

Bean Bonanza



Teacher's Guide



Curriculum Connections

Grade 3 Science - Students will:

- investigate the requirements of plants and the effects of changes in environmental conditions on plants;
- describe, using their observations, the changes that plants undergo in a complete life cycle;
- describe, using their observations, how the growth of plants is affected by changes in environmental conditions;
- design and conduct a hands-on inquiry into seed germination or plant growth;
- record relevant observations, findings, and measurements, using written language, drawings, charts and graphs;
- describe various plants used in food preparation and identify places where they can be grown;
- describe various settings in which plant crops are grown;
- demonstrate awareness of ways of caring for plants properly.

Grade 3 Healthy Living - Students will:

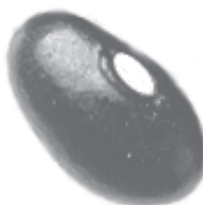
- describe the benefits of healthy food choices, physical activity, and healthy bodies.

Grade 4 Social Studies - Students will:

- describe the distinguishing features of regions within the provinces;
- identify the natural resources necessary to create Canadian products;
- locate key information about natural resources and their uses.

Grade 4 Healthy Living - Students will:

- analyse, over a period of time their own food selections and determine whether or not they are healthy choices.



Grade 5 Science - Students will:

- demonstrate understanding of factors that contribute to good health;
- describe the types of nutrients in foods;
- identify a balanced diet as one containing carbohydrates, proteins, fats, minerals, vitamins, fibre and water, and design a diet that contains all of these;
- identify food sources from which people in various societies obtain nutrients;
- interpret nutritional information to make healthy food choices;
- demonstrate awareness that some disorders can be affected by diet.

Grade 5 Healthy Living - Students will:

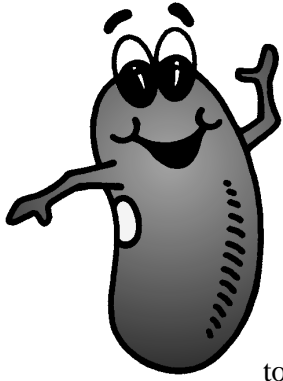
- explain the purpose and function of calories and major food nutrients;
- identify critical content information on food labels (e.g., ingredients, calories, additives, fat content).

Grade 6 Geography - Students will:

- describe ways in which Canada is connected to the rest of the world through trade;
- identify some of Canada's trading partners;
- identify countries to which Canada exports goods.

Grade 7 Geography - Students will:

- demonstrate an understanding of how Canada's natural resources have contributed to its economic development;
- demonstrate an understanding of the concept of sustainable development and its implications for the environment;
- produce a report on the factors that affect the availability of natural resources in the future;
- present and defend a point of view on how a resource should be used;
- describe the correlation between physical patterns and types of crops (e.g., land-forms; plains/grains; climate; tropics/bananas).



History - Bean There

Beans were a popular meal as far back as 5,000 years ago in ancient civilizations in Mexico, Turkey, Babylonia, and Troy. The ancient Egyptians revered the bean as a symbol of life. Canadian pioneers regarded baked beans and home made bread as a staple of life that provided substantial nutrition to hard-working settlers everywhere.

Beans have been grown commercially in Canada since 1856, principally in the rich soil adjacent to Lake Huron where today 155,000 hectares of land are devoted to the production of a variety of beans.

Today, although Canadians continue to eat large quantities of beans, less than one quarter of our crop stays in Canada. Canadian beans are now shipped to more than 70 countries and are regarded as a gourmet delicacy in Japan and Bavaria, standard fare in the House and Senate restaurants in Washington and a staple in Britain where 60% of the population eat beans four times a week - at breakfast on toast and during the afternoon at High Tea. Bean salads, chili, bean soups, bean flour, and bean brownies, pizza and pitas are examples of the growing popularity that beans have on international menus.



