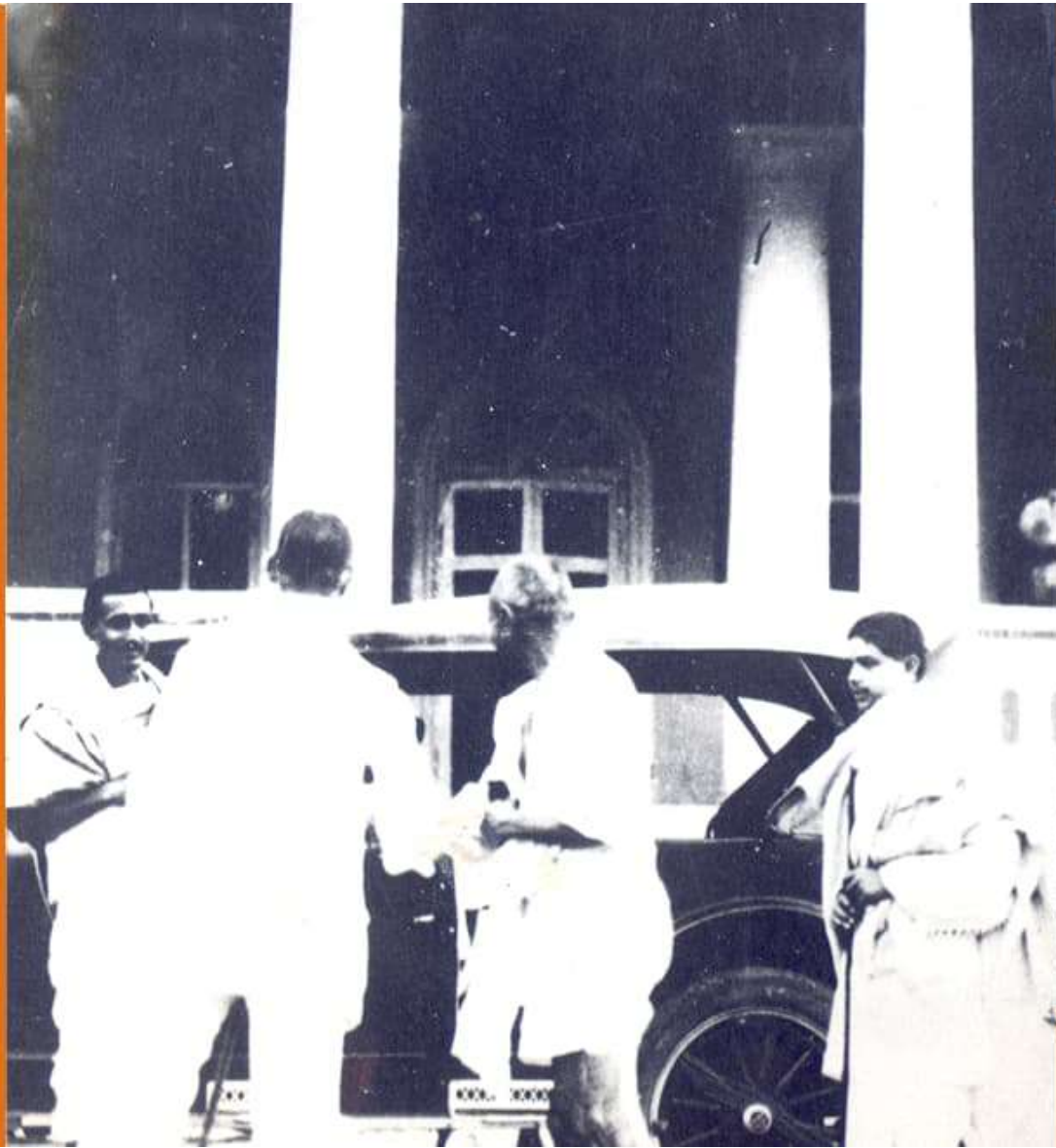




IOT SMART

GREENHOUSE



**“Agriculture is the backbone
of the Indian Economy”**

- Mahatma Gandhi

Mahatma Gandhi visited ICAR-NDRI, Bangalore in the year 1927



भारत 2023 INDIA

वसुधैव कुटुम्बकम्

ONE EARTH • ONE FAMILY • ONE FUTURE



Materials Used

Node MCU ESP8266

Humidity sensor

Temperature Sensor

Relay

BreadBoard

