GOVERNMENT OF WEST BENGAL
DEPARTMENT OF FOOD PROCESSING INDUSTRIES & HORTICULTURE
4TH FLOOR, BENFISH TOWER, GN 31, SALT LAKE, KOLKATA – 700 091

Memo No. 1292/FPI&H Dated: 22nd February 2022

NOTIFICATION

1) As in other parts of the state, horticulture plays an important role for generating livelihood in the two hill districts of Darjeeling and Kalimpong of West Bengal. This region of the state is also known for its diverse flora including a large variety of orchids, lilies, spices, *etc.* There is a visible trade in cut flowers in this region which has the potential to grow manifold. It is felt that with appropriate support and technology inputs horticulture based activities in this region may receive a significant boost.

2) Naturally Ventilated Polyhouse (Bamboo structure) is a very useful structure suited for hilly terrains for quality production of horticulture produce due to easy availability of bamboo. There is also a farmers' demand for bamboo-based polyhouse structures in the hills. It is well known that cultivation in protected structures such as polyhouses can improve both quality and quantity of horticulture produce.

3) Livelihood support to horticultural farmers particularly vegetables and flower growers of these hilly areas through provision of critical inputs for Naturally Ventilated Polyhouse (bamboo structure), has been under active consideration of this department for sometime past.

4) Mission for Integrated Development of Horticulture (MIDH), a Centrally Sponsored Scheme aims at the holistic growth of horticulture. Presently, this scheme is being implemented in Darjeeling and Kalimpong districts along with 15 other districts in West Bengal. A substantial amount of fund is allotted every year for Naturally Ventilated Polyhouse (Bamboo) under

MIDH. As per the extant norms of MIDH, the project cost of Naturally Ventilated Polyhouse (Bamboo) is Rs.450/- per sqm and financial assistance is 50% of the project cost, *i.e.* Rs.225/- per sqm, the balance 50%, *i.e.* Rs. 225/- per sqm being the beneficiary's contribution.

5) West Bengal State Food Processing & Horticulture Development Corporation Ltd. has prepared a model estimate along with two designs (enclosed as annexure) of Naturally Ventilated Polyhouse (Bamboo) of 100 sqm size.

6) Considering the above circumstances, the governor is, now, pleased to encourage Naturally Ventilated Polyhouses in Darjeeling & Kalimpong districts with an innovative model namely "Naturally Ventilated Polyhouse (Bamboo structures) – Do It Yourself" kit dovetailing the local demand of the farmer and the existing MIDH norms in the following manner:

a) The farmers of hilly areas shall be supported with Polyhouse kits (poly film, shade net, drip irrigation set and other accessory materials required for construction) from the subsidy allotment for 100 sqm Naturally Ventilated Polyhouse (Bamboo) under MIDH, *i.e.*, Rs.22500/- [50% of the project cost, *i.e.*, Rs 225/- per sqm as "DO IT YOURSELF" Kit].

b) Farmers' contribution in the form of bamboo and labour cost for erecting the Naturally Ventilated Polyhouse (Bamboo) shall be treated as the beneficiary's contribution of 50% of the project cost.

c) An instruction booklet would be provided with the kit providing step by step guideline for erection of the bamboo polyhouse by the beneficiary himself.

d) The beneficiary may also seek assistance of trained staff of Directorate of Chinchona & Other Medicinal Plants and/or trained members of Self Help Groups during erection of the polyhouse.

e) Depending on the area available, any beneficiary may apply for two or more 100 sqm kits of polyhouses.

f) The application procedure for "Naturally Ventilated Polyhouse (Bamboo) – Do It Yourself" kit project shall be same as for other MIDH schemes.

g) The names of beneficiaries along with Aadhaar Number, land holding, address, mobile number, etc. are to be sent by the concerned District Horticulture Officer to the state for obtaining approval of SLEC *pre facto/ post facto*.

All concerned are being informed accordingly.

Encl: Instruction for DIY
NVP structure

By the order of the Governor

22/II/2022

(Subrata Gupta)
Additional Chief Secretary
to the Government of West Bengal
Department of Food Processing Industries & Horticulture

Memo No. 1292/1(5)/FPI&H Dated: 22nd February 2022

CC:

1) Private Secretary to Hon'ble MoS
   – for kind information of the Hon'ble MoS.
2) Director of Horticulture, Directorate of Horticulture.
3) District Magistrate – Darjeeling/ Kalimpong.