Producer Profile

Bernadine and Warren Wolfe

Bernadine and Warren Wolfe have operated a 2500 acre farm in the Mitchell area for the last twenty years. In addition to growing 500 acres of Kidney and Cranberry beans, they also grow corn, soybeans, wheat and barley, run a seed cleaning operation and a seed lab. Bernadine is a qualified seed analyst trained by Agriculture and Agri-Food Canada to analyze a large number of seed varieties.

Assisted by their children, Kim, Rob, Brighite, and Dan, there is never a dull moment at the Wolfe farm. At least one of their children, Rob, plans to attend Agriculture College in Ridgetown to continue in the family business.

Warren uses a three-year rotation system in his bean operation and regular tilling to ensure that his bean seeds have the best possible chance to grow. Every two weeks he checks the crop for weeds, leaf hoppers and mould and adjusts his pesticide program accordingly. Because of the delicate nature of beans, which require regular rainfall, and excellent soil with lots of sunshine, he is usually busy from dawn to dusk, tilling, spraying and checking for pests.

Harvesting normally occurs in late August. Bernadine uses a windrower and two combines to cut, gather, dry and separate her beans. Plants and stems are returned to the earth for compost, augmented by manure from her hog operation.

Bernadine and Warren are an excellent example of the drive and energy typical of Canadian farmers striving to create Canadian produce that is second to none in the world marketplace.





Bean Power

Beans are the meal of the new millennium. They are high in fibre and protein and low in fat. A diet that features bean consumption may help to reduce cancer, heart disease and stroke - the main diseases in our society.

Nutritional Content of 1 cup/ 250 ml of cooked White Pea Beans

Calories (energy)	269 Kcal	Riboflavin	0.11 mg
Energy (kilojoules)	1124kJ	Niacin	3.9 mg
Protein	17 g	Pantothenic Acid	0.47 mg
Fat (total lipids)	1 g	Vitamin B6	0.24 mg
Fatty acids	0.9 g	Folate	259 mcg
Cholesterol	0 mg	Iron	5.4 mg
Carbohydrates	49 g	Calcium	138 mg
Total Dietary Fibre	13 g	Phosphorous	320 mg
Sodium	4 mg	Magnesium	129 mg
Potassium	876 mg	Zinc	2.1 mg
Thiamin	0.45 mg	Copper	0.28 mg

Beans are nutritional powerhouses. Half a cup of cooked and drained kidney beans, for example will provide more than 50 per cent of the recommended daily intake for folacin and 20 per cent of our fibre requirements.

Most other beans have similar features.



Folic Acid - This B vitamin is instrumental in controlling and reducing Homocysteine in our arteries. Homocysteine is an amino acid that thickens and destroys the elasticity of arteries, making them susceptible to arteriosclerotic plaques. Replacing refined sugar and flour products with beans prevents the build-up of homocysteine in arteries.

Fibre - Fibre controls diabetes, obesity and heart disease, lowers blood cholesterol levels and blood sugar levels and may also help to prevent diabetes and colon cancer. Beans are an excellent source of soluble and insoluble fibre.

Iron - Iron combines with haemoglobin in the blood and helps to transport oxygen to all our cells. Deficiencies in Iron produce anaemia - a common disorder in people on vegetarian diets or reduced food intake. Beans are an excellent source of iron.

Magnesium - Magnesium helps muscles to contract and relax. When the muscles lining arterial walls contract blood pressure rises. Magnesium has dramatically reduced high blood pressure in a variety of studies. Many people lack adequate supplies of this chemical. Beans are an excellent source of magnesium.



Beans also supply copper, potassium and phytochemicals, all nutrients playing a major role in the prevention of heart disease and cancer.

Bean Power continued



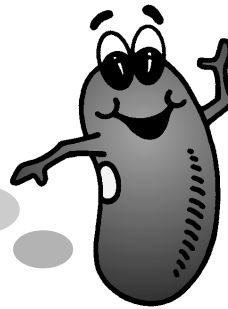
Members of the legume family, beans are excellent sources of vegetable protein. Since vegetable protein alone does not contain all of the essential amino acids necessary for human assimilation, the protein in beans is maximized when beans are mixed with bread, rice, fish, dairy or animal proteins. The amino acid, methionine, that is low in dried beans is high in cereal protein. Lysine, an amino acid low in rice and corn, is high in dried beans. Hence,

when the two are eaten together as they are in such treats as baked beans and toast, Cuban black beans with rice and Mexican beans with corn tortillas, the bean protein becomes complete and ready for body use.

