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CAPITAL REQUIREMENTS OF OVERWINTERING STRUCTURES FOR NURSERIES IN OHIO - 1984

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ABSTRACT

The objective of this study was to develop the resources and costs associated with four model structures used by Ohio nurseries for overwintering nursery products. The four structures were: a simple polyhut, a polyhouse constructed to support a single polyethylene film, a polyhouse equipped with an inflation kit so it would support a double polyethylene film with air being blown between the films, and a polyhouse equipped with both an inflation kit plus heating capacity. The latter house would normally be used for overwintering very temperature sensitive plants. Costs of constructing the overwintering structures were $120.24 or $0.20 per sq. ft. for a 6' x 96' polyhut, $1131.58 or $0.84 per sq. ft. for a 14' x 96' polyhouse without inflation or heating capability, $1201.08 or $0.89 per sq. ft. for a 14' x 96' polyhouse with inflation but not heating capability and $1882.18 or $1.40 per sq. ft. for a 14' x 96' polyhouse with both inflation and heating capability.

INTRODUCTION

Costs of overwintering plant material contribute significantly to the expense of producing nursery products in Northern U.S.D.A. climatic zones. This is especially true of production in containers where practically all material not previously sold and shipped must be overwintered. A recent study (1) showed polyhouse structures for overwintering accounted for about 20% of the total capital requirement for establishing an 8 acre (growing space) container nursery. The study was based on a 20' x 200' structure without inflation or heat. Adding inflation would have only increased costs slightly while adding inflation and heat would have increased the cost to about 33% of total capital requirements.

The specific objective of this study was to determine construction costs of alternative overwintering structures.

MATERIALS AND METHODS

In the study, four overwintering structures were synthesized using the conceptual framework of economic engineering wherein the 'best proven practice' was included in each model. They were synthesized based on the Columbus, Ohio, area, but would be representative of U.S.D.A. climatic zones five and six. Each structure measured 14' x 96'in the case of polyhouses and 6' x 96' in the case of the polyhut. This size was suggested by horticulturists as being typical for the two climatic zones.

Data for this study were obtained from wholesale nurseries and nursery suppliers in Ohio during 1984. Prices reflect quantities of materials based on a nursery containing 17 total acres, 350,000 sq. ft. of growing space and 210,000 sq. ft. of polyhouse/hut space. The polyhouse/hut space would be made up of either 156 polyhouses, 365 polyhuts, or some combination of the two.

Construction costs did not include ground preparation, irrigation fixtures or the cost of poly covers. It was determined that ground preparation and irrigation fixtures should be charged to "grow out" rather than overwintering. Poly covers are variable rather than capital costs. The polyhouse synthesized to contain heating facilities would be constructed with plywood ends, while those without heat would have plastic ends.

RESULTS AND DISCUSSION

Capital investment requirements for constructing a simple 14' x 96' polyhouse were itemized under five broad divisions: galvanized steel pipe, wood, hardware, miscellaneous, and labor (Table 1). Construction costs were $1131.58 or $0.84 per sq. ft. Galvanized steel pipe represented 48% or $543.33 of the investment, wood 11% or $115.54, hardware 3% or $42.60, miscellaneous 9% or $100 and labor 29% or $330. Adding a shaded pole blower kit (for where double poly covering would be used) increased construction cost by $69.50 to $1201.08 or $0.89 per sq. ft. (Table 2).

Capital investment requirements for constructing a 14' x 96' polyhouse with inflation capability and heat were itemized under seven broad divisions: galvanized steel pipe, wood, hardware, heating system, inflation, miscellaneous, and labor (Table 3). Construction costs were $1882.18 or $1.40 per sq. ft. Galvanized steel pipe represented 29% or $543.44 of the investment, wood 10% or $180.30, hardware 2% or $44.04, heating system 29% or $548.90, inflation 4% or $69.50, miscellaneous 5% or $100, and labor 21% or $396.

Polyhut investment requirements for a 6' x 96' structure were itemized under polyhut framework, concrete blocks for weighting plastic and labor (Table 4). Construction costs were $120.24 or $0.21 per sq. ft. Polyhut framework represented 35% or $42, concrete blocks 10% or $12.24 and labor 55% or $66.

