
Chapter Vegetables



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Chapter 20

Vegetables



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I. Beans, Snap

A. Food Value

A pound of raw green bean pods broken into 1- or 2-inch lengths yields about 3 2/3 cups of cooked beans. They are composed of 90.1 percent water, 145 calories, 8.6 grams of protein, 0.9 gram of fat, and 32.2 grams of carbohydrates.

B. Description

Snap beans grown from the immature pod originated in Central America and were widely distributed by the Indians, basically as bush and pole beans. Bush beans ripen earlier, but pole bean yields are higher.

C. Yield Per Person

It is estimated that each person will consume 6 to 12 pounds of garden fresh beans and 12 to 14 pounds of canned or frozen beans per year. Each foot of row space planted to beans produces an average of 0.35 to 0.5 pound of snap beans. A 20- to 30-foot row of beans produces enough beans for one person.

D. Seedbed

Beans do best on sandy loam soil that warms up early in the spring and has a soil pH from 7.0 to 7.5 but can tolerate a soil pH near 8.0. Cultivate the soil for planting when the moisture in the soil allows the formation of a soil ball that crumbles into pieces under finger pressure. Cultivate to mix crop residues and organic matter into

the top 7 to 8 inches of soil, destroy current weed growth, and provide a granular soil bed for seeding. Overcultivation causes the soil to become powdery or to crust.

E. Seed Time

The best time to seed beans is after the last killing frost in the spring, when day temperature is 65°F and the night is expected to average above 55°F. Select early maturing varieties that ripen in 55 to 70 days.

F. Planting Specifications:

<i>Seed per foot</i>	<i>6 to 8</i>
<i>Row width</i>	<i>18 to 30 inches</i>
<i>Germination</i>	<i>6 to 14 days</i>
<i>Seed depth</i>	<i>1 1/2 to 2 inches</i>
<i>Ounce per foot</i>	<i>0.13</i>
<i>Plant spacing</i>	<i>2 to 4 inches</i>

G. Planting Suggestions

Beans need a warm soil to grow and good spacing for sunlight. Some gardeners are tempted to soak their seeds before planting. This practice injures many of the bean varieties, and could result in poor germination and diseased, weak plants.

H. Fertilizer

Beans are a legume and can produce some of their own nitrogen (N) because of their N fixation ability. The seed may be inoculated with rhizobium to stimulate additional fixation. To supplement this, add a preplant fertilizer of 0.2 pound of N for each 100 square feet. After the first heavy bloom and set of pods, sidedress with 1 1/2 ounces of ammonium sulfate.

The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants are easily over- or under-fertilized.

Acknowledgment

The author compiled information for Chapters 19 and 20 from the Virginia, Utah, Oregon, and Washington Master Gardener handbooks and adapted it to Idaho conditions.

I. Cultivation

Cultivate (shallow) when necessary to remove other plant competition. Deep cultivation close to the plants destroys much of the root system and reduces yield and quality.

J. Watering

Beans have a water stress point of 60 percent. When the percentage of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. To estimate water percentage, take a handful of soil at the 6-inch depth and squeeze it into a ball in your hand. If it forms a ball and your hand feels like it has a film of water on it, the soil moisture will be 60 percent or higher. If the soil moisture is below 60 percent, you will not feel the film of water on your hand, and it is time to water again. Plant growth can suffer from too much or too little water. The symptoms will be the same. As the percentage of soil moisture drops the oxygen level in the soil increases.

K. Insects

Lygus bugs, nitidulid beetles, aphids including the bean aphid, army worms and cut-worms, grasshoppers, pea leaf weevil, corn maggot, slug, spider mites, cucumber beetles, and wireworms create problems in beans.

L. Diseases

Common diseases include brown spot, curly top, halo blight, mosaics, necrosis, root rot, rust, sclerotinia disease, white mold, seed rot, and seedling blight.

M. Harvesting

Beans can be harvested when pods are 3 inches long but before the seed is much larger than the diameter of a pencil lead. Harvest every 3 to 4 days to prevent over maturity. Frequent picking stimulates the plants to produce new pods and helps to ensure a heavy harvest. Disturbing wet vines spreads rust and other diseases.

II. Beets

A. Food Value

A pound of raw, peeled, common red beets consists of 90.9 percent water, 5.0 grams of

protein, 0.5 gram of fat, 23.7 grams of carbohydrates, and 145 calories.

B. Description

Beets are native to the Mediterranean area of north Africa, Europe, and west Asia. They are cool weather biennials that are grown as annuals for their leaves and roots. The roots may be round, flat, or elongated. They are usually red in color, but there are several golden varieties.

C. Yield Per Person

On the average, each person consumes 7 to 12 pounds of fresh beets during a growing season, and an additional 12.5 to 30 pounds of canned and frozen beets. Each foot of row space should produce approximately 1.25 pounds of beets.

D. Seedbed

Beets grow best in sandy loam and peat soils. Heavy clay soils can be improved by the addition of organic matter. Seedbed preparation should start when the soil has sufficient moisture to form a ball that crumbles into medium-sized fragments. Cultivate to mix crop residues and organic matter into the top 7 to 8 inches of soil, destroy current weeds, and provide a small granular-type bed for planting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for beets is from 6.0 to 7.5, although a pH value near 8.0 is acceptable.

E. Seed Time

The best time to seed beets is 2 to 4 weeks before the last killing frost in the spring when soil temperature is 50°F or above. Select early maturing varieties that ripen in 55 to 65 days.

F. Planting Specifications:

Ounce per foot	0.01
Seed per foot	15 to 20
Row width	2 to 18 inches
Germination	10 to 15 days
Seed depth	1/2 to 1 inch
Plant spacing	2 to 3 inches
Row spacing	12 inches

G. Planting Suggestions

Beets need a cool soil to grow and good spacing for sunlight. Their frost tolerance is

moderate. They are not harmed by spring and fall frosts, but their roots may become tough during hot weather. The seed of beets is actually a dried fruit or seed ball containing several tiny true seeds. Heat, drought, or crusting of the soil surface interferes with seed germination and emergence. Make successive plantings 3 weeks apart to ensure a continuous supply of young beets.

H. Fertilizer

Preplant fertilizer is a recommended 0.2 pound of N for each 100 square feet. No sidedressing is required. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

I. Cultivation

Use shallow cultivation when necessary to remove other plant competition. Deep cultivation close to the plants destroys much of the root system and reduces yield and quality.

J. Watering

Beets have a water stress point of 50 percent. When the percentage of water in soil drops below this level, the plants will start to dehydrate, and growth will be slowed down or stopped. To estimate the water percentage take a handful of soil at the 6-inch depth and squeeze it into a ball in your hand. If it forms a ball but feels dry, the soil moisture will be 50 percent or higher. If the soil moisture is below 50 percent, the ball will be fragile and break apart with slight pressure, and it is time to water again. Plant growth can suffer from too much or too little water. The symptoms will be the same. Plants need water, oxygen, and nutrients to grow.

K. Insects

Alfalfa looper, army worm, cutworms, flea beetles, two-spotted mite, variegated cutworm, zebra caterpillar, and nematodes are common beet pests.

L. Diseases

Disease problems include boron deficiency, curly top, damping-off, downy mildew, and leaf spot.

M. Harvesting

Beets can be harvested as soon as the roots are large enough to use. Early thinning is critical for beets to develop large, tender roots. Leave 2 inches between plants. The tops of beets removed during thinning can be used for "greens." Beets are ready to be pulled up for their roots 8 to 9 weeks after seeds are sown. Roots are most tender when less than 2 inches across. Harvest for storage before roots become woody. Pull the beet and cut off the tops, but leave 1 to 1 1/2 inches of top above the crown. To see if roots are ready for use, push the soil away from the top of the beet and check its size.

III. Broccoli

A. Food Value

A pound of broccoli stalks (head or bud clusters, stem, and leaves) consists of 89.1 percent water, 16.3 grams of protein, 1.4 grams of fat, 26.8 grams of carbohydrates, and 145 calories.

B. Description

Broccoli is a member of the cabbage family with similar requirements and problems. It was developed in southern Europe and brought to America by immigrants. The plant has a loose flower head on a tall, green, branching stalk. The flower heads are formed both terminally and laterally. The plant may grow to 3 to 5 feet tall.

C. Yield Per Person

It is estimated that each person consumes 3 to 5 pounds of fresh broccoli during a growing season and an additional 5 to 6 pounds of frozen broccoli each year. Each foot of row space produces about 0.75 pound of broccoli.

D. Seedbed

Broccoli will grow in most soils from sand to clay. Seedbed preparation should start when the soil has sufficient moisture to form a ball that crumbles into medium-sized fragments. Cultivate mix crop residues and organic matter into the top 7 to 8 inches of soil, destroy weed growth, and provide a small granular-type bed for transplanting. Overcultivated soil becomes powdery and

has a tendency to crust. The ideal pH for broccoli is from 6.0 to 7.0, but values near 8.0 are acceptable.

E. Seed Time

The best time to seed broccoli is 6 to 8 weeks before transplanting when soil temperature is 50°F or above. The variety should have an early maturity date and be suitable for weather conditions in the area planted. The maturity date should be 60 to 80 days after transplanting. Plant in containers inside for early crops and transplant after last frost.

F. Planting Specifications:

<i>Seed per foot</i>	<i>3 to 4</i>
<i>Row width</i>	<i>24 to 30 inches</i>
<i>Germination</i>	<i>3 to 10 days</i>
<i>Seed depth</i>	<i>1/2 inch</i>
<i>Plant spacing</i>	<i>20 to 24 inches</i>

G. Planting Suggestions

Broccoli needs a cool soil to grow and good spacing for sunlight. If transplants are purchased, they should be stocky and from 4 to 6 inches tall.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended. Three weeks after transplanting, sidedress with 1 1/2 ounces of ammonium sulfate (southern Idaho) or ammonium nitrate (northern Idaho) per 10 feet of row. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

I. Cultivation

Use shallow cultivation when necessary to remove other plant competition. Deep cultivation close to the plants destroys much of the root system and reduces yield and quality.

J. Watering

Broccoli has a water stress point of 60 percent. When the percentage of water in soil drops below this level, the plant will start to dehydrate and growth will be slowed down or stopped. The percentage of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into

a ball in your hand. If it forms a ball and your hand feels like it has a film of water on it, the soil moisture will be 60 percent or higher. If the soil moisture is below 60 percent, you will not feel the film of water on your hand, and it is time to water again.

Plant growth can suffer from too much or too little water. The symptoms will be the same. As the percentage of soil moisture drops, the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

K. Insects

Aphids, cabbage maggots, cabbage worm, cabbage looper, diamond back moth, flea beetles, spider mites, and wireworms are common broccoli pests.

L. Diseases

Diseases include bacterial soft rot, club root, and downy mildew.

