Starting a Commercial Greenhouse Business In Alberta 2023

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Introduction

Success in the greenhouse business requires a well-defined market, a good location, significant capital dollars, a well-planned production system, people skills and experience in dealing with the "mechanical" necessities of the business. The knowledge of the existing greenhouse industry is essential so that one knows where the competition is. A successful business requires knowledge of plant management in terms of vegetative and generative actions, computerized controls and their use, good diagnostic skills and abilities to digest and use current information to increase productivity per unit area of the greenhouse. There is great interest in vertical farming. Only leafy vegetables can be grown in this farming system. The development of newer LED lights is making vertical farming more viable. Vertical farming business is also developing now in Alberta and there are a few facilities built in Calgary and Edmonton.

COVID-19 virus epidemic has forced greenhouse crop growers to grow and market the produce and products differently. The rules and regulations of social distancing, isolation and limit the number of customers which can be in the greenhouse at a time has forced growers to set up internet marketing and curb side picking of bedding plants and flowers. It remains to be seen what happens after the pandemic is over in terms of new methods of marketing. One thing is certain that this disease has definitely brought into focus the importance of local production and supply of fresh produce.

After the pandemic the number of people who want to build a greenhouse has increases especially those who want to grow their own food. Larger commercial growers have also expanded significantly.

Identify Your Market

Alberta greenhouse industry is the fourth largest in Canada and stands at 500 acres of covered area in 2023, excluding cannabis greenhouses. In 2020 many cannabis greenhouses are empty and people are talking about growing vegetables in this space. Such production has to be based on orderly marketing strategies so that existing supply and demand scenarios are not affected.

Historically it has doubled in size since 1986 and it has been growing at a modest rate of between 4 and 7%. A profile of the industry in 2014 indicated a growth rate of 10.5% when compared to a study in 2001. The details of this profile are available at www.agga.ca in member's section. Some basic figures: The greenhouse industry generates about $ 250 million per year gross revenue and there is a total investment of

over 400 million dollars.
From a marketing perspective it should be understood that in case of vegetables we are price "takers", not price "makers". We have to compete globally when we are supplying the wholesale markets. The nature of doing business with wholesalers is different than selling directly. Many growers do both wholesaling and retailing. Wholesale markets will demand consistency of product and quality and of course volumes.

That is why in Alberta two marketing groups are fairly successful. Red Hat Cooperative is a group of about 40 growers in Redlcliff and they market together. It means that growers are not marketers. It is a dedicated job of marketing managers. In central Alberta, Pik-N-Pak Produce Ltd. markets through Sunfresh Farms in Edmonton. By joining together the demands of wholesale marketing can be met and thus successful greenhouse businesses are developed. In case of bedding plants, there are a large number of diversified greenhouses and garden centers where customers come to your greenhouses. These greenhouses have the capability to change their price structure and also focus on quality and information. A limited number of bedding plant growers supply to wholesale markets like Home Depot, Super stores, Walmart and others.

In case of tree seedlings, one must secure contracts before constructing a greenhouse. Tree seedlings for reforestation are not grown on speculation. Specific knowledge of stock types, bud setting and hardening and post harvest handling is required. Most of the nursery plant growers have greenhouses for rooting and early plant handling.

Another part of the industry is perennials and succulents. During the past decade perennial market for landscaping has increased. Succulents share of the market has also increased. Market for plugs has also increased significantly and many growers have specialized in this area.

To begin with you may wish to start small for direct marketing. If you want to grow for large-scale wholesale markets then it will be good idea to align yourselves with the existing channels. Most of the existing successful greenhouses and garden centres started small and now are well established.

One of the most asked questions is "What can I grow to make money on?" The answer is that greenhouse is a farming business and it is mostly family run and in some cases family-investment run. The return on investment is not very large. It is estimated to be around 6 to 10%.

General benchmark guidelines for return on assets and for net worth

Primary financial objective	Return on assets	Return on equity	Effect on company performance
Minimum	4-7%	7-10%	Minimum long term return necessary to ensure survival
Target	8-10%	12-20%	May meet owner's minimum needs, but doesn't provide for growth or offset inflation
Top performance	15-20%	30-40%	Most profitable and efficiently run companies

The above table reflects general greenhouse businesses in Alberta for the entire industry blended together. There will be variations based on crops grown, wholesale verses retailing and duration of crops.

