

Blueberries are “Best”

Prepared by Jennifer Johnson
B.Ed
British Columbia Agriculture
in the Classroom Foundation
Summer Institute 2006 Unit Plan
For Food Studies 11 & 12



Summer Institute 2006 was sponsored by:



Summer Institute for Educators

This document is the result of the author's participation in the BC Agriculture in the Classroom Foundation's Summer Institute for Educators. This third year level course in curriculum design is offered through the University of British Columbia's Faculty of Education's Office of External Programs.

Participants (up to 20 educators from Kindergarten to Grade 12) spend one week at the Montfort House Rural Resource Centre situated on Vancouver Island. Here they develop a number of practical teaching strategies for their classrooms using examples drawn from the agricultural, environmental, economic and nutritional concepts featured in the BC Integrated Resource Packages for their particular grade or subject area.

The agricultural community sponsors participants for the costs of learning resources, meals, tours and accommodation.

Participants taking the course for credit create teaching modules such as this to share with other educators from around the province.

Applications can be made on the BC AITC website at www.aitc.ca/bc.

Core funding for BC Agriculture in the Classroom Foundation's Summer Institute for Educators 2006 was provided by:



Teacher sponsorship was provided by:

- BC Blueberry Council
- BC Broiler Hatching Egg Commission
- BC Cattlemen's Association
- BC Chicken Growers' Association
- BC Institute of Agrologists - Okanagan Branch
- BC Institute of Agrologists - Fraser Valley Branch
- BC Landscape Nursery Association
- BC Milk Producers Association
- BC Turkey Marketing Board
- Bevo Farms
- Greater Vancouver Regional District
- Nechako Valley Regional Cattlemen
- North Okanagan Livestock Association

BC Agriculture in the Classroom Foundation is supported by:



1767 Angus Campbell Road
Abbotsford, BC V3G 2M3
P: 604-556-3088
F: 605-556-3030
www.aitc.ca/bc

Table of Contents

Table of Contents	3
Rationale.....	4
Curriculum Outcomes	6
Objectives for these Teaching Activities:	7
Activity 1: “What Food am I?” – An Introduction to	8
Blueberries	8
What Food Am I?	9
Background Information for Debriefing What Food am I?	10
Activity 2: What makes Blueberries the “Best”? – the health benefits of blueberries.....	12
What makes Blueberries the “Best”	14
What makes Blueberries the “Best” Student handout.....	15
What makes Blueberries the “Best” - Answer Key.....	17
Activity 3: Growing Blueberries – A virtual tour	20
Activity 4: The challenges of Blueberry Farming.....	21
Blueberry Farmer Challenges Cards	22
Activity 5: Cooking with blueberries - a consumer comparison (Part 1).....	26
Super Blueberry Muffins.....	27
Activity 6: Cooking with Blueberries Part 2 Exploring the Diversity of Blueberries	29
Exploring the Diversity of Blueberries – Evaluation.....	30
Other Extension Activities:	31
Resources	32

Rationale

Eating is something that we all have to do, but many of us do not think about why we are eating what we are eating, let alone looking further at the “what.” We live in a society that is always in a hurry and is looking for the quick meal. This meal is not necessarily the healthiest meal that will have a larger benefit to them and their overall health, but instead it is the quick fix. We tend to eat foods that are high in fat, salt and sugar in order to get the taste we crave, and we tend to find foods that are low in all of these ingredients to be lacking in flavour. Part of the problem with the lack of flavour in many of the foods that we eat can be attributed to the number of miles that food has had to travel in order to get to our plates. Consumers want foods that are not necessarily in season here in Canada. They are willing to pay for food that has been grown in other countries and picked when it was unripe. As a result, these foods have less flavour than those that are able to ripen on the tree/vine/bush/plant. In order to get food that has great flavour, we need to start eating food that has been produced locally and that is in season. By doing this, one is then able to not only benefit from the amazing flavour of locally produced seasonal food, but is able to benefit nutritionally as well.