M. Harvesting

Broccoli should be harvested when the center head is 4 to 6 inches across, but before the buds separate or open. Lateral buds will develop into smaller heads after the terminal head is removed. When a head is ready for use, cut the stem 3 inches below the flower buds.

IV. Brussels Sprouts

A. Food Value

A pound of Brussels sprouts consists of 85.2 percent water, 22.2 grams of protein, 1.8 grams of fat, 37.6 grams of carbohydrates, and 204 calories.

B. Description

Brussels sprouts originated in Europe, the principal location being Brussels, Belgium. They resemble small cabbages but require a longer growing season. Each plant grows to about 2 1/2 feet tall, bearing small cabbage like buds along its stem. Each stem may bear as many as 100 1- to 2-inch ball-like sprouts.

C. Yield Per Person

On the average, each person eats from 1.5 to 3.75 pounds of fresh Brussels sprouts during a growing season and uses an additional 3.75 to 6 pounds of canned or frozen sprouts

during the year. Each foot of row space produces about 0.5 pound of Brussels sprouts. From 3.5 to 8.5 feet of row space per person should be planted for fresh use during the growing season and an additional 3.5 to 14 feet for canning or freezing.

D. Seedbed

Brussels sprouts are adaptable to different soils as long as the soils are fertile, have good texture, and are moist. Brussels sprouts mature less rapidly than cabbage. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that you can crumble into medium-sized fragments. Cultivation should mix crop residues and organic matter in the top 7 to 8 inches of soil, destroy current weed growth, and provide a small granular-type bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for Brussels sprouts is from 6.0 to 7.5; they do well in Idaho's soil, which ranges from 7.0 to 8.0.

E. Seed Time

The best time to plant Brussels sprouts seed in containers is 4 to 6 weeks before transplanting in the garden, when soil temperature is 40°F or above. Seed planted in the garden for later maturing plants should be inserted into the soil as soon as the soil can be cultivated, 6 to 8 weeks before the last killing frost. The variety of Brussels sprouts planted should have an early maturity date and be suited for weather conditions in the area planted. The maturity date should be 80 to 90 days after transplanting.

F. Planting specifications—

<i>Seed per foot</i>	<i>3 to 4</i>
<i>Row width</i>	<i>24 to 30 inches</i>
<i>Germination</i>	<i>3 to 10 days</i>
<i>Seed depth</i>	<i>1/4 to 1/2 inch</i>
<i>Planting space</i>	<i>18 to 24 inches</i>

G. Fertilizer

Brussels sprouts require good fertility and moisture. A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended. When the plants are one-third grown, sidedress with 1 1/2 ounces of ammonium sulfate in high pH soils or ammonium nitrate in low pH soils per 10 feet of

row. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

H. Cultivation

When necessary, cultivation should be shallow to remove other plant competition. Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality. Hilling soil up around the main stem of the cabbage may stimulate early heading.

I. Watering

Brussels sprouts have a stress point of 55 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball and your hand feels like it is moist but does not leave a film of water on it, the soil moisture will be 55 percent or above. If the soil moisture is below 55 percent, the moisture will not be felt on your hand, and it is time to water again.

Plant growth can suffer from too much or too little water. The symptoms will be the same. As the percentage of soil moisture drops the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

J. Insects

Aphids, flea beetles, cabbage looper, garden symphylans, slugs, thrips, and cauliflower head maggot are common pests.

K. Diseases

Brussels sprouts diseases are minimal in Idaho but may include bacterial soft rot, blackleg, club rot, and sprout rot.

L. Harvesting

Remove lower leaves as sprouts start to enlarge. Harvest sprouts as they become solid at about 1 to 2 inches in diameter. The lowest sprouts will mature first. To speed up sprout maturity pinch off the tip of each plant in late August or early September,

however, this may reduce the total yield of the plant by as much as one third. Break the sprouts from the stalk. The tastiest sprouts will be those that mature after the first fall frost.

M.Storage

When night temperatures drop to 20°F on a regular basis, dig up the plants with a little soil remaining around the roots. Put them into a deep cold frame or in an unheated dark garage. They will continue to grow until all the sprouts mature.

V. Cabbage

A. Food Value

A pound of cabbage consists of 92.4 percent water, 5.9 grams of protein, 0.9 gram of fat, 24.5 grams of carbohydrates, and an average of 109 calories.

B. Description

Cabbage ranks as one of the most important homegrown crops. It may be globular, flat, or flowery and green, red, or purple. It was developed from wild leafy nonheading plants native to Europe.

C. Yield Per Person

On the average each person eats 4 to 5 pounds of fresh cabbage during a growing season, and an additional 6 to 12 pounds of canned or frozen cabbage during the year. Each foot of row space produces about 1.5 pounds of cabbage. Plant 5 to 6 feet of row space per person for fresh use during the growing season and an additional 7.5 to 15 feet for canning.

D. Seedbed

Cabbage is adaptable to different soils as long as they are fertile, have good texture, and are moist. Start seedbed preparation when the soil has enough moisture to form a mud ball that will crumble into medium-sized fragments. Mix crop residues and organic matter into the top 7 to 8 inches of soil, destroy current weed growth, and provide a small granular-type bed for transplanting. Overcultivated soil is powdery and has a tendency to crust. The ideal pH for cabbage growth is 6.0 to 7.5, and they do well in Idaho soil, which ranges from 7.0 to 8.0.

E. Seed Time

The best time to plant cabbage seed is 5 to 7 weeks before transplanting in containers. Large cabbage transplants may produce seed stalks if subjected to 3 to 4 weeks of 40° to 50°F weather. To help prevent this problem, plant out transplants when the stem is about the size of a pencil lead when soil temperature is 50°F or higher. Seeds planted in the garden for later maturing plants should be inserted into the soil as soon as the soil can be cultivated, 6 to 8 weeks before the last killing frost. Select cabbage varieties suited to weather conditions in the area planted. Maturity dates should be 65 to 95 days after transplanting.

F. Planting Specifications:

<i>Seed per foot</i>	<i>8 to 10</i>
<i>Row width</i>	<i>24 to 30 inches</i>
<i>Germination</i>	<i>4 to 10 days</i>
<i>Seed depth</i>	<i>1/4 to 1/2 inch</i>
<i>Plant spacing</i>	<i>4 to 6 inches</i>

G. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended. When the plants are one-third grown, sidedress with 1 1/2 ounces of ammonium sulfate in alkaline soils and ammonium nitrate in acid soils per 10 feet of row. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

H. Cultivation

Cultivation should be shallow, when necessary, to remove other plant competition. Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality. Hilling soil up around the main stem of the cabbage may stimulate early heading.

I. Watering

Cabbages have a water stress point of 55 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. To estimate water percentage, take a handful of soil at the 6-inch depth and

squeeze it into a ball in your hand. If it forms a ball and your hand feels like it is damp but does not have a film of water on it, the soil moisture will be 55 percent or above. If the soil moisture is below 55 percent, the dampness of water will not be felt on your hand, and it is time to water again. Plant growth can suffer from too much or too little water. The symptoms will be the same. As the percentage of soil moisture drops the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

J. Insects

Aphids, flea beetles, cabbage looper, blister beetles, diamond back moth, wireworms, and the imported cabbage worm are common cabbage pests.

K. Diseases

Cabbage diseases, minimal in Idaho, may include bacterial soft rot, blackleg, club rot, damping off and wire stem, downy mildew, drop or watery soft rot, leaf spot, and oedema.

L. Harvesting

Cabbage is ready to harvest 50 to 65 days after transplanting. The heads should be solid but must be picked before they crack. Soft heads have poor quality. Heads may split during hot weather if there is an over supply of water. Reducing irrigation or twisting the mature heads part of the way around to sever half the roots will allow mature cabbage to stay in the garden longer without losing quality. Plants harvested early in the summer and left with as many leaves as possible will often develop small heads on the stem next to the base of the leaves. These heads are edible and should be picked when firm.

M. Storage

Cabbage freeze at about 30°F. For storage, place mature cabbages in a pit, trench, or outdoor cellar. The temperature should be as near 32°F as possible but at least 40°F or below. Humidity should be high. Stored cabbages will last into early winter.

VI. Cantaloupes

A. Food Value

A pound of raw cantaloupe consists of 91.2 percent water, 3.2 grams of protein, 0.5

gram of fat, 34.0 grams of carbohydrates, and an average of 136 calories.

B. Description

Cantaloupes are native to India. The plants have separate male and female flowers on the same vine and are cross-pollinated. They do not cross-pollinate with cucumbers, gourds, watermelons, squash, or pumpkins. Cantaloupes may develop a bitter flavor because of cloudy weather, excessively high temperatures, or too much or too little water during the ripening period. They need a lot of heat and a long growing season to mature.

C. Yield Per Person

Each person eats about 8 to 10 cantaloupes during the growing season. Each foot of row space produces about 1 pound of cantaloupe, and 8 to 10 feet of row will supply one person.

D. Seedbed

Cantaloupes are adapted to most soils but grow best in a fertile mellow soil with large amounts of compost. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that will crumble into medium-sized fragments. Mix crop residues and organic matter into the top 7 to 8 inches of soil, destroy current weed growth, and provide a small granular-type bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for cantaloupe growth is from 6.0 to 7.5, but the fruit does well in Idaho soil, which ranges from 7.0 to 8.0.

E. Seed Time

The best time to transplant cantaloupes in Idaho is 3 weeks after the last killing frost. When transplanting, soil temperature should be 65°F or above, and night temperature should average above 55°F. Select varieties that ripen in 75 to 85 days after transplanting.

F. Planting Specifications:

<i>Seed per foot</i>	<i>1</i>
<i>Ounce per foot</i>	<i>0.05</i>
<i>Row width</i>	<i>60 to 72 inches</i>
<i>Germination</i>	<i>3 to 5 days</i>
<i>Seed depth</i>	<i>1 inch</i>
<i>Plant spacing</i>	<i>36 to 72 inches</i>

G. Planting Suggestions

Cantaloupes need warm soil to grow and good spacing for sunlight to ensure high sugar content and flavor. If transplants are used, they should be stocky. Soils should be well drained and contain large amounts of compost or well-rotted manure. Clear plastic mulch can be used around the plants to warm the soil.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended. One week after blossoming begins, sidedress with 1 1/2 ounces of ammonium sulfate per 10 feet of row. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

I. Cultivation

Cultivate no more than 1 inch deep to control weeds.

J. Watering

Cantaloupes have a water stress point of 60 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball and your hand feels like it has a film of water on it, the soil moisture will be 60 percent or above. If the soil moisture is below 60 percent, the film of water will not be felt on your hand and it is time to water again.

Plant growth can suffer from too much or too little water. The symptoms will be the same. As the percentage of soil moisture drops the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

K. Insects

Aphids, cucumber beetle, and squash bug are common pests.

