

**Course on Introduction to Ancient Indian Technology**  
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**Lecture 14**  
**Module 3**

I welcome this all of you to this lecture and let us have a thought process before starting this lecture. And we should keep in mind that agriculture is the only primary wealth of human kind it is not only for India alone ok, that spins other firms of secondary wealth but unfortunately in the name of modernity, people are not giving importance to agriculture today. But that is the primary wealth and which nature gives us, Mother Nature gives us.

So, we should you know concentrate on that and I must say you that if you want to be Rishi that means sage you have to do Krishi, Rishi banana ke liye krishi karna zaroori hai, that means if you want to be a good human being, you will have to get a task to the agriculture, farming, gardening all those things is important.

So that you can understand the Mother Nature that is why our ancestors were giving importance to the agriculture and question arises as I told the soil is important and then a question arises what do you mean by soil?

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**What do you mean by soil ?**

It is a mixture of **small rock particles, debris and organic materials/humus** which develop on the earth surface and support growth of plants.

**Types of Indian Soils**

- Alluvial Soils.
- Black Soil.
- Red and Yellow Soil.
- Laterite Soil.
- Arid Soils.
- Forest/mountain Soil.



Soil is basically, mixture of small rock particles, debris and organic materials like which you call humus, right and which develops on the earth surface and support the growth of plant. As I told earlier this humus comes from the micro-organism and this micro-organism will be working all the time for you know their life and those thing they will be died and then they will be having lot of minerals, other things will be coming from their bodies and then that will be helpful for our thing in the name of modernity and scientific understanding modern I am criticizing that.

So, we have started using fertilizers and (( ))(2:20) and also pesticide insect that spoiling the humus you know micro-organism is working for us why should we you know use those things there is no need but only thing that rather to support them and that is the reason also why you should not deal you know depth wise more depth wise by using the tractors, using the brutal force rather the use the plough and then of course that angle of the plough share is very important.

And what are the kinds of Indian soils you are aware if you look at any idea? There you must have studied and I had also told you in the earlier lecture. Let me repeat again. One is Alluvial soils but question arises how I will identify Alluvial soils? Alluvial soils is basically comes from the river bed you know, it will be occurring in the river bed and it is carried by the river itself and then some of the (hu) humus and other things will be carried with that and it will become and from the colour you can know and it will be colour will be yellow I will show you some picture later on.

The Black soil Black soil is basically arises from the volcanoes and then your their material which will be coming during the volcanoes and it will be containing Manganese and the things but unfortunately it will be containing less organic matter but Alluvial soil will be containing lot of organic material which is required for the cultivation like and this Alluvial soil will get in Gangetic plains, the river beds nearby, I will show you that where we are getting in it.

And Red and Yellow soils which is basically laterite you know sediments of the laterites stones which are there in Tamil Nadu and other Deccan areas and then your in Odisha and then Bihar some portion and Laterite soil is another one where Iron it will be containing more Iron and the Aluminium right.

And Arid soils which is been in the desert area will be getting from the containing sand and also it will be containing less amount of organic matter.

And Forest/Mountain soils always will be you know containing lot of organic materials and also some portion of minerals kind of things.

If you look at this is the forest and mountain soil what you will be getting in Kashmir and then Himachal Pradesh and some portion of north is this region, right and these are roughly you may get in some other places as well this one but roughly we are saying. And this is your Alluvial Gangetic plains you know these are your you know some portion of Bihar and other things, this portion also you know, this portion are Alluvial soil. And the red and yellow, this region is yellow will become you know when the Iron is less so that is the what will having right and this region and then like even some portion of Madhya Pradesh, some portion of Odisha, Andhra also some portion and of course the Tamil Nadu and some portion here in this region.

And Black soil you will get in Deccan Plateau, even in Tamil Nadu this middle portion you know, this portion is black kind of things, this will be Black soil and of course the Laterite you will get here, very small portion where are the mountains will be there of Laterite stones and then those are the places of course I have also told you that this in these regions, right you will get these portions. And Arid soils you will get here in Rajasthan area in some portions in the coastal side also you will get Arid regions right.


