



**How to increase productivity
in small farms through
Multi-Layer (*Machan*) Farming**

What need does the playbook address?

- A majority of Indian farmers have small landholdings, which makes agriculture a particularly perilous occupation.
- Incomes from these small parcels of land are low, forcing families to migrate elsewhere for work.
- By maximizing the number of crops that can be grown in small fields, incomes for small and marginal farmers can increase.

Who can use this Playbook: Trainers, CRP's and Progressive Farmers.

This solution can be adopted if:

- your average landholding size is less than 1 acre
- you have access to groundwater or irrigation channels throughout the year
- you have Sandy loam and loamy soil

This playbook is designed using the expertise of TCL, which works on augmenting incomes among socio-economically disadvantaged communities and landless/marginal farmers in Uttar Pradesh, India. Trust Community Livelihoods (TCL) uses the traditional knowledge of Machan or Trellis farming to simultaneously cultivate creeper vegetables, leafy vegetables, broad-leaf vegetables, and leafy vegetables in one patch of land.

SOLUTION: MACHAN FARMING OR MULTI-LAYER FARMING

What are the benefits to farmers through multi-layer or Machan farming?

Mohan, you know a man in Bahraich in Uttar Pradesh grows upto 4 crops in a Machan on 0.5 bigha land? I saw it on Youtube yesterday.

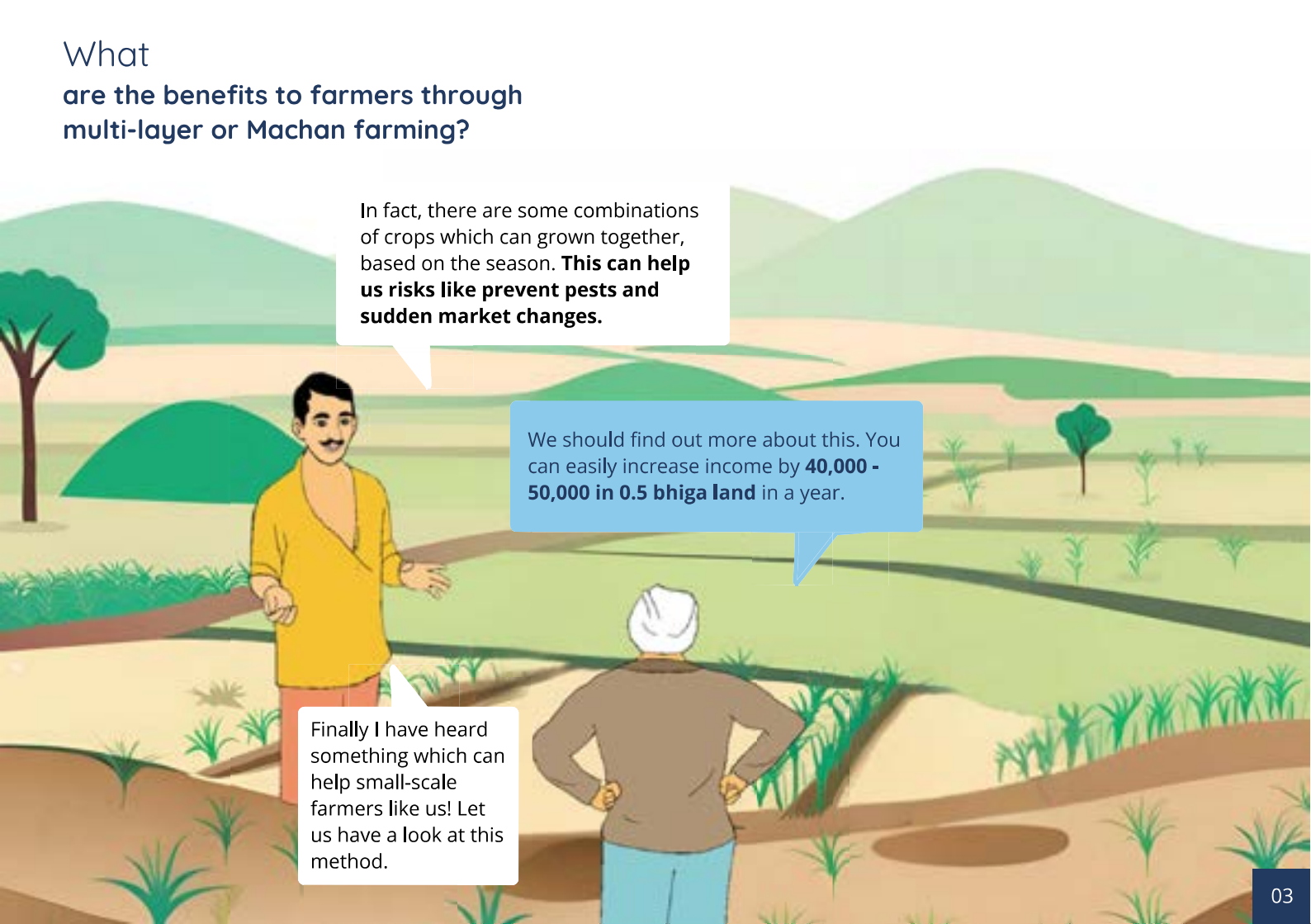


How did we never wonder about using space above the soil? They call it the "Machan Model" and helps us use land, assets and take advantage of every season.

Oh yes. Multiple layers can help us **increase incomes** even in small landholdings. We can grow upto **5 types of vegetables** in a year. **More crops means more income.**

Rising temperatures are becoming such a problem for us these days. With creeper plants on top, temperatures are lowered inside the Machan structure.

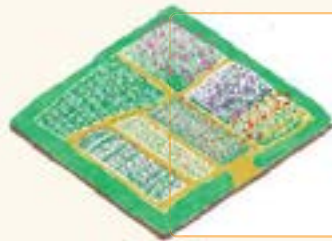
What are the benefits to farmers through multi-layer or Machan farming?



