

# Vegetables

## HISTORY

A *vegetable* is the edible portion of a plant with a soft stem (as opposed to a woody stem). Vegetables are categorized by what part of the plant is edible.

Vegetable farming began over ten thousand years ago in several places around the world. It grew out of gathering and collecting, and later cultivating, locally grown crops, and then expanded to include exotic crops introduced by trade. Today, most vegetables are grown all over the world as climate permits.

## VARIETIES

In Manitoba, farmers grow seven categories of vegetables:

1. **Leafy green vegetables** have edible plant leaves. Examples: lettuce, spinach, swiss chard, kale.
2. **Edible plant stem vegetables** have stems that are consumed. Examples: celery, asparagus, rhubarb.
3. **Root vegetables** have edible, fleshy large roots that grow underground. Examples: beets, carrots, parsnip, sweet potatoes.
4. **Tuber vegetables** have enlarged underground stems called tubers that are high in starch. Example: potatoes.
5. **Allium vegetables** are planted as a bulb or seed and eventually grow into a flowering plant. Examples: cultivated onions, scallions, shallots, leeks, chives.
6. **Cruciferous vegetables**, also known as Cole crops, are one of the largest groups of vegetables. Examples: broccoli, cauliflower, cabbage, Brussels sprouts.
7. **Marrow vegetables**, also known as cucurbit fruiting vegetables, have an elongated shape and creamy white to dark green smooth skin. Examples: cucumbers, squash, zucchini.

## PRODUCTION

Before a seed or seedling is placed into the ground, the soil must be prepared to create a good seed bed. Farmers use machines like discers, cultivators, or rototillers to break up surface soil crusts and any clumps of soil. This creates a soft, even soil bed which allows water and air to penetrate easily. A good seedbed makes it easier for the seedlings to emerge from the soil and ensures good germination (growing from seed to sprout).

Factors that impact the emergence of seedlings include:

- **Soil crusting**, which is caused when soil particles stick together and form a crust on the top of the soil.
- **Soil temperature**, which can affect the germination of seeds. Each type of crop has an optimum soil temperature range for maximum germination.
- **Soil moisture**, which affects the seed's ability to absorb sufficient moisture and germinate.

In Manitoba, vegetables are produced by *direct sowing* or *seedling planting*.

**Direct sowing** means putting seeds directly into the prepared soil. Seeds are placed an equal distance apart using precision seeding equipment such as belt seeders, disk or plate seeders, or vacuum seeders. This ensures that every plant has the space it needs to grow. Direct sowing is used for vegetables with delicate roots and taproots, such as carrots, turnips, parsnips, rutabagas, and radishes as well as other vegetables like asparagus, beets, broccoli, cabbage, cauliflower, lettuce, and onions.

**Seedling planting** is the practice of putting sprouted seedlings into the soil with a tool called a transplanter. Seedlings can be grown in the field or greenhouses. In Manitoba, the most



## DID YOU KNOW?

Peppers, pumpkins, cucumbers, eggplant, zucchini, and squash are often considered vegetables, but technically, they are actually fruit! Fruits produce seeds, but vegetables do not.

common type is *rootball seedlings*. These are grown in pots or blocks and are then moved to the planting site with the soil attached to the roots.

Seedling planting has many benefits for vegetable production and yields. It reduces the risk of plant failure, improves plant growth, extends the growing season, improves crop uniformity, and enhances crop maturation and hardiness.

Growing vegetables from seedlings is more appropriate than direct sowing for slow-growing perennials, fine and expensive seed crops, and warm-season crops. It is also recommended for annual vegetable crops when the soil is too cold or moist for direct sowing.

Like precision seeding, transplanting prevents overplanting and ensures each plant has enough space to grow at the same rate as the rest of the crop. No matter how it is done, precision planting also saves money because less seed is required.

As plants grow, one of the major challenges is protecting the plants from pests, diseases, and weeds. Pest management techniques have evolved into what is known as *integrated pest management* (IPM). IPM uses many crop protection methods and tactics to control threats to vegetable crops. For example, some methods include purchasing certified seed that is free of disease, choosing a *cultivar* (plant breed) that is pest resistant, monitoring the crop regularly for the presence of pests, establishing controls and thresholds for allowable damage, using chemical and biological pesticides, and introducing beneficial predators.

## WATER

Water is vital for vegetable growth because most vegetables are over 80 percent water. Large amounts of water are needed not only for growing but for cooling and washing the vegetables. Water for *irrigation* can be sourced from lakes, ponds, rivers, streams, wells, dugouts, or municipal supplies. Even if farmers have direct access to a water source, they must get special

licenses to use the water for their vegetable operations.

Irrigation is a critical component of most vegetable operations. It provides crops with consistent moisture and nutrients they need to grow and can improve crop yields and quality. Irrigation must be managed carefully, though: too much water can lead to disease, cause run-off, and cost more for the farmer.

Irrigation systems come in many different styles. The type of irrigation systems required for a vegetable crop is dependent on the soil type, topography, water supply, crop type, field size and budget. The latest *smart irrigation systems* measure all these things as well as current weather conditions to determine when to turn irrigation on and off. These smart systems decrease water use while maximizing yields by ensuring that the crop gets exactly the right amount of water exactly when it needs it. The farmer can keep track of what their irrigation system is doing on their phone.