Beans also act as an appetite suppressant. Because they are digested slowly, and cause a low sustained increase in blood sugar, beans can delay the reappearance of hunger for several hours, dramatically enhancing weight-loss programs.



Flatulence or Intestinal Gas



Some people may experience flatulence when switching to beans as part of their diet. The following suggestions may help in the reduction of flatulence:

- Eat beans regularly
- Gradually increase beans in your diet
- Increase your fluid intake when increasing fibre in your diet
- Rinse dry beans under cold running water
- When soaking dry beans add 1/8 tsp of baking soda to the water to reduce indigestible sugars
- After soaking, rinse beans again before cooking in fresh water
- Rinse beans after cooking if the recipe allows
- Avoid eating other gas-producing vegetables such as cabbage, cauliflower, broccoli and Brussel sprouts with beans
- When using canned beans in brine, discard the canning liquid and rinse beans under cold running water
- Try a digestive enzyme such as Beano or a gas relieving product such as Phazyme
- Check the sodium level. Some brands are much lower in sodium than other brands
- Try frozen beans. Like other frozen vegetables, frozen beans have less salt, are easy to prepare and are delicious.

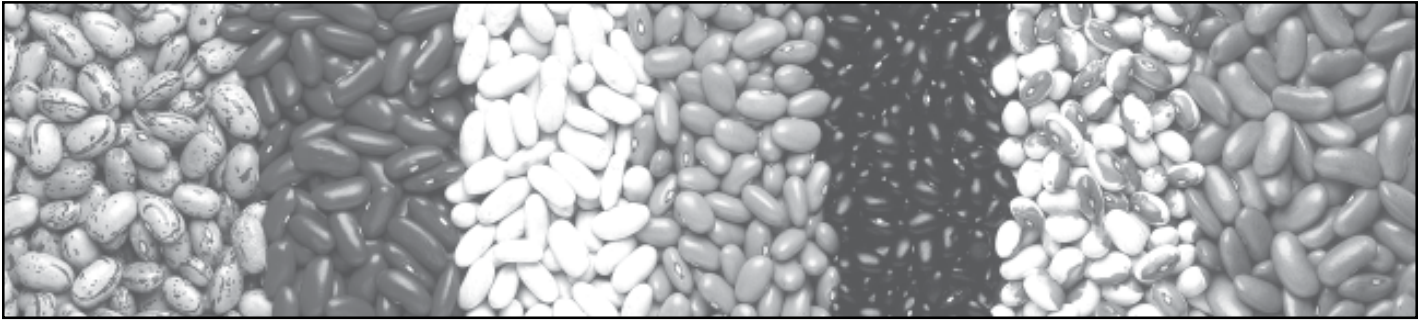


Student Activities

1. Soil scientists rank land into seven classes. The first three are the most important for farmers. If Class 4 soil is farmed, it takes two hectares to produce the same crop yield gained from one hectare of Class 1 soil. Ontario is comprised of 89 million hectares of land. Only 7.4 million hectares are Class 1,2,or 3 soil. Only two million hectares are Class 1 soil. What percentage of total Ontario land is Class 1 soil?
2. Ninety percent of Ontario's Class 1 land (45% of all of Canada's Class 1 land) is located south of a line from the northern tip of Toronto to Lake Huron, an area which is also the industrial heartland of Canada. Most Ontario bean production occurs in Huron, Perth and Middlesex counties. Explain why the soil is so rich in these areas.
3. From 1971 to 1976, Ontario lost 200,000 hectares of its farmland to urban expansion. Canada's Wonderland amusement park, and Stelco's Lake Erie works at Nanticoke are two examples of this loss. There was also a severe downturn in the agricultural economy during this time. At least 15,400 hectares of land lost was prime farm land. What can be done to prevent further losses of this valuable resource?
4. From 1976 to 1986, a further loss of 6% of Class 1 and 2 soil occurred. Successive governments, concerned with such losses, tightened rural development policies to slow the rate of loss to 1.6% over the next decade. In 1996, however, the Harris government imposed changes to the planning act which made it easier for developers to access farmland for industrial / residential purposes. What reasons would a government have for doing this?
5. Before 1996, staff at the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) reviewed all proposals for the development of agricultural land. Now most authority for planning approvals rest with local councils. Why would this change benefit the interests of land developers?
