

# Preconstruction Considerations - Florida Greenhouse Vegetable Production Handbook, Vol 1<sup>1</sup>

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Careful planning prior to construction is an essential first step in the development of a successful, profitable greenhouse production system. The major engineering design considerations can be divided into four categories: site selection, choice of structure, environmental controls, and materials handling.

## Site Selection

Before anything else, the site of the operation must be chosen. Ideally, many sites should be objectively evaluated for their suitability to the proposed project. However, the property being considered for the greenhouse system may already be owned by the potential investor. Under these circumstances, the investor should be especially careful to fairly appraise the site.

First, the site must be appropriately zoned and satisfy any other governmental construction permitting requirements. Other site considerations include:

- the availability and cost of installation of electric power
- the availability of sufficient high-quality water, and current and projected tax rates
- current and projected land values

- accessibility to workers, buyers, and suppliers.

The site should also be evaluated for its environmental qualities; exposure, drainage, and soil characteristics. Finally, the site's potential for future expansion and/or alternative uses should be considered.

## Choice of Structure

There are many styles of greenhouses that differ mainly in shape and in the choice of glazing materials. The extremes range from gabled glass houses that require a very high initial investment and long-term commercial expectations to less expensive, Quonset-style, poly-covered houses. Another distinction is between smaller, single-unit houses and larger, gutter-connected houses. The larger houses offer economies of scale and increased energy efficiencies, but correspondingly, require more management. Double-poly, Quonset-shaped houses are currently popular for vegetable greenhouses.

Greenhouses are structurally simple buildings, but are quite different from other types of residential and farm buildings. A prospective owner should carefully consider whether to build the house himself or use a reputable, experienced greenhouse contractor. The choice of who should construct the greenhouse should also account for the time schedule of construction. Ideally, the greenhouse should be completed

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just in time to begin planting in order to generate cash flow as soon after investment as possible.

An improperly constructed greenhouse will not function optimally and is likely to require repairs earlier than expected. Attention to construction details and contractual relationships with material suppliers and builders are two steps that can help forestall such problems. Normal maintenance, replacements, and repairs should be anticipated.

## Environmental Controls

A greenhouse functions by modifying the environmental conditions to optimize plant growth and yield.



Figure 1. Footbath at greenhouse entrance can help prevent entry of disease organisms.

Depending on the particular system, the structure and associated control equipment can adjust air temperature, light level, humidity, irrigation, and fertilization levels. Each of these control subsystems has the capacity to directly affect the crop's performance in accordance with the degree to which it is properly operated.

Most Florida greenhouses should be equipped with large fans capable of exchanging greenhouse air once a minute to prevent temperatures from building up to damaging levels. Most houses also are equipped with an evaporative cooling system, either wet pads on the wall opposite the exhaust fans or high pressure fog systems. Shade systems can also be used to reduce the heat load on a greenhouse.

Although high temperatures are the predominate problem, houses must also be equipped with heating systems capable of preventing greenhouse temperatures from dropping to damaging levels at the very least.

Hydroponic systems cannot be allowed to function incorrectly because any failures will have an immediate effect. Pumps, plumbing, and tanks must all be installed to facilitate easy maintenance and repair.



Figure 2. Stock tanks containing concentrated fertilizer are located under the fertilizer proportioner bench to conserve space.

All of these control subsystems must be regulated with some kind of controller. Heaters, fans, water flow to pads, and vents are usually operated as a function of temperature. Shade systems usually respond to light level and temperature. Hydroponic irrigation systems are regulated based on time of day, transpiration rate, and growth stage. In a basic system, controls can consist of thermostats, timers, and simple light sensors. Computer controls can be used if precise records of environmental conditions, alarm functions, and centralized remote monitoring are required.

## Materials Handling

Finally, design consideration should be given to materials storage and to the movement of materials into and out of the greenhouse. Clean water and chemicals flow into the house while plant products and discharge water flow out. Safe, appropriate storage of fertilizer and pesticide

products must be considered. Lawful, appropriate disposal of discharge water must also be considered.

Physical handling of the products should be designed to minimize distances and handling operations. Handling pathways should be clear and not be in conflict with other traffic patterns. Designated spaces should be located to keep visitor/buyer parking separated from loading/unloading operations.

## More Information

For more information on greenhouse crop production, please visit our website at <http://smallfarms.ifas.ufl.edu>.

For the other chapters in the Greenhouse Vegetable Production Handbook, see the documents listed below:

### Florida Greenhouse Vegetable Production Handbook, Vol 1

Introduction, HS 766

Financial Considerations, HS767

Pre-Construction Considerations, HS768

Crop Production, HS769

Considerations for Managing Greenhouse Pests, HS770

Harvest and Handling Considerations, HS771

Marketing Considerations, HS772

Summary, HS773

### Florida Greenhouse Vegetable Production Handbook, Vol 2

General Considerations, HS774

Site Selection, HS775

Physical Greenhouse Design Considerations, HS776

Production Systems, HS777

Greenhouse Environmental Design Considerations, HS778

Environmental Controls, HS779

Materials Handling, HS780

Other Design Information Resources, HS781

### Florida Greenhouse Vegetable Production Handbook, Vol 3

Preface, HS783

General Aspects of Plant Growth, HS784

Production Systems, HS785

Irrigation of Greenhouse Vegetables, HS786

Fertilizer Management for Greenhouse Vegetables, HS787

Production of Greenhouse Tomatoes, HS788

Generalized Sequence of Operations for Tomato Culture, HS789

Greenhouse Cucumber Production, HS790

Alternative Greenhouse Crops, HS791

Operational Considerations for Harvest, HS792

Enterprise Budget and Cash Flow for Greenhouse Tomato Production, HS793

Vegetable Disease Recognition and Control, HS797

Vegetable Insect Identification and Control, HS798