

Introduction to Ancient Indian Technology
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Module 2
Lecture No 08

(Refer Slide Time: 0:17)



Let us start this lecture with a thought process Tough time does not last forever; but it makes you tougher forever. So don't get shy away from tough time. Fight with yourself so that you will be tougher. So, before starting let us recapitulate, what we learnt in the last lecture. We basically looked at various aspect of the Physics like your optics and other things. And the later on, I moved to the chemistry part, how it was. And then we looked at also, little bit about what you call like games like ludo, and then what we call Pachisi and then your snakes and ladders and other things and then we also discuss about what you call other aspects of the, I mean other arts form various things and then we moved into also the how we can utilize the NCN technology of making roof in place of concrete or the RCC- Reinforce concrete roof kind of things.

Let us now discuss about what you call problems with the modern agricultural farming because we will be discussing it with agriculture. Agriculture is very important for the food. As our ancestors says Anna Prathistha Dev. That means we need to have a food even for the God you know to exist. So therefore it is important.

(Refer Slide Time: 2:02)

Problems with Modern Agricultural Farming:

Artificial fertilizers and herbicides washed from the soil and pollute rivers, lakes and water resources.

- It results in soils with a low organic matter content.
- Dependency on fertilizers.
- **Greater amounts** of fertilizers needed every year to produce the same yields of crops.
- Artificial pesticides can stay in the soil for a long time and enter the food chain.
- Artificial chemicals destroy soil micro-organisms resulting in poor soil structure and aeration and decreasing nutrient availability.
- Pests and diseases become more difficult to control as they become resistant to artificial pesticides.
- **Habitat losses**.

And artificial fertilizers we are using and so are the herbicide which is spoiling the soil and polluting the rivers, lakes and water resources. In the name of growing more, we are doing that. And we are, you know, as a result, the soils with the low organic matter content we are having and it became infertile and our body is getting diseases. And we are depending too much on the fertilizers. As a result, if you look at, our farmers are committing suicide because they are in death trap.

Of course, we are trying to propagate a zero budget you know farming. And which was there earlier in our country. Ok. We should do that. And it is integrated with that. Our ancestors were very aware how to do farming but we do now know because of utilization of modern science and technology driven by the market processes. And greater amount of fertilizers needed year after year to produce same yield of crop, for example, let's say 10 years back for acre, they are putting let's say 10 kg of urea.

But today you will have to produce at least give something may be 30kg. Then you know, cost is increasing. And the soil is getting spoiled. So as we are using also pesticides, because the eco system is being spoiled because of that and there is a imbalance because there is a pest and pray kind of things which will be balancing each other. So artificial pesticide what we are using. We will stay on the soil for longer time, enter into our food chain and then we get diseases. Artificial

chemical destroy the soil micro organism. This modern people have not understood, there is a lot of micro organism which are working. For that, we, you know, nature works on that.

Even in our body, it is there. Even on the surface of your skin, it is there. So we should not destroy. They are the part of the nature. They are doing lot of work which we do not know, understand. No, of course the modern science has started realizing this. But our ancestors were might be aware. They were in the balance. That is the thing key what they have talked about it. As a result, this destruction of the soil, micro organism, the poor soil structures and aeration problem, there is a decreasing of nutrient availabilities. As I was telling pest and diseases become more difficult to control as they becoming resistant to the artificial pesticide.

Because you pesticide put and they will get resist, you know, resistance. So that you go for a higher level of chemicals to have that effect. Then you know you are spoiling the whole soil, water, air and your body and then so, as a result the habitat loss also is going on. So which is very important therefore whole system we are in deep trouble, in the name of what, development. Right? And people are making money and we are in trouble. So this is not the way we should do. Then what is the solution? Solution is basically go back to the farming the our ancestors doing but you need to do research in such a way that you will have to handle the present situation because you have spoiled now.

Now you will have to get back to the earlier thing is not that easy. Right? Is it like that you have already put a arrow and then you will have to take it back. It will go and hit. So it is a difficult, dicey situation, one has to handle. Therefore, you need to.

