Conservation Economics
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Module 10
Labour market economics and Conservation
Lecture 1
Markets for factors of production

Namaste! Today, we begin a new module which is Labour Market Economics and Conservation. This module will have 3 lectures; markets for the factors of production, earnings and discrimination, and income inequality and poverty. So, let us begin with the markets for the factors of production.

Now, we are studying topics such as the market for the factors of production or poverty or inequality because they have a very large building with conservation. And in this context, it is important to remember this chart; poverty is closely related to environmental degradation.

This is because if there is poverty in a society, it would mean less per capita resources which in a number of cases would also translate into overpopulation. Now, what we are saying here is that in the case of poverty people have less amount of resources that are available with them; they do not have sufficient money, they do not have sufficient other resources. Now, if the resources are less in a society, then that might result in overpopulation. Now, this might appear a bit too far based, but in a number of societies what we have been observing is that the human populations go through a demographic transition.

What is a demographic transition? In the case of primitive societies or poor societies in today's time, what we observe is that a child when he or she is born, does not have a very good chance of living till adulthood. Why? Because parents are poor. So, the child in a number of cases is malnourished; he or she does not get a sufficient amount of food. Now, because of malnourishment, the child easily falls sick. Now, if the child falls sick, either he or she does not get to see a doctor, because in this society, the per capita resources are so less that the society does not have hospitals, it does not have doctors. Because hospitals and doctors, again they require money to be there in the first place, they are also resources.

When we talk about a dearth of resources, we are not just talking about a dearth of money, but we are also talking about a dearth of these resources; resources such as resources for education, resources for health and so on. So, the child who has fallen sick, does not get to see a doctor and in a very few situations where he or she does get to see the doctor and the doctor prescribes medicines, then probably the parents are unable to pay for it. Now, when you have a situation, where children regularly fall ill because of malnourishment and they regularly are denied hospital care because the hospitals they just do not exist or when they exist, then they are a bit

too pricey for their parents because of which they become unaffordable; what will happen? In a number of situations children will die.

If children die and they die in large numbers, they have a very less life expectancy; in that situation, if the society has to continue, then it will have to compensate at some point. Because if say most of the children have a life expectancy of say 10 to 12 years, in that case the next generation will not have sufficient number of human beings and ultimately, the size of the population will go on decreasing with time. So, to compensate for a very high death rate, societies tend to have a higher birth rate. That is, if each parent finds out that on an average 4 out of 5 children die that would mean that if the parents have 10 children and 8 die, at least 2 will remain. If the parents have 15 children and 12 die, at least 3 will remain.

So, having more children is an insurance that at least a few of the children will reach adulthood. Now, when we have a situation like that, then there is also a good chance of overpopulation, when the society moves towards the phase-II of the demographic transition. Now, what is phase-II of demographic transition? Earlier, we have we begin with a very high birth rate and a high death rate, but then slowly and steadily when the population does get some resources, when it does get the benefits of medical advancements and we are not talking about hi-fi medicines or hi-fi operation theaters; we are talking about things such as clean water, things such as sufficient amount of food.

Once the society starts to get a sufficient amount of food which reduces malnutrition and these diseases or once the society starts to get clean water or a bit of sanitation or even things like soap, then that would drastically bring down the level of infections that we see in the society. Because of that, the death rate would go down. Now, the society that was earlier having a very high birth rate and a very high death rate, now is having a situation where the death rate is going down; but the birth rate does not go down as fast. So, in such a society, you will have a very high birth rate because it started with a high birth rate and we are now having a reducing death rate. So, a high birth rate and a reducing level of death rate would mean that, in total there will be a net growth of population which might even give rise to an overpopulation.

Because these days, we have at least some level of medical advancement, we have at least some facilities that we as a society provide to most of our people. So, government programs ensure that people have access to clean water, and people have access to sanitation. So, in that case, the death rate goes down and there is a chance that there will be more population growth. Now, of course, every society has to go through these transitions or most of the societies go through such transitions; but then what happens is in the third phase, the birth rate starts to go down because now people do have no longer a need to have more and more number of children because they are now more assured that a number of their children will be able to reach to the adulthood.

So, even having 1 or 2 children is good enough and once we have a situation of a reduced birth rate as well, then the population becomes stabilized. But in the intervening period, there is a chance that the population will rise and which is what we are observing here, less per capita resources could lead to overpopulation. There is also another thing that might occur in certain situations. When the per capita resources are less, then in a number of situations people want to have more children, also because these children will provide hands to work in the fields. So, to

increase the resources of a family, it is prudent. And remember, that in economics, we always begin with the assumption that people do rational thinking. So, rationally, if they have more children, that would mean that at least their fields will get plowed and at least their fields will be sown with crops, the crops will be taken care of.