Existing greenhouse industry

Crops	Hectares
Vegetables	
Regular Long English cucumbers	29.13
Mini seedless cucumbers	14.97
Tomatoes	36.00
Peppers	16.18
Lettuce	5.26
Egg plants	0.40
Total vegetables	101.94, 252 acres,10.9m/ft2,1m/m2
Fruit	
Strawberries	1.0
Ornamentals	
Bedding and potted plants	77.20
Tree Seedlings	
Spruce and pine	21.80
Total Ornamentals and tree seedlings	99.00 250 acres
Total greenhouse industry	201.94, 500 acres,

Note: The vegetable acreage keeps on changing every year based on supply and

demand scenarios. It has surpassed bedding plants and ornamentals. It is worthwhile to point out that all bedding plant growers produce a significant amounts of vegetable transplants and containers of different vegetables.

It is critical to take the time to develop your business plan. The business plan summarizes your business objectives and how you will attain them. Information on how to prepare your business plan is readily available on various government and websites.

Financial lenders will be looking for the type of information included in the business plan. Your equity is still the most important part of getting a loan. Your own experience with greenhouses and plants will be an asset.

Greenhouse vegetables are either Cucumbers, Tomatoes, Sweet Peppers and/or Lettuce. In Alberta seedless cucumbers are grown in larger number when compared to tomatoes and this is opposite of Ontario and BC where tomatoes are grown in larger numbers. The production is geared towards the packers/wholesale market for distribution through the chain stores and fruit/vegetable markets. Alberta market for vegetables is primarily in the Prairies with some sales to Eastern Canada and U.S. Limited exports to U.S. occurs when there is an over supply of produce.

From marketing viewpoint, locally grown cucumbers are available from February to the end of November with imports in December and January from Mexico and Spain in December and January. During the past several years there is more production of cucumbers using supplemental lights. The capacity to supply vegetable through winter is steadily increasing.

Price for seedless cucumbers are highest in February and March, start declining in April to August and then recover. The price for seedless cucumbers has never been lower than field-grown cucumbers because of quality and freshness. Greenhouse tomatoes are available from the end of March to the middle of December and the price dips to its lowest in June, July and August and then recovers in September. During the past two years the price has been strongly influenced by production in Mexico, Florida and California. Just to understand the market place, look at what happened in 2004-2005 season. The price went as low as $ 7.00/15 pound case in July and August. With hurricanes in Florida and rain storms in California and some problems in Mexico, the price started increasing and by November it was over $ 50.00/15 pounds case. The challenge is in taking advantage of the information and planning our crops accordingly.

Peppers supply begins in April and remains steady till the end of November and price remains relatively stable through the year with a slight drop in summer.

Greenhouse flowers include cut flowers, potted plants and bedding plants. The production is either geared towards the wholesale market (chains, garden centres, florists) or in the case of bedding plants may be direct to the consumer in what is called a retail grower situation. Cut flowers industry has generally suffered due to competition from South Americas and other areas.

Location

There are many factors to consider when selecting a site for your greenhouse business. Just because you already have a piece of land does not necessarily mean it will be a good location. Try to locate closer to your markets. Easy access to utilities will reduce your construction costs. Also remember county and municipal bylaws and highway access may be a problem. Greenhouse vegetables are primarily grown in soilless grow systems so top quality soil is not essential. Soil is used in organic production at this time. Please see an article at the end of this publication on use of warehouses for vegetable production (vertical farming). This information also applies to roof top gardening as well.Natural Gas
This is the most efficient of the fuel sources for heating your greenhouses. i.e. the cost per BTU is less than oil or propane and since heating may represent from 10-35% of your total production, it is a significant cost. You will also find less equipment maintenance problems with natural gas. Natural gas should be available at your location and normally you would pay for the cost of making the connection from the outside wall of the boiler room to the boilers/heaters. Due to carbon foot print emphasis as part of climate change, coal use is minimal. Wood chips and byproducts are used by some smaller growers however common in BC greenhouse industry.

