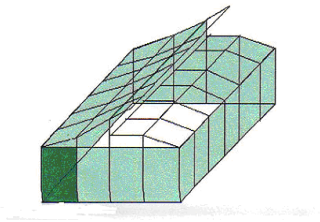
Tropical High Tunnels



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High tunnels are used in many tropical regions of the world for the production of vegetable crops. The primary reasons for protected cultivation in the tropics are for pest exclusion, protection from extreme solar radiation, and heavy rain / wind protection. These are somewhat different primary reasons than for high tunnels in temperate zones where limiting temperature extremes is often the primary factor for their use.

Because tropical high tunnels are used for some different reasons than temperate ones, their design and construction is also different. An effective design uses insect netting for side walls and a passively ventilated polyethylene roof. In many developing countries, a need exists for a low-cost high tunnel, using locally available materials where possible.

An effective design incorporates the needed components for a high tunnel in the tropics: locally available support materials (bamboo or “greenwood” poles), passive ventilation (no electricity required), reliable protection from heavy rain, and a low-cost pest exclusion side wall material. Working examples of tropical high tunnels are common in Egypt, Lebanon, Jordan, El Salvador, Nicaragua, and Honduras.

One underlying factor that is important in any design is the amount of vent area. For passive or naturally ventilated high tunnels, the roof vent area should be 20% of the floor area and located on the leeward side of the high tunnel. As an example, a structure that is 6 meters by 12 meters equals 72 square meters of floor area. The roof vents should be 72 X 0.20 = 14.4 square meters. A design with roof vents of 12 meters long by 1.2 meters wide equals 14.4 square meters. Bottom/ side vent area can be important in

temperate high tunnels, but with insect netting for side walls in most tropical designs, it is not a limiting factor.

Although the example mentioned is for a 6 m x 12 m high tunnel, larger structures can be made if desired. However, if the low-cost roof supports are made of the standard length of PVC pipe (6 m), the width is not be easily expanded, but increasing the length is feasible. Simply adjoining end-to-end two 6 x 12 m high tunnels would produce a 6 x 24 m or 144 sq. meter structure. Starting small and expanding later is always a good idea.

For the support posts, bamboo is a low-cost option when available. This material has a reasonable 3 year in-service life, which is the same as the 3 year polyethylene. If bamboo is not available or more permanent structures are desired, any other material with at least a 3 year life expectancy can be used. This includes 10 cm diameter “greenwood” logs, pressure treated wood posts or metal posts.

In many locations, the item most difficult to obtain is the polyethylene. Although construction grade poly, not ultra-violet (U.V.) inhibited, is often available, the relatively short life, 3 months to one year, makes it impractical for this use. Also, U.V. grade poly has been found in some countries, but only in one meter widths. This also would dramatically reduce the effectiveness of tropical high tunnels and is not recommended.
From experience, once a market exists for the proper grade and size of polyethylene, it becomes available from local suppliers.

The total estimated cost of a 6 m x 12 m high tunnel, using PVC roof supports, UV polyethylene, bamboo or greenwood support posts and insect netting side walls is $960 or $13 / square meter. Construction time (after the site is level and all supplies are on-site) is about 40 person-days (10 people x 4 days, or 5 people x 8 days).

Information on complete tropical high tunnel diagrams, construction sequence photos, and supply lists are available at:

http://cuestaroble.com/tropicalgreenhouse.aspx