It is prudent for the families, just because of a rational thinking to have more children, when they are more poor which is what we are observing here. So, less per capita resources could lead to overpopulation. Now, in the case of overpopulation, there is an extra stress on the land. Why? Because more children does not just mean more hands towards the field, it also means more mouths to feed. So, when you have a society where more children are being born, a society which has a large population, in that case there are a number of mouths to feed, there are a number of bodies to clothe, which means that the level of resources that is required in total will increase.

Now, here still we are having low per capita resources, but the total number of resources that is needed is given by total resources needed is equal to per capita resources. So, this is resources per unit population multiplied by the population size. In this case even though the per capita resource requirement is less, but because the population size is more, which means that the total resources limited are very high. Now, where will these resources come from? Where will we get sufficient food for all these people? Now, remember here that when we are saying sufficient food, it is not sufficient food when we talk about a biological sense.

So, people are not getting sufficient food, they are still malnourished; but they at least need that amount of food that can remove their hunger. So, when we talk about just feeding the people that in total would require a very large amount of food because the population size is large and how are people going to get that large amount of food? Well, by taking out resources from land. So, in that case a number of forests will be cut and they will be converted into farmlands, which is what we are observing here; land and environmental degradation. So, there is a great stress on land and this will lead to land and environmental degradation. Now, this is even more so because there are less resources that are available with people in this society.

If the resources were more, then probably the same amount of agricultural land would have given a higher amount of crops through the application of fertilizers of pesticides or modern machinery. But because the per capita resources are less, it would also mean that the stress becomes even more, because of a less amount of productivity. So, this leads to the land and environmental degradation, where more and more forests are destroyed and they get converted into farmlands and these farmlands are just working on a subsistence level, which means that even when people work on large sized farmlands, they do not still get sufficient output from the land because the productivity is less.

And also, because in a number of cases the forests are there in those lands that were not that much fertile because if the lands were fertile, then people would have actually converted them into farmlands way back. Only the best lands are preferentially converted into agriculture. So, the forests that still remain are there on those lands that are not good enough for agriculture. Even though there is an expansion of agriculture and there is a huge amount of land and environmental degradation, there will be a further loss of productivity. Because these expansions

are being made in those areas that are even more infertile and when we have a loss of productivity that would further accentuate the poverty.

So, this cycle becomes a vicious cycle and it goes on and on and it is important to remember here that poverty is also a part of this cycle and land and environmental degradation are also a part of this cycle. So, poverty is closely, intimately related to environmental degradation, which is why it is important for us as conservation economists to know what causes poverty and how we can solve poverty.

So, to understand poverty, we need to understand the labour market economics. What is labour market economics? What is the labour market? If you will remember, we had talked about the circular flow diagram. Now, the circular flow diagram is a model of the economy in which we have firms and firms are those parts of the economy that produce and sell goods and services and hire and use the factors of production. A good example is an industry that is making things such as a pen. Now, this industry is producing a good and to produce the good, it is hiring labour, it is making use of other factors of production such as land and capital and by using these factors of production, it is churning out pens and it is selling them out in the market. So, that is a firm.

The other component is households, who buy and consume the goods and services, that is the households will purchase this pen and they own and sell the factors of production such as land labour or capital. So, the people who comprise the household, they have their labour to sell and they sell their labour to the firms and so, we have two kinds of markets. We have the market for goods and services that you are very much aware of because in the good market for goods and services, the goods and services are sold by the firms and bought by the households. So, if you go to the market and purchase a pen, then that is a market for the goods and services.

In this market, there is a firm that is selling you the pen, you are purchasing the pen and so, you are paying the firm with money. In this case, the household spends; they are doing their spending and this spending becomes a revenue for the firms. But there is also another market which is the market for the factors of production. In this market, the households sell the land, labour and capital, which means that people in the households will offer their labour. They will offer to work to save wages or they will offer their land on rent or they will offer their capital which is with them, that is the money that is with them for a share of the profit. When a household invests in say a company's shares, then it is investing in this market. Because it is giving the company its money in the form of its capital, in return for a profit from the shares.