(Refer Slide Time: 5:37)



What is the solution ?

Organic Farming **What is organic farming?**

Organic farming is as old as Indian Civilization.
It is the process of farming developed and professed by our ancestors

- British survey of 2000 villages of Chengalpattu, Tamilnadu (1762-1766).
- Yielding was **12 tons of paddy a hectare**

It is the process of cultivation which works in harmony with nature unlike modern farming that works against nature

This process helps to achieve good crop yields without harming the Natural Environment/habitats (man/animal/insects/microorganism/plants/air/water/etc)

Ref: Annam Bahu Kurvita by JK Baja & M D Srinivas, Centre for Policy Studies, 1996 (<http://cpsindia.org/index.php/pub/96-annam-bahu-kurvita>)

Of course, this farming has now come up from the western name. It is organic farming. In India, we call it as a Prakritik Krishi or the natural farming, which was very much there. And this organic farming is as old as Indian civilization because ours is an agriculture country. Even today, 75% of the population relies on agriculture as a well-known enterprise. So it is the process of farming developed and professed by your ancestors. But we lost it. And then you know, we are now using their technology.

They are being modified, is coming now the organic food, food, whatever available in mass and is much costlier than when you are using the what you call artificial fertilizers and pesticides and herbicides. So what is this? This is nothing but a mere business. You know we are spoiled. So therefore we are working on that zero budgets. Lot of people are working. I think some of you should look at and some IITians after leaving the jobs they are doing that now in some pockets of India, in the interiors. I am having some you know contact with them. They have left the job. They are doing because they find this is more you know interesting and then what you call satisfying.

The British survey of 2000 village of Chengalpattu in Tamil Nadu in 1762-1766. You know data says, that yielding was around 12 tonnes of paddy a hectare, which is much higher than whatever the urea, whatever the artificial fertilizer used. It is the process of cultivation that organic farming or the natural farming what we call is basically work in harmony with the nature unlike modern

farming that was against the Mother Nature. So that is the important aspect which I am harping on this course. That science and technology should be aligned with the plans and the programs of the Mother Nature than that of going against it. That is the basic philosophy one has to put it, which is modern science and technology is unable to understand. And that is why all problems are coming.

Modern science is trying to solve one problem but creating another 100 problems which cannot be solved. Right? So that is not the way. Way is that you understand, plan and programs and other things, align with that so that things will be very natural. So this process helps to achieve good crop yield without harming the natural environment habitats. When you talk about, it is men, animals, insects, micro organism, plants, air, water, altogether. It is not that you will you know look at in a, it is a holistic approach, the whole approach, it is not the part.

It is not that, you know like what you call, it would not be the what you call BBC, the whole reductionist, it is not that we reduce the thing and then, we look at in a whole. That is a main problem thing. So you can look at this data what I gave you. Particularly this 12 ton in 2000. You can look at Anna Bahu Kurvita by JK Baja and MD Srinivas. They are having Centres for Policy Studies. I have taken from this you know website, this data. They have done some research there for the indigenous knowledge system.

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Food Quality : Organic vs Conventional

Vegetables Type of Soil Management	Minerals (in milliequivalents)						
	Calcium	Magnesium	Potassium	Sodium	Manganese	Iron	Copper
Snap Beans							
Organic	40.5	60.0	96.7	8.8	60.0	227.0	69.0
Conventional	15.5	14.8	29.1	0.0	2.0	10.0	3.0
Cabbage							
Organic	60.0	43.6	148.3	20.4	13.0	94.0	48.0
Conventional	17.5	15.6	53.7	0.8	2.0	20.0	0.4
Lettuce							
Organic	71.0	49.3	176.5	12.2	109.0	516.0	60.0
Conventional	16.0	13.1	53.7	0.0	1.0	1.0	3.0
Tomatoes							
Organic	23.0	59.2	148.3	6.5	68.0	1938.0	53.0
Conventional	4.5	4.5	58.6	0.0	1.0	1.0	0.0
Spinach							
Organic	96.0	293.9	257.0	69.5	117.0	1584.0	0.0
Conventional	47.5	46.9	84.0	0.8	1.0	19.0	0.5