SUMMARY

Costs of constructing overwintering structures were $0.20 per sq. ft. for a polyhut, $0.84 per sq. ft. for a polyhouse without inflation or heat capability, $0.89 per sq. ft. for a polyhouse with inflation capability but not heat and $1.40 per sq. ft.for a polyhouse with both inflation and heat capability. The polyhut, while being inexpensive, is also difficult to work with. A polyhut is normally covered with poly in late autumn and generally it is not opened until spring. Of the various structures analyzed, a nurseryman can normally expect the maximum amount of plant damage from plants stored in polyhuts. The more expensive structures protect plants more effectively with the degree of protection being directly correlated with costs of construction.

LITERATURE CITED

1. Taylor, Reed D., Harold H. Kneen, David E. Hahn and Elton M. Smith. 1983. Costs of Establishing and Operating Container Nurseries Differentiated by Size of Firm and Species of Plant in U.S.D.A. Climatic Zone Six. Southern Coop. Ser. Bull. 301.

TABLE 1.--Cost* of Construction for Container Nursery Overwintering System, 14' x 96' Polyhouse, U.S.D.A. Climatic Zones Five and Six, 1984

Item	Description	Unit	Useful life (years)	Quantity	Cost per Unit (dollars)	Total Cost (dollars)	Percent of Total Cost
Galvanized steel pipe							
Arches - 26	3/4" x 21'	ft	10	546	.57	311.22	28
Ground inserts - 52	3/4" x 4.2'	ft	10	218.4	.57	124.49	11
Threaded ridge line - 5 including couplings	3/4" x 21'	ft	10	105	.57	59.85	5
End braces - 4	3/4" x 21'	ft	10	84	.57	47.88	4
Subtotal				953.4		543.44	48
Wood - treated white pine							
Base boards	2" x 4" x 220'	ft	10	220	.27	59.40	5
Door frame - Uprights - 4	4" x 4" x 8'	ft	10	32	.54	17.28	2
Door frame brace - 4	1" x 4" x 6'	ft	10	24	.27	6.48	1
Door sill plate - 4	2" x 4" x 3'	ft	10	12	.27	3.24	**
Doors (3' x 6') - 2	4' x 8' plywood	each	10	2	14.57	29.14	3
Subtotal						115.54	11
Hardware							
Pins for connecting arches and ground inserts - 52	1/2" x 6"	ft	10	52	.65	33.80	3
Hinges	3" rustproof	each	10	4	1.20	4.80	**
Door latch	Hasp	each	10	2	2.00	4.00	**
Subtotal						42.60	3
Miscellaneous	welding rod, nails, connectors, etc.					100.00	9
Labor requirements		hours	10	50	6.60***	330.00	29
TOTAL						1131.58	100

*Based on a nursery containing 17 total acres, 350,000 sq ft of growing space, 210,000 sq ft of polyhouse space, 156 (14' x 96') polyhouses.

**Less than 1/2 of 1 percent.

***Average basic wage before withholding taxes and fringes $5.00, taxes and fringes add 32% or $1.60 for a total of $6.60.

TABLE 2.--Cost* of Construction for Container Nursery Overwintering System, 14' x 96' Polyhouse with inflation, U.S.D.A. Climatic Zones Five and Six, 1984

Item	Description	Unit	Useful life (years)	Quantity	Cost per Unit (dollars)	Total Cost (dollars)	Percent of Total Cost
Galvanized steel pipe							
Arches - 26	3/4" x 21'	ft	10	546	.57	311.22	26
Ground inserts - 52	3/4" x 4.2'	ft	10	218.4	.57	124.49	10
Threaded ridge line - 5 including couplings	3/4" x 21'	ft	10	105	.57	59.85	5
End braces - 4	3/4" x 21'	ft	10	84	.57	47.88	4
Subtotal				953.4		543.44	45
Wood - treated white pine							
Base boards	2" x 4" x 220'	ft	10	220	.27	59.40	5
Door frame - Uprights - 4	4" x 4" x 8'	ft	10	32	.54	17.28	1
Door frame brace - 4	1" x 4" x 6'	ft	10	24	.27	6.48	1
Door sill plate - 4	2" x 4" x 3'	ft	10	12	.27	3.24	**
Doors (3' x 6') - 2	4' x 8' plywood	each	10	2	14.57	29.14	3
Subtotal						115.54	10
Hardware							
Pins for connecting arches and ground inserts - 52	1/2" x 6"	ft	10	52	.65	33.80	3
Hinges	3" rustproof	each	10	4	1.20	4.80	**
Door latch	Hasp	each	10	2	2.00	4.00	**
Subtotal						42.60	3
Inflation							
Shaded pole blower kit	complete	each	10	1	69.50	69.50	6
Miscellaneous	welding rod, nails, connectors, etc.					100.00	8
Labor requirements		hours	10	50	6.60***	330.00	28
TOTAL						1201.08	100

*Based on a nursery containing 17 total acres, 350,000 sq ft of growing space, 210,000 sq ft of polyhouse space, 156 (14' x 96') polyhouses.