6. Heavily populated areas like Hamilton Wentworth where 78% of the land is zoned agricultural and 1060 farm businesses occupy 110,000 acres, are under increasing pressure to convert agricultural land to subdivisions for housing. Farmers look to sell their land as their only means of attaining a secure retirement. What safeguards need to be in place to protect this non-renewable resource?
7. Rural severances create a pattern of scattered development that results in a demand for urban services - water and sewage, for example. This increases taxes and causes hardships for farmers who are unable to afford such dramatic tax increases. How can a policy of strong urban boundaries prevent such problems?



8. Developers can offer higher prices for farm land than can be justified by the income it can earn producing food. Land for farming generally sells at \$4,000 per acre. Developers will pay between \$8,000 and \$20,000 per acre for the same land. Loss of agricultural land to developments is irreversible. Thus the country's need to preserve farmland results in the loss of farmers' rights to put their land to its most profitable use. Suggest solutions to this dilemma.
9. If bean seeds are planted at a rate of 45 kg/ha and are spaced in 20 seeds per metre in rows 70 cm apart, how many rows of beans would be planted in a hectare measuring 10 m by 1000 m ?
How many bean seeds would the farmer plant in that hectare?



10. The following acreage was devoted to bean production in Ontario and Canada in 2004:

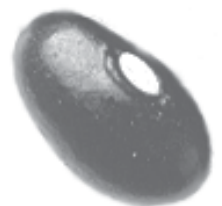
Based on industry numbers for the 2004 crop

Bean Type	Ontario	Canada
White Pea	62,000	152,900
Cranberry	13,500	29,110
Dark Red Kidney	9,000	13,600
Black Turtle	5,500	16,300
Light Red Kidney	4,500	11,500
White Kidney	1,700	1,700
Pinto	200	78,700
Other	8,200	9,900
Total Acreage	100,900	340,130



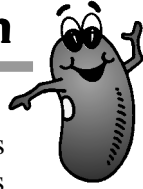
- What is Ontario's percentage of total Canadian bean production in terms of acreage planted?
- In terms of total Canadian bean production, which bean type does Ontario produce the most of? Which bean type does Ontario produce the fewest of?
- Total acreage devoted to bean production in Canada is estimated as follows in 2003-04:

Manitoba	166,000	Ontario	98,000
Alberta	60,000	Quebec	23,000
Saskatchewan	9,000		
- Explain why there is such a variation in provincial acreages devoted to bean production.



Create a Bean Sprouting Station

in Your Classroom



Supplies needed:

- 30 transparent plastic cups
- brown sturdy paper towels
- Masking tape to label student cups
- Water
- Measuring cups for watering plants
- An assortment of: White Pea, Black, Pinto, Cranberry, Dark Red, Great Northern, Light Red Kidney, Pink and White Kidney beans

Directions

- Give each student 1 cup, 2 paper towels, 5 beans, tape and water.
- Have each student write his/her name and the date on their cup.
- Have students place one rolled paper towel in the bottom of their cups.
- Scrunch the remaining paper towel on top of the other one.
- Give each student their choice of bean type. Have them drop their beans in the cup so that they land between the paper towels close to the sides of the cup.
- Pour water into cup saturating both towels.
- Place cups on window sill.