In this market, the land, labour and capital are sold by the households and they become the factors of production for the firm and in return, the firms pay wages, rent or profit which becomes the income of the households. Now, in this module, we are concentrating ourselves with this market, the market for the factors of production and we are asking the question that if there is a household and this household is a poor household, what are the factors that determine how much money this household will get in this market. Because this is the market in which the household is earning. So, what determines, what will be the level of wages that is received by this household? What will determine the level of profits that they receive? What will determine the rent that they receive, if they give the firm their land to establish a factory?

That is the question that we are asking because that has got a lot to do with the level of poverty

that is there in this household. So, if the wage rates go up, if people start to earn more, in that case the per capita availability of resources will increase for the household and when that happens, it is possible that the household will no longer remain poor and if the household is no longer poor, then the pressure that they are putting on the land and environment that will go down, which will have important ramifications for things like conservation. We will have less of our forest that will be deforested to convert into farmlands and we will have less number of people who would be willing to go into a forest to cut trees. So, this has very important ramifications. What governs the wages, rent and profit in this particular market?

We begin by defining a few terms. The factors of production; the factors of production are the inputs that are used to produce goods and service; "inputs used to produce goods and services". Now, what are these inputs? These inputs include things like land, labour and capital and when we talk about this market, we are talking about the demand and supply for land, labour and capital, that will determine the prices that are paid to the land owners, workers and the capital owners.

What we are saying here is that just like in the market for goods and services, here as well we have a demand and we have a supply and this demand and supply will determine at its equilibrium, what is the equilibrium price and what is the equilibrium quantity and we are interested in knowing the equilibrium price and the equilibrium quantity. Capital is defined as the equipment and structures used to produce the goods and services. It is equipment such as tools and structures such as a building. If there is a factory that is residing in a building, so this building is the structure and the equipment or the tools that they are using all of these are known as capital. So, capital is the equipment and structures used to produce the goods and services.

And in the market for labour or in the market for the factors of production, what we are saying is that there will be a demand, there will be a supply. And on the Y-axis, here in place of the prices, we have the wages because the price that is paid to the workers is the wages that they get. So, that is there on the Y-axis and on the X-axis, we have the quantity of workers which is telling us the level of employment that we will have or how easy it will be for a person to get a job in this market. So, these two things the demand and supply in the labour market will determine the wages that people get and whether they get the wages at all or not; that is whether or not they will get some sort of an employment through this market or not.

To understand how demand and supply are regulated in the labour market, let us take the example of a firm that is a labour intensive firm, such as a firm that is making samosas. Now, for our study, we will take the firm to be a competitive profit maximizing firm. Now, when we say that the firm is competitive, it means that it is a price taker. So, it does not have a huge amount of market power and the price that has been determined by the market for the product that it is making, that is the samosa is fixed. Let us say that 1 samosa can be sold for 5 rupees in the market. So, competitive means that this firm is a price taker and it is a profit maximizing firm, which means that the decisions in this firm are taken on the basis of rational decision-making processes, that is the firm tries to maximize the profit that it has.

In this chart, the first column we have the number of workers. The firm can have 0 workers, it can have 1, 2, 3, 4, 5, 6 or any number of workers. Now, because the production of samosas

requires labour; so, if you have a firm with 0 labourers, then probably the amount of output will also be 0. So, in that case, we are just taking this value of 0 as a theoretical construct, it is not a practical construct because you will not find a samosa making firm that is not employing anybody. So, if the number of labourers is 1, then the output or the number of samosas that are being made in this firm per hour is say 50. Now, when the firm hires more labourers, then the output will increase. But it will not increase in a regular fashion as in it will not double, when you are doubling the labour that is there being employed.

Now, why is that so? Because there are a number of considerations. Labour is not the only factor of production. You also require things like land and capital and perhaps, they will start to show their limitations in a very short period of time. If there is a firm that has a kitchen and this is not a very big sized kitchen. If there is 1 labourer, he is making 50 samosas. If there are 2 labourers then it is possible that there will be a small shortage of space, that is the 2 might start to bump into each other or they may start to chit chat because you have 2 people, so they will naturally start to have some conversation.

When they are having a conversation, then that is a time or that is an effort that is being removed from the process of samosa making and diverted into conversation or it is possible that now the labourers, they are not getting everything right there on the spot and one labourer starts to make the samosa and the second one starts to move things around. So, it is possible that the efficiency may go down, which is what we are observing here. So, with 1 labourer the firm was putting an output of 50 samosas per hour; with 2 labourers it is putting an output of 90 samosas per hour; it is not putting an output of 100. With 3 labourers, the output has increased further; but it has only increased to 120. With 4 labourers, it has increased to 140.