L. Diseases

Diseases include Fusarium wilt, leaf blight, and powdery mildew.

M. Harvesting

Cantaloupes must ripen on the vine for maximum quality. Ripe fruit forms an abscission layer, and the stem loosens from the fruit. When the stem is nearly loose, the cantaloupe is said to be at the full slip stage. Softening of the blossom end, a change in color of the base of the pedicel from green to waxy, and a strong cantaloupe smell are indications of ripeness. Cantaloupe harvested before the full slip stage do not increase in sugar after picking.

VII. Carrots

A. Food Value

Carrots are a good source of vitamins A, B₂, and C, sugar, and iron. A pound of carrots consists of 88.2 percent water, 5.0 grams of protein, 0.9 gram of fat, 44.0 grams of carbohydrates, and an average of 191 calories.

B. Description

Carrots are related to the wild flower Queen Anne's Lace. They have bright green feathering foliage 10 to 12 inches tall and develop an orange yellow root.

C. Yield Per Person

Each person eats about 5 to 10 pounds of fresh carrots and an additional 10 to 15 pounds of canned or frozen carrots per year. Each foot of row space should produce about 1 pound of carrots.

D. Seedbed

Carrots grow best in sandy loam and peat soils. Heavy clay soils can be improved by the addition of organic matter. If you apply manure, do so sparingly and use only well-rotted manure to avoid rough, branching carrots. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that will crumble into medium-sized fragments. Cultivation should mix crop residues and organic matter in the top 7 to 8 inches of soil. It should destroy current weed growth and provide a small granular-type bed for transplanting. Over-cultivated soil becomes powdery and has a tendency to crust. The ideal pH for carrot growth is from 6.0 to 7.0, but it does well in Idaho soil, which ranges from 7.0 to 8.0.

E. Seed Time

Plant carrots after the last killing frost in the spring when soil temperature is 40°F or above. Their frost tolerance is moderate. Low temperature carrots grow long and have pointed tips. High temperature carrots have blunt tips. For an extended harvest, you can continue planting throughout the summer until about 70 days before the last expected frost. Most varieties mature in 60 to 70 days.

F. Planting Specifications:

Ounce per foot	0.02
Seed per foot	15 to 20
Row width	14 to 24 inches
Germination	10 to 17 days
Seed depth	1/2 inch
Plant spacing	1 to 2 inches

G. Planting Suggestions

Carrots prefer warm soil and need good spacing for proper root development. A salt or pepper shaker can be used to scatter seeds in the row. For small gardens, try growing carrots in raised beds at least 12 inches deep. A mixture of one-fifth garden soil, two-fifths sand, and two-fifths compost or peat moss works well. Carrot seedlings are tiny. Some gardeners mix a few radish seeds with the carrot seeds so they can see the row.

To prevent the soil from forming a crust that would inhibit the seedling's growth, cover the seeds with a light layer of compost, (sifted) grass clippings, and sawdust of vermiculite. A film of clear plastic over the seedbed will speed up germination by warming the soil, prevent crusting, and keep the soil moist. Remove the plastic as soon as the seedlings emerge. Thin seedlings to 2 inches apart.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended. No sidedressing is required. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Excessive N causes carrots to split into forks in the top half.

I. Cultivation

Cultivation should be shallow, when necessary, to remove other plant competition. Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality.

J. Watering

Carrots have a water stress point of 55 percent. When the percent of water in soil drops below this level, the plants will start to dehydrate, and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball, and your hand feels damp, but does not have a film of water on it, the soil moisture will be 55 percent or above. If the soil moisture is below 55 percent, the dampness will not be felt on your hand, and it is time to water. Plant growth can suffer from too much or too little water. The symptoms will be the same. As the percentage of soil moisture drops, the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

K. Insects

The following insects may cause problems: aphids, carrot rust fly, garden symphylan, wireworm, six-spotted leafhopper, and slug.

L. Diseases

Diseases include aster yellows, cottony soft rot, damping-off, leaf spot, deaf blight, motley dwarf virus, phytophthora root rot, and nematode soft rot.

M. Harvesting

Carrots can be harvested as soon as the roots are the size of your little finger. Harvest carrots before they become woody.

N. Storage

Carrots can be stored throughout the fall and winter in a pit, storage cellar, or covered row. Storage temperature should be as near 32°F as possible. Humidity should be high.

VIII. Cauliflower

A. Food Value

A pound of cauliflower with head and 4 to 6 inches of stem consists of 91 percent water,

23.2 grams of protein, 1.7 grams of fat, 44.7 grams of carbohydrates, and an average of 232 calories.

B. Description

The most delicate member of the cabbage family, cauliflower has similar requirements and problems. It was developed in southern Europe and is grown for its flower buds, which are clustered together in a head or curd. It may be difficult to grow because it requires cool temperatures, constant moisture, and frequent fertilizing. Cauliflower does not head up well in hot weather and is less tolerant of cold temperatures than cabbage. It grows about 2 feet high and has blue green leaves.

C. Yield Per Person

It is estimated that each person eats from 3 to 5 pounds of fresh cauliflower and 8 to 12 pounds of canned or frozen cauliflower each year. Each foot of row space produces about 1 pound of cauliflower.

D. Seedbed

Cauliflower grows in most soils from sand to clay. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that will crumble into medium-sized fragments. Cultivation should mix crop residues and organic matter in the top 7 to 8 inches of soil. It should destroy current weed growth and provide a small, granular bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for cauliflower is from 6.0 to 7.5. It is a plant that does well in Idaho's soil, which ranges from 7.0 to 8.0.

E. Seed Time

The best time to seed cauliflower is 6 to 8 weeks before transplanting when soil temperature is 50°F or above. The variety of cauliflower planted should have an early maturity date and should be developed for weather conditions in the area planted. Maturity date should be 60 to 80 days after transplanting. For transplants, start seeds indoors 5 to 7 weeks before the last expected frost. Seed directly into the garden as early as 4 weeks before the last expected frost. Allow 50 to 85 days for maturity, depending upon variety.

F. Planting Specifications:

<i>Seed per foot</i>	<i>3 to 4 per hill</i>
<i>Row width</i>	<i>30 to 36 inches</i>
<i>Germination</i>	<i>4 to 10 days</i>
<i>Seed depth</i>	<i>1/2 inch</i>
<i>Plant spacing</i>	<i>18 to 20 inches</i>

G. Planting Suggestions

Cauliflower needs cool soil and good spacing. If transplants are used they should be stocky and from 4 to 6 inches tall. Transplant about the same time as the last killing frost.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended.

When the plants are grown, sidedress with 1 1/2 ounces of ammonium sulfate in high pH areas or ammonium nitrate in low pH areas per 10 feet of row. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

I. Cultivation

Cultivation should be shallow, when necessary, to remove other plant competition. Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality. Hill the soil up around each plant.

J. Watering

Cauliflower has a water stress point of 60 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. The percent inches of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball, and your hand feels like it has a film of water on it, the soil moisture will be 60 percent or above. If the soil moisture is below 60 percent, a film of water will not be felt on your hand, and it will be time to water again.

Plant growth can suffer from too much or too little water. The symptoms will be the same. As the percentage of soil moisture drops, the oxygen level in the soil increases.

K. Insects

Aphids, cabbage maggot, cauliflower head maggot, diamond back moth, flea beetles, spider mites, and wireworms are common pests.

L. Diseases

Diseases include bacterial soft rot, club root, downy mildew, blackleg, black rot, damping-off, wirestem drop or watery soft rot, leaf spot, and oedema.

M. Harvesting

To prevent discolored heads, tie the plant leaves above the head to shade it when the head reaches golf ball size. Cut the head 4 to 6 days later. Make your decision based on the temperature, but be sure to cut it before the curd starts to separate. Leave 4 to 6 inches of stem with the head.

N. Storage

Cauliflower freezes at 30°F. Store in a cellar with a temperature as near 32°F as possible. Humidity should be moderately high. Stored under ideal conditions, cauliflower may last up to 6 to 8 weeks.

IX. Cucumber

A. Food Value

A pound of raw, whole cucumbers with skins consist of 95.7 percent water, 2.7 grams of protein, 0.5 gram of fat, 14.5 grams of carbohydrates, and provide an average of 64 calories.

B. Description

Native to Asia and Africa, cucumbers do not cross-pollinate with muskmelons or water melons, and the flavor of cucumbers is not affected by the pollen from these plants.

C. Yield Per Person

It is estimated that each person eats from 2.5 to 4 pounds of cucumbers per year, requiring a row of cucumbers 2 to 3 feet long.

Each foot of row space should produce about 0.8 pound of cucumbers.

D. Seedbed

Cucumbers grow in most soils, but they grow best in a fertile soil with 5 percent or more organic matter content. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that

will crumble into medium-sized fragments. Cultivation should mix crop residues and organic matter in the top 7 to 8 inches of soil. It should destroy current weed growth and provide a small granular-type bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for cucumber growth is from 5.5 to 7.0, but it does well in Idaho soil, which ranges from 7.0 to 8.0.

E. Seed Time

The best time to seed cucumbers in Idaho is 3 weeks before transplanting when soil temperature is 65°F or above and night temperature is expected to average above 55°F. The variety of cucumbers planted should have an early maturity date and should be developed for weather conditions in the area planted. Maturity date should be 55 to 65 days after transplanting. Cucumbers may be seeded directly into the soil. They are killed by very light frosts. Cucumbers love warm soil, and the use of plastic mulches is common.

F. Planting Specifications:

<i>Seed per foot</i>	<i>6 to 8</i>
<i>Ounce per foot</i>	<i>0.05</i>
<i>Row width</i>	<i>75 to 72 inches</i>
<i>Germination</i>	<i>6 to 10 days</i>
<i>Seed depth</i>	<i>1 inch</i>
<i>Planting spacing</i>	<i>12 to 24 inches</i>

G. Planting Suggestions

Cucumbers need a warm soil to grow and good spacing for sunlight. If transplants are purchased, they should be stocky.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended. One week after blossoming begins, sidedress with 1 1/2 ounces of ammonium sulfate in high pH soils or ammonium nitrate in low pH soils. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

I. Cultivation

When necessary, cultivation should be shallow to remove other plant competition. Deep cultivation close to the plants will de-

stroy much of the root system and reduce yield and quality. If it becomes necessary to cultivate, penetrate the soil no deeper than 1 inch.

J. Watering

Cucumbers have a water stress point of 60 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball and your hand feels like it has a film of water on it, the soil moisture will be 60 percent or above. If the soil moisture is below 60 percent, the film of water will not be felt on your hand, and it is time to water again.

Plant growth can suffer from too much or too little water. The symptoms will be the same. As the percentage of soil moisture drops, the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

K. Insects

The following insects may cause problems: aphids, cucumber beetle, cabbage looper, thrips, slugs, spider mites, garden symphylans, and wireworms.