- Students are informed that their plant is their responsibility. They will be evaluated on the completeness of this form, accuracy of observations, identification of days when germination, planting and flowering occur and comparisons of their bean growth with that of at least two other varieties of beans. Once the beans germinate, students are to plant them in pots containing potting soil brought in from home. A complete report including graphs of plant growth, explanation of variations in growth and comparisons with at least two other bean varieties will be required at the end of the experiment.
- Have students keep a log of their bean plant growth using the following form:

Date	Sunlight Hours	ml of Water Added	Dates of Germination, Planting, Flowering Stages	Height of Plant in cm
DAY 1				
DAY 2				
DAY 3				
DAY 4				
DAY 5				
DAY 6				
DAY 7				
DAY 8				
DAY 9				
DAY 10				
DAY 11				
DAY 12				
DAY 13				
DAY 14				
DAY 15				
DAY 16				
DAY 17				
DAY 18				
DAY 19				

The Baked Bean Story



The Baked Bean Story is an informative film that explores the history and cultivation of the white bean from spring planting, through harvest and processing to distribution to the tables of the world.

Expectations - *Students will:*

- understand how a Canadian crop is produced for the domestic and export market
- learn how and where beans are grown and the conditions required to grow this crop successfully
- understand the critical part nature plays in agriculture
- become aware of the interdependence of natural cycles and the business of agriculture

Pre Viewing activities

- Find Huron, Perth and Middlesex counties on an Ontario map.
- Explain how the soil got there and what are its special properties.
- Check with Statistics Canada to find average rainfalls during the growing season. Compare this with other parts of Canada. Find other places in the world where similar soil, land-form and rainfall conditions occur.
- Study the paths of glaciers in Canada during the ice age. When did this age end? What effect did this have on the land? What happened when the climate changed?



Vocabulary Study - Define the following words by referring to your dictionary:

Babylonia	bean ladder	criteria	custom	galley
germinate	gourmet	Great Glacier	hectare	Murphy's Law
pioneer places	porridge	quality control	red carpet	silo
substantial	Troy			

Post Viewing Activities

- Are beans planted on flat or hilly land? What was this land like before the pioneers arrived? How was the land cleared?
- What elements are most important for the bean farmer? How many of these does the farmer have control of? What can't he control?
- What kind of quality controls were used in the factory? What steps were taken to ensure that the beans are of the very best quality? Does the food processor have complete control here?
- How many different ways are beans shipped and sold? What is the easiest method to transport large quantities of beans? How are beans bought in stores? What kinds of containers are used?
- How has this video changed your opinion of beans, bean production and processing methods?

Extension Activities associated with the video

- What is your favourite bean recipe? Collect recipes from the class, duplicate them and create a class recipe booklet. Give your booklet a title and give copies as gifts at Christmas, Mother's Day or Valentine's Day.
- Advertise a **bean festival day** for the whole school. Invite members of your class to bring in bean salads, casseroles, pitas, pizza or baked beans for lunch. Serve beans to the whole school. Use the proceeds to finance a favourite class project or a charity of your choice.
- Compare the nutrition found in beans with that found other vegetables and in meats. Create a report that compares the cost and nutrition found in beans with that of other comparable foods.
- Visit a field-crop farm or food processing factory to see work in progress. Write a report explaining production or processing procedures.
- Visit The Farm Museum in Milton and compare old farm implements with their current day counterparts.
- Create a list of examples of unusual uses of beans; i.e. bean bags, markers, counters, measurers, artwork ...

A "Beanword" Puzzle

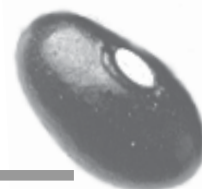


ACROSS

- _____ protect plants from infection and humans from heart disease.
- Seeds are controlled best in bean crops through the use of rotary _____.
- Sixty percent of Brits eat beans more than _____ times a week.
- Navy or Pea beans are also called _____ beans.
- _____ beans have a black satin colour.
- Beans are harvested when their pods are brittle and _____.
- The most popular bean in Ontario is the _____ bean.
- Another name for White Kidney beans is _____ beans.