What we are observing here is that the increase is going on, but it is becoming less and less with time or with more and more labourers. Why? Because when you have just 2 labourers, then probably the space is not that big of a shortage than if you have say 5 labourers. So, when you increase from 1 to 2, the space is not a shortage; but when you increase from 5 to 6, probably it has become a bit too overcrowded. So, in such a scenario, the labourers are not able to have sufficient space to make the samosas, which is what we are observing here. And from this, we can compute the marginal product of the labour. Marginal product is the change in the quantity divided by the change in the number of workers. So, when you move from 0 to 1 labourer, there is an increase of 50. So, delta Q in this case is 50, which is 50 minus 0; delta L is 1 minus 0, which is 1.

In this case, the marginal product of labour, MPL is delta Q by delta L which is 50 minus 0 divided by 1 minus 0 is 50 by 1 is 50. When the number of labourers increases from 1 to 2, then the output increases from 50 to 90. So, in that case the MPL is delta Q by delta L is 90 minus 50 divided by 2 minus 1. Because earlier the Q was 90 and now the ah, earlier the Q was 50 and now it is 90. So, delta Q is 90 minus 50 which is 40 delta L is 2 minus 1 is 1. So, this is 40, which is what we are observing here. So, the marginal product of labour in this case is 40.

When the number of labour is increased from 2 to 3, then delta Q in this case is 120 minus 90 is 30. Delta L because we are increasing 1 labour at every point of time, so delta L is 1 in each case. So, essentially for this labourer, the third labourer, the marginal product is 20 is 120 minus

90 which is 30 divided by 1 is 30. For the fourth one, it is 140 minus 120 which is 20 divided by 1 is 20. For the fifth one, it is 150 minus 140 which is 10 divided by 1 is 10. For the sixth one, it reduces even further.

What we are observing here is that the marginal product of labour is going down or in essence, what we are seeing is that when the number of workers is increased, the output per hour increases; but it goes on becoming flatter with more and more workers. This is known as the production function. The output versus the number of workers is the production function. We are observing that the output is increasing, but the rate of increase is decreasing. It is increasing; but earlier the increase is very high when you add 1 labour, but later on it becomes lesser and lesser.

The marginal product of labour is the increase in the output in the amount of output from an additional unit of labour; increase in output from additional unit of labour. So, you are adding 1 more labour, what is the increase in the output which is what we calculated here. Now, here we can talk about the law of diminishing marginal product. What does that mean? It is the property whereby, the marginal product of an input declines as the quantity of the input increases, which is what we are observing here.

As the number of labourers increase, the marginal product goes on decreasing. This is the Law of diminishing marginal product. Diminishing means reducing, so it is the law of reducing marginal product with more and more labour, the marginal product of labour goes on decreasing and the reasons include things like crowding, insufficient access to equipment, chit chats and so on. So, probably there is only 1 mixer or probably there is only 1 stove or let us say that there are only 2 stoves and if you have 6 labourers, then not everybody is having an access to the stove at all times. So, you can have the diminishing marginal product because of crowding, physical crowding or insufficient access to equipment or because of chit chats and so on.

If we plot the marginal product, we observe that in the first case, the marginal product was 50, then 40, then 30, then 20. So, it is decreasing with an increase in the number of workers. So, this is showing us the Law of diminishing marginal product.

Next, we can define the value of the marginal product, which is the marginal product of an input times the price of the output. Now, in this case, the firm is interested in maximizing its profit. So, what the firm does is is that it is doing a calculation of what is the amount of output that I am going to get with each labour and what is the market value of that output, that is if an additional labour is going to produce say 30 samosas and 1 samosa is will will be sold for 5 rupees. So, the value of the marginal product of the labour is 30 samosas into 5 rupees per samosa is 150 rupees. So, that is the value of the marginal product. The marginal product of an input times the price of the output, which is what we are showing here.

The value of the marginal product of labour is 50 into 5. Now, here we are taking that 1 samosa is 5 rupees because this is a competitive fund. So, it is not able to change the market prices and at the same time there are so many buyers that if it is producing more samosas that is not changing the price of the samosa. So, whether it sells 1 samosa or whether it sells 1000 or 10000, they will be sold for 5 rupees a piece. Now, this again is a theoretical construct, we do not observe such scenarios in the market.