Water

A good supply of high quality water is critical to the success of the business. Have the water analyzed for a full range of criteria from a recognized laboratory. A specialist can help you to understand quality parameters. Basically the Total Salts, pH and bicarbonate levels along with some of the specific nutrient ions will determine its use. One quick fact to remember is that if sodium level is higher than 100 ppm then generally that water is not suitable for greenhouse irrigation. Hard water is suitable for irrigation. You should also determine your total water needs for summer and winter. In summer most of the vegetable crops require as high as 7-8 liters/sq.m/day of greenhouse area. Many growers recycle water so a system of collection, filtering and mixing should be in place. Sand filters and UV disinfection systems are getting more popular. Be aware of the fact that water can be contaminated with herbicides. Avoid the mistake of building the greenhouse first and then start growing plants and then you find that sodium levels are very high. That may become a disaster for the business.

Electricity

3 phase power is much more efficient than single phase both in the initial purchase of equipment (motors) and their operation. Carefully plan you electricity needs. Determine how many Kilowatts/hour are needed to meet your needs. If you are planning to use supplemental lights then your electrical load will be very high.

An on-site generator will also be an "essential" piece of capital equipment to handle power interruptions of your hydro supply.

Soil

Preparing ground for building a greenhouse requires careful attention. It is encouraged to install good drainage system although the soil may not be used for direct cultivation. Having a drainage system will help to avoid water logged conditions when it rains.This picture shows where ground work has been done with slope and poles have been put into the ground. The drainage system was installed earlier. This was an expansion project
The type and drainage characteristics may be particularly important if you plan on growing the crop directly in the ground. Cut flower crops such as chrysanthemums and snapdragons require lighter, well-drained soils especially for winter production.

Suppliers

Suppliers of growing material to your greenhouse business are important and in particular their closeness/accessibility when equipment fails or supplies are needed in a hurry. It is difficult to have a successful greenhouse business in a "remote" area. As a production facility, the need for a constant supply of "inputs" is ongoing. In Alberta most of the greenhouse suppliers are in Calgary. Limited warehousing storage is done in Edmonton.

Customers

Know your customer base. If you are going to sell to a wholesaler then know all aspects of food safety. Good Agricultural Practices (GAP) and other practices which may be required. If you are supplying directly to restaurants and smaller specialty stores then know about the product delivery times and volumes. One of the biggest challenge is to supply the amounts of volumes of produce committed. You may need your own trucks for delivery or depend on commercial transport.

For retail growers where the crop is being sold directly to the public a major cost of doing business is actually getting the customer to your greenhouses. The old adage, the 3 major factors to consider when setting up a retail greenhouse are "Location, Location and Location". Farmers Markets in Alberta are a major source of direct marketing and many growers take advantage of these opportunities. Some of the large growers may wholesale up to 70% of their crop and sell 30% through farmers markets. It is not only the vegetable growers who sell through these markets but bedding plant and flower growers also use these marketing channels. Customers enjoy freshness and personal touch. It is a direct connection between the grower and the customer.

Farmers Markets are popular with greenhouse vegetable and bedding plants growers.

One point to remember that in these Farmers Markets one has to grow their own product. This is a strict requirement. So one may find smaller areas in greenhouses devoted to the production of crops like lettuce or hot peppers, or egg plants.

Besides there are opportunities to sell directly to smaller specialty stores. There is also interest by restaurants to grow at least some produce of their own either on roof tops or on Southern exposures.

Capital

The greenhouse business is very capital intensive with the basic structure erected ranging in price from $6-$10 per sq. ft. depending on such major options as covering materials, ventilation systems, etc. Next we need to provide heating (both the source and distribution), irrigation (source and distribution), electric service (main connection and interior work), nutrient injection system for the irrigation water complete with pH and E.C. controllers, environmental computer to "run" the heating/cooling requirements with the option of adding humidity, CO2 and irrigation control. Now we need to build some type of support buildings for storage/shipping, staff room, office, etc. Add in some pesticide application equipment, concrete walkways, benching or a crop support system, high pressure lighting for the starting and/or finishing areas AND before long you have a total investment of $15-$25 per sq. ft.