4) Managing Director, West Bengal State Food Processing and Horticulture Development Corporation Ltd.

5) Director of Cinchona & Other Medicinal Plants.

– for information, record and appropriate action.

22/12/2022

(Subrata Gupta)
Additional Chief Secretary
to the Government of West Bengal
Department of Food Processing Industries & Horticulture

INSTRUCTIONS FOR CONSTRUCTION OF NATURALLY VENTILATED POLY HOUSE (BAMBOO) 100 sq m

The bamboo poly-houses are very useful for hilly areas. Usually, the climate of hilly areas remains cool for most of the year which is suitable for farming under bamboo based protected cultivation. The easy availability of bamboo in such areas brings these bamboo-based naturally ventilated poly-houses within the reach of small and medium farmers.

Lay Out of Naturally Ventilated Poly House (Bamboo)

A) **Land condition** – Selection of a suitable piece of land for erecting the poly house is very essential. Land should be flat and level for construction of poly house. The ground should be well drained so that water does not stand for long duration. The land should receive abundant sunlight throughout the day time.

B) **Land size**– Minimum width of land should be 6 meters. The length should be 17 meters or more. The land should be rectangular in shape.

C) **Land leveling** – If vegetables are cultivated, the plot should receive two rounds of ploughing initially. 400kg well decomposed FYM should be thoroughly mixed with the soil in 100 sqm area. After mixing, another round of ploughing should be done. Finally, weeding and leveling should be done to make the land ready for cultivation.

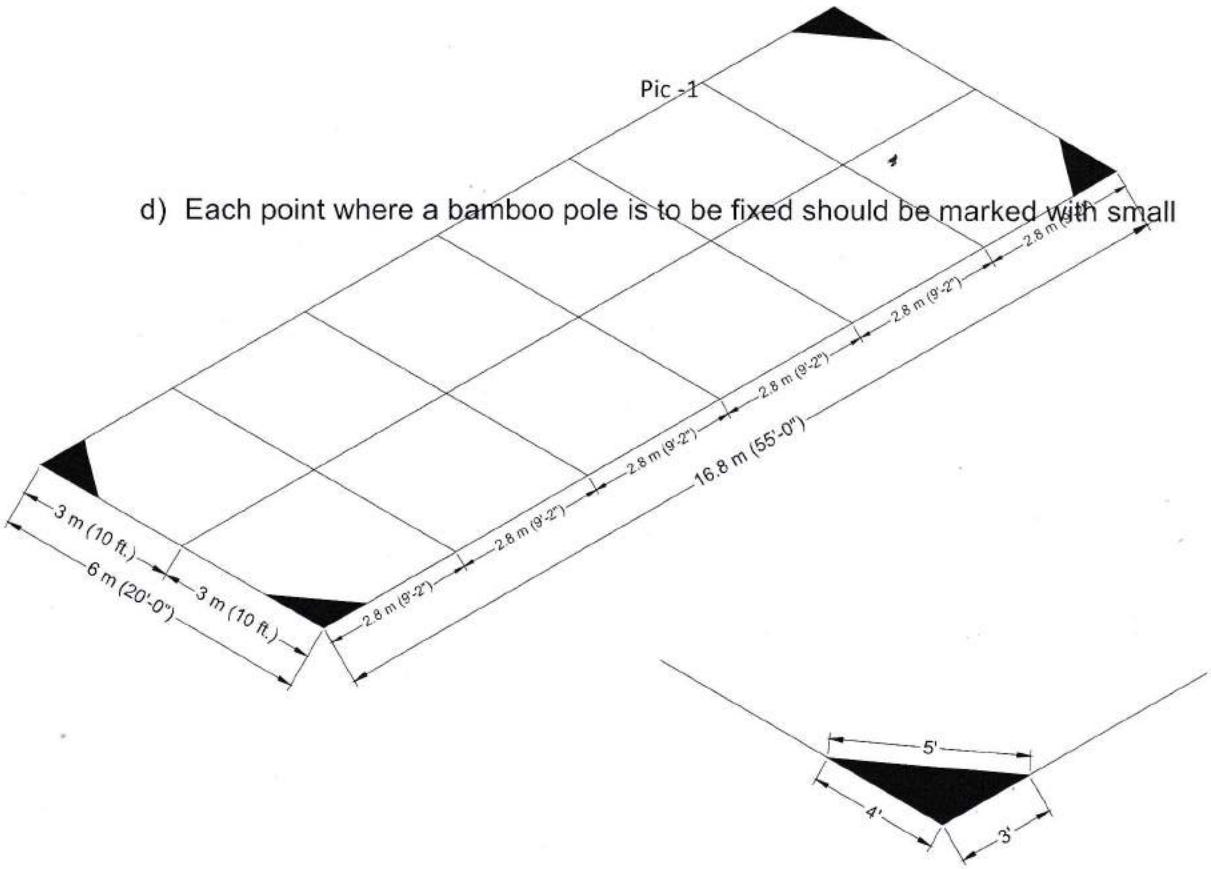
D) **Demarcation of land for bamboo pillar**