In fact, there are some combinations of crops which can grow together, based on the season. **This can help us risks like prevent pests and sudden market changes.**

We should find out more about this. You can easily increase income by **40,000 - 50,000 in 0.5 bhiga land** in a year.

Finally I have heard something which can help small-scale farmers like us! Let us have a look at this method.



Ideal size of the farm:

**0.5 bhiga or 10 biswa/
400 sqm**



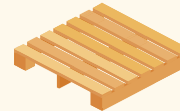
Bamboo poles
(10 feet long) – 123



Iron wire (20 gauge) – 8 kg
Iron wire (18 gauge) – 8 kg



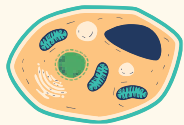
Wooden peg
(5 feet) – 10



Pallet
10 loads



Lime powder
10 kg



Trichoderma
0.5 kg/ 250 ml



Dori plastic
2 kg



Neem cake
10 kg



Vermi compost
200 kg



Green net
20 meters/ number



Vegetable seeds
(as per farmer's plan)



Coal tar/ Used Motor Oil
5 liters



Nails
150



Old Saree
4

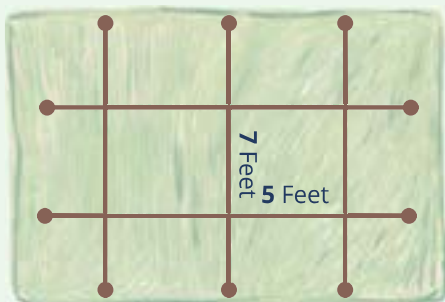
SETTING UP THE FARM LAND

02

01

MEASURING THE LAND

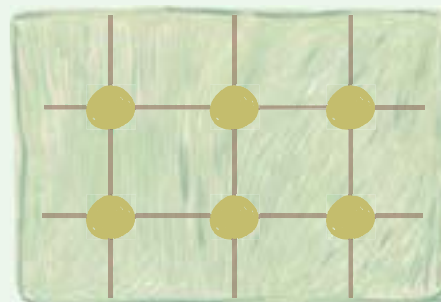
Divide land into rectangles of **7*5 feet**



02

DIG PITS

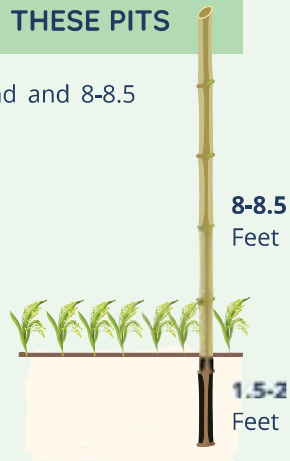
Dig pits in these markings



03

DIG BAMBOO IN THESE PITS

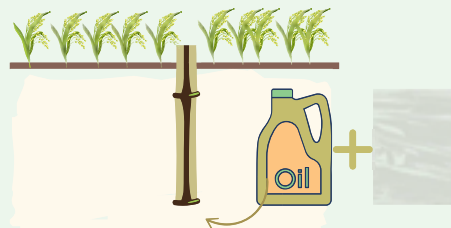
Around 1.5-2 feet, underground and 8-8.5 feet above ground



04

SETTING UP BAMBOO POLES

Bottom of bamboo (which is underground) can be covered in **coal tar/ motor oil/diesel oil and then wrapped in plastic**. This prevents termite attack as well as decomposition of bamboo poles.

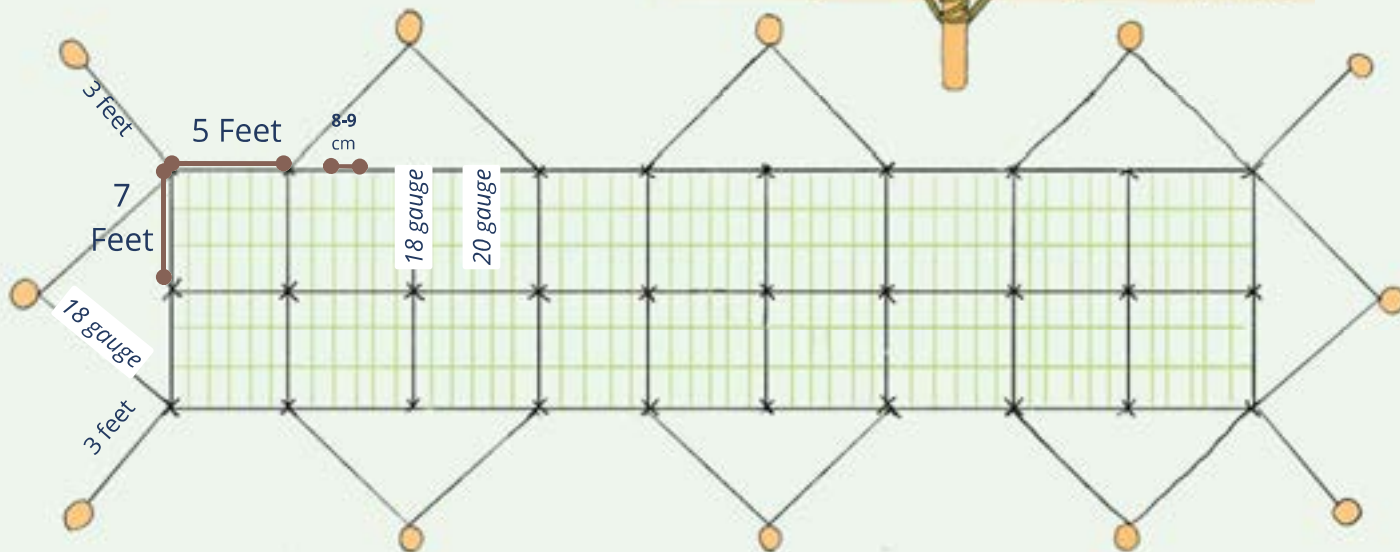
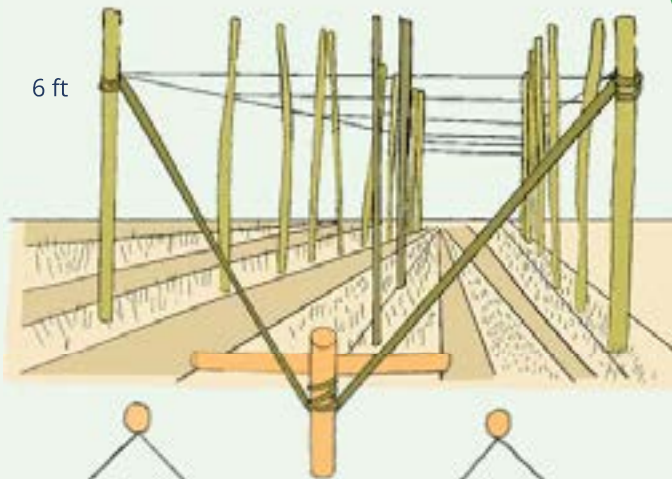