L. Diseases

Diseases include Alternaria leaf spot, angular leaf spot, bacterial wilt, curly top mosaic, powdery mildew, root knot, nematode root rot, scab, and white mold.

M. Harvesting

Cucumbers may be harvested any time after they have reached the desired size, but be sure to do so before the cucumbers turn yellow and the seeds become hard. For slicing, the fruits should be 6 to 10 inches long.

Harvest when 2 1/2 to 6 inches in length for pickles. Cucumbers are of the highest quality when they are dark green in color, firm, and crisp.

X. Eggplant

A. Food Value

A pound of cooked (boiled) drained eggplant contains 94.3 percent water, 4.5 grams

of protein, 0.9 gram of fat, 18.6 grams of carbohydrates, and an average of 86 calories.

B. Description

Native to India, eggplants grow from 2 to 3 feet tall. The fruit is generally large and purple or white in color, with smooth, shiny skin. The seeds are embedded in the flesh.

C. Yield Per Person

Each person eats about 3 to 5 pounds during a growing season and will use 2 to 3 pounds for canning, storage, or freezing. This will require a row of eggplants 6 to 10 feet long. Each foot of row space should produce about 1 pound of fruit.

D. Seedbed

Eggplants grow in fertile, sandy loam soil. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that will crumble into medium-sized fragments. Cultivation should mix crop residues and organic matter in the top 7 to 8 inches of soil. It should destroy current weed growth and provide a small granular-type bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for eggplant growth is from 5.5 to 6.4, but it does well in Idaho soil, which ranges from 7.0 to 8.0.

E. Seed Time

Plant seeds in containers 10 weeks before transplanting in soil with a 65°F temperature or above. The variety should have an early maturity date and should be developed for weather conditions in the area planted. The maturity date should be 75 to 95 days after transplanting.

F. Planting Specifications:

<i>Seed per foot</i>	<i>6 to 8</i>
<i>Row width</i>	<i>24 to 36 inches</i>
<i>Germination</i>	<i>8 to 12 days</i>
<i>Seed depth</i>	<i>1/4 to 1/2 inch</i>
<i>Plant spacing</i>	<i>18 to 24 inches</i>

G. Planting Suggestions

Eggplants need a warm soil to grow and good spacing for sunlight. If transplants are purchased, they should be stocky and from 4 to 6 inches tall. A plastic mulch can be used to increase soil temperatures.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended. When the first fruits set, sidedress with 1 1/2 ounces of ammonium sulfate in high pH areas or ammonium nitrate in low pH areas. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over-fertilized.

I. Cultivation

Cultivation should be shallow, when necessary, to remove other plant competition. Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality.

J. Watering

Eggplants have a water stress point of 65 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. The percent inches of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball and your hand feels like it has a film of water on it, the soil moisture will be 65 percent, the film of water will not be felt on your hand, and it is time to water again. Plant growth can suffer from too much or too little water. Symptoms will be the same. As the percentage of soil moisture drops, the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

K. Insects—The following insects may cause problems: aphids, Colorado potato beetle, spider mites, western potato flea beetle, and wireworms.

L. Diseases—Common diseases include anthracnose, cercospora leaf spot, root rot fungus, and verticillium wilt.

M. Harvesting

Eggplant can be harvested any time after the fruits reach egg size, but be sure to do so before the fruit reaches full maturity and the seeds harden. The quality of young fruit is better than older fruit. Leave a short stem on the fruit when harvesting. The stems are woody, so harvest with pruning shears.

XI. Kohlrabi

A. Food Value

A pound of kohlrabi contains of 92.2 percent water, 7.7 grams of protein, 0.5 gram of fat, 24.0 grams of carbohydrates, and will provide an average of 109 calories.

B. Description

Developed in northern Europe, kohlrabi is a member of the cabbage family with similar requirements and problems. The edible portion is an above-ground enlargement resembling a mild turnip in shape and flavor. An excellent raw addition to relish dishes, it also may be boiled, stuffed, or baked.

C. Yield Per Person

Each person will eat from 2 to 4 pounds of fresh kohlrabi a season, and 4 to 8 pounds for canning or freezing. A foot of row space produces about 0.75 pound of kohlrabi.

D. Seedbed

Kohlrabi grows in most soils from sand to clay. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that will crumble into medium-sized fragments. Cultivation should mix crop residues and organic matter in the top 7 to 8 inches of soil. It should destroy current weed growth and provide a small, granular-type bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for kohlrabi is from 6.0 to 7.5, and the plants do well in Idaho soil, which ranges from 7.0 to 8.0.

E. Seed Time

Seed kohlrabi in container 6 weeks before transplanting in soil with 65°F or above. The variety should have an early maturity date and should be developed for weather conditions in the area planted. The maturity date should be 60 to 70 days after transplanting.

F. Planting Specifications:

<i>Seed per foot</i>	<i>8 to 12</i>
<i>Row width</i>	<i>18 to 24 inches</i>
<i>Germination</i>	<i>3 to 10 days</i>
<i>Seed depth</i>	<i>1/2 inch</i>
<i>Plant spacing</i>	<i>18 to 24 inches</i>

G. Planting Suggestions

Kohlrabi needs a cool soil to grow and good spacing for sunlight. If transplants are pur-

chased, they should be stocky, from 4 to 6 inches tall.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended. When the plants are one-third grown, sidedress with 1 1/2 ounces of ammonium sulfate in high pH areas or ammonium nitrate in low pH areas per 10 feet of row. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

I. Cultivation

Cultivation should be shallow, when necessary, to remove other plant competition. Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality.

J. Watering

Kohlrabi has a water stress point of 50 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball and feels damp, but fails to leave a film of water on your hand, the soil moisture will be 50 percent or above. If the soil moisture is below 50 percent, the film of water will not feel damp, and it is time to water again.

Plant growth can suffer from too much or too little water. Symptoms will be the same. As the percentage of soil moisture drops the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

K. Insects

The following insects may cause problems: aphids, flea beetles, cabbage looper, and wireworms.

L. Harvesting

Kohlrabi is ready to harvest 50 to 60 days after transplanting. It has the best flavor when it is 2 to 4 inches in size, and the flesh is still tender. The leaves of the young plant may be used like spinach.

XII. Lettuce

A. Food Value

A pound of lettuce contains 95.1 percent water, 5.4 grams of protein, 0.9 gram of fat, 11.3 grams of carbohydrates, and will provide an average of 64 calories.

B. Description

Lettuce is the most extensively grown and important of all salad crops. Common lettuce comes in three types: head, leaf, and butterhead. It is native to Mediterranean and Near East. It grows best at low temperatures and is sensitive to high temperatures.

C. Yield Per Person

Each person will eat about 4 to 5 pounds of fresh lettuce during a growing season. Each foot of row space should produce about 0.5 pound of lettuce. About 10 feet of row space per person should be planted for fresh use during the growing season.

D. Seedbed

Lettuce is adaptable to different soils as long as they are fertile, of good texture, and moist. The plants grow quickly. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that will crumble into medium-sized fragments. Cultivation should mix crop residues and organic matter in the top 7 to 8 inches of soil. It should destroy current weed growth and provide a small, granular-type bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for lettuce growth is from 6.0 to 7.0, but lettuce does well in Idaho soil, which ranges from 7.0 to 8.0.

E. Seed Time

The best time to seed lettuce is 4 to 6 weeks before transplanting when soil temperature is 50°F or above. Transplant lettuce into the garden when it is 2 to 3 inches tall and night temperature is 25°F or above. For garden-planted lettuce, plant as soon as the ground can be worked and 6 to 8 weeks before the last killing frost. To spread out the lettuce season, make subsequent plantings every 2 weeks. Early plantings should be placed where they get full sunlight, and later plantings in partial shade for hot summer

growth. The variety should have an early maturity date and should be developed for weather conditions in the area planted. The maturity date should be 55 to 80 days after transplanting.

F. Planting Specifications:

<i>Seed per foot</i>	<i>4 to 8</i>
<i>Row width</i>	<i>18 to 24 inches</i>
<i>Germination</i>	<i>4 to 8 days</i>
<i>Seed depth</i>	<i>1/4 to 1/2 inch</i>
<i>Plant space, leaf</i>	<i>6 to 12 inches</i>
<i>Plant space, head</i>	<i>8 to 15 inches</i>

G. Planting Suggestions

Lettuce needs light to germinate and may not germinate at temperatures of 80°F or above. During hot weather, lettuce bolts, produces seed stalks, and develops internal tip scorching and a bitter taste.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended.

When the plants are 4 weeks old, sidedress with 1 1/2 ounces of ammonium sulfate per 10 feet of row. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

I. Cultivation

Lettuce must be thinned to produce good plants. For head lettuce, thin to 12 to 15 inches between plants. For leaf lettuce, thin to 4 to 6 inches between plants in the first thinning and 6 to 12 inches in the final thinning. Cultivation should be shallow to remove other plant competition. Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality. Lettuce has a shallow, meager root system.

J. Watering

Lettuce has a shallow root system, and the plant requires frequent watering to support rapid leaf development. Too much water on heavy soils may lead to leaf scorch and disease. Don't wet the foliage any more than necessary when watering.

K. Insects

The following insects may create problems: aphids, flea beetles, looper, cucumber

beetles, wireworms, cutworms, army worms, and slugs.

L. Diseases

Lettuce diseases include anthracnose, aster yellows, big vein virus, bottom rot fungus, downy mildew, drop or watery soft rot, mosaic, and red rib.

M. Harvesting

Lettuce thinnings can be used for early salads. The lettuce heads should be solid but not overly mature when harvested. Butter-head lettuce can be harvested as soon as the heads form. Leaf lettuce can be harvested any time before it sends up seed stalks.

XIII. Onions

A. Food Value

A pound of onions contains 89.4 percent water, 7.8 grams of protein, 0.9 gram of fat, 37.2 grams of carbohydrates, and an average of 16.3 calories.

B. Description

Onions are native to North America. They are cold hardy and adaptable to Idaho. There are more than 300 species of onions in the world. In Idaho, onions are grown as green onions for table use and bulbs for storage. The bulbs for harvest come in yellow, white, and red. They may be round, flat, or long.

C. Yield Per Person

Each person will eat about 3 to 5 pounds of onions during a growing season and another 30 to 50 pounds per person may be desired for storage. Each foot of row space should produce about 0.74 pound of onions. Plant from 3 to 5 feet of row per person for use during the growing season and an additional 30 to 50 feet for storage.

D. Seedbed

Onions grow well in a wide range of soils and climates, but they develop best in a loose, crumbly soil with high fertility. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that will crumble into medium-sized fragments. Cultivation should mix crop residues and organic matter in the top 7 to 8 inches of soil. It should destroy current weed

growth and provide a small, granular-type bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for onion growth is from 5.5 to 7.0, but onions do well in Idaho soil, which ranges from 7.0 to 8.0.