a) **Demarcation of land** – The poly house shape shall also be rectangular. (Width – 6 meters x length –16.8 meters). The boundary of the land where the bamboo poly house is to be erected should be demarcated. (See Pic 1)

b) **Width** –The width of the structure is 6 meters. There should be three poles 2 meters apart along the shorter side.

c) **Length**–The length of each side of the structure is 16.8 meters. There should be seven poles at an interval of 2.8 meters.

Pic -1



d) Each point where a bamboo pole is to be fixed should be marked with small bamboo stump. Care should be taken to ensure that identified points are on a straight line, no point should be out of alignment.

E) How to set right angle in each corner of the plot.

1. Mark a line with chalk or stretch a string in the direction of one side of the fence. Measure 3 feet along that line with a tape measure and make a mark.
2. Create another line in the general direction of the other side of the fence and make a mark 4 feet away on that line.
3. Extend the tape measure between the marks. Without changing its distance from the post, adjust the position of the second mark until it is exactly 5 feet distant from the first mark. The angle between the two sides is now exactly 90 degrees. [Pic- 1]

F) Selection of Pole

There are a few essential factors to consider when checking bamboo for the right quality:

1. **Size**. Each bamboo pole does not fit into an exact mould and will not match specific dimensions but it should fit into an average range within its species. If you find a bamboo pole that is significantly smaller, or even bigger, than

the rest, it probably means that it is not suitable for structural purposes as it will not behave in the same way as the other poles of the same species.

2. **Condition.** It is advisable to avoid using bamboo poles which already have cracks or splits running down the length of them. These cracks might have happened because of the treatment method, the drying process or even during the transport over to the site. Either way, it is best to set them aside as using them might increase the risk of structural damage. If the crack is only on a small portion of the pole but the majority of the pole seems intact and fit for structural use, then you can trim off the cracked portion.
3. **Moisture Content and Density.** An average bamboo pole fit for construction after being treated should have a moisture content level of around 18%. Anything above or below that number will affect the structural integrity of the pole. To test this, weigh the bamboo in hands. If it is felt that one pole is much heavier than the others, it might need more time to dry before being used for construction.

Running through these different characteristics will already inform you which poles are the best in the group for your structure. However, there are a couple of things to remember. First, do not throw away all the poles you do not end up using; some might be useful for other parts of your design. Second, remember that relativity is also crucial to take into account. Because bamboo poles are all so different from one another, you need to feel for the relative average of your selection to determine the group's general quality.

All there is left to do is choose the right pole for the right part of structure. It is easier said than done because the choice of pole depends on the physical attributes that the pole offers and those that one wants for his design.

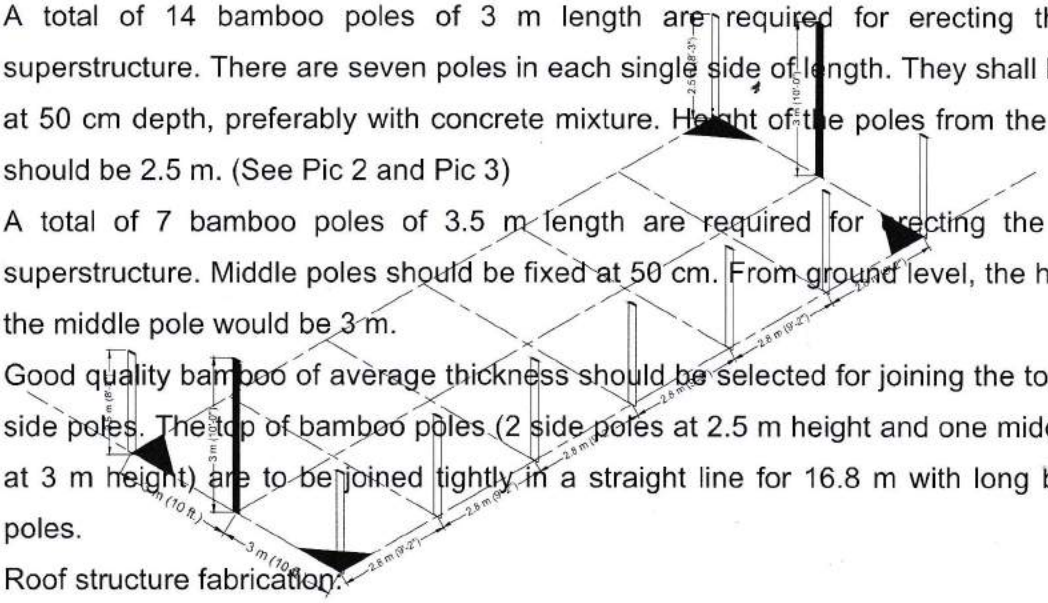
The strongest parts of pole's anatomy are the nodes. When we are designing with bamboo, joining should align with the pole's nodes so that a joint sits closely to a node. This will make sure that the joint is firm.

