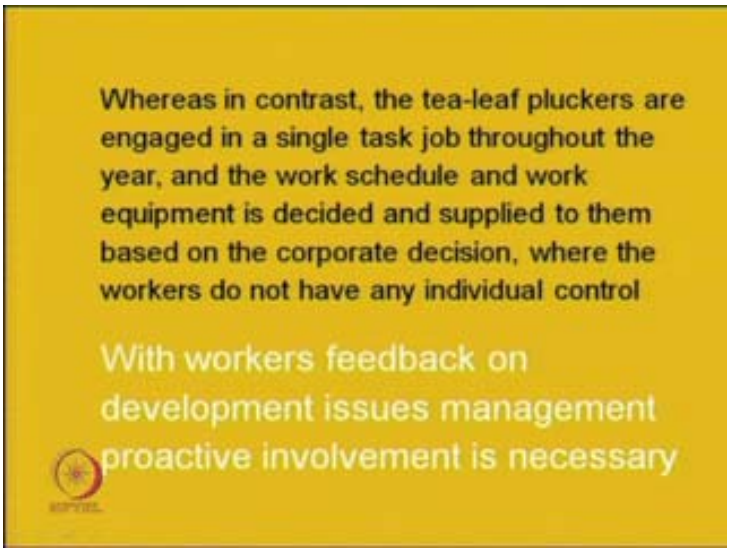

Whereas, in contrast the tea leaf pluckers are engaged in a single task job throughout the year, and the work schedule and work equipment is decided and supplied to them based on the corporate decision where, the workers do not have any individual control with workers feedback on development issues management proactive involvement is necessary. So, it is better to organize awareness workshops with both the workers and the management groups together to have a good sustainable strategy.

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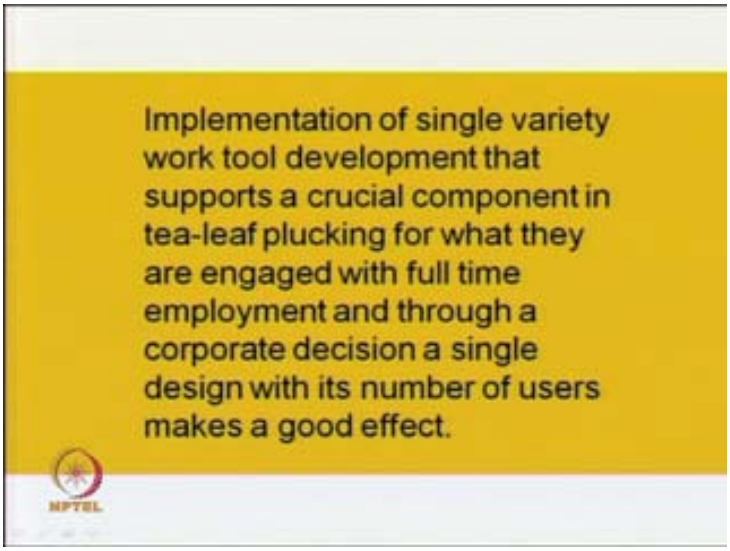

Implementation of single variety work tool development that supports a crucial component in tea-leaf plucking, for what they are engaged with full time employment and throughout and through a corporate decision a single design with its number of users makes a good effect.

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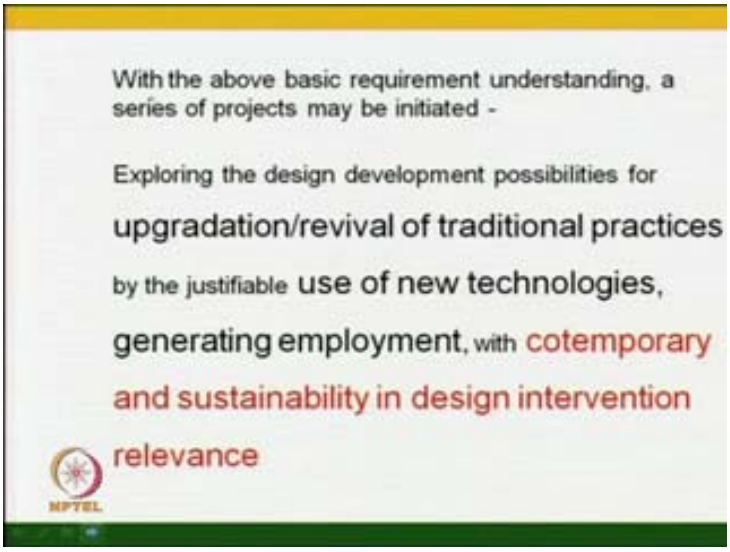

With the above basic requirement understanding, a series of projects may be initiated - E xploring the design development possibilities for upgradation or revival of traditional practices by the justifiable use of new technologies, generating employment, and contemporary and sustainability in design intervention relevance's are required and we need to consider this, for a sustainable development.

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So, what we learnt from this discussion today - Design ergonomics means criteria and principles are necessary that is the, what is the human behavior? How they operate? How they work etcetera? Context specific application- towards meeting towards meeting the requirement, Creative ideation- conforming trust.

So with this, we are concluding this ninth module: Performance support and design intervention. Next the last session or last module of this ergonomics for beginners industrial design perspective is (Refer Slide Time: 00:27) module number 10 that is: Design ergonomics in India scope for exploration that we will discuss in the next day.

Thank you.