

# Design and fabrication of prototype green house for plant Protection-Agricultural high tunnel applications

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## ABSTRACT

Design and fabrication is a process of incorporating 3D modeling or computing aided design (CAD). The meteorite makes protective nets for agriculture, which ensures pest control and growth control, and withstands harsh weather conditions. Photo-select netting for better protection of insects through bio-technical deorientation, through high-density netting monofilament insect prevention.. High tensile strength netting for protecting pests and birds; Colored shade nets for growth control and sunburns protection. High Tunnels are an increasingly popular trend for growers and a

proven technology for crop production. The term “high tunnel” is a loosely defined phrase for growing vegetables in greenhouses. High value warm-season crops such as tomatoes, peppers, cucumbers, and ladies finger can be transfer into high tunnels as much as 6 weeks earlier than the outdoors, depending on location, without supplemental heating, and can extend the harvest season by up to a month in a fall. Crop quality and marketable yields are often significantly higher for crops grown in tunnels than for field grown crops, in large part because tunnel covering keep rain off crops

Key words: high tunnel design greenhouse applications, Agricultural high tunnel poly house

## 1. INTRODUCTION:

Greenhouse effect is the natural process that warms the earth surface. When the sun’s energy reaches the earth’s atmosphere some of it is reflected back to the space and rest is absorbed and reradiated by greenhouse gases. Khajan Mehta et.al., Reflecting the severity of global food insecurity, over 60% of the East African population is considered malnourished, with many regions in a state of famine[1-3]. There is broad agreement on the need to help small-scale farmers move from subsistence

to sustainable and profitable farming by boosting their agricultural productivity, reducing post-harvest spoilage losses and providing market linkages. Inflation, resulting in high fuel and fertilizer prices, prevents farmers from producing larger harvests. Most countries in East Africa have an agrarian economy with over 80% of the households depending on agriculture for their livelihoods[4-6]. The climate is characterized by biannual dry seasons where many farmers suffer



Fig.1 green house effect

due to water shortages coupled with poor soil nutrition. While short periods of rain benefit local farmers, heavy rainfall sometimes destroys cash crops. Greenhouses are permanent glass or plastic-covered structures that allow farmers to grow vegetables and fruits year-round through mechanically-controlled temperature and irrigation systems[7-9]. Greenhouses can help farmers in East Africa grow and protect crops in both wet and dry seasons

## I. MATERIAL REQUIREMENT

**A. With Pipes:** Type of pipe-UPVC

No of pipes-4

Length-20 feet

Diameter-0.3feet

Linear joints-6

Junction joints-3

T joints-6

Pipe Glue



Fig.2 poly ethylene greenhouse

#### B. Types of plants:

Tomatoes

Peppers

Cucumbers

Lettuce

Broccoli

Peas

Carrots

Ladies finger

**C. Covering Material:** Plastics mostly used are polyethylene film and multiwall sheets of polycarbonate material.

#### D.Non Bio degradable PLA material.



Fig.3 Non Bio degradable PLA material.

#### E. Polyethylene:

LDPE Properties: Semi-rigid, translucent, very tough, weatherproof, good chemical resistance, low water absorption, easily processed by most methods, low cost. HDPE Properties: Flexible, translucent/waxy, weatherproof, good low temperature toughness (to -60°C), easy to process by most methods, low cost, good chemical resistance.

#### F. Polycarbonate:

Polycarbonates are strong, stiff, hard, tough, transparent engineering thermoplastics that can maintain rigidity up to 140°C and toughness down to -20°C or special grades even lower. The material is amorphous (thereby displaying excellent mechanical properties and high dimensional stability), is thermally resistant up to 135°C and rated as slow burning.

#### G. PLA material:

**Density:** 1.210–1.430 g·cm<sup>3</sup>, **Melting point:** 150 to 160 °C and **Solubility in water:** Insoluble in water PLA polymers range from amorphous glassy polymer to semi-crystalline and highly crystalline polymer



Fig.4 general construction of green house

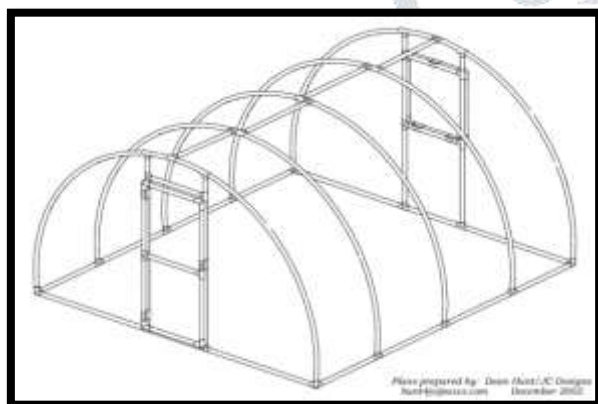


Fig.6 Inner view of green house

## II. METHODOLOGY

Step 1: Designing of a high tunnel greenhouse prototype by using CATIASOFT ware. Step 2: Selection of site in our college.

Fig.5 Design layout green house



Step 3: Construction of a high tunnel greenhouse prototype for agriculture purpose.

### A. Fertilizers:

Nitrogen (N) – is often thought of as the most important element in a nutritional program. However it is only one of several essential elements to plant growth. The most common sources of N used in liquid feed programs include: ammonium nitrate, calcium nitrate and potassium nitrate. Generally speaking no more than 50% of the total N supplied to the plant should be in the ammonium form. Phosphorus (P) – is another element required in relatively large quantities for plant growth

[10-14].