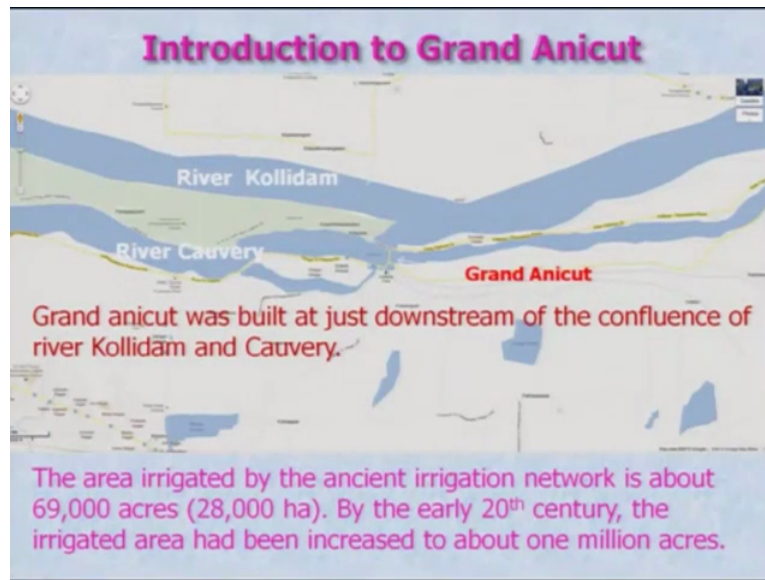
Research conducted by Firman E. Bear,
Rutgers University in the Natural Gardener's Catalog (1995)

So I will just give you some data about the quality of the food because quality of food is important for the health. And if you look at, these are basically vegetables like you know Snap Beans, Cabbage, Letus, Tomatoes and spinach. And this is minerals what it will be containing. Calcium, magnesium, potassium, sodium, manganese, iron and copper. This data I have taken from the research conducted by Firman E. Bears & Rutgers University in the Natural Gardner Catalogue.

If you look at this is, there is a term if you look at, one is organic, right? And other is conventional. Ok. Conventional means the with urea, with your pottas or any other chemicals you are using. That is the traditional. Ok. Conventional. Organic means where you would not be using, using natural things. Ok. Are you getting my point? So now if you look at, let us say, iron, in the tomatoes. If we use organic, which is natural farming, what our ancestors were doing, you will get 1938 milliequivalent. You know what is a milliequivalent? A 1000's of a gram in a some kind of things you know like very small quantities. A one litre or some kind of units for the saying that (10:26). And this is one.

So you know that iron is very essential for the, what? For our body. All minerals are, you know somewhere it is required. So similarly if you look at spinach or any other things, it is like that. if you look at sodium, let us say this is 6.50 and it is zero and this spinach 69.5 and this. What I am trying to say with this data, that look, if you do that, it is having higher level of the minerals which are required for the, for our body. We need not to take some vitamin tablets. You know like for as a supplement. So, it is important. And why it is so. I could have shown you may be in agriculture, when I talk about it, I now remember, I will show you. What will be the root size when you do naturally and what will be the root size, when you do with with the artificial fertilizers.