## GROWING SEASON

The Manitoba growing season is relatively short, usually beginning in early spring and ending in fall. Producers can use a combination of techniques to extend the growing season, including transplants, raised beds, soil mulches, row and crop covers, and high tunnels.

Crops are removed from the fields by hand or machine. To make sure only the highest quality vegetables reach the market, farmers take care to harvest them at exactly the right time. Farmers also handle vegetables carefully after harvest. A late harvest or improper post-harvest care can shorten vegetable shelf life or result in rot or decay.

Once vegetables are harvested from the fields, they are washed, inspected, and graded by size and shape. Some are immediately packaged for market, but some types of vegetables are placed into short-term or long-term storage to allow for supply long after harvest. Many vegetables can be stored for a long time in storage environments that provide complete control over temperature, humidity, and ventilation.



Many vegetable production operations in Manitoba could not plant or harvest their crops on time without the help of an international community of temporary foreign workers during the annual crop production. The Seasonal Agriculture Worker Program (SAWP) between Canada, Mexico, and Caribbean countries brings over 550 workers to Manitoba every year to work in the agriculture sector. In 2018, 58 percent of the jobs filled by foreign workers were in greenhouse, nursery and vegetable production. Often, temporary foreign workers return to the same farm each year and form strong relationships with the farmers and their operations.

## FOOD SAFETY

From farmers to processors to retailers, everyone along the food chain follows rigorous agricultural, storage and production practices to keep the vegetables they handle clean and safe. These steps include ensuring the quality and safety of irrigation water, controlling storage conditions, following proper hygiene practices, sanitizing equipment and facilities, and more.

Vegetables are sometimes served and eaten raw, so it's important to follow regular food safety practices at home to maintain quality and safety.

1. **Wash** your produce before eating it.
2. **Discard** the outer layers of leafy vegetables such as lettuce or cabbage.
3. **Clean** your hands and the utensils you use (scrub brushes, cutting boards, colanders, and the sink itself) for at least 20 seconds before using them to wash or prepare your vegetables.
4. **Prevent** cross contaminating your vegetables with other items in the kitchen by storing them separately and cleaning surfaces (including cutting boards) between each use.

## NUTRITION

Remember to “eat the rainbow” of vegetables to get the widest range of nutrients and benefits from your diet. Vegetables are nutrient-dense foods that help keep our body healthy. A diet rich in vegetables can lower blood pressure, reduce the risk of heart disease and stroke, prevent some types of cancer, lower risk of eye and digestive problems, and have a positive effect on your blood sugar, which can help keep appetite in check.

Vegetables are high in **dietary fibre**, which moves through your digestive tract and helps it function properly. A high-fibre diet can help reduce the risk of obesity, heart disease and diabetes. Peas, squash, parsnips, kale, broccoli, carrots, and spinach are

just a few examples of vegetables with high fibre content.

Vegetables are also high in vitamins. Carrots, for instance, are rich in beta carotene, which your body converts into **Vitamin A**, known for promoting good vision. Leafy green vegetables such as kale, spinach and broccoli are also high in Vitamin A. **Vitamin C** helps heal cuts and wounds and keeps teeth and gums healthy. You have lots of choices when it comes to getting enough Vitamin C in your diet. Eat plenty of broccoli, Brussels sprouts, cauliflower, green and red peppers, spinach, and/or cabbage. **Folate**, a B vitamin, helps the body produce red blood cells. Research suggests it may have cancer-fighting benefits, too. Fill up on folate by eating lots of dark leafy green veggies, including turnip greens, romaine lettuce, spinach, Brussels sprouts, and broccoli.

Vegetables also contain many minerals you need to stay healthy. **Calcium** helps maintain healthy bones and teeth, and keeps muscles, nerves and some glands functioning normally. Broccoli, spinach, podded peas, and kale are examples of vegetables high in calcium. **Iron** is needed for healthy blood and normal cell function. You can find lots of iron in spinach, sweet potatoes, peas, broccoli, and kale. **Magnesium** is necessary for healthy bones. It keeps your heart rhythm steady, balances your blood sugar, and helps your nerves send and receive messages. Spinach, kale, green peas, and potatoes (with the skin on) are foods high in magnesium. **Potassium** helps maintain healthy blood pressure. Potatoes and leafy greens are vegetables high in potassium, as are beets and beet greens, Brussels sprouts, spinach, and sweet potatoes.

**Phytonutrients** give vegetables their vibrant colours and flavour and have nutritional benefits of their own. Many have cancer-fighting properties, promote heart health, good digestion, boost immune response, prevent blood clots, lower blood sugar, and more.

## ENVIRONMENT

Taking action to conserve and manage the land helps to ensure that vegetable farms remain valuable and can produce into the future. Managing the land well and paying attention to the health of its water, soil and other natural resources help it stay productive.