Also to remember that vegetable growers need better greenhouse structures not just a plastic cold frame. The investment cost for vegetable greenhouses will be higher when compared to bedding plants growers. The estimates cost for such greenhouses is close to $ 40 to 50/sq.foot

Cut flowers growers have to invest in artificial lighting so their initial costs will be higher.

One of the realities of the greenhouse business is that the initial capital investment must make a return from operations because the re-sale value is only a fraction of the initial investment.

Production Systems/Economics

Vegetables

Greenhouse vegetables are usually grown in soilless media such as rockwool, coir (coconut fiber), pine and/or spruce sawdust and NFT (nutrient film technique) because there is better control of the total growing conditions compared to growing in the soil.

A one-acre size facility may be the starting point needed in order to have any economies for the required equipment (boilers, fertilizer, generator, service/packing building, etc). Smaller sized greenhouses may be built to match your demands and use strategies.

This picture is a good example of vegetables grown in Alberta. This was part of a display at Red Hat Cooperative. One can see regular Long English cucumbers, mini cucumbers, tomatoes of different types and colors, peppers, egg plants and peppers.

Growing Greenhouse Vegetables

Seedless Cucumbers:

Cucumbers are grown at a density of 1.25 to 1.50 plans/sq.m and the yields are reported in cucumbers/m2. Average yields in 2003 were around 110 cucumber/m2 while some growers reported yields as high as 130/m2. The potential yields could be as high as 150 cucumbers/m2 with the world highest yields reported to be close to 300 cucumbers/m2. Cucumber producers can grow, two or three crops per year because it

is a relatively fast growing crop. In 2020 there are over 50 acres of glass greenhouses using supplemental lights for year round production. Yields of 250 to 300 cucumbers/m2 have been reported. Production in mini-cucumbers has also increased and so is the demand.

With the two-crop system, cucumbers are seeded in the middle of November and harvest begins in early February. Cloudy periods in late January can delay the harvest by one to two weeks. A second crop is seeded in June, planted in July with harvest beginning in early August. This crop continues until late November or early December.

In a three crop system, the spring crop is terminated in late May and a second crop is planted by the end of May or early June. Harvest continues until the middle of August. The third crop is planted by late August and harvest continues until late November or early December. A three-crop system generally produces better quality fruit although the production costs are higher.

In 2006 growers tried a system which is called "high wire" training system where fruit is developed and harvested from a single stem. It also allows for planting new crops while harvest is still continued from the older crop. This has allowed at least 20% higher production. Inter-cropping with cucumbers is slowing down now because of disease issues.
There is market for many different types of mini cucumbers. They come in the

category of salad, pickling, gherkins and slicers. The production capacity is around 70 to 90 kg/sq.m per year on a 3-4 crops per year basis.
Different types of cucumbers are also grown by many bedding plants growers. After the bedding plants are sold out, the space is devoted to the production of cucumbers in nursery pots. These cucumbers are sold through their garden centers or through farmers markets as a value added, diversified produce. Almost all bedding plants growers also produce cucumber transplants for sale along with mature, fruiting plants in baskets.

Coir (coconut fiber is the most commonly used growing medium at this time and is used for one year.

Cucumber seedlings are generally brought in from BC at 3 weeks stage at a price of around $1.75/seedling. There is an opportunity to grow these seedlings locally. At an estimate of 56 acres of cucumbers with 4,000 seedlings per acre, that is $ 392,000.00

Tomatoes

Beef steak tomatoes Large cluster tomatoes Roma Tomatoes

Smaller cluster tomatoes Grape tomatoes Smaller cluster tomatoes

Tomato crops are seeded in the middle of November and planted by early January. Many growers bring in 35 days old seedlings from BC. The planting density is around 2.5 plants/m2 and then in late March or early April every 4th plant is twin headed and that brings the plant density close to 3.2 plants/m2. For summer climate an additional side shoots can also be allowed to develop which means more labor will be required to manage the crop. The harvest begins about 110 days from seeding and continues until late November.