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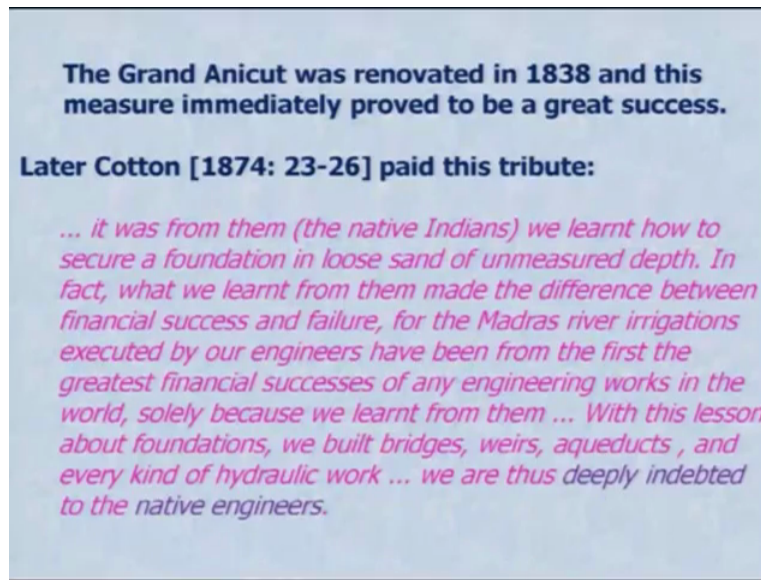
So that question we will answer. Let us now look at irrigation systems. If you look at, irrigation, you might be aware. The introduction, you know the Grand anicut which is in Cauvery river, which is quite old, you know like something 2000 year old and all. There is a river River Kollidam and river Cauvery. They mix together here and there is a you know the confluence, the downstream confluence there is a anicut, which was being made in the Chola kingdom, which is very old. And this area irrigated by ancient irrigation network, you know is about something 69000 acres of land at that time. But after that there is a modification. I don't know, this is now around 1 million acres is increased. Ok.

And this is a very old dam. And most of that dam, if you look at, having problems. You know what are the problems in the modern dams, what being made by our modern engineers? Any idea? Silting. Silting is the big problem. Ok. And that is hardly may be 70 years, 80 years. These are 2000 years.

Student: Sir, can you please mention the date of this Grand anicut?

Professor: It is something around 2000 years back. We will be discussing about this, when I will be talking irrigation system.

(Refer Slide Time: 13:05)



Ok. So, this Anicut was in you know need to be maintained and there is a renovation work done by the British engineers in 1838 and they were finding lot of problems with that. They couldn't manage well. And then what they did, they , had a dialogue with the local people, which, at the time you know, and there they could get the solution. They were very unsuccessful in the beginning to handle this one. They were thinking they can do because they were great engineers. Ok. and then they learnt from the local people, that is something 1874 Later Cotton who paid tribute to these people native Indians, who had instrumental in imparting the knowledge for making this success, successful renovation of this Grand anicut.

What he says? He says that it was from them, the native Indians; we learn how to secure a foundation in loose sand of unmeasured depth. Are you ready to learn from them now? No na? They had learnt. He is saying 1874, when we are under them. And in fact, what we learnt from them, made the difference between financial success and value. They were you know always saying that we are putting money, we are not getting back. But this local native people taught them how to do that. For the Madras river irrigation executed by our engineers have been from the first greatest financial success of any engineer works in the world.

But we are not taking care of local knowledge or the indigenous knowledge. They had taken care. Solely because we learnt from them, with this lesson about foundation, we built bridges after learning that from the native people. They learnt how to build bridges, weirs, aqueducts and

every kind of hydraulic work and it goes on. We are this deeply debted to the native engineers. Where are these native engineers? Let me tell you. it is also some of them are coming up. Some of the people are working. We are not working. They have revived the river, the village people, which was dead.

I will be talking about that when I will go to irrigation system. It is not, don't think that you people know the engineering. Ok. The people who are in the villager, uneducated, they do not know. They know because I told you, science is nothing but a common sense at the best. They are having better common sense than all of us. So therefore we should not looked down upon them rather work with them and learn from them what we need.

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So this is about a Natraj Temple. Can you see that? It is very intricate. How we can make it? What are what are the method you need to do? All of you are engineers. Tell me. Casting. What kind of casting? How many castings you are aware? What kind of casting it will be? And they had done long time back. Ok. It goes back to the what you call even Harappan, no no, I think later on. Ok. This is known as lost wax casting. And this casting was being used, right, for making these intricate safe. Right? And this is made of 5 metal, which is known as Panchdhatu.

It is nothing but alloy. People were knowing the alloys. And the metal crafting has started in South India during 6 and 9 century. What you call C that is common era. But before that it was

there also. And they are masters by the Pallava dynasty. And this method is basically known as the investment or the lost wax casting method and which is being used today for casting of turbine blades. Ok. And our ancestors didn't do that for turbine blade. They were doing for idols, for other things.