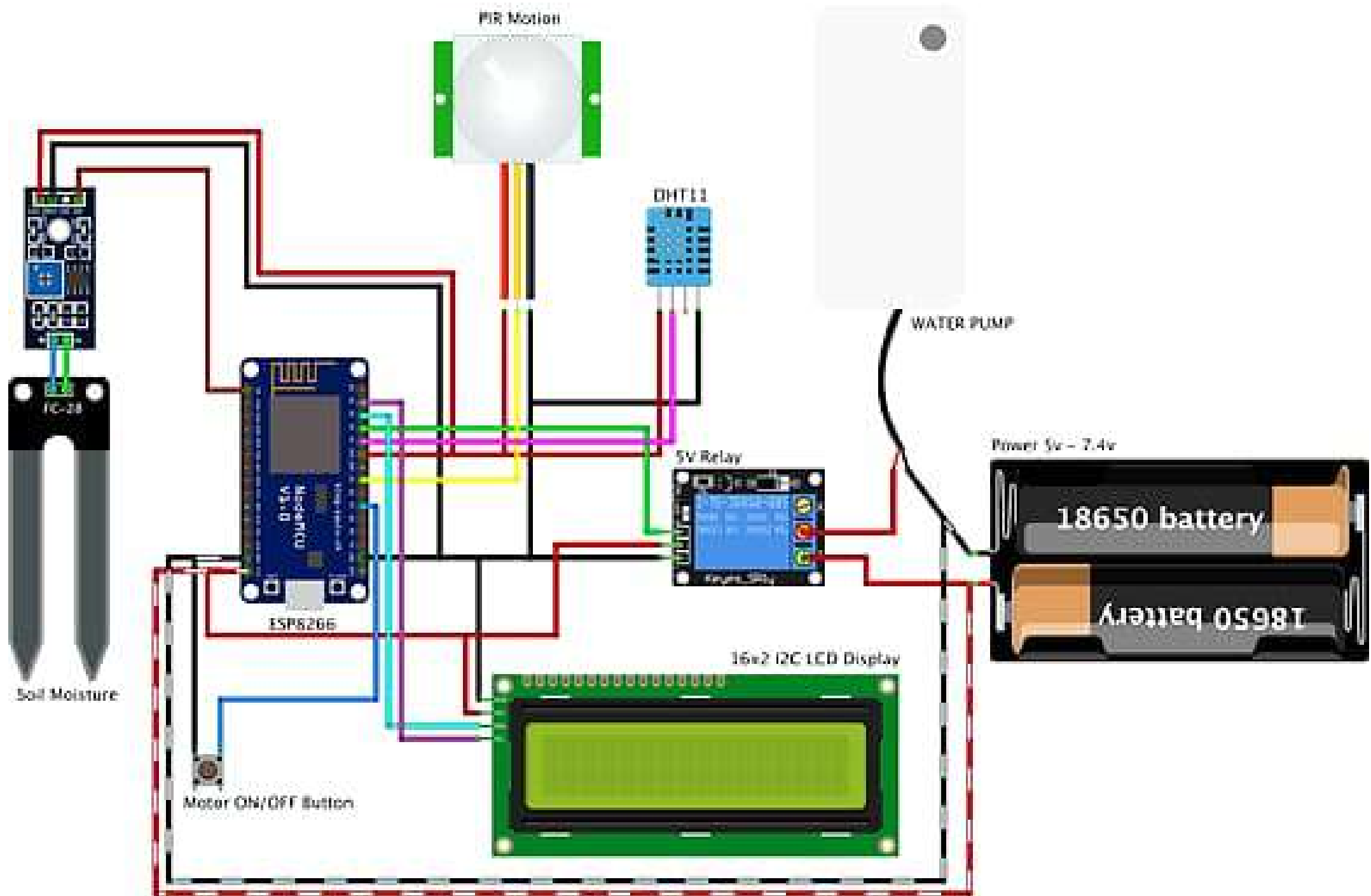
Infrared Sensor

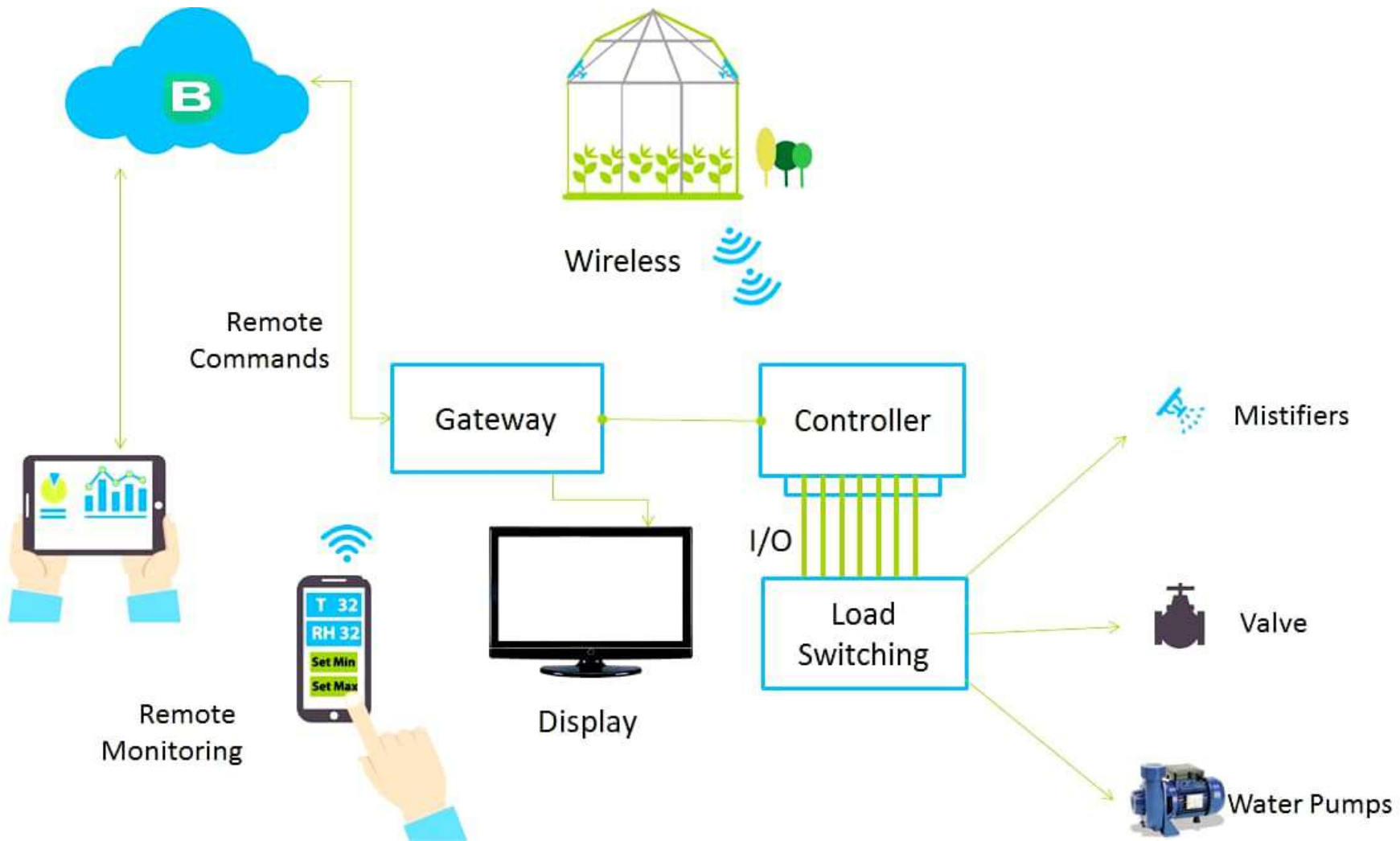
Pump Motor

Battery

LCD Display i2c 16x2







THIS PROJECT CAME UNDER IN ALL,

Physics

That we use electronics

Chemistry

That we use organical nutrients

Biology

That we apply Horticulture and plant wealth



The future of greenhouses



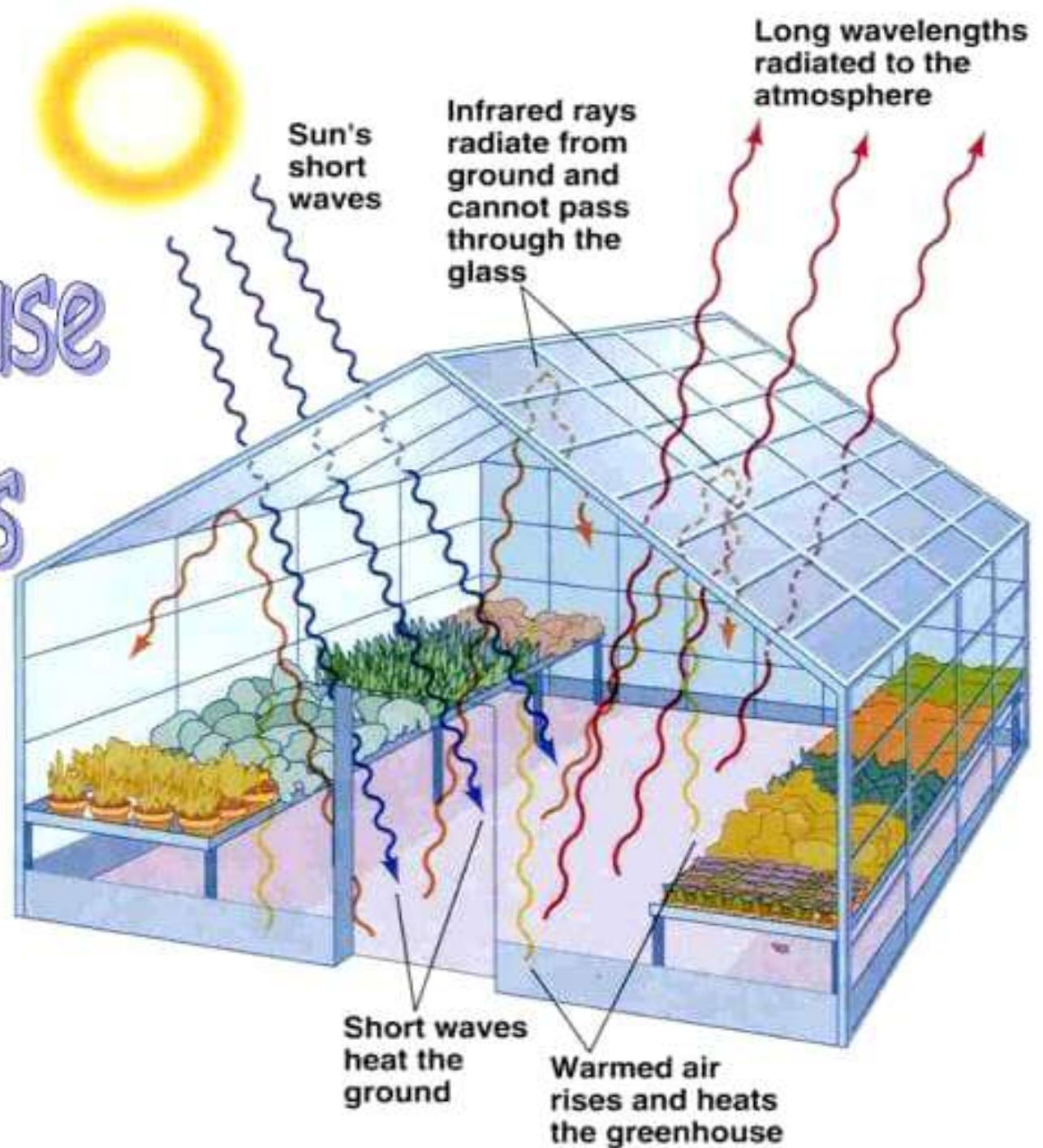
By 2040, Indian horticulturists are hoping to become climate-neutral, by having a net zero carbon footprint. They will accomplish this through several means: controlling the energy and humidity the greenhouses use; using already-proven heat sources such as geothermal and solar heat and including smart windows allowing the glass to insulate in the winter, while cooling in the summer.