Now from the colour you can get this is basically which soil it would be it will be Alluvial soil, right and the Black soil of course is from colour you can see right, it is a black soil and do not think that soil will be that black but you know like in some places it will be a little whitish also I mean like less black rather I cannot say, this is the soil the red and yellow soil which will be getting in this region, you know this region Red and Yellow Yellow you will get only when the Iron content will be less right, in the soil.

And these are Laterite soils, right Laterite is a stone what is being used being the less compressed you know stone you can say and (Lat) and this is about basically Arid soils right and this is your Forest or Mountain soil. So, from this colour and combination you can see this is of course the modern way of classifying the soil. But let us see now how our ancestors were classifying the soil, whether they were having any understanding or not, right.

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**Soil and its preparation**

- **Farm land** is called as *Kehtra* in Vedic Culture.
- *Urvara*-Fertile land, *anurvara*-barren land, *Krsya*-arable land
- Nature of soil : *sarkara* (salty), *sikata* (sandy) and *asman* (stony)
- Different types of land as *Amarakosa* (II.1.1-5, 9-11): *bhummi* (soil), *mrtsna* (excellent soil), *urvara* (a fertile land), *usa* (salt ground), *usara* (a spot with lime soil), *maru* (a region devoid of water), *khila* or *aprahata* (waste land), *nadvan*, *kumudvan* and *sadvala* (abounding in reeds, water lilies, ratnas or green grass), *pankila* (muddy soil), *anupa* (land adjoining to water), *sarkaaria* (stony soil) and *siktala* (sandy soil). Some of these words can be found in *Vedic* literature.
- In ancient India, land were generally classified into three categories: *jangala* (dry/and land), *anupa* (wet land) and *sadharana* (moderate moisture) on the basis of moisture content.



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So, before that let us look at the farm land which is also known as *Kehtra* in Sanskrit in or in Vedic culture right, it can be divided into 3 categories *Urvara* *Urvara* means fertile from the farming point of view, *Anurvara* means barren land, right the other is *Krsya*, *Krsya* means arable land, right which can use for purposes but however agriculture we have to give you know irrigation you will have to use irrigation, you have to give water.

Nature of soil: If you look at this is a *Sarkara* means basically salty and *sikata* it will be sandy and *Asman* means basically stony there will be lot of stones kind will be there that is and of course there are several you know text or the scriptures are there on them is *Amarakosa* and which it talks about different kinds of land like we call it *bhummi* that is soil, *Mrtsna* that is basically *Mrtsna* means basically are *maru* is a region of devoid of water right, and *Usa* means salt ground right, of course and *Usara* a spot with lime you know lime soil will be there, that is known as that means salt and lime are different things you know *Usa* and *Usara*.

And *Maru* actually as I told you is a region of devoid water and *Mrtsna* is excellent soil, that is the *Mrtsna* soil is an excellent one, right. And *Khila* are the are also known as *Aprahata* is waste land that means you know which cannot be really used for cultivation and *Nadvan*, *Kumudvan* and *Sadvala* like that means you know like these are the lands which is having different purposes like reeds, water lilies, ratnas or green grass this is known as grass land kind of things you can say right, will be there.

And Pankila that is a muddy soil, if the soil is muddy and the water is there it becomes mud kind of things and very fine soil structure then call Pankila, Anupa means land adjoining to water is known as Anupa, right. And Sarkaarila Sarkaarila means stony soils and Siktila sandy soils of course very Sikta, Siktila, right is adjective basically. Some of these words can be found in Vedic literature also but I have taken some of the words different you know defining different kinds of land that word if you look at they are having a varieties kind of things, we will see as you go on.

And in ancient India, land were generally classified into 3 categories Jungala I mean where you will be having dry or arid land where you will not use for cultivation, you keep as it is, right for veget you know kind of things vegetation. There is Anupa wet land where lot of water and other things will be there which will be also will not be using for cultivation. Sadharana moderate moisture on the basis of moisture content. And these categories is basically based on the what? Moisture content because moisture is very important for the cultivation, right.