However, over supplies of P may render other nutrients insoluble and therefore unavailable for plant uptake. Phosphorus is generally supplied in nutrient solutions by phosphoric acid or in some cases superphosphate may be incorporated in the growing medium to supply P. Potassium (K) or potash is used by the plant in a number of ways, but is primarily required in water relationships. Among the many greenhouse crops produced, poinsettias are notably heavy feeders of K. The most common source of K in liquid feed programs is potassium nitrate, however other sources may be used. These elements generally include: calcium (Ca), magnesium (Mg), sulfur (S), iron (Fe), zinc (Zn), copper (Cu), manganese (Mn), boron (B), molybdenum (Mo), and chloride (Cl).

### 3. RESULTS

Over the years, the inorganic fillers used to increase the thermicity of LDPE, EVA, and EBA films have been evolving. The first patents and the first commercial films, in the 1970s, mainly used silica, silicates, and hydrated alumina. With time, the extrusion temperatures used by the processors were increasing, and aluminum hydroxide was abandoned, since it decomposes around 180C.

### 4. CONCLUSIONS

Affordable greenhouses can empower small-scale and Subsistence farmers to take control of their farming Environment. They can install drip irrigation systems to reduce water requirements by up to 50% compared with open-field conditions. They can create a cool microclimate within the structure during the hottest hours of the day and keep crops safe from winds during the night. Insects and small animals as well. Essentially, the greatest benefit of greenhouses to poor farmers is that they can increase their crop productivity in a cost-effective manner. The success or failure of the

greenhouses hinges on their functional life and commercial potential. The unique features of expandability of the greenhouse, the use of the PPR pipe framework and the bolted bamboo connectors are proving to be successful so far. Further research over a 3-5 year time frame will validate the effectiveness of each feature. Longitudinal studies in the coming years. However, the initial results are encouraging. Our team has raised about \$50,000 in grants to refine the technology further and disseminate it in East Africa through a network of distributed micro-enterprises over the next two years. Planning is underway with a Kenyan entrepreneur to set up a mass-manufacturing facility for the greenhouse kits.

## REFERENCES:

- [1] M. Mati, Overview of Water and Soil Nutrient Management Under Smallholder Rainfed Agriculture in East Africa , Colombo: International Water Management Institute, 2006, p. 13.
- [2] R. Oniang'o, "Our children need to be saved from hunger," African Journal of Food, Agriculture, Nutrition, and Development.
- [3] Garnaud, J.C. (2000). *Plasticulture Magazine: A Milestone for a History of Progress in Plasticulture*.
- [4]. Dı 'az, T., Espı ' , E., Fontecha, A., Jime 'nez, J.C., Lo ´pez, J. and Salmero ´n, A. (2001). *Los FilmesPla ´sticos en Iaproduccio ´n agrı ´cola*, Repsol YPF, Mundi-Prensa, Madrid.
- [5].Castilla, N. (2004). *Invernaderos de Pla ´stico. Tecnologi ´a y manejo* , Mundi-Prensa, Madrid.
- [6]V. Mallikarjuna, B RAMANJANEYULU. C.Tirupathaiiah L. Sreenivasa Rao.Journal of Emerging Technologies and Innovative Research published on "Operation Speculate On Epoxy Resin Reinforcement Of Aluminium Oxide And Silicon Carbide On Glass Fiber Laminate" for publication in IJSETR Volume.05, IssueNo.18, July-2016, Pages: 3685-3695
- [7] R. Oniang'o, "Our children need to be saved from hunger," African Journal of Food, Agriculture, Nutrition, and Development , Vol. 11, no.4, p. 1, 2011.
- [8] A. Odulaja, G. Kiros, "Modelling agricultural production of small-scale farmers in sub-saharan africa: a case study in western Kenya," ElsevierVol. 14, no. 2, pp. 85-91, 1996.
- [9]J. Essex, "Sustainability, food security, and development aid after the food crisis: assessing aid strategies across donor contexts," Sustainability, pp. 3367-3369, 2010.
- [10] C. Barrett, "Food Security and Food Assistance Programs,"Elsevier ,2002.
- [11] M. Indeje, H. Semazzi, J. Ogallo, " ENSO Signals In East African Rainfall Seasons, International Journal of Climatology , pp. 19-46, 2000.
- [12] B.Ramanjaneyulu, S. LakshmiNarayana Reddy, G.NarasaRaju,R.VidyaSagarRaju.), International Journal of Engineering Research & Technology published on"Performance Analysis on 4-Si Engine Fueled With HHO Gas and LPG Enriched Gasoline"for publication in IJERT Vol. 2 Issue 8, August - 2013ISSN: 2278-0181.
- [13]K.L.Srinivasulu, D. Srikanth, K. Rafi, B.RAMANJANEYULU,Journal of Mechanical and Civil Engineering (IOSR-JMCE) published on "Optimization of Air Filter in an Automobile Diesel Engine by Using CFD Analysis" for publication in IOSR-JMCE Volume 15, Issue 2, Oct 2012 page no-17 to 25.
- [14] P. MOULALI, B. RAMANJANEYULU. International Journal of Scientific Engineering and Technology Research published on "CFD Analysis of Aerodynamic Trailer Devices for Drag Reduction of Heavy Duty Trucks"for publication in IJSETR Volume.05, IssueNo.18, July-2016, Pages: 3685-3695.