G) Numbers of Bamboo poles required for 100 sq m and their sizes –

a) A total of 14 bamboo poles of 3 m length are required for erecting the side superstructure. There are seven poles in each single side of length. They shall be fixed at 50 cm depth, preferably with concrete mixture. Height of the poles from the ground should be 2.5 m. (See Pic 2 and Pic 3)

b) A total of 7 bamboo poles of 3.5 m length are required for erecting the middle superstructure. Middle poles should be fixed at 50 cm. From ground level, the height of the middle pole would be 3 m.

c) Good quality bamboo of average thickness should be selected for joining the top of the side poles. The top of bamboo poles (2 side poles at 2.5 m height and one middle pole at 3 m height) are to be joined tightly in a straight line for 16.8 m with long bamboo poles.



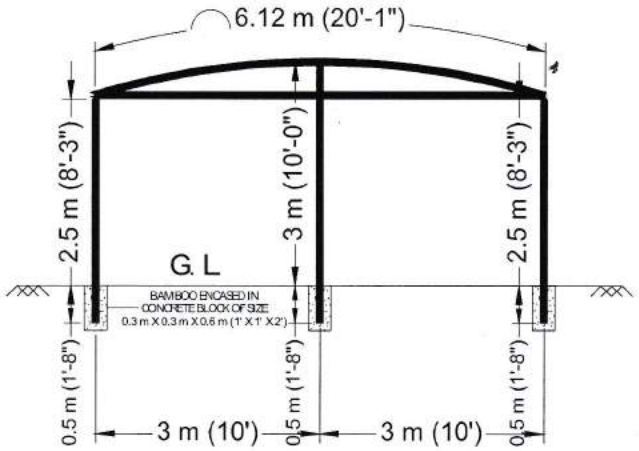
d) Roof structure fabrication:

There may be two types of top structure

a. Arch type – 6.12 m split bamboo should be used for preparation of arch type roof. Thus arch should be formed over all seven points of poles along the length side (16.8 m side). The middle of the arch shall be, thus, of 3 m height and the side would be of 2.5 m height. (see Pic 4)

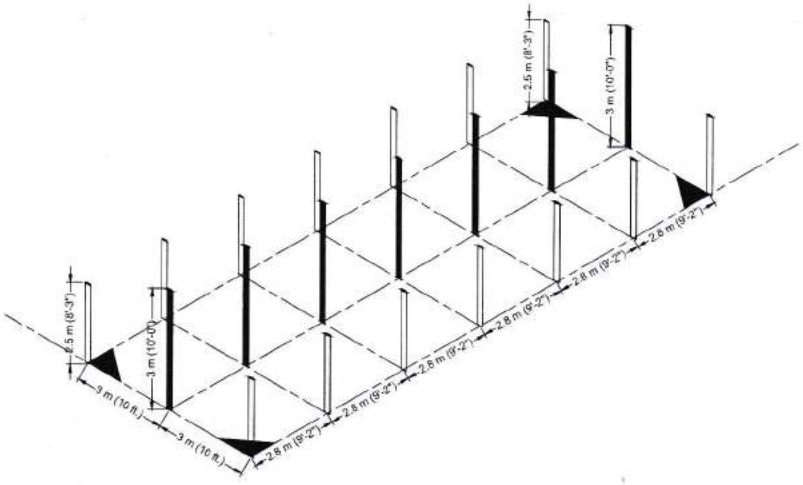
b. Triangular type- Two seasoned bamboos of 3.04 m should be fixed in such a way over the poles that take the shape of a triangle. The height of the middle pole would be 3 m and that of side pole would be 2.5 m. Thus, total 14 poles of 3.04 m are required for fixing seven points along the length side. (see Pic 5)