But for the sake of simplicity, we are assuming that the price remains constant. So, the value of

the marginal product of labour is shown in this column. So, if the marginal product of labour is 50, then 50 into 5 is 250. If MPL is 40, then 40 into the price; 40 into 5 is 200; 30 into 5 is 150; 20 into 5 is 100; 10 into 5 is 50 and 5 into 5 is 25. So, this is how we compute the value of the marginal product of labour.

Similar to what we observed in the case of the marginal product, if you plot the value of the marginal product of labour, we will again find a diminishing curve. Now, this is expected because there will be no difference between this curve and this curve; it is just that the first curve, the marginal product, is multiplied by a constant value. In this case, 5 rupees because the firm is a competitive firm and it is a price taker.

Next, we have the wages. Now, we can have the prevailing wage rate and suppose the wage rate is 100 rupees. If we plot 100 rupees as this green line, then the profit maximizing quantity of labour in this case will be given by this point, where both the curves are intersecting each other. Now, why is that so? Well, when the number of workers is increased from 0 to 1, now this first worker is able to produce a good that can be sold for 250 rupees and the wage that has to be given to hire this labour is just 100 rupees.

So, when the number of laborers is increased from 0 to 1, then the additional labour is producing something that has a much greater value of the marginal product than the wage rate, which means that if the company or the firm hires this labour and uses this labour to produce the good; then the company is adding to its profit and we began by saying that this is a profit maximizing firm. Now, when the number of workers increases from 1 to 2, then the second worker that the company hires will produce a good that is worth 200 rupees, more than what the first labour was producing. So, the first labour was producing goods of 250 rupees, the second labour was producing goods of 200 rupees, so totally the goods that are being produced are now 450 rupees worth. But to make this extra good of 200 rupees, the company has to pay 100 rupees. So, this difference is the profit of the company or of the firm.

For the first worker, the profit to the firm is this much; for the second firm, the profit to the firm is this much. For the third worker, he makes goods worth 150 rupees and the company has to pay 100 rupees. So, the profit to the firm is only this much. In the case of the fourth worker, the value of the goods is 100 rupees; but to make those goods, the firm will have to pay 100 rupees of wages to the worker. So, now the company would be in a dilemma because whether it hires this worker or not, there is no change in the profit. But if the company or the firm hires 1 more labourer, then the value of the goods is 50 rupees; but the firm has to pay 100 rupees. So, this is the level of loss to the firm. So, at this point, the firm was at a profit; at this point, the firm is at a loss. So, this becomes the profit maximizing quantity and at this point, the firm may or may not hire the labour.

We can also look at the marginal profit in each case. What is the marginal profit? It is defined as the value of the marginal product of labour minus the wage rate; the prevailing wage rate. So, if we did this computation for the first labour, the value is 250 rupees, the wage is 100 rupees. So, the marginal profit is 150 rupees. That is, if the company hires this labour, then by hiring 1 unit of labour, the company will increase its marginal profit or will increase its profit by 150 rupees. So, that is the marginal profit. For the second labour, the value is 200 rupees, the wage is 100

rupees. So, you can think of it as the value of the product that you are buying from the market and the cost that you have to pay.

In this case the value of the marginal product of labour is the value to the company and we had seen even in the case of the market for goods and services, if I am going to the market to purchase a pen and the value of this pen in my eyes is 30 rupees and the cost or the price at which it is available is 20 rupees. Then, I will buy this pen. But if the value in my eyes is 30 rupees and if it is available for 50 rupees, then I will not buy the pen and this is exactly what we are observing here. If the value of the marginal product of labour is greater than the wage, that is if the value is greater than the price that needs to be paid; then, the company will or the firm will buy this good. In this case, it is the labour and the marginal profit for the second labour is 200 minus 100 is 100.

For the third labour, he makes goods worth 150 rupees and the company has to incur a cost of 100 rupees. So, in this case, the marginal profit becomes 150 minus 100 is 50. And we are observing that the marginal profit is reducing with each extra labour because of the Law of diminishing marginal product. For the fourth labour if the company hires him, then the value of the of the marginal product of labour is 100 rupees, the wage is 100 rupees which means that the company will earn a marginal profit of 0 rupees, which means that before the company hires this labour and after the company hires this labour, there is no change in the profit. And with an extra unit of labour, now the company is incurring a loss because the value of the marginal product is now less than the wage rate, which means that in the case of our pen example the value of this pen is 30 rupees and it is now available for 50 rupees or say 40 rupees. So, if it is available for anything more than its value, then I am not going to purchase it and similarly, in the case of a firm that is there in the market to purchase labour, if the value of the labour is less and the price of that labour is more. In this case, the value is the value of the marginal product of labour and the price is the prevailing wage rate. So, if the value is greater than the price, the company will buy the labour. If the value is less than the price, then the company will not buy the labour of this person. So, as the number of labourers increases to 6, then you have the situation that the value of the marginal product of labour is 25 rupees and the wage rate is 100. So, the marginal profit is now minus 75 rupees.