This model illustrates that semitransparent organic solar cells can be employed on greenhouses to achieve net zero energy greenhouses in warm or moderate climates.

Illustration courtesy of North Carolina State University

Greenhouse Effects



Greenhouse



PROTECTED AGRICULTURE FOR HIGH VALUE CROPS

Introduction

What is a Green House ?

- ❖ A Green House is a structure covered with a transparent material in which various crops are grown under a system of farming known as Protected Cultivation
- ❖ The Structure is also referred to as Glass House / Poly House, depending upon the Cladding material used.
- ❖ Under Green House Technology favorable Micro Climatic conditions are created suiting to the crops raised.
- ❖ Green House Protects the Plants from adverse climatic conditions such as wind, low temperature, rainfall, excessive radiation, extreme temperature and pests.
- ❖ Green House Technology facilitates off-season production of crops to realize higher returns.



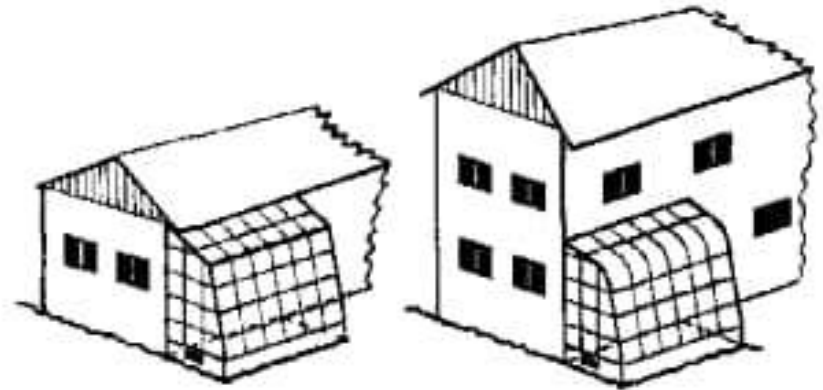
Advantages of Greenhouses :

- ❖ **Ensures multi-fold increase in crop output compared to open cultivation**
- ❖ **Facilitates year round production of selected crops.**
- ❖ **Mitigates impact of adverse climatic conditions in respect of certain type of Green House**
- ❖ **Facilitates substantial control of pest & diseases .**
- ❖ **Facilitates optimum utilization of all inputs.**
- ❖ **Facilitates raising of off-season production of crops.**
- ❖ **Aids in Nursery Propagation, Hardening of Plants**
- ❖ **Facilitates High-Tech Cultivation Practices like Hydroponic , Aero-ponics and Nutrient Film Techniques.**



Greenhouse type based on shape:

- Lean type greenhouse.
- Even span type greenhouse.
- Uneven span type greenhouse.
- Ridge and furrow type.
- Saw tooth type.
- Quonset greenhouse.
- Interlocking ridges and furrow type Quonset greenhouse.
- Ground to ground greenhouse.