e) Foundation: For 100 sq m area, foundation is to be done for 21 points (3x7). In all foundation points, pit (0.3 m x 0.3 m x 0.6 m) should be dug. Bamboo should preferably be encased in concrete blocks (sand & cement mixture). If concrete block at base is not possible, fill the blocks tightly with soil so that poles are erect. [see Pic 4 and Pic 5]

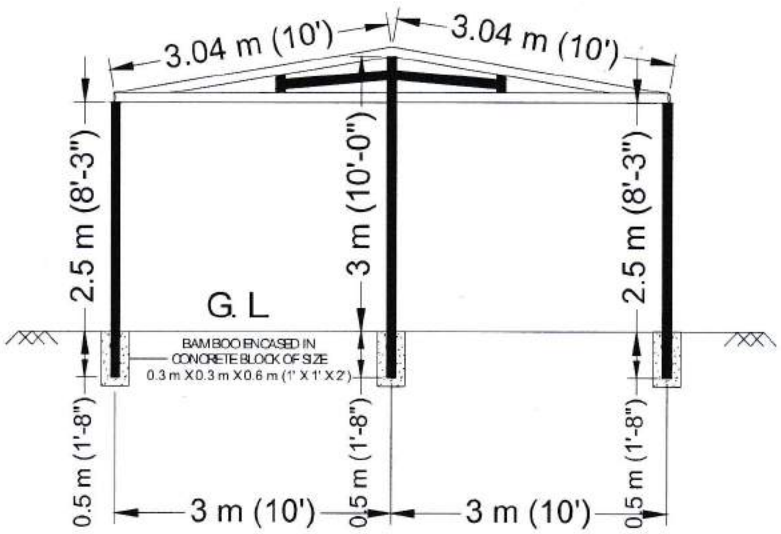

6.12 m (20'-1")
2.5 m (8'-3")
3 m (10'-0")
2.5 m (8'-3")
G. L
BAMBOO ENCASED IN CONCRETE BLOCK OF SIZE 0.3 m X 0.3 m X 0.6 m (1' X 1' X 2')
0.5 m (1'-8")
0.5 m (1'-8")
0.5 m (1'-8")
3 m (10')
3 m (10')

Pic 2

Pic 3



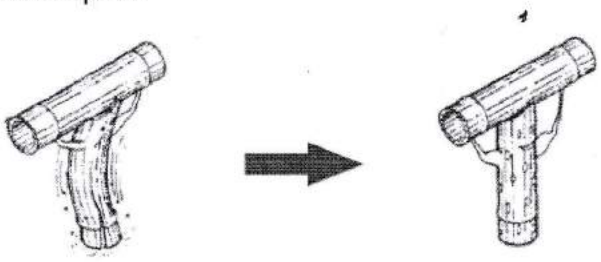
Pic 4



Pic 5

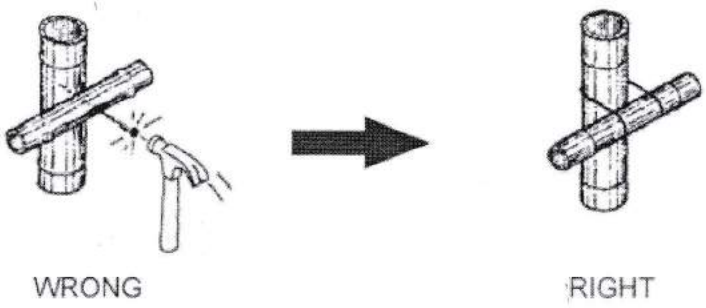
H) Bamboo joining technique:

First of all, it is important to know a few basics principles about joining bamboo before discussing the different techniques.