This is what we are plotting here. The marginal profit versus the number of workers and the profit maximizing quantity is given by this point, where the marginal profit is 0. So, at all the points to the left of this point, we have that there is a positive marginal profit and a positive marginal profit means that by adding one more unit of the labour, the company will add to its profit. And to the right of this point, we have a negative marginal profit, which means that if the firm adds the labour, then it will reduce its profit and we begin with the assumption that this firm is a profit maximizing firm. So, when the marginal profit becomes negative, then the firm will not hire the labour.

So, the demand for the labour will be determined by the value of the marginal product and the value of the marginal product is the marginal product multiplied by the price of the output. So, in this case, the labour demand will depend on the price of the output.

If the price of the output is more, then the demand will increase. Now, suppose in our example,

the P in place of 5, suppose it was 10. If we compute P, P is equal to 10; then, the value of the marginal product of labour in place of 250, it would be 500. Here, it will be 400 because what we are doing is 40 into 10 is 400; 30 into 10 is 300; 200; 100 and 50. So, this is the value of the marginal product of labour.

In the earlier case, we were observing that when the company hires the fourth labour, then the value of the marginal product of labour is equal to the wage rate; but in this case, when the company hires the fourth labour, the value of the marginal product of labour is greater than the wage rate. So, the fourth labour is definitely hired. What about the fifth one? In the case of the fifth labour, the value of the marginal product is equal to the wage rate. So, now, one more labour will be employed by the firm because the price has increased. And because of an increase in price, it reflects in the value of the marginal product of the labour and we have seen that the profit maximizing quantity is where the value of the marginal product of the labour is equal to the wage rate.

If the wage rate remains the same and if the price changes, then this curve, the red curve, will shift upwards which will change the number of labour that will be hired by the firm at the profit maximizing quantity. The labour demand depends on the price of the output; more is the price of the output, more is the demand for the labour and also, on the marginal product. Now, marginal product in turn depends on labour productivity such as including technological changes and it depends on the supply of other factors such as raw materials. Now, what we are observing here is that the marginal product depends on things like labour productivity. Now, in our example if the labour productivity was more, that is the number of samosas per unit per hour, if it increases because the marginal product of labour increases.

What we are saying is that in place of making just 50 samosas, if this labourer was more trained, and suppose he was able to make 70 samosas. Similarly, if this one was able to make say 60 samosas, if the next one was able to make 55 samosas, if the next one was able to make say 50 samosas, if the next one was able to make say 45 samosas; now, in this case if the price remains the same. We are again talking about a price of 5 rupees. Now, what happens to the marginal product of labour and suppose the next one was able to make 40 samosas? Now, in this case the marginal product of labour will be given as for the first one, it is 70 into 5 is 350; for the second one, it is 60 into 5 is 300; for the third one, it is 55 into 5 which is 275; for the next one, it becomes 50 into 5 is 250; for the next one, it becomes 225 and for the next one, it becomes 200.

So, this is the value of the marginal product of labour, if the price has remained the same. So, the price is 5 rupees only, but the marginal productivity of labour has changed. So, we have increased the marginal productivity by providing more training to the labour. Now, in this case, if the wage rate remains the same, then even the sixth labour will be hired because the value of the marginal product of the labour is 200 rupees; whereas, the wage is only 100 rupees. So, what we are observing here is that if you increase the marginal product of the labour or if you increase the price of the output, the value of the marginal product of the labour increases and this would change the demand for the labour. It would determine how much labour is going to be employed and the marginal product can increase by increase in productivity or it can increase by the supply of other factors such as raw materials.

What we are saying here is that if the labour gets trained or the labour gets say a better stove or the or we increase the supply of other factors such as say the fuel, then the total marginal product for the labour would increase and even if the price remains the same, the value of the marginal product in this case will increase and we have seen that if the value of the marginal product of labour is greater than the wage rate, then the person gets hired. If the value of the marginal product of labour is less than the wage rate, then the person does not get hired in the case of a profit maximizing firm. So, this determines what will be the number of labour that get employed. So far, we were looking at the demand side, what about the supply side? The supply of labour depends on the number of factors such as the trade-off between work and leisure or the value that is given to leisure. Now, if we have a society in which leisure is given a very high value. So, people put a very high premium on the time they are able to spend in say chit chatting or watching movies or with their family or say wandering around. If this leisure is put at a premium, then people will have less incentive to leave this premium of leisure and go and work. So, it would depend on how much is the premium that we pay to leisure in a society.