The total marketable yields range between 50 to 60 kg/m2 with some growers reporting 65 to 70 kg/m2 yields. From a cash flow point this means that there is no income for 100 days. Only one crop is produced in a year. Cluster tomatoes were introduced to the Alberta market in early 2000 and now form up to 50% of tomatoes. Unlike the beefsteak type of tomato, which is harvested as individual fruits, cluster tomatoes are harvested as a cluster of five to nine fruit attached together to a stem.

The entire cluster of uniform-sized fruit ripens more uniformly and has more flavors.
More recently tomatoes are grown on raised troughs (see picture). This system offers the flexibility of harvesting without bending and also much better air movement around the plant and also better drainage.

Many growers are developing markets for yellow and orange tomatoes which are rich in Vitamin A and are sweeter in taste. They are considered to be low acid tomatoes.

Peppers:

Pepper is a more difficult crop to grow. Production takes about 130 days from seed to harvest, the crop is seeded in the middle of October and harvest begins in the middle of March until November. Many growers will bring in 40 days old seedlings from B.C. Because of the time to produce a crop, growers have no income for five months. In addition, the greenhouse structure must have excellent environmental controls because peppers need precise day and night temperature to set flowers and fruit. This means higher investments costs for the construction of a greenhouse to grow peppers. The planting density is between 3.3 to 3.5 plants/m2 (6.5 to 7.1 stems/m2). It takes between 7 to 9 weeks from fruit set to fruit harvest. The yields range between 22 and 26 kg/m2 with potential yields up to 30 kg/m2.

Red-fruited varieties make up about 70% of the crop, followed by orange, yellow and purple varieties. All peppers turn green first and then change colors based on their genetics. The demand for hot peppers is slowly growing. At this time it is mostly grown for direct marketing although some is being sold through wholesale channels.
Hot peppers are increasing in popularity and market acceptance. They are also grown in hanging baskets during spring bedding plants markets. They bring good revenue.

Egg Plants:

There is no large-scale commercial production of eggplants. Many growers will grow a few rows of eggplants for direct sales. The plant density is like tomatoes. The leaves are

very attractive to whiteflies and thrips and biological controls work quite nicely on plants. Gradually production is going to increase because of interest from ethnic communities. Developing wholesale markets will take time and more research in plant management.

Lettuce production is gradually increasing because of more interest in loose leaf and specialty lettuce. Hydroponic systems like NFT (nutrient film technique) or floating raft systems are gaining popularity for lettuce production. It takes about 3-4 weeks from seed to planting of a seedling and another 6-8 weeks to harvest. Crops are planted on a weekly basis. Up to 12 crops per year can be grown. Gross revenue potential for lettuce is around $10/sq.ft.

Lettuce

The picture shows leaf lettuce being grown on a floating system where nutrients are supplied from fish waste. The system is called Aquaponics where fish and plants are grown together.

Other possible vegetables:

With demographic changes different types of vegetables are imported in the market. There is no economic data available and also standard production practices need to be researched. Few examples include, okra, fenugreek, spinach, several brassica species like rappini, amaranth, different types of radishes and others.

Leafy herbs, baby green and micro greens

LED lights use on leafy vegetables Water spinach

The market for microgreens, baby lettuce, spinach, arugula, dil, mints and many other herbs has been developing during the past decade primarily for direct supply to restaurant markets. Floating hydroponic systems are being used for this purpose. It is a high capital cost area due to use of supplemental lights. Recently many growers have installed LED lights for winter production of leafy vegetables. A grower successfully grows water spinach for Chinese markets.

Cut flowers

Some of the more common cut flowers such as roses and chrysanthemums are being cautiously planted now due to the ease of their importation from southern climates (equator countries). This import pressure has also served to lower average prices. There has been no new greenhouse investment into cut flowers for the past two decades.

More difficult to import cut flowers such as gerbera, snapdragon, lily and lisianthus are being planted more often. The bulk of the cut flowers are sold through the traditional retail flower shops and as such have not enjoyed big increases in sales. The "Cash and

Carry" type of marketing by the large chain stores and independent fruit/vegetable markets is moving an increasing volume of cut flowers.