E. Seed Time

The best time to seed onions is 6 to 8 weeks before the last killing frost in the spring when soil temperature is 50°F or above. The variety of onion planted should have an early maturity date and should be developed for weather conditions in the area planted. The maturity dates should be 95 to 120 days for sets, and 95 to 120 days for plants (transplant to maturity and seed, 100 to 165 days).

F. Planting Specifications:

Ounce per foot	0.02
Seed per foot	10 to 15
Row width	12 to 14 inches
Germination	7 to 12 days
Seed depth	1/2 inch
Sets depth	2 to 3 inches
Plant space	3 to 4 inches

G. Planting Suggestions

Onion sets should be separated into two sizes: sets smaller than 3/4-inch and 3/4- inch and above. The large sets are used for green onions, as they frequently form seed stalks instead of a bulb. The smaller sets are used for mature dry bulbs. Seeds for mature dry bulbs should be sown indoors and transplanted into your garden.

H. Fertilizer

Preplant fertilizer of 0.2 pound of N for each 100 square feet worked into the top 2 inches of soil is recommended. Fertilizers should be applied to the soil before seeding. Sidedress with 1 1/2 ounces of ammonium sulfate in high pH areas and ammonium nitrate in low pH areas per 10 feet of row. Do so when onions are 12 inches tall or the bulbs begin to form. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

I. Cultivation

Cultivation should be shallow, when necessary, to remove other plant competition.

Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality. Onions have a shallow root system and cannot compete with weeds.

J. Watering

Onions have a water stress point of 70 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a hard ball and your hand feels like it has a film of water on it, and the soil is sticky, the soil moisture will be 70 percent or above. If the soil moisture is below 70 percent, the film of water will not be felt on your hand, and it is time to water again.

Plant growth can suffer from too much or too little water. The symptoms will be the same. As the percentage of soil moisture drops, the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

K. Insects

The following insects may create problems: brown wheat mite, onion thrips, onion maggot, pea leaf miner, and wireworms.

L. Diseases

Disease problems include basal rot, downy mildew, neck rot, pink rot, purple blotch, smut, and white rot.

M. Harvesting

Green bunch onions can be harvested as soon as desired. Thinnings from bulb onions can be used as green onions. Bulb onion maturity is determined by softening of the neck tissues, falling over of the tops, and dying of the roots. At maturity bulbs enlarge rapidly and are ready for harvest when two-thirds of the top has fallen over or after a light frost in Idaho's short growing season. If the onions are slow to mature, it may be necessary to bend the tops over to speed up the maturity process before heavy frosts. Onions should then be pulled and, if the weather permits, left in the garden until tops and outer scales are completely dry. The

tops can be spread over the bulbs to prevent sunburn. After the bulbs are cured they should be topped.

N. Storage

With a freezing point of 30°F, you should store onions as near 32°F as possible in any cool dry (humidity, 70 percent) place. They keep well through the fall and winter in a cool dry cellar or attic.

XIV. Peas

A. Food Value

A pound of English peas contains 78.0 percent water, 381 calories, 28.6 grams of protein, 1.8 grams of fat, and 65.3 grams of carbohydrates. A pound of edible podded peas contains 84.8 percent water, 259 calories, 15.4 grams of protein, 1.4 grams of fat, and 47.2 grams of carbohydrates.

B. Description

Garden peas originated in eastern Europe and western Asia. They are one of the earliest vegetables picked in the spring. Peas are classified smooth or wrinkled according to how the seed looks when dry. The wrinkled seed is normally the sweetest.

C. Yield Per Person

It is recommended that 15 to 20 feet of row space be planted per person for fresh use during the garden season and an additional 40 to 60 feet for storage and canning. About 0.28 pound of English peas is produced per foot of row space. Each person consumes about 4 pounds of fresh and about 10 pounds of frozen and canned peas.

D. Seedbed

Soil types for pea production range from a light sandy loam for early pea harvest to a heavy clay soil for later or main harvest crop. The ideal pH for pea production is 6.0 to 7.5. The soil should be well drained and moderately fertile. Cultivate the soil when the soil moisture will allow formation of a mud ball that will crumble into pieces under finger pressure. It should mix crop residue and organic matter in the top 7 to 8 inches of soil, destroy current weed growth, and provide a granular-type bed for seeding. Overcultivated soil becomes powdery and has a tendency to crust.

E. Seed Time

Plant peas as soon as the ground can be worked in the spring, about 6 to 8 weeks before the last killing frost. Soil temperature for planting should be 50°F or above. Peas are a cool climate crop, and their quality is greatly influenced by cool soil and air temperature. It is suggested that planting successions should be arranged at 10-day intervals to spread harvest over a longer period of time.

F. Planting Specifications:

<i>Seed per foot</i>	<i>6 or 7</i>
<i>Row width</i>	<i>18 to 30 inches</i>
<i>Germination</i>	<i>6 to 15 days</i>
<i>Ounce per foot</i>	<i>0.16</i>
<i>Seed depth</i>	<i>2 inches</i>
<i>Plant spacing</i>	<i>3 inches</i>

G. Planting Suggestions

Some gardeners make a double planting of peas in each row with approximately a 6-inch space between the plantings.

H. Fertilizer

This plant is a legume and is able to draw N from the air. Excessive N can cause the plants to produce large vines, but fewer peas are produced. It is suggested that 0.2 pound of N be broadcasted over a 100 square foot area. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private soil testing laboratory.

I. Cultivation

Cultivation should be conducted only when necessary to remove other plant competition. Pea roots are easily damaged by hoeing and shallow cultivation.

J. Watering

Peas have a water stress point of 50 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball and your hand feels moist without a film of water on it, the soil moisture will be 50 percent or above. If the soil moisture is below 50 percent, the moist condition will not be felt on

your hand, and it will be time to water again. Plant growth can suffer from too much or too little water. The symptoms will be the same.

K. Insects

The following insects may cause problems: looper, cutworms, army worms, grasshoppers, pea aphids, pea leaf weevil, pea moth, pea weevil, and wireworms.

L. Diseases

Diseases that may be a problem include bacterial blight, basal stem rot, downy mildew, enation mosaic virus, leaf and pod blight, root rots, seed rot, damping off, seed borne mosaic virus, viruses, and wilt.

M. Harvesting

English peas can be harvested when pods are nearly full but before pods begin to wrinkle. Edible podded peas should be harvested while the pods are still flat and the peas are hardly discernible. These peas need to be picked every other day to prevent over maturity. If they do become over mature the pea seed inside can be eaten. Pick peas from the vine during the cool part of the day.

N. Storage

Edible podded peas can be stored 10 days in plastic bags in the refrigerator without a loss of quality.

XV. Peppers

A. Food Value

A pound of immature, sweet, green, raw peppers contain 93.4 percent water, 5.4 grams of protein, 0.9 gram of fat, 21.8 grams of carbohydrates, and provides an average of 100 calories.

B. Description

Peppers are native to the warmer parts of America and were cultivated more than 2,000 years ago. They are classified as sweet, mild, or hot, and are excellent for salads, seasoning in other foods and for baking.

D. Seedbed

Peppers grow best in a sandy loam soil. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that will crumble into medium-sized fragments. Cultivation should mix crop resi-

dues and organic matter in the top 7 to 8 inches of soil. It should destroy current weed growth and provide a small, granular-type bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for pepper growth is from 5.5 to 7.0, but the pepper does well in Idaho soil, which ranges from 7.0 to 8.0.

E. Seed Time

The best time to seed peppers is 6 to 8 weeks before transplanting when soil temperature is 65°F or above. The variety of peppers planted should have an early maturity date and should be developed for weather conditions in the area planted. The maturity date should be 60 to 80 days after transplanting.

F. Planting Specifications:

<i>Seed per foot</i>	<i>6 to 8</i>
<i>Row width</i>	<i>24 to 36 inches</i>
<i>Germination</i>	<i>10 to 20 days</i>
<i>Seed depth</i>	<i>1/4 inch</i>
<i>Plant spacing</i>	<i>14 to 18 inches</i>

G. Planting Suggestions

Peppers need a warm soil to grow and good spacing for sunlight. If transplants are purchased, they should be stocky, from 4 to 6 inches tall.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended. When the first fruits set, sidedress with 1 1/2 ounces of ammonium sulfate for high pH soils and ammonium nitrate for low pH soils. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

I. Cultivation

Cultivation should be shallow, when necessary, to remove other plant competition. Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality.

J. Watering

Peppers have a water stress point of 60 percent. When the percent of water in soil drops below this level, the plant will start to

dehydrate and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball and your hand feels like it has a film of water on it, the moisture will be 60 percent or above. If the soil moisture is below 60 percent, the film of water will not be felt on your hand, and it is time to water again.

Plant growth can suffer from too much or too little water. The symptoms will be the same. As the percentage of soil moisture drops the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

K. Insects

The following insects may cause problems: green peach aphid, garden symphylan, flea beetles, spider mites, and wireworms.

L. Diseases

Pepper diseases include alfalfa mosaic virus, tomato ring spot virus, anthracnose, cercospora leaf spot, common mosaic, root rot, and verticillium wilt.

M. Harvesting

Peppers can be harvested at any time after they are large enough to use. Bell types usually are harvested when they are 3 to 4 inches long. When picking peppers, cut them from the plant rather than pulling them off. The branches are extremely brittle and will break easily if pulled.

N. Storage

The freezing point of peppers is 30°F. Store in unheated basement or room at 45° to 50°F. Humidity should be moderately high. Storage may be 2 to 3 weeks.

XVI. Pumpkin

A. Food Value

A pound of pumpkin contains 90.2 percent water, 4.5 grams of protein, 1.4 grams of fat, 35.8 grams of protein, 35.8 grams of carbohydrates, and an average of 150 calories.

B. Description

Pumpkins are native to America. They are sensitive to frost but tolerant of cool moist environments. They need a warm but not a

hot, growing season. They do not cross with cucumbers, or watermelon, but will cross with plants of the same species. Their flesh is coarse but can be baked, pureed, or used to thicken soups.

C. Yield Per Person

Each person will eat about 3 to 6 pounds of pumpkin during a growing season and use 3 to 6 pounds for canning, freezing, or storage. This will require a row of pumpkins 2 to 3 feet long for garden use and 2 to 3 feet for storage, canning, or freezing. Each foot of row space should produce about 1 pound of pumpkin.

D. Seedbed

Pumpkins are adapted to most soils, but they grow best in a fertile soil rich in humus. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that will crumble into medium-sized fragments. Cultivation should mix crop residues and organic matter in the top 7 to 8 inches of soil. It should destroy current weed growth and provide a small, granular-type bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for pumpkin growth is from 5.5 to 7.0, but the pumpkin does well in Idaho soil. Pumpkins grow best in full sunlight, but they will do equally well in light shade. For huge exhibition pumpkins, allow one fruit to develop per vine and water heavily.