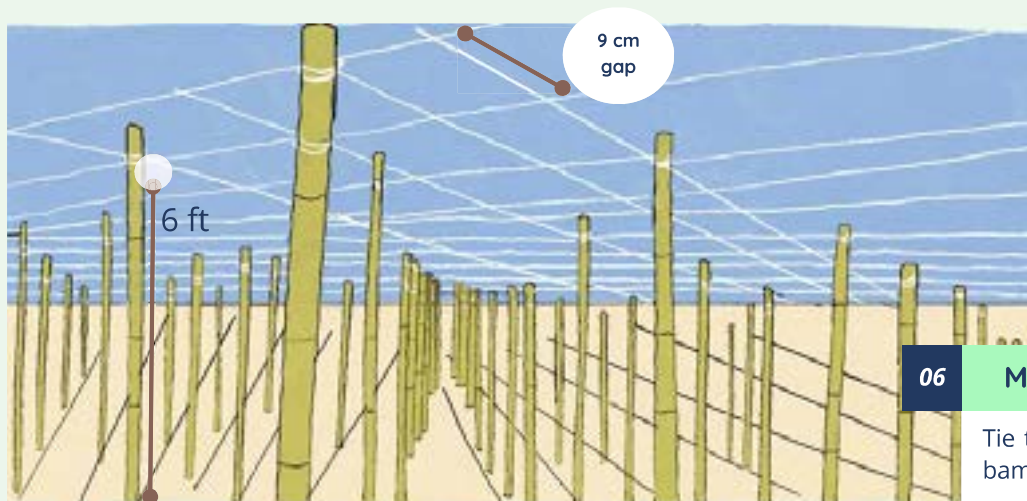
05

WOODEN PEG

Drive wooden peg at a distance of **3 feet outside the four corner bamboos**. Tie the corner bamboo to the pegs (*this will make the bamboo poles stable*). Similarly, drive pegs for every alternate bamboo and support through wire.

The knot to be tied a height of 6 - 6.25 ft above ground, to tie the mesh and help in harvesting.





06

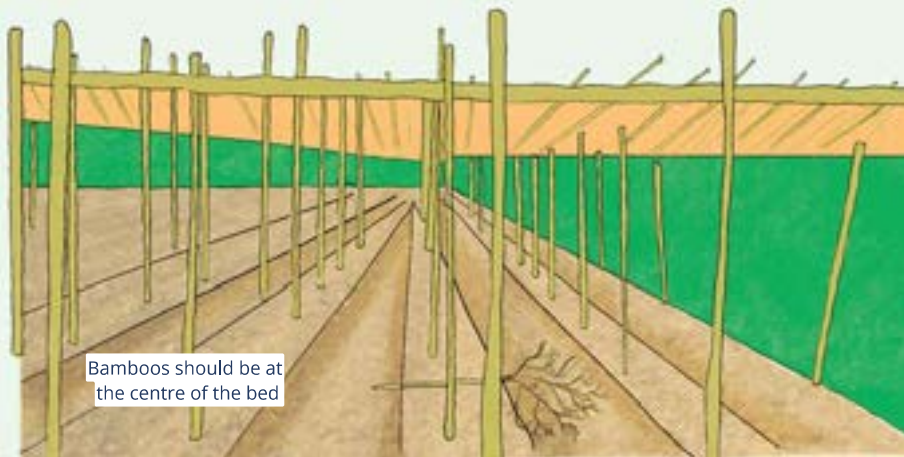
MAKING THE NETTING

Tie the 18 gauge wire between bamboo poles at the top height

Along width of bamboo poles, tie wires at every 9 cm distance to create a broad top wire net (20 gauge).

