Construction Cost of Open Vent Greenhouse in Sangli District

Rajaram Jagannath Gore
Research Student
Dept. of Commerce and Management
Shivaji University, Kolhapur

Abstract:

Greenhouse pays important role in Indian agriculture System. Greenhouse technology is an agro-system that presents important productive advantage in comparison with open field cultivation. The main purpose of this technology is to provide the favourable environment for successively growing high quality plants whole the year. The main objective of this paper is to find out the construction cost of open vent greenhouse 500 model and prepare the design of OVGH 500 model. This study is based on the primary and secondary data of sources. The primary data collected through the field work and secondary data collected through the agriculture census. This technology is very costly as compare to the open field. Total cost of Rs. 1,017 per sq. mtr. for 20mtr×28mtr model and Rs. 1,038 per sq. mtr. for 28mtr×20mtr model.

Introduction

Agriculture in India has been not only a means of livelihood but a way of life for millions of farmers. It provides livelihood to nearly 60% of the population. The pressure on account of population, urbanization and industrialization has affected on the average land holding. Today small and marginal farmers contribute nearly 40% of marketable surplus. Greenhouse can provide answers for round the year cultivation under climatic uncertainties as well as price fluctuation in the market. To fulfil the overall demand there is need to adopt greenhouse technology not only to improve productivity, quality and economics of production but have a salutary impact on the environment.

Greenhouse technology is an agro-system that presents important productive advantage in comparison with open field cultivation. A greenhouse is a formed structure covered with a transparent material to grow crop under fully controlled environment or partial controlled environment conditions to get optimum growth and productivity. The main purpose of this technology is to provide the favourable environment for successively growing high quality plants whole the year. The greenhouse gives the 7-8 times higher production than the open field depending upon the type of greenhouse, type of crop and environmental controlling facilities. Also farmer can produce off season production of vegetable and fruit crops. The use of greenhouse is mainly for the production of seasonal and non-seasonal crops, for the production of high quality flowers, vegetables and preparation of nursery.

Looking at the advantage of greenhouse technology, the government of India has been providing financial assistance for construction of open vent greenhouse and naturally ventilated greenhouse with fan and pad cooling system under the National Horticulture Mission and Horticulture Mission for North East and Himalaya States, centrally sponsored scheme for the development of horticulture in India. The government provide 50% financial assistant of the cost limit to an area of 4000 sqm per beneficiary.

Objectives

1. To study the advantages of greenhouse technology.
2. To study the requirement of material for construction of open vent greenhouse model.
3. To Study the fixed cost of open vent greenhouse model.

Methodology

The present research study is depends on the primary and secondary source of data. The primary data is collected through field work with the help of interviews and discussion with the relevant persons and authorities. The secondary data were collected from the district agriculture office of Sangli district.

Advantages of Greenhouse Technology

1. Provide favourable climatic conditions for the plant.
2. Cultivation in all seasons with all plants is possible.
3. Higher yield with good quality production.
4. Helps to protect from pest and diseases.
5. Conserves moisture thus need less water.
6. More suitable for cultivating high value crops.
7. Protects the crops from wind, rain, snow etc.
8. Self-employment opportunities for educated youth.

Open Vent Greenhouse

The open vent greenhouse it is also called naturally ventilated greenhouse. This type of greenhouse started for the area was temperature range between 15˚C to 30˚C. The structure should have provision of sufficient number of openings for climate ventilation of greenhouse. The percentage of the ventilation will be up to 60% of the floor area.

Material Requirement for Open Vent Greenhouse models

As per the government standards the following specific material required for the greenhouse construction.

1. Greenhouse should be made of Galvanized Iron (GI) with minimum 50 microns thick galvanizing.
2. Complete greenhouse structure made of galvanized steel tubular pipes or equivalent section conforming to BIS Standards (IS 1161:2014) structural member should be joined with fasteners properly.
3. It should not be wielded to one another, but fixed with the nut bolts
4. Members should not have any wielded joints.
5. The overall slope of the foundation should be between 1.25 % and 2 % so as to keep the Gutter slope accordingly
6. The shape of the greenhouse should be according to aerodynamic so as to reduce the impact of wind & consequent damage of greenhouse. The structure should also follow aerodynamics along all four sides with corridors.
7. Grid should be of 4m X 8m
8. Top height should be minimum 6 mtrs for Konkan, Marathawada & W. maharashtra and 6.5 mtrs for Khandesh and Vidarbh.
9. Gutter height should be minimum 4 mtrs.
10. Side curtains should be of minimum 2 m height for OVPH of area below 1008 Sq.mtrs, 2.5 m height for area between 1009 Sq. m to 2016 Sq. m and 3.5 m height for area above 2017 Sq. m
11. Top Vent should be of minimum 0.8 m height for OVPH of area below 2016 Sq.m and 1 m height for area above 2017 Sq. m.
12. Cross bracing should be provided as follows- Horizontal cross bracing on 4 corners of greenhouse (For all models) Vertical Cross bracings on 4 corners of greenhouse (For all models above 1009 Sq. mtrs.)