In Home Economics classrooms in BC we need to be aware that most of our students are coming from households that are described above. They are looking for convenience and foods that are ready to eat in as short a time as possible. The only connection with food that many of our students have is that they can buy it at the local grocery store or drive through, and it satisfies the grumble in their stomach. They do not think much about the food they are eating, but they know what they like, and often are hesitant to try new foods. Many students have never seen a garden or know which foods can actually be grown in their backyard. Most students also do not realize the large variety of foods that are actually grown, raised, produced, packaged, and distributed from British Columbia.

Presently, students are more at risk of health issues due to diet than any other generation before them. In fact, this is the first generation that will probably die prior to their parents, and it is mainly due to their diets and lack of exercise. This was recently reported in the mainstream media (Canadian Press, April 2006), and is something that we should be very concerned about. As teachers of Foods and Nutrition, we need to give our students the tools they need to critically analyze their own diets and to inform them on how to possibly make positive changes to their diets. This information will help students make better food choices, which will allow them to get more nutrients out of their food, and not just empty calories from the fats and sugars that they

tend to eat. We know that we can not just tell them the information. We need to help in developing their critical thinking skills so that even if they do not change their diets now, they have the information to change their diets at a later date. They need to know the reasons why they should choose better foods, and the risks they face if they do not. They also need to know which foods are the most nutrient dense (will get the most benefit of vitamins and minerals), so that they do not need to eat too many “different” foods. The more complicated it gets, the less likely they will choose to eat it.

One of these seasonal foods that have been declared a “super food” is the blueberry. In fact, it has been said that “blueberries contain the most health protecting antioxidants of all fruit and vegetables” (Jacobi, 3). Consequently, blueberries are a food that we should be heavily promoting in our classes so that our students can be eating foods that are nutrient dense. British Columbia was the world’s second largest producer of highbush blueberries in 2004 (BC Blueberry Council). The industry is continuing to grow and will most likely be the number one producer in the world within the next few years. Ninety-nine per cent of the blueberries are grown throughout the Fraser Valley in Richmond, Pitt Meadows, Matsqui Prairie and Surrey (Ministry of Agriculture and Lands), yet if you asked your students where blueberries grew, many would not know that BC even produced them.

Blueberries, therefore, are a very good example of a locally grown product that we can easily introduce into our Home Economics classrooms, while also promoting buying local and choosing foods that are high in nutrients. Our students may be hesitant, but at least they will be able to see that their teachers are encouraging them to do this. By practicing it in their classrooms, students, and hopefully future students, will think more about the foods they are eating.

My final hope is that I will be able to continue supporting local farmers, again in my own life and in my classroom. Identifying where I have purchased local produce, and supporting BC products whenever I am able to (both financially and availability wise). Informing our students what foods are produced in BC and how to identify them, will start them on the process of being more informed consumers. I also hope to foster relationships with the local farmers and to be able to have their products in my classrooms on more of a regular basis. Whether it is buying 40 lbs of blueberries in September and freezing them, contacting a blueberry processor and buying pre-frozen blueberries, meeting the farmer at the local farmer’s market and having them bring me pickling cucumbers for my class or just reading labels and buying as local as possible. It does sometimes get difficult, and it does require advance planning, but in the long run it does make a difference.

Curriculum Outcomes

Blueberries are something that we can integrate into any curriculum in Food Studies from Grade 8 to Grade 12. In fact, the more that our students are exposed to a food item, the more likely they will become familiar with it and will be more likely to continue to try the food. However, due to the terminology and the higher thinking skills that I would like to explore with my classes, I have decided that this unit would work best with Food Studies 11 and 12 classes.

The following are the selected Food Studies 11 and 12 Prescribed Learning Outcomes that can be achieved in this unit.