Yields and therefore revenues will fluctuate greatly but expected gross returns per sq. ft. will be in the $8-$12 range.

Potted flowers - can be classified as being on a weekly schedule such as chrysanthemums, violets, begonias, etc. or holidays such as poinsettia, Easter lily and hydrangea. For this type of crop, the cost of production can include the pot, media, plant material(cuttings, bulbs, etc.), growing time on the bench (usually calculated at $0.15 per sq. ft. per week) and shipping material (pot cover, box). Revenues are in the $12 per sq. ft. area but can be significantly higher depending on pot sizes and number of crops per year (i.e. turns on the bench). Since the past decade the production of poinsettias has been declining because of cheaper imports from BC and Ontario.

The major market for potted plants is the chain store, which has taken over to a large extent from the traditional retail florist. Low mark ups, little/no service and strong competition are what has kept retail prices stagnant for potted crops.

Bedding Plants:

The Spring production of bedding plants is quite often the starting point for people getting into the greenhouse business probably because of the strong demand for plant material and the relative ease of starting. Many will start with a small hoop-shaped Quonset greenhouse, unit heater, ventilation fan and some snow fence benching.

Growers can purchase flats already filled with media, plugs (small, singulated plants) from specialist propagators or buy already transplanted flats for their greenhouse. In short, you can be in business very quickly.

The bedding plant season usually will yield 1.5 turns for the floor space and about 25% additional with overhead hanging baskets. Gross returns are in the $8 per sq. ft. area. Average wholesale price per flat is $8 with direct costs being around $5.

Bedding plants are either sold direct (by retail growers) or to the chain store/garden centres. In Alberta retail sales continue well into July and August of potted material and hanging baskets. Planning should be done accordingly.

Tree Seedlings

Production of tree seedlings in greenhouses primarily spruce and pine started in late 1990s when bare root production was considered as not economical. About 80 million seedlings are produced in various tree nurseries. Different stock types are grown. It should not be grown on speculation. They are grown on contracts. Good knowledge of setting buds and hardening is required to grow these seedlings.

White spruce in greenhouses. Note irrigation system and black plastic curtains for photoperiod control.

Using Warehouses for Indoor commercial production of crops - Vertical Farming

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Introduction: With an increased interest in locally grown produce, Urban Farming ideas and discussions have increased in the media and at conferences. Recently City of

Edmonton started working on a project " Food and Urban Agriculture Project". In its terms reference it is suggested: "Proposals and recommendations regarding creation, support and governance of a Food Policy Council and a City-Wide Food and Agriculture Strategy will be brought forward for City Council's consideration by the end of 2012.

Anticipated benefits are economic, social and environmental, including opportunities for growing food for personal use or sale, an increased role of greenhouse based agriculture, food processing business activities, food waste recycling and support for local food choices by retail and community markets". The details of this Terms of Reference can be found at **www.edmonton.ca/meetings**, under the Executive Committee October 5, 2011 meeting minutes. An Advisory Committee had its first meeting on November 23, 2011. A Terms of Reference have been established for the Committee's work and can be found on the Food and Urban Agriculture Project webpage (**www.edmonton.ca/foodandag**). Check this page for future development.

It appears that exciting developments are taking place and use of available warehouses and roof top gardening is being questioned more. One can see daily news on roof top gardening in heavily populated areas of the world where land resources are scare.

Historical Facts: It appears that such interests in Urban Farming has been around before as well. People have used garages and warehouses to grow leafy crops like basil and lettuce successfully. One of the examples was Sun-Country Foods which used a warehouse in Spruce Grove to grow lettuce at 5 levels using supplemental lights. I remember some funds came from Ven-Cap (Venture Capital). It was an exciting idea in a cold climate where production can be scheduled and multiplied 5 times. It was fairly "robotic" in the sense that lettuce transplants were place in troughs by a machine and those troughs moved constantly from one side to the other and by the time they reached the other side they were ready for harvest. High Pressure Sodium lamps were used to provide light. There was good production and quite a learning experience when plants are moved. At the end the company went out of business and the reason appeared to be the production costs and the price which could be obtained in the marketplace. The wholesalers were able to get similar product from U.S at a cheaper price. Managing insects and diseases in such a controlled climate was also a factor.