E. Seed Time

Seed pumpkins in Idaho 3 weeks before transplanting when soil temperature is 65°F or above. They also may be seeded directly into the garden soil when the soil temperature is 65°F or above. The pumpkin variety planted should have an early maturity date and be developed for weather conditions in the area planted. The maturity date should be 70 to 110 days after transplanting. Pumpkins are killed by very light frosts. Pumpkins love warm soil. The use of plastic mulches is common.

F. Planting Specifications:

<i>Seed per foot</i>	2
<i>Ounce per foot</i>	0.5
<i>Row width</i>	72 to 120 inches

<i>Germination</i>	<i>6 to 10 days</i>
<i>Seed depth</i>	<i>1 to 1 1/2 inches</i>
<i>Plant spacing</i>	<i>40 to 60 inches</i>

G. Planting Suggestions

Pumpkins need a warm soil to grow but not extremely hot days. They are sensitive to frost.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended. One week after blossoming begins, sidedress with 1 1/2 ounces of ammonium sulfate if the soil pH is high or ammonium nitrate if it is low. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

I. Cultivation

Cultivation should be shallow, when necessary, to remove other plant competition. Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality. If it becomes necessary to cultivate, penetrate the soil no deeper than 1 inch.

J. Watering

Pumpkin roots are shallow. Their water stress point is 60 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball and your hand feels like it has a film of water on it the soil moisture will be 60 percent or above. If soil moisture is below 60 percent, the film of water will not be felt on your hand, and it is time to water again. Plant growth can suffer from too much or too little water. The symptoms will be the same. As the percentage of soil moisture drops the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

K. Insects

The following insects may create problems: aphids, cucumber beetle, slugs, spider mites, and squash bugs.

L. Diseases

Disease problems include aster yellows, root rot, and storage rot.

M. Harvesting

Pumpkins can be harvested any time after their rinds are hard and their skins turn gold in color. Harvest before they are injured by hard frost. Some types have the best quality if they are harvested after their vines are killed by frost. When pumpkins are cut from the vine, leave 3 or 4 inches of stem attached to the fruit. Pumpkins without stems do not store well.

N. Storage

Cure pumpkins after a light frost kills the vines or by cutting the stems and allowing them to lie in the garden for a week to 10 days. Pumpkins can cure inside a house for the same period at 75°F. They may then be stored in a home cellar or basement at an average temperature of 55°F with a moderately high humidity. High quality cured pumpkins will store in good condition through the fall and early winter months.

XVII. Radish

A. Food Value

A pound of radishes contains 94.5 percent water, 4.5 grams of protein, 0.5 gram of fat, 15.3 grams of carbohydrates, and 77 calories.

B. Description

Radishes are native to Europe and Asia. They are cold hardy but will not withstand high heat. During hot weather the roots become pungent, and the plants produce seed stalks.

C. Yield Per Person

It is estimated that each person will eat from 2 to 3 pounds of radishes during a growing season. Each foot of row space should produce approximately 0.67 pound of radishes. Plant about 3 to 5 feet of row per person.

D. Seedbed

Radishes grow best in sandy loam and peat soils. Heavy clay soils can be improved by the addition of organic matter. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that will crumble into medium-sized fragments.

Cultivation should mix crop residues and organic matter in the top 7 to 8 inches soil. It should destroy current weed growth and provide a small granular-type bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for radish growth is from 6.0 to 7.0, but radishes do well in Idaho soil, which ranges from 7.0 to 8.0.

E. Seed Time

The best time to seed radishes is 6 to 8 weeks before the last killing frost in the spring when soil temperature is 50°F or above. The variety planted should have an early maturity date and be developed for weather conditions in the area planted. Maturity date should be 20 to 50 days.

F. Planting Specifications:

Ounce per foot	0.02
Seed per foot	14 to 16
Row width	6 to 12 inches
Germination	3 to 10 days
Seed depth	1/2 inch

G. Planting Suggestions

Radishes need a cool soil to grow in and good spacing for sunlight. Their frost tolerance is good. Make successive plantings every 10 to 14 days, beginning in the spring as soon as the soil can be worked and a month before frost in the fall. Radishes can be mixed with carrot, beet, and parsnips to mark the row of these vegetables that grow slower.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended. Fertilizers should be applied to the soil before seeding to ensure its availability to plants during the short growing season. Over-fertilization can result in excessive top growth with no root enlargement. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

I. Cultivation

Cultivation should be shallow, when necessary, to remove other plant competition.

Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality.

J. Watering

Radishes have a water stress point of 60 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball and your hand feels like it has a film of water on it, the soil moisture will be 60 percent or above. If the soil moisture is below 60 percent, the film of water will not be felt on your hand, and it is time to water again.

Plant growth can suffer from too much or too little water. Symptoms will be the same. As the percentage of soil moisture drops, the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

K. Insects

The following insects may cause problems: cabbage aphid, turnip aphid, cabbage maggot, cutworms, army worms, black cutworms, diamond back moth, flea beetles, and wireworms.

L. Diseases

Radish disease problems include black rot.

M. Harvesting

Radishes can be harvested as soon as the roots reach edible size (1 to 2 inch) and before becoming tough and pithy. They normally mature in 20 to 30 days.

N. Storage

Storage life of radishes is limited to 5 to 6 days in the refrigerator if stored in plastic bags with holes punched for air circulation space. Remove tops at 1/2 inch from radish and clean root before storage.

XVIII. Summer Squash

A. Food Value

A pound of immature raw summer squash contains 94.0 percent water, 5 grams of protein, 0.05 gram of fat, 19.1 grams of carbohydrates, and 81 calories.

B. Description

Summer squash are native to Central American and were used extensively by Indians for food. Summer squash have whitish or yellow flesh and are picked in the summer while immature. They may be vining, semivining, or bush types. Squash will cross-pollinate with other squash, pumpkin, or gourds within the same species, but don't cross-pollinate with cucumbers or watermelon. They grow well in Idaho.

C. Yield Per Person

It is estimated that each person will eat from 6 to 9 pounds of squash during a growing season and need an additional 6 to 9 pounds for storage, canning, or freezing. This will require a row of squash 4 to 6 feet long. Each foot of row space should produce about 1.5 pounds of summer squash.

D. Seedbed

Summer squash grow best on fertile, well-drained soil, well supplied with organic matter. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that will crumble into medium-sized fragments. Cultivation should mix crop residues and organic matter in the top 7 to 8 inches of soil. It should destroy current weed growth and provide a small granular-type bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for summer squash growth is 6.0 to 7.5, but it does well in Idaho soil, which ranges from 7.0 to 8.0.

E. Seed Time

The best time to seed summer squash in a container is 3 to 4 weeks before transplanting. Seed direct into soil or transplant when temperature is 65°F or above. The variety of squash planted should have an early maturity date and be developed for weather conditions in the area planted. Maturity date should be 50 to 60 days after transplanting. Sow squash outdoors when night temperature no longer falls below 55°F.

F. Planting Specifications:

<i>Seed per foot</i>	<i>4 to 6</i>
<i>Row width</i>	<i>26 to 60 inches</i>
<i>Germination</i>	<i>3 to 12 days</i>

<i>Seed depth</i>	<i>1 inch</i>
<i>Plant spacing</i>	<i>6 to 24 inches</i>

G. Planting Suggestions

Summer squash needs a warm soil to grow and good spacing for sunlight. If transplants are purchased, they should be stocky. Bees are needed for pollination.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended. When the plant begins to spread out, sidedress with 1 1/2 ounces of ammonium sulfate for high pH soils and ammonium nitrate for low pH soils. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory.

I. Cultivation

Cultivation should be shallow, when necessary, to remove other plant competition. Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality.

J. Watering

Summer squashes have a water stress point of 65 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball and your hand feels like it has a heavy film of water on it, the soil moisture will be 65 percent or above. If the soil moisture is below 65 percent, the film of water will not be felt on your hand, and it will be time to water again.

Plant growth can suffer from too much or too little water. The symptoms will be the same. As the percentage of soil moisture drops, the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

K. Insects

The following insects may create problems: bean aphid, melon aphid, potato aphid, nitidulid beetles, squash bug, and wireworms.

L. Diseases

Diseases include aster yellows, black rot, curly top, and root rot.

M. Harvesting

Summer squash can be harvested any time the fruits reach a desired size but before the squash forms hard seed or rinds. Break fruit from the vine, leaving a piece of stem with the fruit.

XIX. Sweet Corn

A. Food Value

A pound of raw, white, or yellow sweet corn consists of about 45 percent cob and 55 percent edible. The kernels contain about 72.7 percent water and provide an average of 240 calories, 8.7 grams of protein, 2.5 grams of fat, and 55.1 grams of carbohydrates.

B. Description

Corn is an annual grass, native to the Americas and differing from other types of corn by the retention of large amounts of sugar in the kernels during the milk stage of maturity. Its skin is slightly thinner than other types. Kernel color ranges from white to yellow. There are about 2,000 sweet corn varieties in existence.

C. Yield Per Person

It is estimated that each person will require from 10 to 15 feet of plants in a row for fresh use and an additional 30 to 50 feet for storage, canning, or freezing. Each foot of row space should produce about 0.3 pound of corn.

D. Seedbed

Soil texture can vary for sweet corn production. A sandy loam is best, but corn can be grown in clay or loam soils also. The soil cultivation should be conducted when the moisture in the soil will allow formation of a mud ball that will crumble into pieces under finger pressure. Cultivation should mix crop residues and organic matter in the top 7 to 8 inches of soil, destroy current weed growth, and provide a granular-type bed for seeding. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for corn growth is from 6.0 to 7.0, but it

does well in Idaho soils, which have a pH of 7.0 to 8.0.

E. Seed Time

The best time to seed corn is in May when soil temperature is 50°F or above and air temperature averages 65°F or above. Corn is a tender crop and should be planted after the last frost. The warmer the temperature, the faster the corn grows and matures. The variety planted should have an early maturity date and be developed for weather conditions in the area planted.

F. Planting Specifications:

<i>Seed per foot</i>	<i>4 to 6 inches</i>
<i>Row width</i>	<i>30 to 36 inches</i>
<i>Germination</i>	<i>6 to 10 days</i>
<i>Ounce per foot</i>	<i>0.16</i>
<i>Seed depth</i>	<i>1 1/2 to 2 1/2 inches</i>
<i>Plant space</i>	<i>10 to 12 inches</i>

G. Planting Suggestions

Sweet corn needs a warm soil and good spacing for sunlight. It is wind-pollinated so plants should be in 3 or more short rows, rather than one long row. Varieties should be separated because cross-pollination between low-sugar plants and high-sugar plants reduces the sweetness of the high-sugar corn.