And that is thing which is they had identified where as we are saying the water is important no, what moisture in the what in the soil is important for cultivation that is the understanding they were having, and modern is water.

So, that is not really that right thing but one has to look at it we will have to look at whether it is right or wrong. But I think in I had a discussion with some agriculturist they are saying that is the right, that moisture content in the soil is important rather than the water. And there is a also a book you can read The Straw of Revolution that is known by the Hukwaka and in which he says that you need not to give that much of water for the rice which is well known I mean we and that is you do not need, you can cultivate the rice with a very less amount of water I mean of course one has to look at the arguments and he has proven it in his by his cultivation.

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**Soil and its Preparation**

- Further classification according to *Susrutasamhita*, based on their *odour* (gandha), *colour* (varna), and *taste* (rasa).
- **Six types of soils according to their colour:** *asita* (black), *vipandu* (pallid : dull(Lateratic profile)), *syamala* (dark blue), *lohita* (red), *sita* (white) and *pita* (yellow).
- **Six types of soils according to their taste:** *madhura* (sweet), *amla* (sour), *lavana* (saline), *tikta* (pungent), *katuka* (acid) and *kasaya* (astringent).
- *Vrkshyayurveda* has a separate section on *bhuminirupana* describing all above classification of soil.
- The soil with poisonous matter/stones/ant-hills/saline gravely/deep underground water are not favorable for trees.
- The sadharana (moderate humidity) soil is appropriate for all kinds of trees.
- *Varahmihira* regards soft (*mrdevi*) to be good for all kinds of trees and Emphasize the need for preparation of soil before sowing.
- The first preparation in preparing the land is to sow *sesamum* in the soil and when they grow and have put forth flowers, they are to be uprooted (*Brahatsamhita 54 2*).

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And further classification according to the Susrutsamhita based on their odour, colour and taste, if you look at they are classifying in three ways. One is you know according to the colour, right which we had seen just now based on that colour like Alluvial soil and then Red and yellow soil, Black soil is basically from the colour you can get. But they are classifying six that is Asita-Black and Vipandu there is a pallid or the dull basically this is a Lateratic profile Laterite means Laterite stone and that profile right, that colour.

And Syamala dark blue this I do not know where they got this thing and I have not seen also this dark blue colour soil okay but they are saying I do not know. Lohita of course it is there and Sita is white, white means may be this is little bit less yellow, Pita is yellow and Sita is there saying white in English but according to me it will be less yellow colour you know are the kind of thing that may you call Sita.

So, if you look at all are matching except this Syamala let dark blue may be I am not an expert in this soil, so maybe it will be there I do not know, you can look at it. So, six types of soil according to the taste, now that taste also people are talking about you know, like we really think about in modern times, of course we are having lot of instrument to check the soil quality or the things.

So therefore we may not, but they are having their own test and they can test the soil and say which is what? Madhura that is the sweet, Amla the sour and the Lavana is the saline right, and

tikta is pungent smell and katuka is acrid kind of things and Kasaya is astringent, right. This is a you know 2, 3, 4, 5, 6, 6 types of soil tests they can do, you can depending on that you can change your.

And there is another ancient scriptures Vrksayurveda has a separate section on bhuminirupana bhuminirupana means identifying a land you know for describing all kind of classification of soils so that you can put the crop depending on the kind of land you are having it is not that you will just do whatever you like you know, like the way we are doing even if it is not that area is for the rice but we are cultivating rice there you know because of these things.


So, that is not one should not do that one should have a knowledge about the soil, that is important point what I am trying to tell and which was there in ancient time as well. The soil with poisonous matter, stones, ant-hills, saline and then gravely or deep underground waters are not favourable for trees of course for plantation you can do because in the tress the roots will be getting into deep into the thing so therefore these are the things which of course the poison matter is there means you should not really even have a crop.