DOWN

- Black beans have a _____ like flavour.
- The bean producer has approximately _____ days to grow his crop.
- _____ have the highest folate content of all beans.
- Beans are an excellent source of _____ when mixed with grains or cereals.
- Beans have always been a popular meal in _____.
- Canada ships beans to more than _____ countries.
- Dark Red Kidney beans are great in _____.



Choose your answers from the following words:

hoeing

Mexico

navy

dry

ninety

soups

four

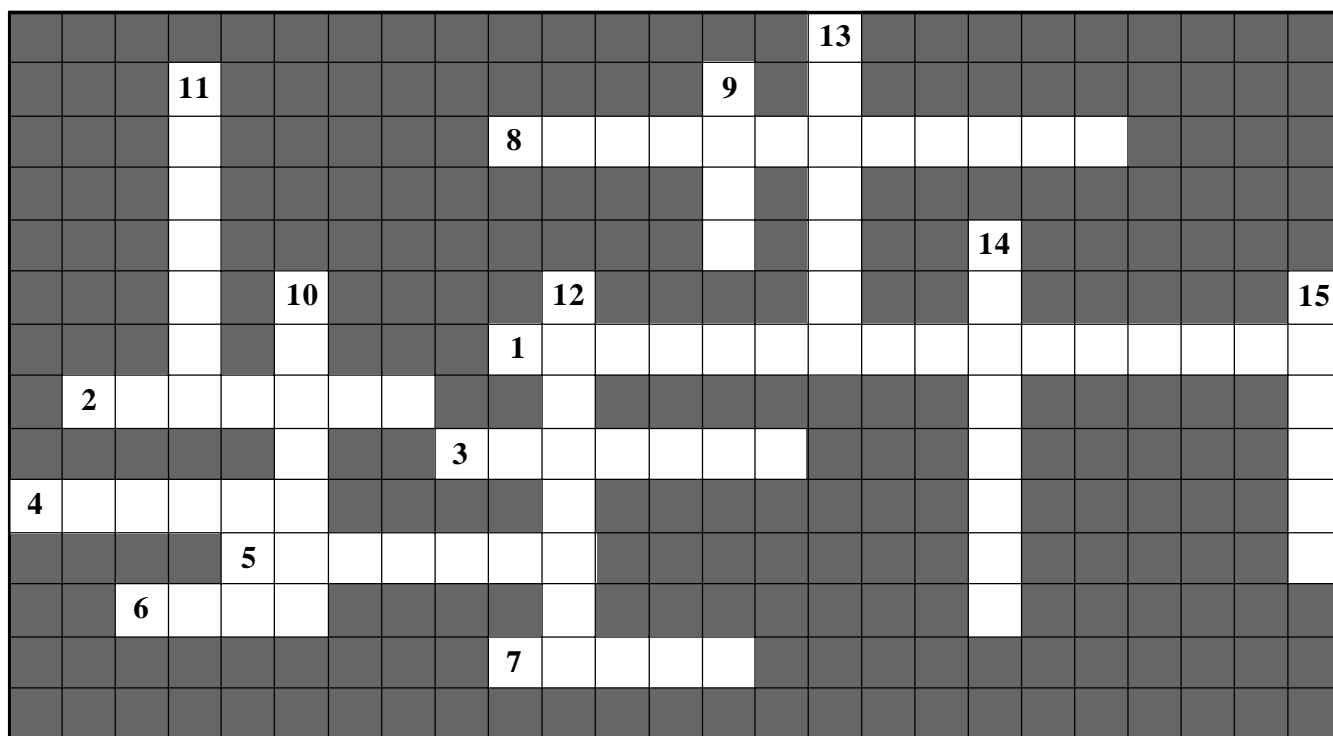
nut

Turtle

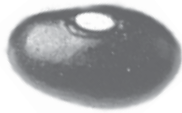
Cannellini

protein

White



Lunch



The following students went out for lunch. They ate the following meals. Compare the nutritional benefits of each.