H. Fertilizer

Corn has a high N requirement. The principal application of N and other fertilizers should be broadcast before planting with, if necessary, a sidedressing 3 inches from the plant at the corn four-leaf stage. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private soil testing laboratory. Plants stunted by a lack of nutrients seldom recover or produce up to their potential.

I. Cultivation

Cultivation should be shallow, when necessary, to remove other plant competition. Deep cultivation will destroy much of the root system and reduce yield and quality. The number of suckers a sweet corn plant produces depends on the variety of the corn. Suckers should not be removed. Their removal does not increase yields but may reduce them.

J. Watering

Corn has a water stress point of 60 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball and your hand feels like it has a film of water on it, the soil moisture will be 60 percent or above. If the soil moisture is below 60 percent, the film of water will not be felt on your hand, and it is time to water again. Plant growth can suffer from too much or too little water. Symptoms will be the same.

K. Insects

The following insects may be a problem in sweet corn: corn ear worm, cutworm, army worm, wireworm, root worm, slug, aphids, spider mites, earwigs, and cucumber beetles.

L. Diseases

Root stock, ear rot, maize dwarf mosaic, seed rot, seedling blight, and smut are common diseases of corn.

M. Harvesting

Depending on temperatures, sweet corn generally ripens in 22 to 24 days after silking. For eating, the silks are brown, and the ear fills the husk. The liquid squeezed from a ripe kernel is milky; from an immature kernel it is watery; and from an overmature kernel, solid or creamy. Prime eating quality lasts about 4 to 5 days before the sugar starts to turn to starch. Pick corn when the sugar is at its maximum. Canning corn can be picked when it is in the cream stage. Sweet corn loses quality quickly after picking, especially at high temperatures. Process as soon as possible after harvesting. Pull cobs from the stocks with a downward motion and a twist to the side.

N. Storage

Refrigerate at 35° to 40°F for 2 to 3 days.

XX. Swiss Chard

A. Food Value

A pound of chard contains about 3.7 percent water, 8.2 grams of protein, 0.9 gram of fat, 15.0 grams of carbohydrates, and 82 calories.

B. Description

Chard is native of the Mediterranean area. It is a relative of the beet and is grown for its tender vitamin rich leaves. The leaves and petioles are cooked to provide a pot herb similar to spinach.

C. Yield Per Person

It is estimated that each person will eat from 1.5 to 3 pounds of fresh chard during a growing season and will use an additional 3 to 4.5 pounds for canning or freezing. Each foot of row space should produce about 0.85 pound of chard. From 2 to 4 feet of row space per person should be planted for fresh use during the growing season and an additional 4 to 6 feet for canning or freezing.

D. Seedbed

Chard is widely adapted to different soils as long as they are rich, of good texture, and well drained. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that will crumble into medium-sized fragments. Cultivation should mix crop residues and organic matter in the top 7 to 8 inches of soil, destroy current weed growth, and provide a small granular-type bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for chard growth is from 6.0 to 7.5, and it does well in Idaho soil, which is 7.0 to 8.0.

E. Seed Time

The best time to seed chard is as soon as the soil can be cultivated in the spring, 2 to 4 weeks before the last killing frost. Minimum soil temperature for planting is 50°F or above. The variety of chard planted should have an early maturity date and be developed for weather conditions in the area planted. Maturity date should be 55 to 65 days after planting.

F. Planting Specifications:

<i>Seed per foot</i>	<i>6 to 10</i>
<i>Row width</i>	<i>18 to 24 inches</i>
<i>Germination</i>	<i>7 to 10 days</i>
<i>Seed depth</i>	<i>1 inch</i>
<i>Plant spacing</i>	<i>4 to 8 inches</i>

G. Planting Suggestions

Chard can be planted in the garden or in a greenhouse for later transplanting.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended. When the plants are one-third grown, sidedress with 1 1/2 ounces of ammonium sulfate per 10 feet of row. Amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

I. Cultivation

Cultivation should be shallow, when necessary, to remove other plant competition. Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality.

J. Watering

Chard has a water stress point of 55 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball, and your hand feels like it has a film of water on it, the soil moisture will be 55 percent or above. If the soil moisture is below 55 percent, the soil will not feel moist on your hand, and it is time to water again.

Plant growth can suffer from too much or too little water. Symptoms will be the same. As the percentage of soil moisture drops, the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

K. Insects

The following insects may cause problems: aphids, blister beetles, looper, lygus bugs, cutworms, serpentine leaf miner, western spotted cucumber beetles, and wireworms.

L. Diseases

Top virus is the main chard disease.

M. Harvesting

Chard can be harvested throughout an entire 3-month growing season. Plants removed at thinning time can be used in salads. Cut outer leaves first about 1 inch from the soil surface with a sharp knife. Care should be taken to ensure the new inner stems and growing point are not damaged.

N. Storage

Before the first hard freeze, plants can be transplanted into containers. Store the containerized plants in a cool place, and water lightly to prevent wilting. Leaves can be harvested into the winter months.

XXI. Tomatoes

A. Food Value

A pound of tomatoes contains about 93.5 percent water, 4.5 grams of protein, 0.8 gram of fat, and 19.4 grams of carbohydrates. The fruits are high in vitamin A, B₁, B₂, and C, and provide an average of 91 calories per pound.

B. Description

Tomatoes are native to the Andes Mountains in South America. They are a warm season crop and rank second in popularity among the vegetable crops grown in the United States. They are classified according to their growth patterns into three groups: Determinant, semideterminant, and indeterminate. Determinant plant vines grow 12 to 18 inches long, and stop fruiting when the vines stop growing. Semideterminant plants are similar but grow 18 to 24 inches. The vines of indeterminate plants continue to grow and fruit is set indefinitely.

C. Yield Per Person

Tomatoes grow best in a fertile, sandy, well-drained, loam soil. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that will crumble into medium-sized fragments. Cultivation should mix crop residues and organic matter in the top 7 to 8 inches of soil. It should destroy current weed growth and provide a small granular-type bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The pH for tomato growth is from 5.5 to 7.5, but it does well in Idaho soil, which ranges from 7.0 to 8.0.

E. Seed Time

The best time to seed tomatoes is 6 to 8 weeks before transplanting when soil temperature is 65°F or above. The variety of tomatoes planted should have an early maturity date and be developed for weather

conditions in the area planted. Maturity date should be 60 to 80 days after transplanting. Two or three different varieties can be planted to obtain ripening at different times. One series of plants could be early bearers and another series that mature later could be used for the main crop.

F. Planting Specifications:

<i>Seed per foot</i>	<i>Use transplants</i>
<i>Row width</i>	<i>36 to 60 inches</i>
<i>Germination</i>	<i>6 to 14 days</i>
<i>Seed depth</i>	<i>1/4 to 1/2 inch</i>
<i>Plant spacing</i>	<i>18 to 36 inches</i>

G. Planting Suggestions

Tomatoes need a warm soil to grow and good spacing for sunlight. If transplants are purchased, they should be stocky and from 4 to 6 inches tall. If you plan to grow your own transplants, seed in your greenhouse or house 5 to 7 weeks before transplanting. Put plants in the garden 10 days after the last expected killing frost. Hot caps or other protection devices may allow earlier transplanting. Tomatoes normally do not set fruit below 58°F or above 85°F and must have 6 or more hours each day of direct sunlight. Transplants should not have fruit on them when planted out as the fruit will stunt the plants' growth and development.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended. When the first fruits set, sidedress with 1 1/2 ounces of ammonium sulfate for high pH soils and ammonium nitrate for low pH soils. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

I. Cultivation

Cultivation should be shallow, when necessary, to remove other plant competition. Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality.

J. Watering

Tomatoes have a water stress point of 65 percent. When the percent of water in soil drops below this level, the plant will start to

dehydrate and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball and your hand feels like it has a film of water on it, the soil moisture will be 65 percent or above. If the soil moisture is below 65 percent, the film of water will not be felt on your hand, and it will be time to water again. Plant growth can suffer from too much or too little water. Symptoms will be the same. As the percentage of soil moisture drops, the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

K. Insects

The following insects may cause problems: green peach aphid, garden symphylan, flea beetles, spider mites, wireworms, and tomato horn worm.

L. Diseases

Tomato diseases include anthracnose, yellow aster, bacterial canker, blossom end rot, curly top, early blight, fruit rot, late blight, leaf mold mosaic, root-rot nematode, spotted wilt virus (tip blight), streak, and wilt.

M. Harvesting

For best flavor tomato fruits should be harvested when they are fully ripe and firm. The best ripening temperature is 65°F. Tomatoes will ripen to high quality indoors if picked as the red color first shows. Remove stems from harvested tomatoes.

N. Storage

The freezing point of tomatoes is 30°F. Store in unheated basement or room temperature of from 55° to 70°F. Humidity should be moderately low. Tomatoes may be stored for 4 to 6 weeks. For fall storage, pick all green fruit that is nearly full size and wrap individually in newspaper and store at 50° to 60°F. They will ripen slowly providing a longer eating season. Green fruit will ripen more quickly when enclosed in a bag or box with an apple or banana.

XXII. Turnips

A. Food Value

A pound of turnips contains about 93.6 percent water, 3.6 grams of protein, 0.9 gram

of fat, 22.2 grams of carbohydrates, and 104 calories.

B. Description

Turnips are native to western Asia. They are cold hardy but will not withstand heat, and during hot weather roots become bitter and pithy. Turnips are grown for their tender, crisp roots, but the leaves or greens of turnips are also good cooked.

C. Yield Per Person

It is estimated that each person will eat from 3 to 6 pounds of turnips during a growing season. Each foot of row space should produce approximately 0.5 to 1 pound of turnips. Plant from 5 to 10 feet of row per person.

D. Seedbed

Turnips grow best in sandy loam and peat soils. Heavy clay soils can be improved by the addition of organic matter. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that will crumble into medium-sized fragments. Cultivation should mix crop residues and organic matter in the top 7 to 8 inches of soil. It should destroy current weed growth and provide a small granular-type bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for turnip growth is 5.5 to 7.0, but it does well in Idaho soil, which ranges from 7.0 to 8.0.

E. Seed Time

The best time to seed turnips is 6 to 8 weeks before the last killing frost in the spring when soil temperature is 50°F or above. The variety planted should have an early maturity date and be developed for weather conditions in the area planted. Maturity date should be 45 to 60 days.

F. Planting Specifications:

Ounce per foot	0.01
Seed per foot	10 to 15
Row width	15 to 18 inches
Germination	3 to 10 days
Seed depth	1/2 inch
Plant space	4 to 6 inches

G. Planting Suggestions

Turnips need a cool soil to grow in. They have excellent frost tolerance. It is sug-

gested that successive plantings be made every 10 to 14 days beginning in spring as soon as the soil can be worked and before the daytime temperature is expected to average 80°F or above. Turnips can be mixed with seed for carrots, beets, and parsnips to mark the row of these vegetables that grow slower.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended.