The Sadharana or moderate soil is appropriate for all kind of trees that is but in today's (15:45) Sadharana means you know like you will say general so in it is useless you will say, but in otherwise this is the Sadharana means it will be used for everywhere. And Varahamihira who has written a book on that like this regards the soft mrdevi, right to be good for all kinds of tress emphasize the need for preparation of soil before sowing the seed that he has the Samhita he has talked about it.

That first preparation of the land is to sow the seed sesamum like you know there is another way of improving the soil quality, he is saying first you sow a sesamum in the soil and when they grow have put forth flowers, right sesamum trees this thing and they are uprooted that is according to Brahatsamhita Brahatsamhita is basically I think written by Varahamihira, Brahatsamhita and so he says that. And what is this sesamum? Any idea? That is what we call in Hindi Til, right I will be showing some pictures for that in the next slide.

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### Seeds



- In **Vrksayurveda** Including big trees (**vanaspati**), trees (**druma**), creepers (**lata**) and thickets (**gulma**), mentions three ways of planting them by seeds (**bija**), scion of a plant (**kaanda**) and bulbous root (**kanda**)
- **Varahamihira** mentions that certain trees (Ashoka, rose-apple, plantain, pomegranate, draksa, etc ) grows from scion and not from seeds. The scions are plastered with mud.
- In **Millindapanho** (IV.6,47.ii, P.79) implies the knowledge about seeds has two main parts- the selection of good seeds and sowing them in proper manner. All seeds do not germinate due to inherent defects.
- The **parched grains** as seeds are unfit to germinate as per Mahabharata.
- **Arthasastra** mentions collection of seed in the appropriate time (Yathakalam) as the first duty of the superintendent of agriculture who should collect all kinds of grains, flowers, roots, creeper fruits, flax and cotton. To increase the fertility of the seeds they were treated before sowing.
- As to **Krisiparasara**, seeds are not to be kept on an ant-hill/cowshed/delivery room. The seeds should not contact with remnant food, women with menses, lamp/fire/smoke/rain. These must not be stored in pit/underground.
- As to **Arthasastra**, Seeds of grain are to be soaked in dew and dried in the heat for seven days; those of pulses for three days and nights.

And there is a Vrksayurveda in that like the big trees you know are they have also classified the trees, big trees means Vanaspati, trees means druma, Latha-creepers, thickets gulma and mentions three ways of planting them by seeds. See how you can have a plant? Because you can use the seeds, you can use also the scion of a plant or the kanda right. Basically if you look at in modern times we are calling it a tissue culture ok, that was there also that time, you might be aware that tissue culture you know you will take some and sculp it out and then put some chemicals and then put this thing and then wrap it with a cotton and other things so that you will get a tree, get a plant out of a this thing.

So, that is a basically modern time tissue culture we call, and bulbous roots or the kanda like your ginger if you take right or some other things you can use for the its propagation. And Varahamihira mentions that certain trees like Ashoka, rose-apple, plantain, pomegranate or draksha, etc, grows form the scion and not from the seeds. That means these trees, they were knowing that which way to be grown from which way has to be grown that is being they were knowing, they have mentioned these things.

And showing them in a proper manner of course modern people like us, we do not know those things and it is very important for us know that. And the scions are plastered with the mud, right and mud and then they some people use also gobar I had seen when I was a kid, I had gone to some village and they were using gobar and paste, gobar means in the cow dung cow dung and



the mud they will be putting it and then using it and there is a various other what you call ingredients they do add, depending upon the locality.

So, Milindapanho that is the basically, Buddhist text it is a if you recall that is a dialogue between a king and a Buddhist monk and implies the knowledge about seeds has two main parts, he says selection of good seeds that is very important which is good or bad a person should have a knowledge, how to decide. And sowing them in a proper manner, right that is also very important, what he has emphasized and keep in mind that what he has told that, all seeds do not germinate due to inherent defects and each you know each seed has to be separated if it is having you knows defects.

Now how to identify the thing, this requires some experience right. You will have to by the observation may be you will have to sow put in a water and then, then you will have to see whether it is floating, if it is floating it is not good quality, you know there is several ways of doing that.