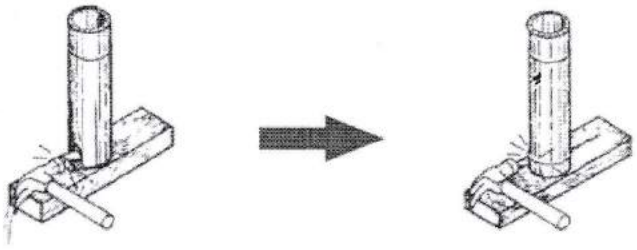
Pic 6

- Do not use green, fresh cut bamboo. Bamboo has to be completely dry before using it in construction (preferable air dried). During the drying process the bamboo shrinks, so when bamboo is used in joining this will result in weak joints after a few weeks. [see Pic 6]
- Do not use bamboo less than 3 years of age. Preferably, use mature bamboo of 4-6 years.
- Do not use bamboo infected by insects (powder beetle, for example). Bamboo has to be properly cured with a boron mix immediately after harvesting.
- Do not use bamboo that has flourished. There is a small probability of this, as bamboo only flourishes once in a lifetime (60-120 years).
- Do not use bamboo poles with prominent vertical cracks.
- Use appropriate cuts and joints.
- Use bamboo with the right diameter and wall thickness for your project.



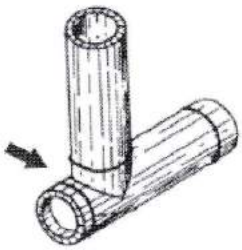
Pic 7

- Do not use conventional wood nails in bamboo joinery, they will cause the bamboo to split. Instead use nylon, steel or vegetal cord of the appropriate diameter. (see Pic 7)



Pic 8

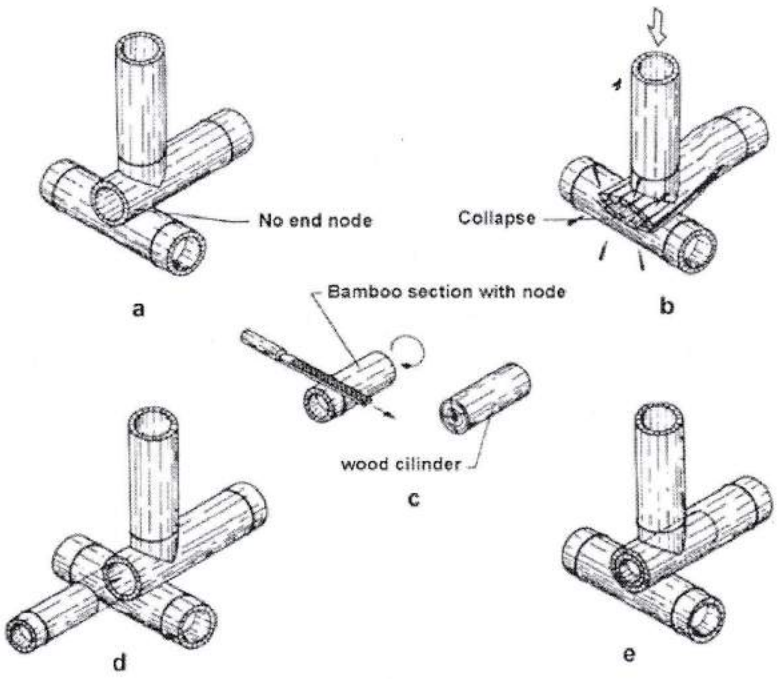
- When using bamboo as a column, make sure that the lower part connecting with the surface ends with a node. (see Pic 8)
- When connecting bamboo poles with bolts, make sure to bolt them together in between 2 nodes, otherwise the bamboo may split. [see Pic 9)



Pic 9

In construction, using bamboo nodes is very important. Bamboo columns or beams need to have a node at both ends (or as close as possible towards the ends). Otherwise, the pressure of the structure on the joint may crush the bamboo.

Often it isn't possible to find bamboo of the required length with both end nodes in place. When this occurs you should insert a wooden cylinder of the appropriate diameter or a fitting piece of bamboo with a node. [see Pic 10]



PIC 10

I) Fixing of cladding materials

All ends/ joints of plastic film need to be fixed with two way aluminum (220grams/RM) / GI with 0.6 mm thickness profiles with suitable locking arrangements.

In both sides of width, structure should be covered with cladding materials above 2.5 m height.

J) **Fixing Shade net**: Side shade net should be tied with the bamboo tightly. The bottom of the shade net should be tied tightly inside the soil. Shade net should be tied around the structure from soil to 2.5 m height of the structure.

K) **Fixing of Drip Kit:** Drip tape is great for watering long rows and garden beds. It has long been used by commercial farmers and backyard gardeners alike. The given drip kits would form the gravity fed irrigation system. Tank should be located at an elevation compared to the ground where cultivation will be taken up, to create the required pressure for drip irrigation.