Food Preparation Principles:

- Demonstrate an understanding of cooking principles
- Explain and use basic food related terminology
- Demonstrate the effective use of time

Food Preparation Techniques:

- Demonstrate a variety of food preparation techniques
- Analyze the effects of food handling on nutrition, health and safety
- Adapt ingredients and methods to create original recipes

Food Products:

- Select food products and meals to meet nutritional and aesthetic standards
- Prepare food products and meals based on Canada's Food Guide to Healthy Eating
- Demonstrate an appreciation of the aesthetic and social aspects of food

Nutritional Issues:

- Describe the functions of nutrients in the body
- Identify the food sources of nutrients
- Identify nutritional issues and describe their effects on well being
- Critique the production, composition, and consumption of commercial food products

Social and Economic Issues:

- Identify environmental and health issues related to the production and consumption of food
- Identify factors that affect the food supply
- Critique global environmental and health issues related to the production and consumption of food

From the Home Economics IRP, BC Ministry of Education

Objectives for these Teaching Activities:

After this unit has been completed students will:

- Have a better understanding of the reasons they choose the foods they do
- Know the benefits of eating foods that come from a local supplier
- Understand the meanings of words that may seem long and confusing when they hear them in the media but are mainly compounds in our food supply that mainly have a positive benefit on our health and future health
- Be able to identify some of the locally produced crops that contain large amounts of health promoting compounds
- Critique the differences between locally produced foods and foods that come a long distance, wild versus cultivated products, organic versus non-organic
- Explain the challenges faced by farmers who produce our food
- Find and prepare recipes that minimize the loss of nutrients and retain the maximum amount of benefit to their diets

Activity 1: “What Food am I?” – An Introduction to Blueberries

Materials/Resources:

- Make an overhead of **What Food Am I?**
- Fresh or dried blueberries for sampling (optional)

Directions:

Use the overhead as a hook or motivator for this lesson. Either cover the clues and reveal one at a time and allow students to guess OR have students in groups discuss the clues and write their guess on a piece of paper. At your signal, have them reveal their answers and discuss who was right and how they came up that particular food. Teacher can debrief this by going through each of the clues giving students additional information, see **Background Information sheet for What Food Am I?** At this point in the lesson, small samples of this “superfood” could be given to students for sampling.

What Food Am I?

My technical name is *Vaccinium corymbosum*.

Of the world production of me, Canada ranks second.

I like acid soil.

95% of the Canadian production of me is located in BC's Fraser Valley

About half of me are frozen or made into value added products and the rest are sold fresh.

Honey bee colonies are brought to the fields when I am in flower so that I get pollinated and produce a good crop.

I hate starlings because they can eat up to half of me.

I can be harvested by hand or by mechanical harvesters.

I grow on high bushes and low bushes but the high bush variety is the most common in BC.

More and more farms are growing me because consumers are demanding more of me for my health benefits. I've been called a "superfood".

Background Information for Debriefing What Food am I?

My technical name is *Vaccinium corymbosum*.

Vaccinium is a general category that refers to bilberries, whortleberries and blueberries. Corymbosum refers specifically to high bush blueberries.

Of the world production of me, Canada ranks second.

We used to be 3rd but in the past few years planting and production has increased dramatically moving us to 2nd place. The United States is first and Poland is third. In 2002, BC produced 36.7 million lbs of high bush blueberries with a farm gate value of over \$44.2 million.

I like acid soil.

Favourable soil and climate conditions made it possible for British Columbia to become Canada's leader in blueberry production. Once grown only in peat (drained bogs) now blueberry bushes are also cultivated in mineral soil.

99% of the Canadian production of me is located in BC's Fraser Valley

About 99% of BC production occurs in the Lower Fraser Valley — primarily Abbotsford, Pitt Meadows, Surrey and Richmond — but blueberries are also grown on Vancouver Island and the Interior.

About half of me are frozen or made into value added products and the rest are sold fresh.

Food processing companies pack approximately 55% of total production for use in the preparation of bakery and dairy products, fruit filling, canned berries, frozen berries in commercial and retail packages, jam stock, juices and concentrate, pasteurized and many new uses and products have been developed including blueberry chips, various confections, even blueberry tablets. Fruit wines are a new development in the wine industry and there are local companies in British Columbia producing blueberry wines.