**Less than 1/2 of 1 percent.

***Average basic wage before withholding taxes and fringes $5.00, taxes and fringes add 32% or $1.60 for a total of $6.60.

TABLE 3.--Cost* of Construction for Container Nursery Overwintering System, 14′ x 96′ Polyhouse with inflation and heat, U.S.D.A. Climatic Zones Five and Six, 1984

Item	Description	Unit	Useful life (years)	Quantity	Cost per Unit (dollars)	Total Cost (dollars)	Percent of Total Cost
Galvanized steel pipe							
Arches - 26	3/4" x 21′	ft	10	546	.57	311.22	17
Ground inserts - 52	3/4" x 4.2′	ft	10	218.4	.57	124.49	7
Threaded ridge line - 5 including couplings	3/4" x 21′	ft	10	105	.57	59.85	3
End braces - 4	3/4" x 21′	ft	10	84	.57	47.88	2
Subtotal				953.4		543.44	29
Wood - treated white pine							
Base boards	2" x 4" x 192′	ft	10	196	.27	52.92	3
Door frame - Uprights - 4	4" x 4" x 8′	ft	10	32	.54	17.28	1
Door sill plate - 4	2" x 4" x 3′	ft	10	12	.27	3.24	**
Ends - including doors	4′ x 8′ plywood	each	10	6	14.57	87.42	5
Ends - wall studs - 4	2" x 4" x 12′	ft	10	48	.27	12.96	1
Ends - vertical stud base - 2	2" x 4" x 12′	ft	10	24	.27	6.48	**
Subtotal						180.30	10
Hardware							
Pins for connecting arches and ground inserts - 52	1/2" x 6"	ft	10	52	.65	33.80	2
Bolts, washers, and nuts	1/4" x 2" (oval hd)	each	10	12	.12	1.44	**
Hinges	3" rustproof	each	10	4	1.20	4.80	**
Door latch		each	10	2	2.00	4.00	**
Subtotal						44.04	2
Heating System							
Gas fired unit heater - Empire	125,000 BTU	each	10	1	408.90	408.90	22
Thermostat		each	10	1	40.00	40.00	2
Set-up for propane***	vent., reg., etc.					100.00	5
Subtotal						548.90	29
Inflation							
Shaded pole blower kit	complete	each	10	1	69.50	69.50	4
Miscellaneous	welding rod, nails, connectors, etc.					100.00	5
Labor requirements****		hours	10	60	6.60	396.00	21
TOTAL						1882.18	100

*Based on a nursery containing 17 total acres, 350,000 sq ft of growing space, 210,000 sq ft of polyhouse space, 156 (14′ x 96′) polyhouses.

**Less than 1/2 of 1 percent.

***Propane tanks, connectors, etc. will be leased from the company supplying propane.

****Average basic wage before withholding taxes and fringes $5.00, taxes and fringes add 32% or $1.60 for a total of $6.60.

TABLE 4.--Cost* of Construction for Container Nursery Overwintering System, 6′ x 96′ Polyhut, U.S.D.A. Climatic Zones Five and Six, 1984

Item	Description	Unit	Useful life (years)	Quantity	Cost per Unit (dollars)	Total Cost (dollars)	Percent of Total Cost
Polyhut framework - 6′ x 96′ concrete reinforcement mesh 6" x 6" - 10 gauge wire**	5′ x 10′ sections	each	10	14	3.00	42.00	35
Concrete blocks for weighting plastic	2" x 4" x 8" - 6 lb weight	each	10	102	.12	12.24	10
Labor requirements***		hours	10	10	6.60**	66.00	55
TOTAL						120.24	100

*Based on a nursery containing 17 total acres, 350,000 sq ft of growing space, 210,000 sq ft of polyhut space, 365 (6′ x 96′) polyhuts.

**Purchased in rolls 5′ x 150′. Rolls would be cut into 10′ sections to make the 6′ wide hoops. Each section would therefore be 5′ long. Approximately 2′ of space would be left between sections to facilitate service.

***Average basic wage before withholding taxes and fringes $5.00, taxes and fringes add 32% or $1.60 for a total of $6.60.