In certain societies, we say that work is worship and so, people are more incentivized to work because of the social set up. But in certain other societies, it is possible that there is a social norm of valuing leisure at a very high premium, in which case people will be less inclined to work. It also depends on the social tastes and traditions, whether women prefer to work outside home or not; whether they are permitted to work outside or not by the society, so that will also determine whether or not women are there as a part of the labour supply pool or not. In certain societies, we can have a situation where even teenagers go out to work. In that case, the labour supply will be more. In certain other societies, the teenagers just do not go out to work. So, the labour supply will be reduced.

In certain societies, people put a very high premium on education. So, in that case people even in their early 20s will not be available in the labour supply. So, the social taste, the traditions also determine to a very large extent, the amount of the supply of labour. Then, it also depends on the changes in the alternative opportunities that people have. With the end of the agricultural season, the labour supply to the industries goes up. Why? Because the amount of employment that was available to the agricultural sector dries out, because the agricultural season has ended. So, when that happens, the supply of labour for industries increases and it also depends on immigration and the movement of labour. So, if more people come into a society or in a country say through immigration or through movement inside the country. So, in that case, the labour supply will increase. So, there are a number of things that determine the supply of labour.

And as in the case of the market for goods and services, here again we have an equilibrium in the labour market. So, there is a demand for labour, there is a supply of labour and the point where both of these curves intersect, this point will give us equilibrium. And at equilibrium, we will have the quantity of workers that are demanded. So, this is the quantity of workers that is demanded or supplied which tells us the equilibrium employment in this particular market situation. So, this is the number of workers that will get employment and they will get employment at a range that is at a wage that is given by this equilibrium wage. So, this is the equilibrium wage and the equilibrium employment.

And just as in the market for goods and services, we can have a shift in the labour supply; the supply may increase, the supply may decrease. For example, in the beginning of the agricultural season, the supply of labour to the industries will decrease. At the end of the agriculture season, the supply of labour to the industries will increase. If we have alternative employment opportunities, then the supply of labour will decrease to firms. So, there are a number of ways in which we can have a shift in the labour supply.

We can also have a shift in the labour demand. So, a good example again talking about the agricultural season. If there is the beginning of the agricultural season, then the demand for labour for working in the agricultural sector will go up. So, the demand increases in this case. At the end of the agricultural season, the demand for labour in the agriculture sector will go down. Now, when there is a shift in the labour supply, a shift in the labour supply is shown by these red curves. If there is an increase in supply, it is shown by this shift to the right; if there is a decrease in supply, it is shown by this shift to the left. Now, if demand remains the same and we have an increased supply. In that case, this is the new equilibrium.

In this equilibrium, with more labourers, they get employment; but the equilibrium wage rate is less. With an increased supply, with no change in the demand, we will have more workers that are employed; but at a lower prevailing wage rate. On the other hand, if there is a decrease in the supply such as in the beginning of the agricultural season, the supply of the labour to the industries decreases. So, in that case, less number of workers will be employed in the industry; but they will get higher wages. Similarly, when there is a shift in the labour demand; so if there is more demand, more demand is shown by the demand curve that is shifting to the right. So, this is an increase in demand, with an increase in demand the equilibrium shifts and this is the new equilibrium, this was the old equilibrium.

Now, with the new equilibrium, the equilibrium quantity of workers has increased. So, more people get employment and at a higher wage rate. On the other hand, if there is a decrease in demand as shown by a shift to the left in the demand curve, so we have this new equilibrium and at this equilibrium, this is the equilibrium quantity and this is the equilibrium wage. So, if the demand decreases, then we will have reduced wages and less number of workers that get employment. A good example is the employment in the agricultural season; in the agricultural sector at the end of the agricultural season. So, we can have a change in or a shift in the labour supply and demand and that will affect the equilibrium and that will affect the number of workers that are employed and also, the prevailing wage rates.