Honey bee colonies are brought to the fields when I am in flower so that I get pollinated and produce a good crop.

Raising bees is called apiculture and it is extremely important that bees and other pollinators are available for crop pollination.

I hate starlings because they can eat up to half of me.

Blueberry farmers worldwide must deal with bird predation. Birds can consume as much as half a farmer's crop. For a farmer, this often represents the difference between profit and loss. Among birds, starlings cause the most damage to blueberry fields in British Columbia. A voracious feeder, the starling was introduced to North America from Europe over a century ago. Since that time, about 100 birds have multiplied into the hundreds of millions that exist today.

I can be harvested by hand or by mechanical harvesters.

Growers purchase or lease mechanical harvesters, or rely on contract services. As acreage increases and labour supply declines, more and more acreage is being harvested by machine. In the past, fruit harvested mechanically was suitable only for processed sales; however, with the right variety and careful operation, machine picked fruit can be sold for fresh markets.

I grow on high bushes and low bushes but the high bush variety is the most common in BC.

Low bush blueberries are native to Eastern Canada. The high bush variety is used in most commercial blueberry farms.

More and more farms are growing me because consumers are demanding more of me for my health benefits. I have been called a superfood.

Blueberry acreage has almost doubled in the last five years

For more information see:

- p. 84 and 85 of “**Grow BC” A Guide to BC’s Agriculture Resources** (there may be a copy in your school library). Order from BC Agriculture in the Classroom Foundation www.aitc.ca/bc

- Fact sheet – Blueberry Farming in your Community...Contributions and Challenges
http://www.agf.gov.bc.ca/resmgmt/fppa/factsheets/contributions_challenges.pdf.

- An Overview of the BC Highbush Blueberry Industry
http://www.agf.gov.bc.ca/berries/publications/document/bchighbush_updatedfactsheet.pdf.

Activity 2: What Makes Blueberries the “Best”?

The Health Benefits of Blueberries

Materials/Resources:

- Make a copy of the statements about “**What makes Blueberries the “Best”**” and cut into strips to separate each of the statements
- Make copies of student handout – “**What makes Blueberries the “Best”**”
- Collect nutrition reference books and make arrangement for computer and internet access
- Collect supplies for students to make pamphlets/posters if you choose to do the follow up activity

Directions:

• What are the Health Benefits of Blueberries?

This activity refers to the last statement on the “What Food Am I?” overhead. (More and more farms are growing me because consumers are demanding more of me for my health benefits. I am called a superfood). The transition is easily made to “let’s find out what the health benefits of blueberries are”.

a) Distribute the statements about blueberries “**What makes Blueberries the “Best”**” to pairs of students, explain that their task is to find out what the highlighted (bolded) word in the statement is, and what it does that contributes to or that affects our health. Students can use reference texts, the library or research on the internet. Give the students a time limit and remind them that their responsibility is to report to the class the results of their search. (Note: this could be given out at the end of a class for homework).

b) Distribute the handout “**What makes Blueberries the “Best”**”. Have each pair read their statement and report on the term they had to research so that each class member can record the results on their handout. If students had difficulty finding the information, the teacher can refer to the answer key to assist. In debriefing this activity, the teacher can highlight the number of servings of fruits and vegetables recommended by Canada’s Food Guide to Healthy Eating. Mention various campaigns recommending consumptions of fruits and vegetables, e.g.

5 to 10 a day for better health

<http://www.5to10aday.com/>

A collaboration involving the Heart and Stroke Foundation of Canada, the Canadian Cancer Society and the Canadian Produce Marketing Association, which involves encouraging Canadians to eat more fruits and vegetables.

5 a day the color way

<http://www.5aday.com/>

This is a US campaign developed as a partnership between the National Cancer Institute and the Produce for Better Health Foundation. It was the first national health promotion focusing on the importance of eating more fruits and vegetables. It encourages people to eat a variety of fruits of vegetables so all the colours (red, yellow/orange, blue/purple, white, and green) are included in the diet each day.

Possible Follow-Up:

- Students could produce a poster/pamphlet about blueberries and their nutritional benefit.