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So and if you look at, this is the iron pillar. You might be knowing rustless. Western people spend lot of money and time to understand what it is? Why is it so? They worked hard, they couldn't. Right? And this was being made by ehhhh if you look at it is a view of Ashokan Pillar, now it is in Qutub Minar. And a pillar at Vaishali. One of the edicts of Asoka, which is 272- 231 reads: "Everywhere King Piyadasi". King Piyadasi means basically Asoka, erected two kinds of hospital, hospital for people, hospital for animals, as I told.

We are not only for the hospitals, for the people but also animals. Today we don't have hospital, you know, enough hospital to accommodate our people. That is the situation. They were having for animals. Forget about animals. So where there were no healing, where there were no healing herbs for the people, animals. He ordered that they be bought and planted. Ok. That was intricate things. So if you look at this as the portion, I have taken. This portion, I have taken from region and magnified here. Right? What you see? This portion what you see?

What is the shape of this? It is a, if you look at a Kalash kind of thing. Ok. How they are making these things? How I will fabricate this? These are the questions we will answer whenever we will be going to talk about iron making and black smith, metal working. But you just talk about think, I am saying, inverted Kalash. Right? Why is it there? Because that is the signature of our civilization. In your house, any auspicious occasion, you will have Kalash. And it will be filled fully with water. Why it is so? Please ask this question. And this is also reflected here. so I will answer some other time. But you think about.

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How was it built ? Was it built without any Engineering ?



The number of temples in India is so large; it is impossible to believe that they were created without any sound technologies.

What technology did the ancient people in India possess that made so many of these structures possible?

Sun Temple in Konark, Odisha Built by Ganga Dynasty around AD 1250

And this is about Sun Temple in Konark, in Orissa, built by Ganga dynasty around 1250 CE and if you look at, it is one of the wonders in the world. That is known as Black Pagoda. And how was it built? Was it but without any engineering? Because they were not. Right? but where those engineers have gone? Do we recognize them? Do we teach these things how to do? Do we how to maintain our temple? Do you know how to repair and you know maintain an existing temple? No na? So we need to do that because the number of temples in India is so large, it is impossible to believe that they were created without any sound technologies. Because the King Choda Ganga Dev, he spent 12 years of his savings of the whole kingdom, for making a temple like this.

Do you think that you will give money unless he was having faith in the technology? If I want to give 500 rupees to anybody, I will think several times, whether he can deliver me or not. Right? and he was a king. So therefore, it was there. And what technology did ancient people in India

possess, that made so many of structures possible, we lost it. But we can revive it. We can study it. There might be some scriptures somewhere. So it is important because these temples are living, till date existing and we are using it. We should learn it. And how to maintain it.

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So if you look at the Kedarnath temple, and it is a temple of something 2000 years people claims and before flash flood this temple was like that. You know all are the new structures. Agreed? After the flash flood, what is there? This temple is where are the new structures? Gone with the flash flood? Why? People say it is a miracle. I told no, it is the technology, what our ancestors have built. Right? So I mean people were having that and then we need to look at it.

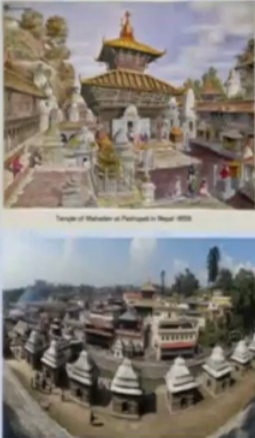
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Pashupatinath Temple

This temple was built in the Nepalese pagoda style of architecture in 11th century AD and renovated 17th century AD

All the features of pagoda style is founded here like cubic constructions, beautifully carved wooden rafters on which they rest.

The two level roofs are of copper with gold covering. The temple resides on a square base platform with a height of 23 m 7 cm from base to pinnacle.



Similarly if you look at Pashupatinath Temple and which was a you know built around 11th Century C and renovated in 17th Century. And this was the temple which is a lot of in a Pagoda base. And we know that this is a height of 23 meters and 7 cms from the base of the Pinnacle. It is a very you know long temple.