07 MAKING THE THATCHED ROOF

Spreading thatch over the net in such a way that half of the sunlight goes down



Bamboos should be at the centre of the bed

MAKING THE BED

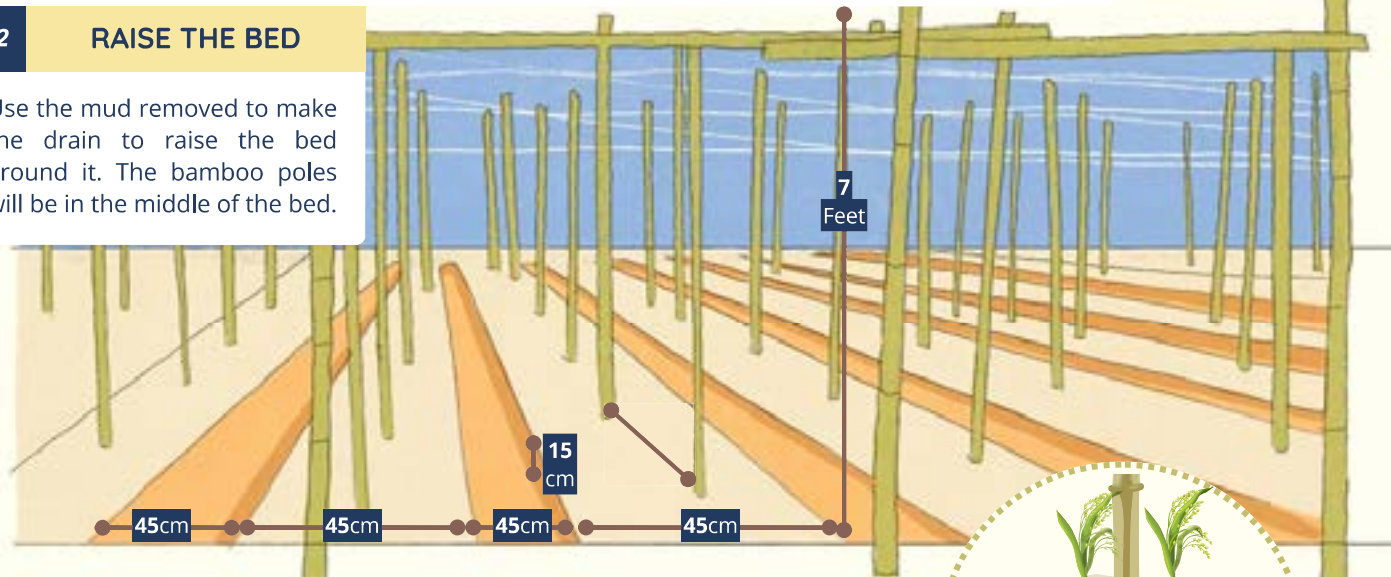
03

01 MAKING A DRAIN

Between the bamboo poles (that is, 45 cm from each bamboo pole), make a drain (width 45 cm, depth: 6 inches). The drain should be along the slope - that is, where water naturally flows in the field.

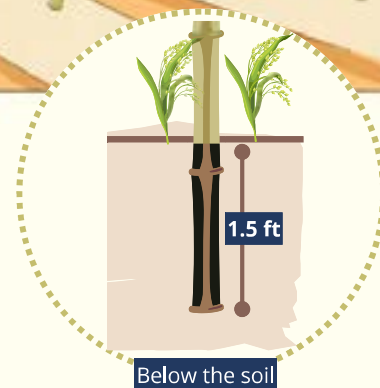
02 RAISE THE BED

Use the mud removed to make the drain to raise the bed around it. The bamboo poles will be in the middle of the bed.

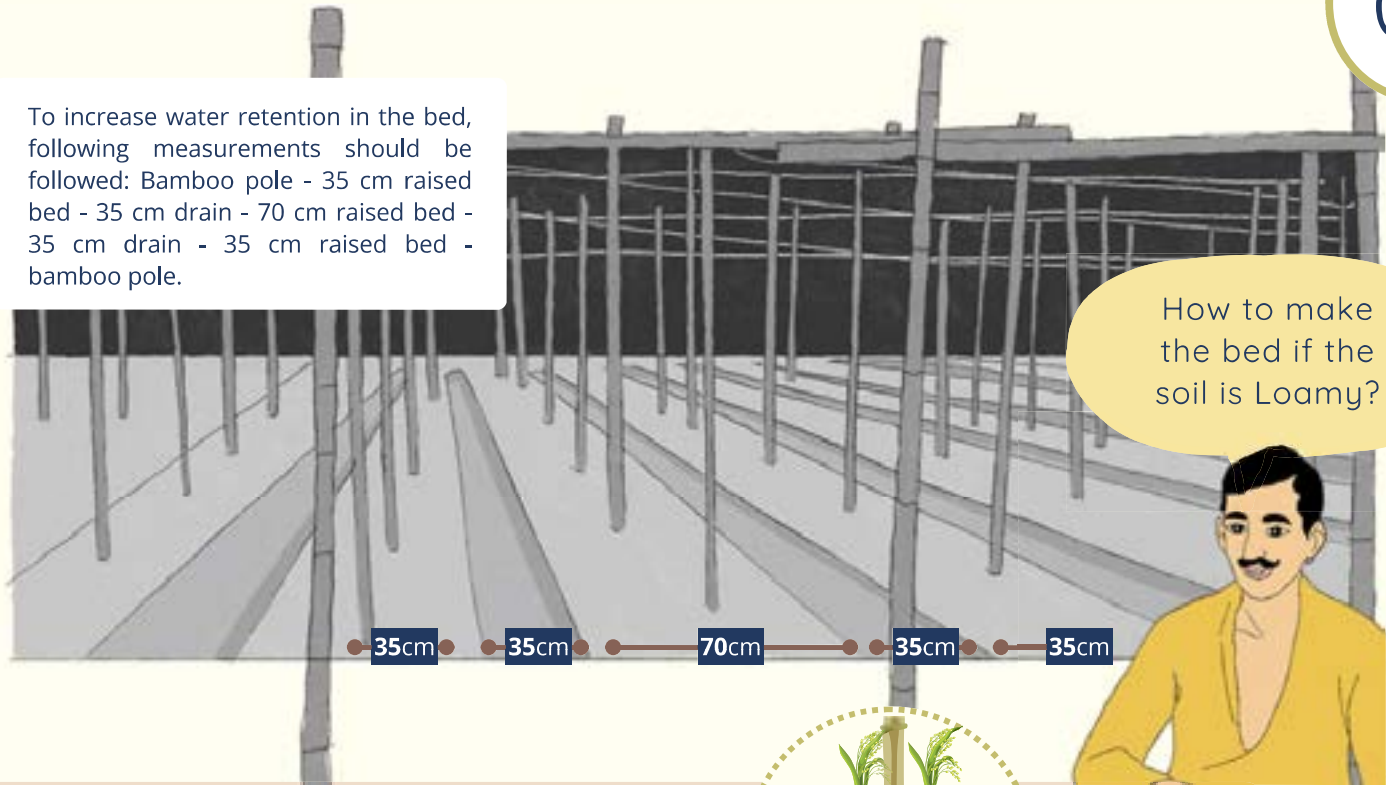


03 MAINTAINING SOIL HEALTH

Mix 5 kg Trichoderma-treated vermicompost and half kg lime in every 10 square meter bed to increase soil health.