I also recall a fellow growing basil at 5 levels using fluorescent lights and was able to supply market pretty well. But after sometime it disappeared from the market and I don't know the reasons. I also remember another fellow who experimented with hydroponics in his basement to grow lettuce and then tried to market the system at various levels.

What you should know before buying a warehouse for production?:

- **Plants need for growth and production**: Simply stated plants need light, sunlight or from Supplemental sources like lamps and light is at the top of the list of growth factors. Remember natural light from sun is free and installing artificial lights is

expensive both from capital costs and operating costs. Argument can be made that electricity is going to be produced from alternate sources. Then of course is carbon di oxide, proper temperature ranges for day and night and water and nutrients.

- **Infrastructures supporting the optimum growth**:

  Heating and ventilating systems to maintain proper temperature. Sometimes we think that it is an insulated warehouse so minimal heating may be required. Your costs for cooling may be higher in this situation. Then one has to decide on a system for growing plants. Would it be a Hydroponics system, Aquaponics, Nutrient Flow System or a Deep Flow System. If production is going to be in a containers, then how they are going to be set up and what will be a good irrigation system? How carbon di oxide is going to be supplied? If a greenhouse is going to be set up on roof top then the logistics will be different than in a warehouse. One of the challenge is going to be controlling insects and diseases.

- **Have you enough information on current greenhouse industry in Alberta and Canada**?

  Alberta greenhouse crops industry is well documented and kept up to date along with economic information. Become a member of the Alberta Greenhouse Growers Association (www.agga.ca) and check out member's section and you will find out lot of good information for making good decisions.

- **Market Intelligence and information:**

  Simply saying that you know somebody in the wholesale grocery system is not going to be enough. Know the market trends, what is coming into the province and what is being locally produced. Alberta Greenhouse Industry Profile is a good reference material. Agriculture and Agri-Food Canada has very good information on Horticulture. Check **www.agr.gc.ca** and you will find out information on imports and exports of many greenhouse crops. There is also very good information on production costs at **www.agric.gov.ab.ca**

- **What type of crops are to be grown?**

  This will be based on markets on the concept you are going to use. Technically speaking, crops like cucumbers, tomatoes and peppers are challenging to grow in warehouse situations. They need to be trained vertically at certain spacing and artificial lights. Artificial light is only available to the top of the crop and minimum light is diffuses. We have good information available on cucumbers, tomatoes and peppers in normal greenhouses where natural light is used. For the past 4 years growers have added High Pressure Sodium Lights which are used from

Example of an indoor, vertical farm where leafy vegetables are grown on a floating hydroponics system

October to March and thus supplying more vegetables for Winter markets.

Single layer crops like lettuce and other leafy green lend themselves better to warehouse situations especially when combined with floating hydroponic system. We don't have any good data on production per sq.m and production costs.

What I want to say is get as much information as possible and make it part of knowledge for your business plan. Totally enclosed system are managed differently than a normal greenhouse. At this time good economic information is lacking on totally enclosed systems.

Resources

Further Contact:

- Dr. Mohyuddin Mirza, consultant with Alberta Greenhouse Growers Association, 780-885-0652, drmirzaconsultants@gmail.com
- Green Acres Agricultural Consulting Group, 780-450-4943, greenacres@greenacresgroup.com, www.greenacresgroups.com

- **Emmanuel Anum Laate,** Senior Crop Economist
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Associations/Conferences/Trade Magazine/Websites

- Alberta Greenhouse Growers Association, agga.ca
- Landscape Alberta
- Green Industry Show and Conference, annual conference of green trade www.greenindustryshow.com
- Canadian Greenhouse Conference
- Alberta Greenhouse Growers Association Newsletter - part of AGGA membership benefit.
- Greenhouse Canada monthly magazine. AGGA members get it as part of their membership.