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PASUPATINATH TEMPLE BEFORE EARTHQUAKE 2015

PASUPATINATH TEMPLE AFTER EARTHQUAKE 2015

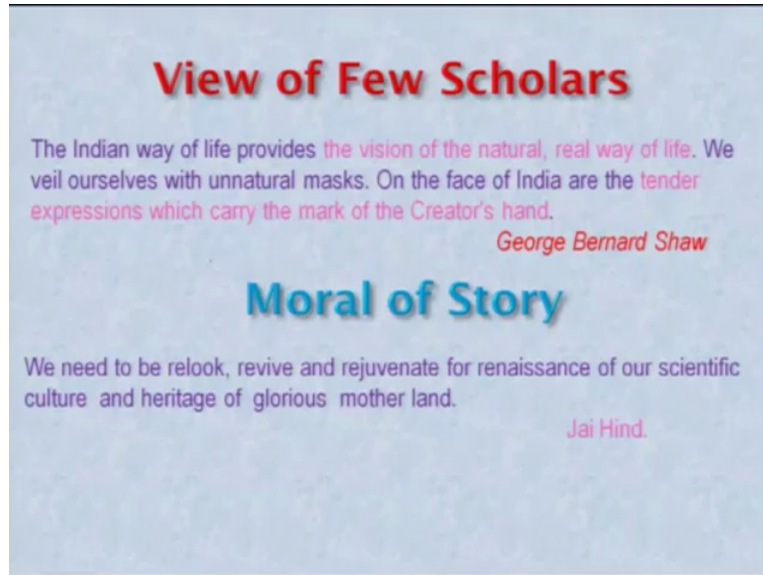


Why was Pashupatinath temple saved amidst the Earthquake disaster?

And, so if you look at this is temple, lot of structures were there. And the earth quake, you know, it is a Richter scale of something around 7.8 or something. I am not remembering exactly. It is a

very high. But what happened? The temple is remaining. Rest of the things have gone. That means it is the technology that is it what. So therefore we need to study that and the technologies.

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And therefore let me tell you that what George Bernard Shaw has told. He says that Indian way of life provides the vision of natural real way of life. But today we don't have that life. We veil ourselves with unnatural mask today. You know he is saying that they are veiling their unnatural, you know, they are cover their you know the mind and the body, you know like consistness with unnatural mass. We are also doing. And on the face of the India, a tender expression, which can carry the mark of the Creator's hand.

If you lead a natural balanced life, integrated with the mother nature, you can know a lot of what you call intuitive knowledge from the mother nature and you can do better science and engineering. That is the I can interpret in that. Am I right? My interpretation. So let me moral of the story, I would like to say that we need to relook, revive, rejuvenate for the renaissance of our scientific culture and heritage of glorious mother land that is Bharat, what we call in modern time India.

So with this, we will stop over here and we are having a very journey of I was trying to tell you that what is the gamut of the ancient Indian science and technology we are having. And we have learnt that we are having a lot of stuffs and lot of you know technologies still existing in some

pockets. And those thing has to be also renovated, has to be maintained properly. For that we need to learn and also we need to look at the philosophy of the Indian science and technology which was unique because it was integrated with the mother nature and not mechanised that way that it will spoil the mind of a person.

Today you people are using all electronic gadgets and then what you call your all those things, getting engaged and you are spoiling your mind. Your intellectuality would not be blossomed unless you have a peace of mind and a very tranquillity in that. So, we need to have a technology. And I must tell you that we need to go back to a technology, which is need not to be automated, unless otherwise required.

Like for your blast furnace and some other places, where man cannot go, you can robots and do that. rest of the things, we need to have technology which will generate more jobs, more mechanical and, so that mind and body and the spirit will be in balance. So that is the basic philosophy of ancient technology and it should be integrated with the modern, mother nature. So that we live a very fruitful and productive and enjoyable life on this earth and make this earth a beautiful place.

Thank you very much for listening to me. And that is the essence of the philosophy of ancient technology what I am trying to propagate.

Thank you very much.