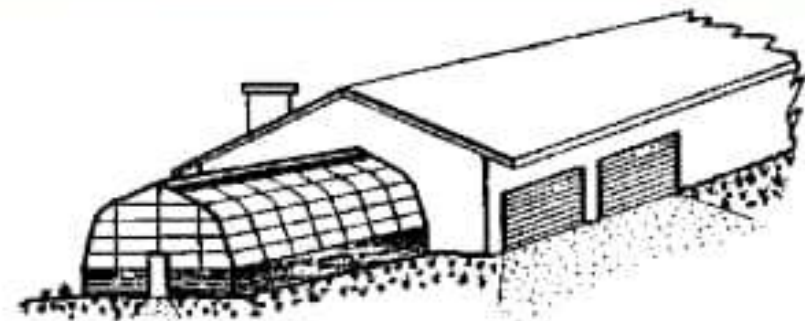


A straight-eave lean-to greenhouse can fit under the roof of a single-story house

This is an example of a curved-eave lean-to built on a two-story house

Figure 2A. Different types of greenhouses allow many options

Lean to type



An even-span attached to a garage allows a larger greenhouse in a limited space

Figure 2B. Different types of greenhouses allow many options

Even span type

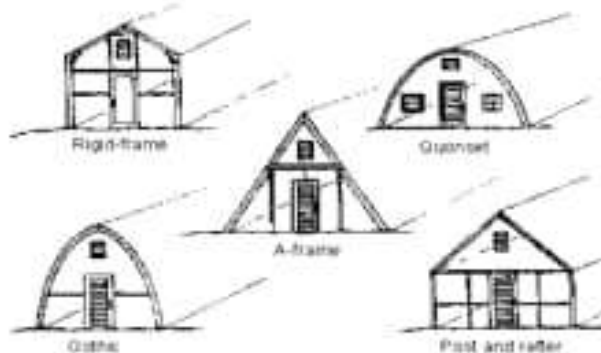


Figure 3. Greenhouses can have a variety of different structural frames

Others

1). Green house type based on Utility

- Greenhouses for active heating.
- Greenhouses for active cooling.

2). Green house type based on construction

- Wooden framed structure.
- Pipe framed structure.
- Truss framed structure.

3). Green house type based on covering material

- Glass glazing.
- Fibre glass reinforced plastic (FRP) glazing
 - i. Plain sheet
 - ii. Corrugated sheet.
- Plastic film
 - i. UV stabilized LDPE film.
 - ii. Silpaulin type sheet.



a) Low cost or low tech Greenhouse

- Low cost greenhouse is a simple structure constructed with locally available materials such as bamboo, timber etc.
- The ultra violet (UV) film is used as cladding to cover the roof and sides.
- Increasing or decreasing the temperature and humidity mostly by opening side walls.
- Suitable for cold climatic zone.
- Suitable for high value vegetable crops during off-Season.



Low cost green house with Casuarina poles

**Tomato cultivation in Low tech
Greenhouse – In side view**



**Out side view – Low tech Green
house**



b) Medium-tech Greenhouse (Semi- Automated)

- Less expensive compared to High- tech GH.
- Control possible manually/ Semi- automated.
- GI material can be used for frame work.
- Exhaust fans, thermo- stat to control temp.
- Cooling pads/ mist system to control humidity.
- Sun light control by regulating shade nets.
- Need more attention in operations.
- Suitable for Dry & composite climate zones



Medium -tech Greenhouse

C.) High- tech Greenhouse (Fully Automated)

- Fully automated controls.
- Less attention in operations.
- Uses computer software for controls.
- More initial cost.
- More suitable to high end applications . (Floriculture, Hydroponics/ Aeroponics)
- Requires assured availability of power.