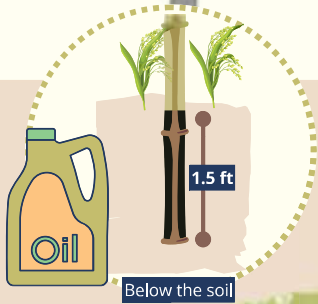
To increase water retention in the bed, following measurements should be followed: Bamboo pole - 35 cm raised bed - 35 cm drain - 70 cm raised bed - 35 cm drain - 35 cm raised bed - bamboo pole.



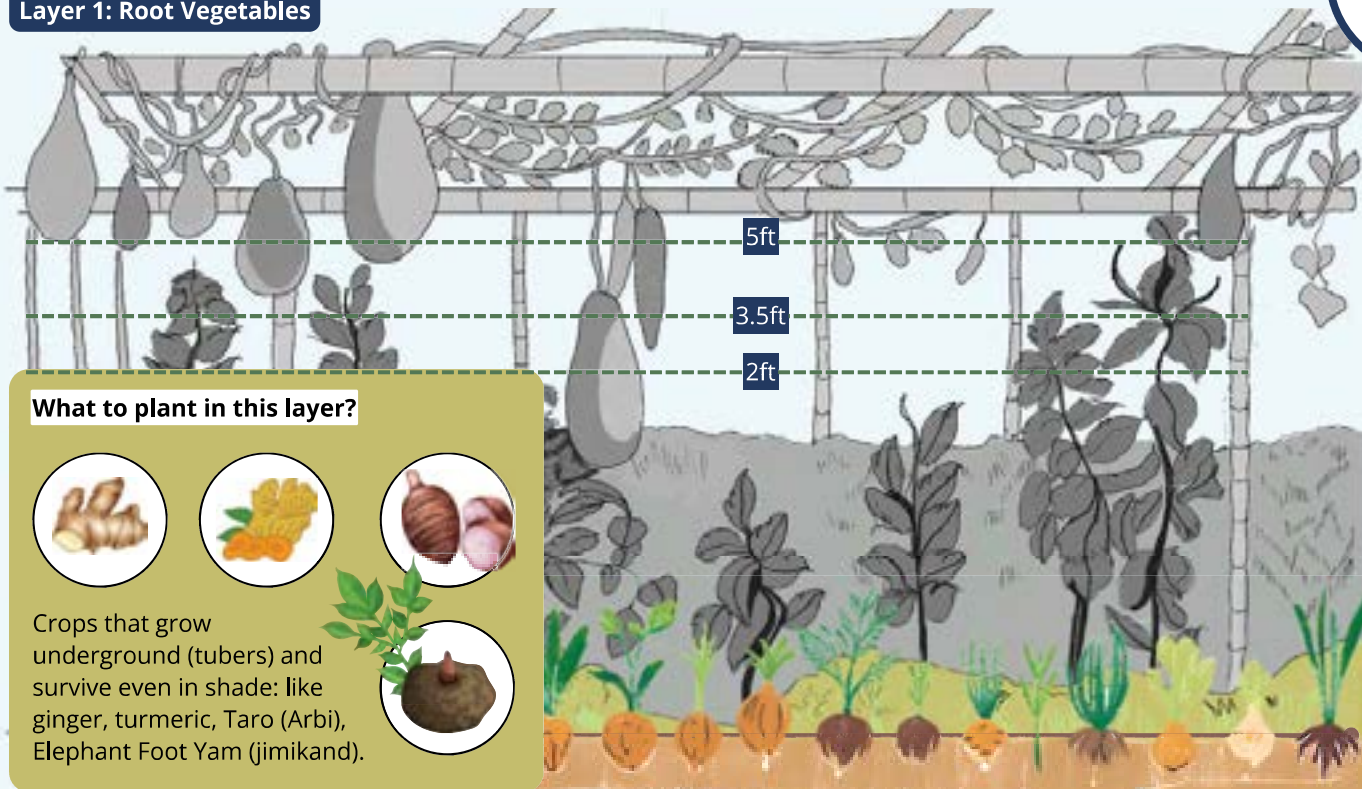
How to make the bed if the soil is Loamy?



plastic/ tarpoulin/
disealoil/ motor oil



Layer 1: Root Vegetables



What to plant in this layer?