Specification of GI pipe for Open Vent Greenhouse Models

The following specification of GI pipe is required for the open vent greenhouse model.

Sr. No.	Particulars	Size (in inches)	Size (Outside Diameter) (mm)	Thickness (mm)	Weight (Kg/m)
1	Tor bar for hold-fast in foundation	n.a.	8mm	--	--
2	Columns	2 ½”	76.1 mm	2.9	**5.24**
3	Foundations for all columns	2”	60.3 mm	2.9	**4.11**
4	Truss bottom-Big	2”	60.3 mm	2.9	**4.11**
5	Truss bottom-Small Sides & Front/Back(F/B)	1 ½”	48.3 mm	2.9	**3.25**
6	All Corridors	1 ½”	48.3 mm	2.9	**3.25**
7	Top cross	1 ¼”	42.4 mm	2.6	**2.55**
8	Corridor support members (sides & F/B)	1 ¼”	42.4 mm	2.6	**2.55**
9	Trusses-Top curved members	1 ¼”	42.4 mm	2.6	**2.55**
10	Purlins-(All except curtain)	1 ¼”	42.4 mm	2.6	**2.55**
11	Door column	1 ¼”	42.4 mm	2.6	**2.55**
12	Door	1”	33.7 mm	2.6	**1.99**

13	Purlins-Curtain	1”	33.7 mm	2.6	**1.99**
14	Truss members (minimum 5 nos per Bay)	1”	33.7 mm	2.6	**1.99**
15	Cross bracing	1”	33.7 mm	2.6	**1.99**
16	Door top	1”	33.7 mm	2.6	**1.99**
17	Curtain-Universal	1”	33.7 mm	2.6	**1.99**
18	Runners (for top UV Film)	¾”	26.9 mm	2.3	**1.40**
19	Curtain pipe	¾”	26.9 mm	2.3	**1.40**
20	Curtain handle	¾”	26.9 mm	2.3	**1.40**
21	**Curtain guide**	**½”**	**21.3 mm**	**2.0**	**0.952**

(Source- Complied by researcher)

The above table shows the list of size and quality of items required for the open vent greenhouse as per the government standard. As per that list greenhouse operator should require to maintain the quality GI pipe. The list of items depends on the size, thickness and weight of the item. Government provides the subsidy to the greenhouse operator as per this standard.

Fixed Cost of Open Vent Greenhouse (OVGH) - 500 Model

Model		**OVGH-500**		**Dimensions**		**20 m x 28 m**	
Structural material		G.I. Pipes				**28 m x 20 m**	
Size		560 sq m		Height		**Minimum 6 m at center**	
Sr. No.	**Particulars**	**Rate (Rs)**	**Unit**	**20 m x 28 m**		**28 m x 20 m**	
				560		**560**	
				Quantity	**Amount**	**Quantity**	**Amount**
A	**Cost of Material**						
1	GI Pipes	**65**	Kgs.	3604	234260	3683	**239395**
2	UV stablised Poly Film	**55**	Sq.mtrs	1101	60555	1154	**63470**
3	GI	**65**	Kgs.	115	747	153	**994**
	Gutter				5		**5**
4	Aluminium Profiles	**40**	Mtrs.	406	16240	429	**17160**
5	Clamps & Accessories	**22**	Sq.mtrs.	560	12320	560	**12320**
6	Shade Net (Tapenet on roof)	**30**	Sq.mtrs.	428	12840	420	**12600**
7	Insect Net (on sides)	**40**	Sq.mtrs.	252	10080	252	**10080**
8	Laminated woven film (apron)	**52**	Sq.mtrs	126	6552	126	**6552**
9	Locking spring	**6**	Mtrs.	590	3540	625	**3750**
10	High Tensile Nuts & Bolts	**8**	Sq.mtrs.	560	4480	560	**4480**
11	Self drilling tapping Screws	**1.5**	Nos.	775	1162.5	820	**1230**
12	GI Wire	**55**	Kgs.	13	715	12	**660**
13	Plastic Rope	**4**	Mtrs.	145	580	131	**524**
14	Curtain Clamps	**10**	Nos.	67	670	67	**670**
15	Pulley assembly	**30**	Nos.	8	240	10	**300**
16	Curtain Rings	**2**	Nos.	84	168	60	**120**
17	UV stabilised FRP-Door	**2000**	Nos.	1	2000	1	**2000**
	Sub Total				**373878**		**385256**
	VAT (compulsory)	**5%**			18694		**19263**
	Total Materi				**392571**		**404519**