Nutritional Component	John Cheese Pizza	Jasmine Four Bean Salad	Dominic Greek Bean Pita	Julie Hamburger and fries
Calories (Kcal)	480	240	287	502
Protein (grams)	22	10	16	14.5
Fat (grams)	16	7	4	20.3
Carbohydrate (g)	60	34	49	65.3
Fibre (grams)	3.2	18	8.85	3.4

- Which student had the “best” meal?
- Which nutrients did Julie miss that were prevalent in John, Jasmine and Dominic’s lunch?
- What medical complications is Julie susceptible to if she continues to maintain this type of diet? Why?
- Which student is most likely to be more alert for afternoon classes? Why?
- Sample all four meals. Which one tastes best to you?
- How could you encourage people to eat more bean-based meals?



Create a Beanfest

- Divide your class into five teams. Have each team select one of the following quick recipes. Ask teams to provide lunch on a specified Beanfest day. Ask students to discuss their favourite recipes.

Maple Baked Beans

- Add diced ham, chopped onion, mustard and maple syrup to a can of baked beans. Bake at 350 F/ 180 C for 25-30 minutes.

Bean Muffins

- Spread toasted English muffin halves with mustard, top with heated baked beans, sprinkle with sharp cheddar cheese and broil until cheese bubbles.

Mexican Beans

- Combine baked beans, kernel corn, chopped red and green pepper, chopped tomato and chili powder to taste. Heat and serve.

Bean Soup

- Combine one can baked beans, one can condensed tomato soup and one can water. Add some diced salami or pepperoni, a dash of Worcestershire sauce. Heat and serve.

Cheesy Beans

- Combine one can baked beans with chopped onion, celery, carrot, minced garlic and oregano. Sprinkle with grated Parmesan cheese.



BEAN BONANZA BEAN BONANZA BEAN BONANZA BEAN BONANZA BEAN BONANZA BEAN BONANZA BEAN BONANZA

What a Bean Needs to Sprout



Materials needed:

- 4 jars
- 4 rubber bands
- plastic food wrap
- 8 bean seeds
- 2 paper towels
- water



- Tear each paper towel in half to produce 4 pieces. Fold each into a square that will fit in the bottom of the jars. Soak three of the squares with water. Leave one square dry. Place two beans on the paper in each jar. Cover each jar with plastic wrap and secure with the rubber bands.
- Number each jar from 1 to 4, using the following descriptions:
 1. Light and water
 2. Light and no water
 3. Cold and water
 4. No light and some water
- Place the dry jar and one of the wet jars in a warm sunny place. Put the second wet jar in the refrigerator and the third in a dark closet.
- Notice the changes in the beans over the next several days.
- Number 1 seeds will grow normally. Number 2 seeds will not change. Number 3 seeds will wrinkle but otherwise remain unchanged. Number 4 seeds will grow like number 1 seeds but will be completely white with no colour. These results indicate that plants need moisture, warmth and sunlight to develop.

Bean Planting Process

Beans - from Planting to Harvest

Bean farmers must be aware of weather conditions throughout the growing season. Beans are sensitive to moisture, cold, fertilizers and pesticides. Beans are planted in late May or early June and harvested about three to three and a half months later. Harvesting may take place using a pull and windrow system, with combining twelve to forty-eight hours later. Some farmers may use the “narrow row direct harvest” system in which beans are harvested directly with a harvester. In either case, it is important that the beans are harvested when dry; consequently, fairly dry weather just before harvesting is important.

Preparing the Soil

The best soil for bean growing is clean, well-drained clay loam or sandy loam with a high percentage of organic matter. Bean farmers always rotate their bean crops, most often using a three-year cycle which allows the soil to replenish nutrients. Beans grow best in areas where cereals, corn or alfalfa have been grown in the past years. Since beans are particularly sensitive to moisture and could rot in compacted soil, farmers tend to avoid the preparation

of the soil when it is wet. At the same time, some moisture is needed to germinate the seeds.