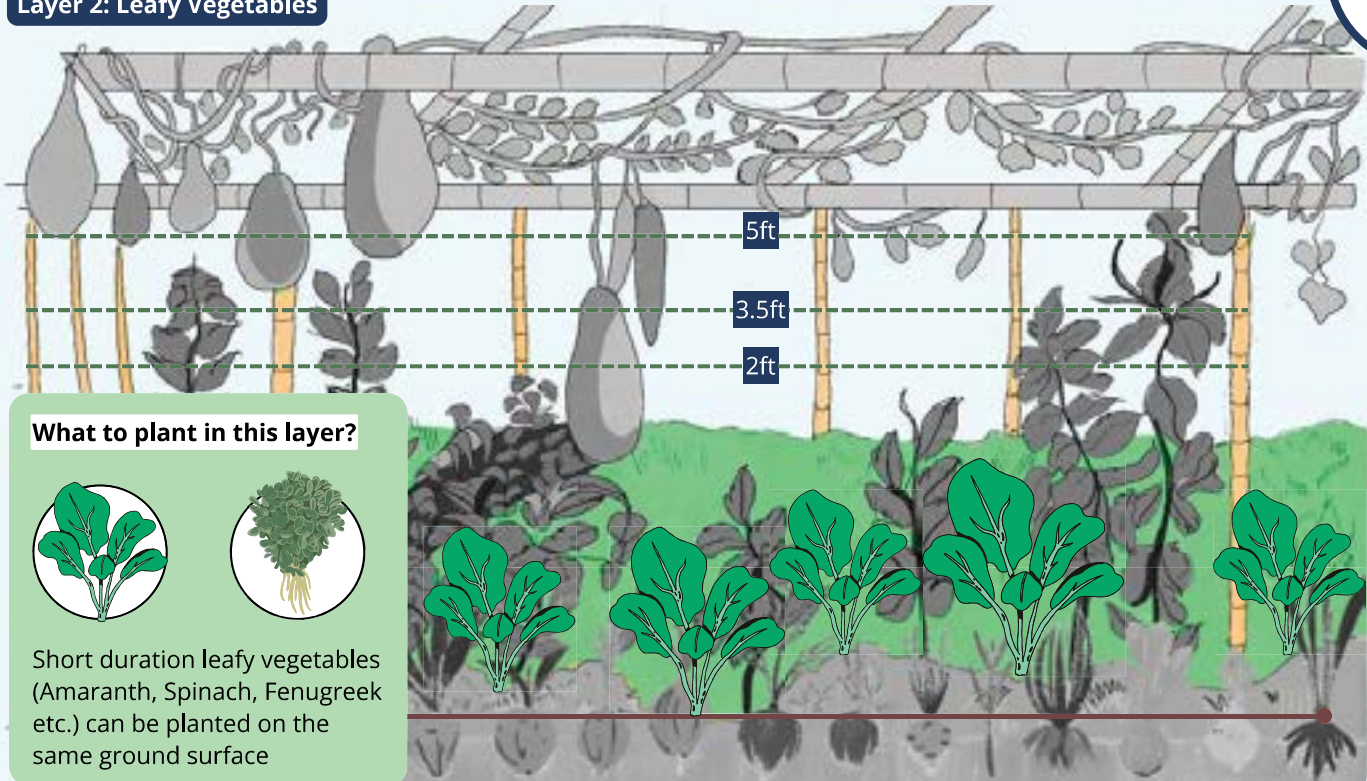
Crops that grow underground (tubers) and survive even in shade: like ginger, turmeric, Taro (Arbi), Elephant Foot Yam (jimikand).

How to Plant? Seeds of tuber crops is put in the bed at a depth of 5 cm.

Distance between the crops:

- Ginger/Turmeric - 30 cm line to line and 20 cm seed to seed.
- Depending on the size of Arbi, the line to line distance is between 45 cm - 60 cm and seed to seed distance is between 30 cm - 60 cm

Layer 2: Leafy Vegetables



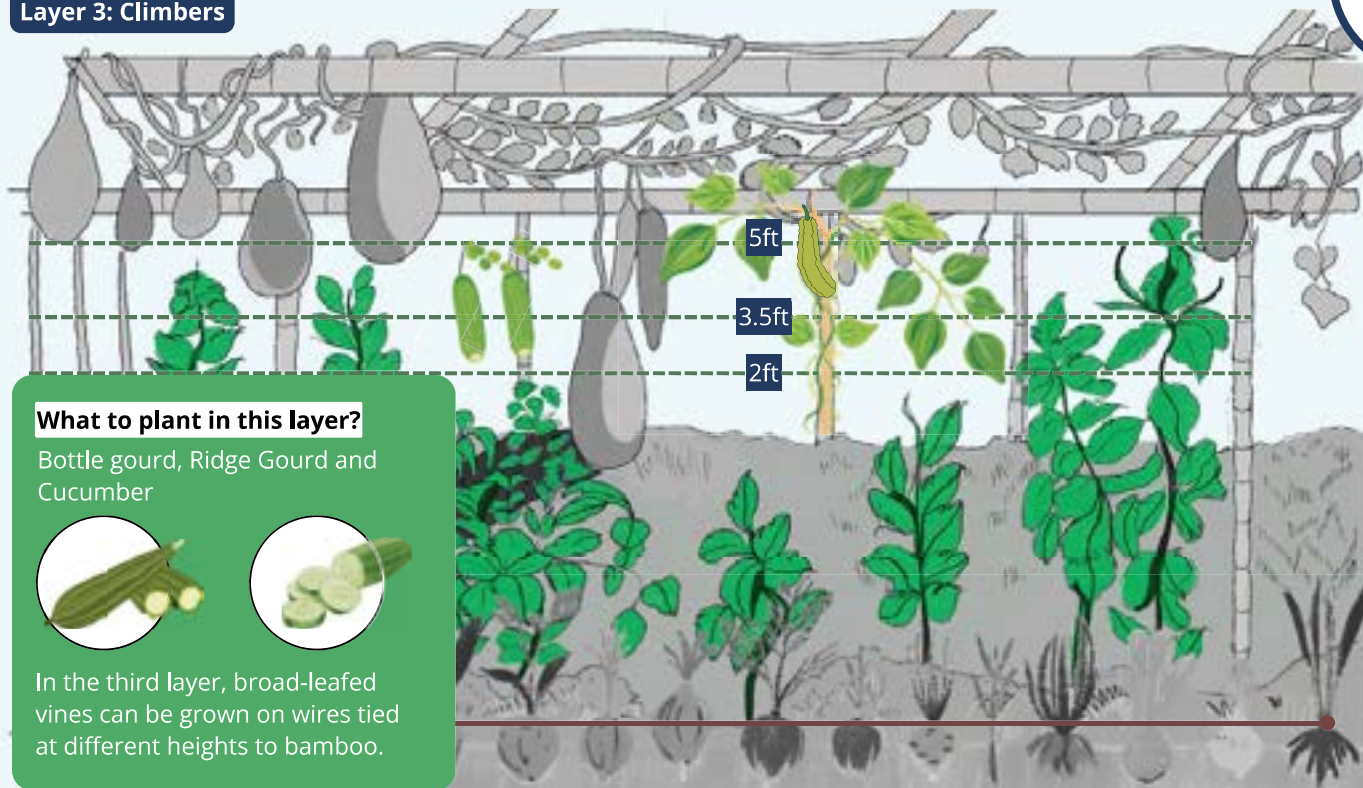
What to plant in this layer?