Sidedress the plants with 1.5 ounces of ammonium sulfate for high pH soils or ammonium nitrate for low pH soils per 10 feet of row when plants are about one-third grown. Over fertilization can result in excessive top growth with no root enlargement. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

I. Cultivation

Cultivation should be shallow, when necessary, to remove other plant competition. Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality. Thin by leaving 1 to 2 inches between plants. Plants removed during thinning can be eaten.

J. Watering

Turnips have a water stress point of 60 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball, and your hand feels like it has a film of water on it, the soil moisture will be 60 percent or above. If the soil moisture is below 60 percent, the film of water will not be felt on your hand, and it is time to water again.

Plant growth can suffer from too much or too little water. The symptoms will be the same. As the percentage of soil moisture drops, the oxygen level in the soil increases.

K. Insects

The following insects may cause problems: cabbage aphid, turnip aphid, cabbage root

maggot, cutworms, army worms, black cutworms, diamond back moth, flea beetles, and wireworms.

L. Diseases

Turnip disease problems include black root rot, club root, and powdery mildew.

M. Harvesting

Turnips can be harvested as soon as the roots reach edible size (2 to 3 inches) and before becoming bitter and pithy. They normally mature in 45 to 60 days. Pull or cut off tops above the crown.

N. Storage

Storage life of turnips can be extended into the fall and winter by leaving them in the ground and covering them with a mulch to prevent them from freezing in the ground. For pit storage the temperature should be as near 32°F as possible under moist air conditions.

XXIII. Watermelon

A. Food Value

A pound of raw watermelon contains 92.6 percent water, 2.3 grams of protein, 0.9 gram of fat, 29.0 grams of carbohydrates, and 118 calories.

B. Description

Watermelons are a native of Africa. The plants have separate male and female flowers on the same vine and are cross-pollinated. They do not cross-pollinate with cucumbers, squash, or pumpkins. Watermelons are difficult to grow in many parts of Idaho. They need high temperatures and a long growing season.

C. Yield Per Person

It is estimated that each person will eat from 3 to 6 pounds of watermelon during a growing season. This will require a row of melons 6 to 12 feet long. Each foot of row space should produce about 0.5 pound of watermelons.

D. Seedbed

Watermelons are adapted to most soils but grow best in a fertile, light, sandy soil with large amounts of compost. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that will

crumble into medium-sized fragments. Cultivation should mix crop residues and organic matter in the top 7 to 8 inches of soil. It should destroy current weed growth and provide a small, granular-type bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for watermelon growth is from 6.0 to 7.5, but it does well in Idaho soil, which ranges from 7.0 to 8.0.

E. Seed Time

The best time to seed watermelons in Idaho is 3 weeks after the last killing frost. When transplanting, the soil temperature should be 65°F or above. The variety of watermelons planted should have an early maturity date and be developed for weather conditions in the area planted. The maturity date should be 80 to 100 days after transplanting.

F. Planting Specifications:

<i>Seed per foot</i>	<i>2 to 3</i>
<i>Ounce per foot</i>	<i>0.05</i>
<i>Row width</i>	<i>72 to 84 inches</i>
<i>Germination</i>	<i>3 to 12 days</i>
<i>Seed depth</i>	<i>1 inch</i>
<i>Plant spacing</i>	<i>12 to 24 inches</i>

G. Planting Suggestions

Watermelons need a warm soil to grow and good spacing for sunlight for high sugar content and flavor. If transplants are purchased, they should be stocky.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended. One week after blossoming begins, sidedress with 1 1/2 ounces of ammonium sulfate for pH soils or ammonium nitrate for low pH soils per 10 feet of row. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

I. Cultivation

Cultivation should be shallow, when necessary, to remove other plant competition. Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality. If it becomes necessary to cultivate, penetrate the soil no deeper than 1 inch.

J. Watering

Watermelons have a water stress point of 65 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball, and your hand feels like it has a film of water on it, the soil moisture will be 65 percent or above. If the soil moisture is below 65 percent, the film of water will not be felt on your hand, and it is time to water again.

Plant growth can suffer from too much or too little water. The symptoms will be the same. As the percentage of soil moisture drops, the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

K. Insects

The following insects may cause problems: aphids, cucumber beetle, cabbage looper, spider mites, and wireworms.

L. Diseases

Diseases include curly top, leaf spot, and wilt.

M. Harvesting

Watermelon is ripe when the vine tendril next to the fruit yellows and dries, when the underside of the melon next to the ground takes on a yellow tinge, and when thumping with a finger causes a dull rather than a sharp sound. Cut the melon off the vine, leaving a short stem on the fruit. Pulling the stem from the fruit may damage the fruit. Most melon cultivars form an abscission layer at maturity, and the stem loosens from the fruit. When the stem is nearly loose the melon is said to be at the full slip stage.

XXIV. Winter Squash

A. Food Value

A pound of cooked winter squash contains about 81.4 percent water, 8.2 grams of protein, 1.8 grams of fat, 69.9 grams of carbohydrates, and 286 calories.

B. Description

Winter squash is native to America and was grown by the Indians. There are three main

types: vining, semivining, and bush. Squash will cross-pollinate with other squash, pumpkins, and gourds within the same species. They have separate male and female flowers on the same plant. The fruits, which vary widely in shape and color, may be baked, boiled, or used for pie filling.

C. Yield Per Person

Each person will eat about 6 to 9 pounds of squash during a growing season and need 6 to 9 pounds for canning or freezing. This will require a row of squash 12 to 18 feet long. Each foot of row space produces about 1 pound of squash.

D. Seedbed

Squash is adapted to most soils but grows best in a fertile soil rich in humus. Seedbed preparation should start when the soil has sufficient moisture to form a mud ball that will crumble into medium-sized fragments. Cultivation should mix crop residues and organic matter in the top 7 to 8 inches of soil. It should destroy current weed growth and provide a small, granular type bed for transplanting. Overcultivated soil becomes powdery and has a tendency to crust. The ideal pH for squash growth is 6.0 to 7.5. Squash does well in Idaho soil, which ranges from 7.0 to 8.0.

E. Seed Time

The time to seed squash in Idaho is 3 weeks before transplanting when soil temperature is 65°F. The variety of squash planted should have an early maturity date and be developed for weather conditions in the area planted. Maturity date should be 85 to 120 days after transplanting. Squash may also be seeded directly into the soil 2 to 3 weeks after the last killing frost. Squash thrives in warm soil, and the use of plastic mulches is common.

F. Planting Specifications:

<i>Seed per foot</i>	<i>1 to 2</i>
<i>Ounce per foot</i>	<i>0.05</i>
<i>Row width</i>	<i>72 to 120 inches</i>
<i>Germination</i>	<i>6 to 10 days</i>
<i>Seed depth</i>	<i>1 inch</i>
<i>Plant spacing</i>	<i>12 to 24 inches</i>

G. Planting Suggestions

Squash needs a warm soil to grow in, but not an extremely hot growing season.

Squash tolerates partial shade and is sometimes interplanted with corn.

H. Fertilizer

A preplant fertilizer of 0.2 pound of N for each 100 square feet is recommended. One week after blossoming begins, sidedress with 1 1/2 ounces of ammonium sulfate for high pH soils or ammonium nitrate for low pH soils. The amount of fertilizer applied should be based on a soil test report from the University of Idaho Analytical Laboratory or a private testing laboratory. Plants may be over- or under-fertilized.

I. Cultivation

Cultivation should be shallow, when necessary, to remove other plant competition. Deep cultivation close to the plants will destroy much of the root system and reduce yield and quality. If it becomes necessary to cultivate, penetrate the soil no deeper than 1 inch. Squash plants provide good ground cover and will shade out most weeds as they mature.

J. Watering

Winter squash has a water stress point of 60 percent. When the percent of water in soil drops below this level, the plant will start to dehydrate, and growth will be slowed down or stopped. The percent of water in the soil can be estimated by taking a handful of soil at the 6-inch depth and squeezing it into a ball in your hand. If it forms a ball and your hand feels like it has a film of water on it, the soil moisture will be 60 percent or above. If the soil moisture is below 60 percent, the film of water will not be felt on your hand, and it is time to water again.

Plant growth can suffer from too much to little water. The symptoms will be the same. As the percentage of soil moisture drops, the oxygen level in the soil increases. Plants need water, oxygen, and nutrients to grow.

K. Insects

The following insects may cause problems: aphids, cucumber beetle, slugs, spider mites, wireworms, and squash bugs.

L. Diseases

Squash diseases include aster yellows, black rot, curly top virus, root rot, and storage rots.

M. Harvesting

Harvest winter squash when fully mature. Indications of maturity are a hard rind and a solid exterior coloring. The acorn types are harvested when a yellow, orange color has developed on the fruit where it is in contact with the soil. In Idaho, the growing season is short at best, and most winter squash are harvested when the vine has been killed by frost but before a hard frost. To harvest, cut the stem with a knife 2 inches from the fruit. Let the squash cure in the sun for 1 or more weeks or cure inside house at a temperature of 75°F for 1 week or more before storage.

N. Storage

When cured, store in a home cellar or basement at 55°F. The humidity should be moderately low. Properly cured and stored squash should remain in good condition throughout the winter.

Further Reading

Booklets and Pamphlets

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| CIS 292 | Blossom-End Rot of Tomatoes (25¢) |
| CIS 1041 | Conduct Your Own Garden Research (\$2.00) |
| CIS 660 | Gardening: Growing Beets, Carrots, Radishes and Other Root Crops (50¢) |
| CIS 661 | Gardening: Growing Cole Crops (25¢) |
| CIS 756 | Gardening: Growing Cucumbers (35¢) |
| CIS 686 | Gardening: Growing Garlic (25¢) |
| CIS 691 | Gardening: Growing Lettuce, Spinach, and Swiss Chard (35¢) |
| CIS 659 | Gardening: Growing Peppers (25¢) |
| CIS 723 | Gardening: Growing Squash and Pumpkin (35¢) |
| CIS 800 | Growing Vegetable Seedlings for Transplanting (50¢) |
| PNW 495 | Grow Your Own: Beans and Peas (\$1.00) |
| BUL 775 | Planning an Idaho Vegetable Garden (\$4.00) |
| CIS 1000 | Potato Production in the Home Garden (50¢) |
| PNW 497 | Short-Season Vegetable Gardening (\$2.00) |
| CIS 910 | Sweet Corn Production for the Small-Market Grower and Home Gardener (50¢) |
| CIS 667 | Tomatoes for the Home Garden (35¢) |
| CIS 755 | Vegetable Gardening: Planning and Preparing the Site (35¢) |
| CIS 803 | Vegetable Gardening: Growing Asparagus (35¢) |