## SPOTLIGHT: CARROTS VS CABBAGES

Not all vegetables are planted, grown, harvested and stored the same way. Each crop has unique characteristics and demands. Let's compare carrots and cabbages – two vegetables most of us are familiar with – to highlight some of the many similarities and differences.

	Carrots	Cabbages
<i>Soil Preference</i>	Carrots are a cool weather crop, which means they germinate in cold soil and mature in cool weather and short periods of daylight. They prefer deep, loose, fertile soils to help grow long, straight roots.	Cabbage is also a cool season crop. A shallow-rooted plant, it prefers loose, well-drained soil with plenty of nutrients.
<i>Planting</i>	Carrot seeds are direct seeded mid-May, or late May for crops that will be stored over the winter. Rows are spaced 60 to 90 cm apart, and the seeds are planted 2.5 cm below the surface. Seeds are treated to prevent decay.	Unlike carrots, cabbage is seeded in the greenhouse and then transplanted into the ground in early spring. Transplanting reduces seed costs, accelerates crop development, increases yield, and eliminates some of the challenges of growing from seed. Cabbage seedlings are planted in rows 75-90 cm apart, with 25-40 cm between plants in each row. They are fed a starter solution of nitrogen and phosphorous.
<i>Irrigation</i>	Carrots don't tolerate drought or high temperatures, so they need adequate irrigation for optimum growth. However, they don't like too much water, which can encourage disease and forking of the roots. To prevent too much moisture from damaging the plant, they're <i>hilled</i> like potatoes (grown on raised beds). For most of the growing season, carrots require approximately 2.5 cm of water per week.	Because of their large leaf area, cabbages require at least 2.5 cm of water per week to sustain good growth. When growing cabbage in the field, farmers use <i>sprinkler systems</i> , which distribute water evenly overhead, or <i>drip irrigation systems</i> , in which tubing carries a uniform supply of water along the rows to the plants. Drip systems require less water to irrigate the plant and can also combine fertilizer with the water to increase yields.
<i>Harvest</i>	Carrots are ready for harvest when they reach ideal size and sweetness, between 70 to 80 days depending on the cultivar planted. Carrots are harvested using a machine that pulls out the carrots by the tops, and then <i>topping</i> them (removing the tops) in the field.	Cabbage matures in 63 to 88 days but is harvested slightly before that, just when the heads are firm, to lengthen storage time. Cabbage is harvested by hand, rather than by machine, and packed directly in the field.
<i>Storage</i>	In Manitoba, carrots are stored on the farm. Prior to harvest, the storage area is sanitized and dried. The carrots are cooled and stored at 0°C and 90 to 95 per cent relative humidity to prevent rot. State-of-the-art storage facilities can store carrots for six to nine months.	Cabbages are stored on the farm at 0°C and a relative humidity of 100 per cent. They must be cooled quickly after harvest to retain their rich green colour. They are stored in facilities that allow farmers to precisely control temperature, humidity, and air flow. The heads are usually placed in pallet boxes to help air circulate. Cabbages are never stored with fruit to avoid discolouring caused by the ethylene gas fruits give off.
<i>Market</i>	When farmers are ready to ship carrots to the store, they are washed and bagged on the farm. You purchase them in bags at the grocery store.	Farmers pack cabbages as individual heads, which are boxed and shipped to the store and purchased that way.

### INDUSTRY IN MANITOBA

**Production:** 20,515 metric tonnes (2019)  
**Number of Producers:** 196 (2016)  
**Value to Economy:** \$32.5 million (farm gate value, 2019)



### INDUSTRY IN CANADA

**Production:** 2,183,527 metric tonnes (2019)  
**Number of Producers:** 5,514 (2016)  
**Value to Economy:** \$1,294 million (farm gate value, 2019)



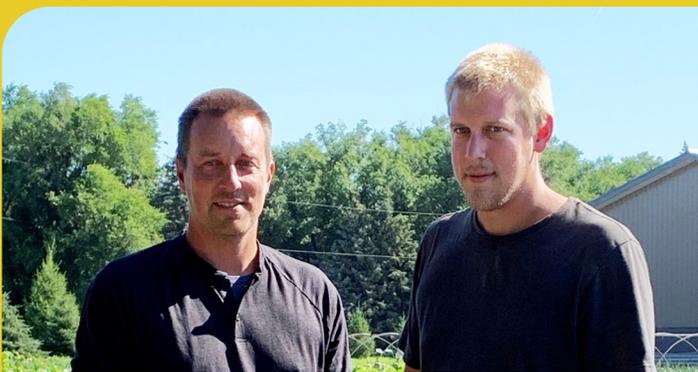
## CAREERS

- » Farmer
- » Accountant
- » Marketing specialist
- » Agronomist
- » Parts sales
- » Mechanic
- » Seed producer
- » Irrigation specialist
- » Geneticist
- » Truck driver



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## FARMER PROFILE



### TIM & PHIL ROOK Carman, Manitoba

“For vegetable farmers like us who live off the land, it’s important to take care of the world we live in. This means taking care of people by providing good food. It also means taking care of our farm. Since all the vegetables we grow come from the ground and depend on the nutrients in it, we work hard to maintain healthy soil and healthy fields. Having a farm that is sustainable for generations to come is a must.”