Short duration leafy vegetables (Amaranth, Spinach, Fenugreek etc.) can be planted on the same ground surface

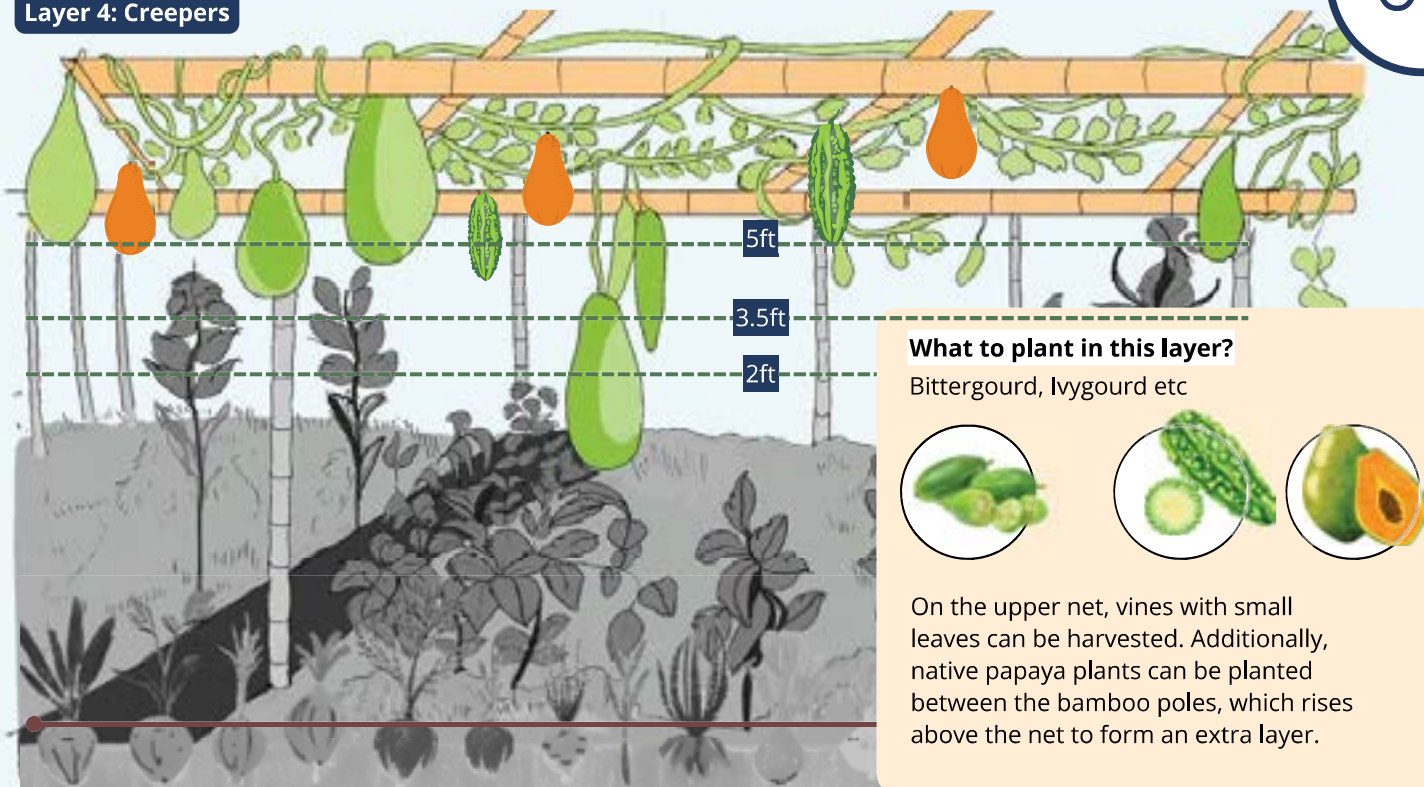
How to Plant? Scatter the seeds of leafy vegetables on the upper surface of the bed over the soil and mix them with the soil.

Layer 3: Climbers




How to plant? Ridge gourd/gourd/cucumber seeds or plant prepared seedlings at a distance of 2*2 feet in the middle of the bed.

Layer 4: Creepers



How to Plant? Plant creeper or saplings of Kundru/Parwal or plant bitter gourd plants are prepared in advance and planted very close to the bamboo pole.
*(An additional, fifth layer can be 1.5-2 feet tall saplings of papaya are planted at a distance of 15*15 feet)*