Hi-tech green house

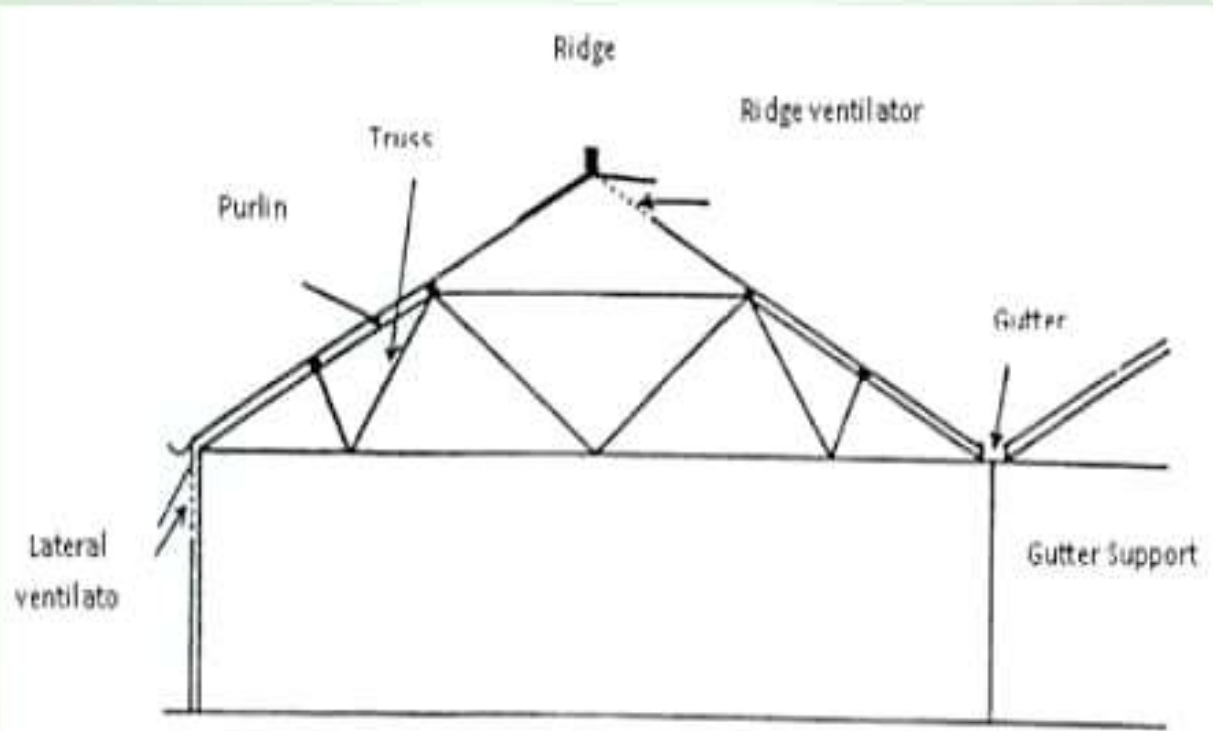
d). Shade net Greenhouses

- Suitable for commercial nurseries / vegetable crops during hot weather .
- It provides protection from excessive sunlight, heat, cold, wind, frost, and hailstorm.
- It also offers protection from insects, birds etc.
- Low Cost of construction