	al Cost						
B	**Foundation-civil material**	**150**	Nos.	56	8400	55	**8250**
C	**Labour Cosst**						
1	Fabrication	**64**	Sq.mtrs.	560	35840	560	**35840**
2	Foundation	**120**	Nos.	56	6720	55	**6600**
3	Installation	64	Sq.mtrs.	560	35840	560	**35840**
	Total Labour cost				**78400**		**78280**
	Total				**479371**		**491049**
D	**Service Tax on Labour cost**	**14.00%**			10976		**10959**
E	**Transport cost**	**2.00%**			7478		**7705**
F	**a) Control Head - 500**	**78**	Rs/Sq.mtr	560	43680	560	**43680**
	b) Irrigation System	**25**	Rs/Sq.mtr	560	14000	560	**14000**
	c) Fogging System	**25**	Rs/Sq.mtr	560	14000	560	**14000**
	Irrigation System	**128**	Rs/Sq.mtr	**560**	**71680**	**560**	**71680**
	Grand Total				**569505**		**581393**
	Total Unit Rate		**Rs/Sq.mtr**		**1017**		**1038**

Source- (Source- Complied by researcher)

Above table shows the fixed cost of open vent greenhouse- 500 model. Open vent greenhouse 500 model indicates the 500 sq. mtr. area of greenhouse. Therefore the name has given OVGH 500 model. Open vent greenhouse it is one of the low cost greenhouse as compare to climate control greenhouse. This model has given in two dimensions first 20 m ×28 m. and second dimension 28 m ×20 m. The height of the greenhouse Minimum 6 mtr height is required at the centre as per the government rules. Also this model builds with GI pipes structured material. As per the above table total cost of GI pipe Rs. 2,34,260 for 20m ×28m dimension and Rs. 2,39,395 for 28m ×20m dimension, Also the cost of material (A) Rs.3,92,571 for 20mtr ×28mtr and Rs. 4,04,519 for 28 m ×20 m. The total cost of foundation material cost (B) Rs. 8400 for 20mtr×28mtr and Rs. 8,250 for 28mtr×20mtr. Total labour cost (C) Rs.78,400 for 20mtr×28mtr and Rs. 78,280 for 28mtr×20mtr. 14% service tax charged on the grand total. The total grant total for the Rs.5,69, 505 for 20mtr×28mtr and Rs. 5,81, 393 for 28mtr×20mtr. Total cost of Rs. 1,017 per sq. mtr. for 20mtr×28mtr model and Rs. 1,038 per sq. mtr. for 28mtr×20mtr model. From the above analysis it has observed that the 20mtr ×28mtr is the cost saving dimension as compare to second dimension.

Design of Open Vent 500 Greenhouse Model

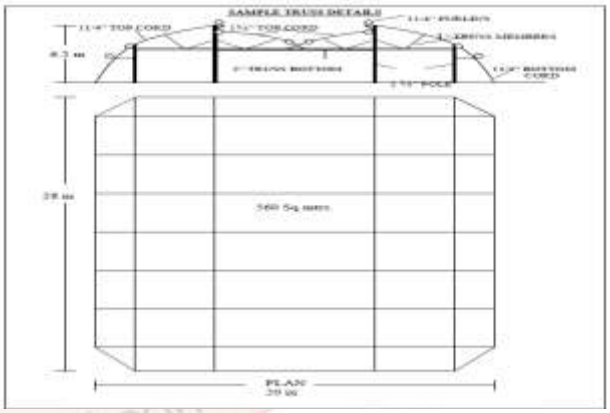

Diagram of Open Vent Polyhouse – 20m × 28m = 560 Sq.mtrs.

Conclusion

A greenhouse is a formed structure covered with a transparent material to grow crop under fully controlled environment or partial controlled environment conditions to get optimum growth and productivity. Greenhouse is one of the innovative practices in the Indian agriculture also it is useful for the Indian farmers because it provide favourable climatic conditions for the plant, farmer can cultivate all plants in all seasons. Also this technology gives higher yield with good quality production. This technology is very costly as compare to the open

field. The minimum cost comes to Rs. 1017 per sq. mtr. for OVGH 500 model.

References

1. Pokhalkar S. M. (1998) Greenhouse Technology Construction and Management, Sona Prakashan, Nashik.
2. Goyal R. K.. Tiwari G. N. (1997) Greenhouse Technology, Nerso Publishing House, New Delhi 1100017.
3. Prakash, Kumar, Kar, Anbukani and Sing (Sept 2019) progress and performance of protectesd cultivation in Maharashtra, Indian Journal of Economics and Development, Valume 15 no 4, 2019 pp 555-563
4. Rajendar, Sushanth, Mithun, Devender, Raju and Anushka (2017) International Journal of Agriculture Science and Research. ISSN :2250-0057 pp-29-36.
5. Baudoin, W. c. (2002) Low cost Efficient Plant Growth Structures, Canadisn Journal of Plastic Saience, Vol 44.
6. Sangale, Patil, Shinde and Mote (2016) Cost Benefit Ratio of Gerbera Greenhouse Flower cultivation in Kolhapur District, Research point, pp-197-204.