CROP CHOICES FOR DIFFERENT LAYERS

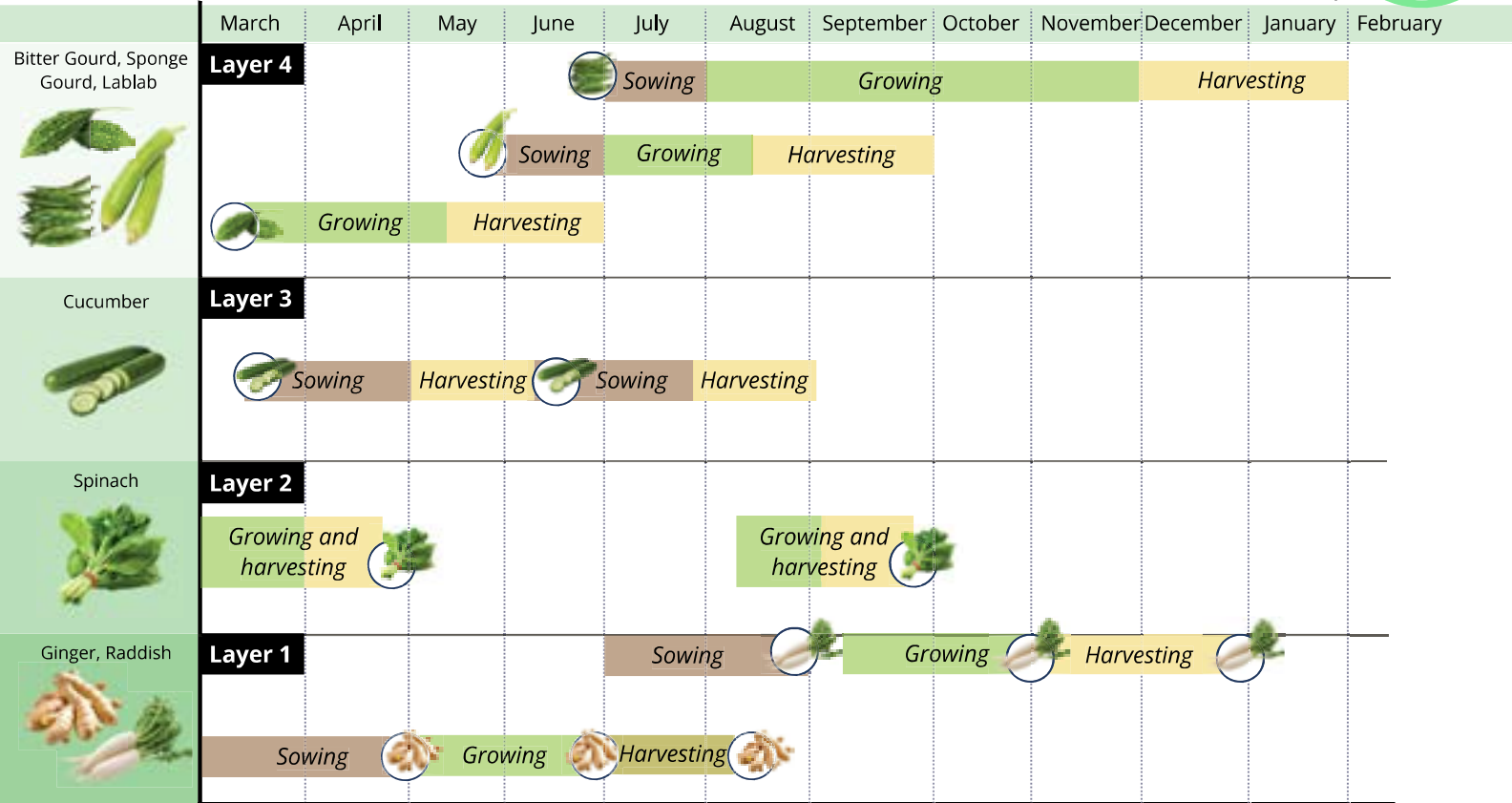
Layer 4	<p>Bitter Gourd (Karela)</p> 	<p>Kundru/Parwal</p> 	<p>Papaya</p> 	<p>Lub Lub</p> 	
Layer 3	<p>Cucumber (Kheera)</p> 	<p>Sponge Gourd (turai)</p> 	<p>Bottle gourd (Lauki)</p> 	<p>Ridge gourd</p> 	
Layer 2	<p>Spinach (Palak)</p> 	<p>Coriander (Dhania)</p> 	<p>Amaranth (Chaulayi)</p> 	<p>Fenugreek</p> 	
Layer 1	<p>Taro,</p> 	<p>Ginger</p> 	<p>Elephant Foot Yam</p> 	<p>Turmeric</p> 	<p>Raddish</p> 

PLANNING- CALENDAR

05

15 feb

15 feb



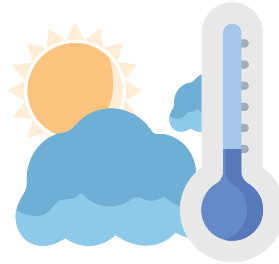
Efficiency through managing time

01



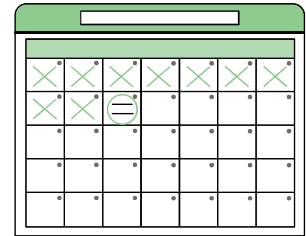
Machan farming can be used to take out multiple crops by planning planting and harvesting schedules.

02



Since the machan is cooler by **4-5C in summers, crops that wilt in direct sunlight can be grown** (for instance, **coriander** wilts in direct sunlight in the summer, when market rates for the produce are at its highest).

03



The machan also enables planning of crops in advance. For instance, in Layer 4, when bitter gourd harvest is at its peak, Sponge gourd can be planted. By the time, bitter gourd harvest ends and the plant is removed, sponge gourd would have taken its place in Layer 4.

PLANNING

Things that can go wrong

01 YEAR-WISE PLANNING

Not planned year-wise schedule of planting, leading to inefficient utilisation of seasons and space



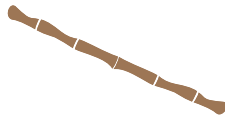
02 CARE OF PLANTS

Lack of care for plants, including use of wrong inputs (pesticides and fertilisers)



03 SUPPORT

Lack of stable support for bamboo poles, causing top layer to sag and wilt



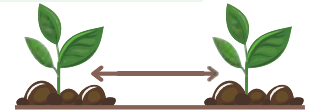
04 HARVESTING PERIOD

Harvesting periods not followed



05 SPACING BETWEEN CROPS

Improper space between plants for cultivation





RESOURCE PERSONS

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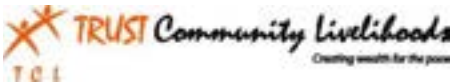
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Documentation Partner



Knowledge Partner



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