Planting

Warm, slightly moist soil, with the seeds planted about 4 - 5 cm below the surface are ideal conditions for initial growth. The beans are planted in rows about 400 - 700 cm apart and at a rate of 16 - 20 seeds per metre. For every hectare of land, the farmer will use between 50 and 75 kg of seed. Manure and commercial fertilizers are used to produce the best possible crop.

Harvesting

Three processes are involved in the harvesting. **Pulling** is done in the morning when the bean plants are damp. The “puller” cuts the plants 3-5 cm below the ground and combines two rows of plants into one row. The **windrower** pushes four or more pulled rows together for combining. The beans are left to dry for up to two days before being combined. The **combine** opens the tough pods and collects the dry beans in a bin for storage and shipping. As has been noted, some farmers will harvest directly without the pulling and windrowing stages of the process.

Resources

Print

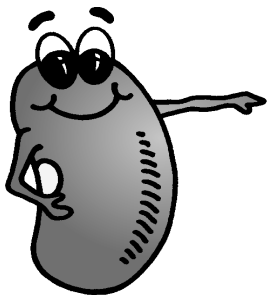
- The Complete Book of Vitamin and Mineral Counts** Netzer, Corinne T.; Dell Publishing; New York; 1998
- Eat Well, Stay Well** Reader's Digest; 1998
- The Fat Counter** Natwo, Annette and Heslin, JoAnne; Pocket Books, New York, 1998
- The Heart Revolution** McCully, Kilmer; Harper Collins, New York; 1999
- The Nutraceutical Revolution** Firshein, Richard; Penguin Putnam, New York; 1998
- Nutrition Action Newsletters** Centre for Science in the Public Interest; Toronto; December 1998, January 1999, May 1999
- The Ontario Curriculum** Social Studies, Grades 1 - 6, Health and Physical Education, Grades 1-8, Science and Technology Grades 1-8.
- The Supreme Bean** Ontario White Bean Producers; London, Ontario
- Vitamin B6 Therapy** Ellis, John and Pamplin, Jean; Avery Publishing; New York; 1999
- Vitamins and Minerals** Sullivan, Karen; Element Books Limited; Dorset, England; 1998
- Where Have You Bean All My Life** The Coloured Bean Growers Association, Mitchell, Ontario

Recipe Booklets

- Supreme Bean 1 / Supreme Bean 2 / Big Beautiful Bean**
Ontario Bean Producers Marketing Board, Tel.: 519-652-3566
www.ontariobeans.on.ca

Videos

- Full of Beans** (*Primary students*)
Ontario Bean Producers Marketing Board, Tel.: 519-652-3566
www.ontariobeans.on.ca
- A World of Beans** (*Senior*) V2608 1995
- Baked Beans Story** (*Junoir*) V2031 1981
- Full of Beans** (*Primary*) V1585 1992
Ontario Agri-Food Education Inc.
www.oafe.org



Websites

- www.ontariobeans.on.ca
www.ocbga.com
www.oafe.org



Ontario White Bean Producers

4206 Raney Crescent
London, Ontario N6L 1C3
519-652-3566
Fax: 519-652-9607

E-mail: whitebeans@ontariobeans.on.ca
Website: www.ontariobeans.on.ca

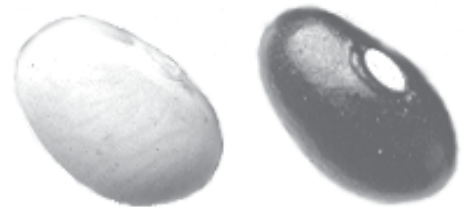


Ontario Coloured Bean Growers' Association

R.R.#5, Mitchell
Ontario N0K 1N0
519-348-4141

Fax: 519-348-8165

E-mail: wbwolfe@allstream.net
Website: www.ocbga.com



Ontario Agri-Food Education, Inc.

Ontario Agri-Food Education, Inc.

8560 Tremaine Road
Milton, Ontario L9T 4Z1
905-878-1510

Fax: 905-878-0342

E-mail: info@oafe.org
Website: www.oafe.org