Now those things of course one has to learn and then record it also I mean it might be recorded in the earlier scriptures. But I know that some people were having those knowledge when I was a kid, in village particularly. But today that knowledge has gone with the wind of the time you know like that knowledge are not there and if it is not been coded or recorded properly then you know we lost that knowledge. And those are knowledge were there with a lot of people, today you know it may be there lying in some book. So, it is important to the knowledge with the people than that of in some book or some person you know some specified persons you know.

The parched grains as the seeds are unfit to germinate as per the Mahabharath. You know what is this parched grain? Any idea, that means the grain which will be boiling it and again dry it that is basically parched grain, right. And Arthashastra which was written by Kautilya or the Chanakya which is a very important scriptures and which is left with the plunder of the invaders you know, left intact so, that is a good thing, that mention the collection of the seeds in the appropriate time, the time is important, right.

Yathakalam that means you know like kalam means is basically time, as the first duty of the superintendent of agriculture there was at that time superintendent of agriculture who will be see that it is being done and it has his job was to educate the people as well, right who should collect

all kinds of grains, flowers, roots, creeper fruits, flax and cottons and also keep as a seed bank. Today where is the seed bank? Each village were having earlier days. But today we will be buying the seeds from the companies which is from outside and they will be you know taking a lot of money from the pockets of the farmers and that is why farmer is committing suicide.

Because everything is costly, everything he has to buy you know, he is not independent he is dependent on the market. And also the most if you look at most of the seed companies are from outside today and they are having monopoly over that and we do not have our own seeds you know that is the sad part of our deposited should be there. And it should be also you know be with the people as well not only with the government alone. To increase the fertilizer seeds they were also treated before sowing right, their method this has to be also tested, I will be talking about that but I I feel that people might not have tested those thing in modern times.

So, according to the Krisiparasara, seeds are not to be kept on an ant hills right, or the cow shed or a delivery room. You might be knowing for delivering baby earlier days we are having a separate room. It is not that you will take deliver in a room which is a living or a deliver a baby in some hospital earlier days, okay It was separate and that is very important. I will not talk about it why it is important that tradition, the tradition is very important according to me. I have tried to interpret it little bit.

And why it is so? This question, this you know seeds are not to be kept on these, but why? We need to understand. It is not that they have written we will follow it no, right. So, therefore one has to look at it because there will a lot of bacteria, other things here which will be affecting therefore they might have done but more studies is required to prove that that is right. And unfortunately we are just saying it is not out dated but we should to understand with the modern science also.

The seeds should not contact with the remnant foods, women with the menses, lamp, fires, smoke and rain, right. So, with this they have there is a restriction they should be kept out. So, these must not be stored in a pit or underground, right. You should not store that but why? Why you will not store? There are various reasons one can think of, if you go to underground, the moisture content will be different and may be it will be not enough air and then these things and

there might be some fungus development, temperature may be low, right. So, all those things has to be there, one has to look at, understand it.

As to Arthashastra, the seeds of grain are to be soaked in dew and dried in the heat for seven days, right why? Of course it is a why they are using dew? Dew you know like in the particularly in the night time there will be dew which will be there in the leaves that has to be collected, what will condense you know, and those water has to be used, why? Why not simple water? Because those will be what you call already evaporated and condensed back. So, it is pure or quality will be improved to that, they were knowing this required.

And dried in the heat of course it is not the heat rather I will say they do not do the dry in the sun directly but they will be using the heat from the sun. Generally, nowadays you will find on the road or some people villagers are drying the what you call grains on the sun shine, on the direct sun, but that was not there earlier days because people are not having that knowledge that you should not dry that. Therefore we are having attic systems where the on the floor you know of the house there will be a place where on the top of the floor and then you will dry there with the shed, right in the shed you will be drying.

So, those pulses for 3 days and nights okay this is what I am saying seed of grains is for the seven days where as seed of pulses for 3 days and nights why? These questions have to be looked at it you know. So, with this I will stop over and we will discuss about also how to take care of various seeds and sowing methods in the next lecture, thank you very much.