Similar to the market for labour, we have a market for land. When we talk about the factors of production or the market for the factors of production, we have three factors of production; land, labour and capital and similar to the labour market, we also have a land market, we also have a capital market. In the case of the land market, we have a demand for land and we have a supply of land. And both of these curves intersect together and this gives us the equilibrium quantity of land that is supplied to the firms and the equilibrium price at which the land is supplied. Now, in a number of cases, the firms do not buy the land; but they take the land on a rental basis which is a lease.

In most of the situations, we talk about the rental price of land which is how much you need to

pay for a fixed piece of land, say per year or per decade. So, in the land market, we have an equilibrium quantity of land and we have the rental price of land.

Similarly, in the capital market, we have the demand for capital, we have a supply for capital; both these curves intersect at this equilibrium point, which gives us the quantity of capital that is demanded or supplied by the market and the rental price of the capital. Now, in a number of cases, this rental price is the interest rate that the firm is going to pay to get this capital. So, if say a company raises a debenture and in the case of a debenture, if you buy a debenture, then the company will pay you an interest rate. Now, that is telling us the equilibrium price for the capital. Now, if the company has a very huge demand for capital, then probably they will be paying a more price. So, this equilibrium in the market will tell us the quantity of capital and the rental price of the capital.

Just as before the demand will depend on the value of the marginal product of the factor that is in question. That is the value of the marginal product of land or capital. If the value of the marginal product is more, then these factors will be in more demand and probably, the firm will be ready to pay a higher price. If the value of the marginal product is less for any of these factors, then the demand will be less and probably, the company will be ready to pay less. Now, for a competitive and profit maximizing firm, each factor's rental price equals the value of the marginal product of that factor.

We have seen that in the case of labour, the value of the marginal product of labour is equal to the labour's wages. So, the company is going to hire only till this point, where the value of the marginal product of the labour is greater than or equal to the wages or is greater than or equal to the rental price of the factor of production. So, the factors earn the value of their marginal contribution to the production process.

And because these three factors of production, land, labour and capital they are linked together, because all three of them are together needed for production. So, in this case the supply of any one factor can alter the earnings of all the other factors and a good example is an epidemic that reduces the labour supply. So, if there is an epidemic and people are dying or people are sick because of it, they are removed from the labour market. So, in that case, the supply reduces. Now, when the supply reduces, the marginal product of labour rises. Why? Because of the Law of diminishing marginal product.

If you have more labour, then you have less marginal product. Remember that we are talking about the product, the production that is being made by one extra unit of the labour. If there is more labour, then the amount of production that is made by one extra unit is less. So, it means that if you have more labour, then there is less marginal product which means that if you have less labour, then you have more marginal product and if you have more marginal product and everything else remaining the remaining same, that is the price remaining the same, the value of the marginal product will increase and this will increase the wages.

But because of a shortage in the labour supply, the marginal product of the land will decrease. Why will it decrease? Because less labour is able to work the land and, in this case, there will be a decrease in the rent and similarly, the marginal product of capital will decrease because less labour is able to work the capital and so, this will decrease the return on the capital. What we are

observing here is that if the value of the marginal product of any factor of production increases, it increases because of a change in the supply and we are taking the example of an epidemic that reduces the labour that is available.

With less labour available, we have a greater marginal product of labour because of the law of diminishing marginal product and in that case, the value of the marginal product of labour increases, which will increase the wages that the labour will get in the market. But because less labour is available, so the value of marginal product of land or capital, it will decrease because less labour are able to work on the land or the capital and so, the productivity of land or capital will decrease, which will reduce the rent or the returns for the land and capital.

Such an analysis is known as the neoclassical theory of distribution. What are the salient points that we have seen so far? The amount paid to each factor of production is derived from the supply and demand for that factor in the market. So, we have seen before that, there is a demand and there is a supply and both of these together are telling us the amount that is paid to each factor of production which is the rental price or the wages. Demand for a factor depends on its marginal productivity. Because if the marginal productivity is more, then the demand will also increase and in equilibrium, each factor of production earns the value of its marginal contribution to the production.

So, you earn more, if you contribute greatly to the production of something that is valued high; meaning that, if you have a larger productivity and the product that you are working on or the product that you are making has a higher price in the market, then because you are making more of those goods that are priced higher, you will earn more. And the corollary is that a person will earn less, if his or her contribution to the production is less; meaning that the productivity is less or the product that is being produced has a lower value.

So, people who work in the primary or secondary sectors of the economy, that make such products that have a low value in the market will earn less and especially so, if their productivity also is less. This helps us explain why there is poverty in the society and as we have seen poverty has a great ramification for the cause of conservation.

That is all for today. Thank you for your attention. Jai Hind!