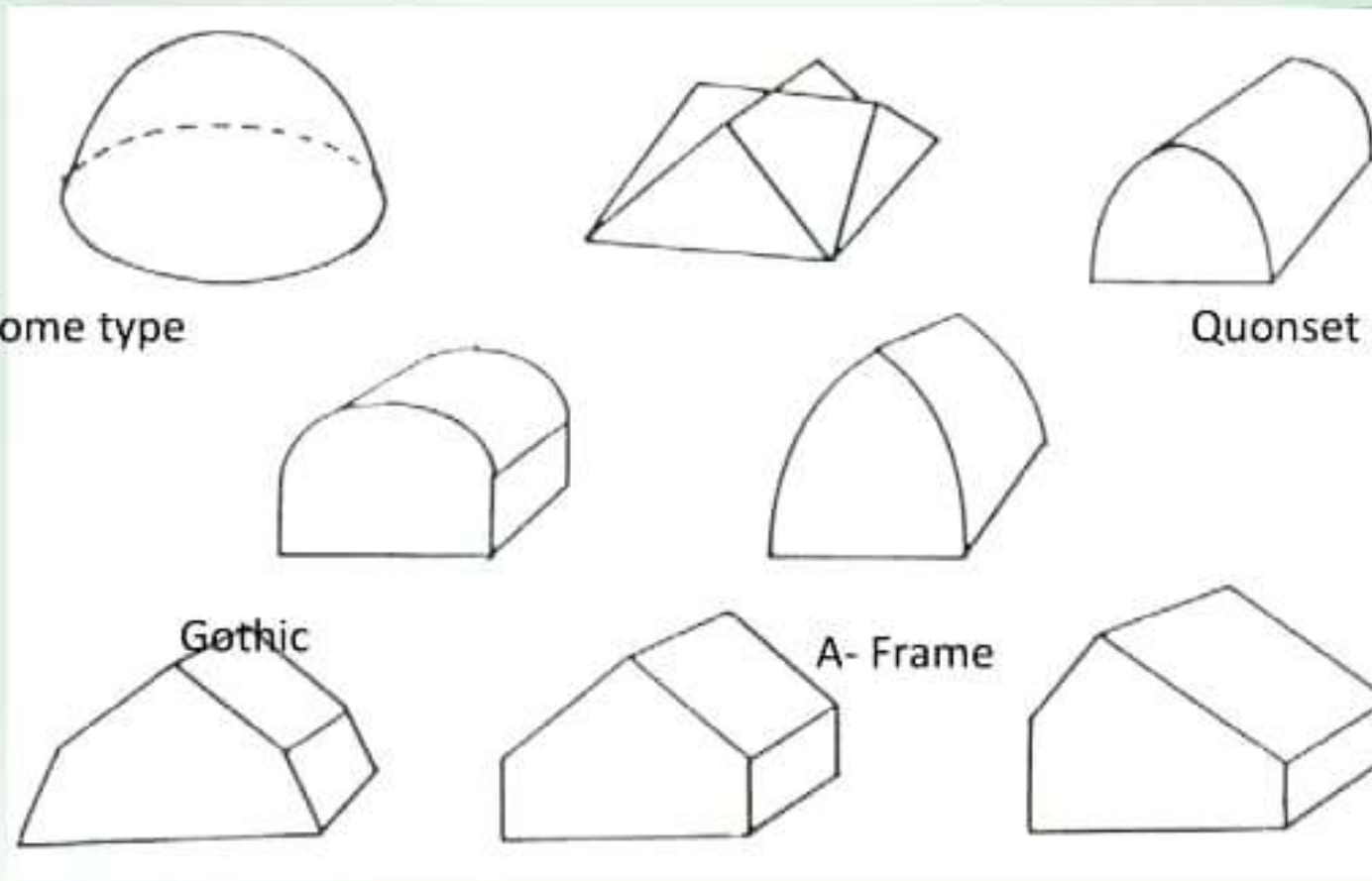
Shade net Greenhouse

Components of typical Greenhouse



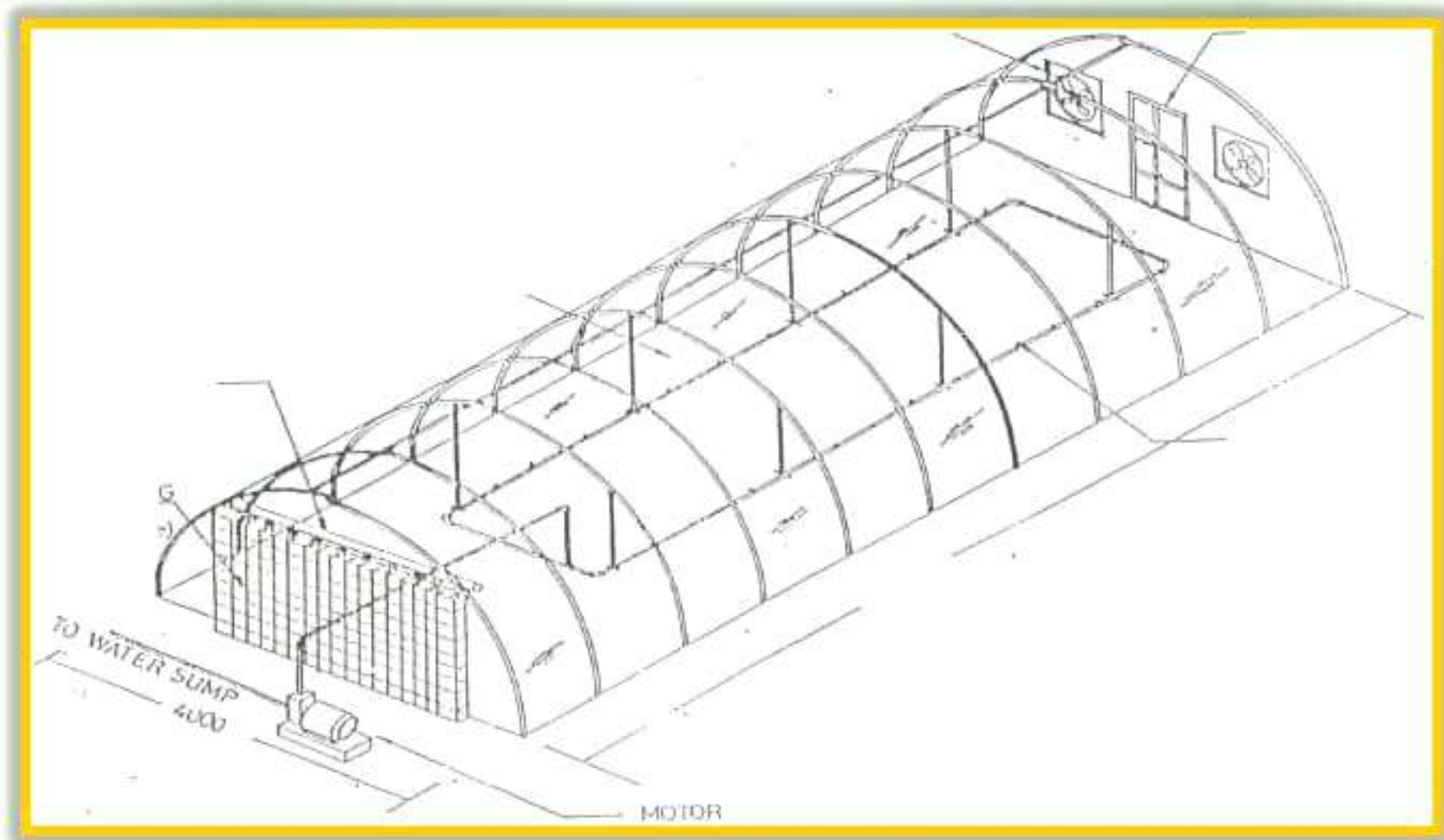
Components of typical greenhouse

Different shapes of the Greenhouse



Ridge frame

Schematic diagram – Semi automatic- Medium cost GH



Comparison of different kinds of covering materials

S. No	Type	Durability	Transmission Light/Heat (%)	Maintenance
1	Poly Ethylene	1 year	90/70	Very low
2	PE (UV Resistant)	2 Year	90/70	High
3	Fiber Glass	Five Year	90/5	Low
4	Tedlar Coated Fiber Glass	Fifteen Year	90/5	Low
5	Double strength Glass	Fifty year	90/5	Low
6	Poly Carbonate	10 – 15 years	90/5	Very Low

Construction Cost

S. No	Type of Greenhouse	Cost per Sq. mt area
1	Less expensive greenhouse without fan and pad	Rs. 300- 500
2	Medium cost greenhouse with pad and fan system without automation.	Rs. 800- 1100
3	Expensive greenhouse with fully automatic control system	Rs. 2000- 3500
5	Shade net house	Rs. 250

Cost/ Benefit Analysis

(Rs. Lakhs)

		1yr.	2 yr.	3 yr.	4 yr.	5 yr.	6 yr.	7 yr.	8 yr.
1	Cost	83.04	32.62	41.79	45.95	41.79	41.79	45.95	28.54
2	Benefit	--	52.50	70.00	70.00	70.00	70.00	70.00	40.70
3	Incremental Benefit (1.B)	-0.10	52.04	69.90	69.90	69.90	69.90	69.90	40.60
4	P.W.of cost at 15% DF	72.24	24.66	27.50	26.28	20.77	18.05	17.28	9.33
									=216.11
5	PW of net 1.B at 15% DF	-0.087	39.61	45.99	39.98	34.74	30.19	26.28	13.28
									=230.57
6	Net 1.B	-83.14	19.78	28.11	23.95	28.11	28.11	23.95	12.06
7	PW of net 1.B at 15% DF	-72.33	14.95	18.50	13.70	13.97	12.14	9.05	3.98
									=+13.96
8	PW of net 1.B at 20% DF	-69.25	13.73	16.28	11.54	11.30	9.41	6.68	2.81
									= +2.50
9	PW of net 1.B at 25% DF	-66.51	12.65	14.39	9.82	9.22	7.36	5.03	2.03
									= -6.01

NPW = =Rs. 13.87 lakhs, BCR = 1.06,

IRR = 20 + 5 (2.50)

2.50 - (-6.01)

= 21.46 % = **21%**

Construction cost : per square meter basis

Sl.No	Specifications	Cost Rs/m ²
1	If double layer polyethylene used	100
2.	Co ₂ generation & distribution	150
3.	Evaporative cooling	200
4	Heating system	100
5.	Humidification system	100
6.	Lighting	200
7.	Night curtain / Shading system	150
8.	Drip system	20
9.	Nutrient application system	100
10	Porous flooring	100
11.	Benches	150
12.	Structural cost	300
13.	Miscellaneous	180

Average cost of High Cost Greenhouse per square metre Rs. 2000.00

Various subsidy schemes

NHM (National Horticulture Mission)

Protected cultivation	Item	Max. Permissible cost	Pattern of Assistance
1. Green House structure			
	(a) Fan & Pad system	Rs. 1465/Sq.m	50% of the cost limited to 4000 Sq.m per beneficiary
	(b) Naturally ventilated system		
	(i) Tubular structure	Rs. 935/ Sq.m	50% of the cost limited to 4000 Sq.m per beneficiary
	(ii) Wooden structure	Rs. 515/ Sq.m	50% of the cost limited to 8 units (each unit not to exceed 500 Sq.m per beneficiary
	(iii) Bamboo structure	Rs. 375/ Sq.m	50% of the cost limited to 20 units (each unit not to exceed 200 Sq.m) per beneficiary.

Source: National Horticulture Mission, www.nhm.nic.in (Scheme validity: up to end of XI plan)

Crop Suitability

- **Low Cost Greenhouse/ Shade net:**
- Nurseries of high value vegetables – Tomato, Chillie etc
- Nurseries of high value fruits- Papaya, Strawberries etc
- Ornamental nurseries
- Vermiculture



Crop Suitability

- **Medium Cost Greenhouse:**
- Seed industry – Seed purification, Screening tests.
- Vegetable cultivation – Value crops like Melons, Capsicum, Beans, Cucumbers, Tomato
- Export Floriculture- Rose, Carnations, Gladiolus
- Tissue culture- Hardening of Banana, Straw berry



Crop Suitability

- **High cost Greenhouse:**
- Hydroponic / Aeroponic cultivation (Soilless)
- Orchid cultivation
- Tissue culture
- Mushroom culture – (Button mushroom)
- High value vegetables: Tomato, Peas





Greenhouses of Almería



THE
Effort Never Dies

THANK YOU FOR THE OPPORTUNITY