What makes Blueberries *the* "Best"

Each of the following **statements** has a term that is used in relation to blueberries and health. Find out the meaning of the term (what they are) and why it is important to health (what they do).

Blueberries have the most **antioxidants** of all fruits (40% more than the second best, the strawberry).

Another health benefit of blueberries comes in the tiny seeds, an excellent source of **fiber**. One cup provides roughly a quarter of the daily recommended total.

Blueberries offer a great lineup of minerals like **potassium and iron**.

Blueberries are an excellent source of vitamins, especially **Vitamin C (ascorbic acid) and Vitamin K**.

Blueberries are a particularly rich source of a group of antioxidants called **anthocyanins**.

Blueberries, with their varying amounts of health-promoting **phytochemicals**, are currently being studied for their health benefits.

Blueberries have been described as a **nutriceutical**.

In general, blueberries are one of the richest sources of antioxidant **phytonutrients** of the fresh fruits and vegetables.

Blueberries came out on top, rating highest of all fruits in their capacity to destroy **free radicals**.

Blueberries and cranberries contain compounds called **proanthocyanides (PAC's)**. Blueberries contain the **phytosterol**, pterostilbene, which is similar to resveratrol, another antioxidant, found in grapes and red wine.

Blueberries contain the phytosterol, **pterostilbene**, which is similar to resveratrol, another antioxidant found in grapes and red wine.

Blueberries are a rich source of **flavonoids**.

What makes Blueberries the "Best"

Student handout

Each of the following terms has been related to blueberries. Find out what they are and what they do for health.

	<u>What they are</u>	<u>What they do</u>
1. Anthocyanins		
2. Antioxidants		
3. Ascorbic Acid		
4. Fibre		
5. Flavonoids		
6. Free Radicals		
7. Iron		

8. Nutraceutical		
9. Phytochemicals/ Phytonutrients/		
10. Phytosterols		
11. Potassium		
12. Pterostibene		
13. Proanthocyanides (PAC'c)		
14. Vitamin K		

Additional Notes:

What makes Blueberries the "Best"

- Answer Key

	<u>What they are</u>	<u>What they do</u>
1. Anthocyanins	These antioxidant flavonoids are the red, purple, and blue pigments found in fruits and vegetables.	Several studies suggest anthocyanins discourage blood clots from forming, warding off heart attacks. They help prevent cancer and heart disease and may improve memory, slow macular degeneration and promote urinary health and healthy aging.
2. Antioxidants	Compounds that protect the body from oxidation, a natural process that creates harmful molecules called free radicals.	Antioxidants help neutralize harmful by-products called "free radicals" and minimize the cellular damage they cause that can accelerate aging and lead to cancer and other age-related diseases. They also reduce the build-up of so called "bad" cholesterol that contributes to cardiovascular disease and stroke.
3. Ascorbic Acid	One of the two active forms of vitamin C. Vitamins are organic, essential nutrients required in tiny amounts. The deficiency disease Vitamin C is scurvy. The term ascorbic comes from antiscurvey.	Vitamin C is an antioxidant, it helps form the connective tissue collagen, and it is a cofactor in many other reactions.
4. Fibre	Fibres are the structural parts of plants. They may be soluble (indigestible food components that dissolve in water to form a gel) or insoluble (indigestible food components that do not dissolve in water e.g., skins, seeds, strings in celery).	Aid in digestion and elimination.

5. Flavonoids	Flavonoids are phytochemicals that occur naturally in plant pigments that are the brightly colored chemical constituents found in most fresh fruits and vegetables. Then include anthocyanins, catechins, isoflavones, lignans, quercetin, and theaflavins.	Flavonoids are powerful antioxidants that may help to protect LDL against oxidation and reduce platelet stickiness, making blood clots less likely. They also protect against cancer as they scavenge carcinogens.
6. Free Radicals	Unstable molecules.	They cause oxidation by attacking other molecules. Oxidation causes damage to the collagen matrix of cells and tissues that can lead to cataracts, glaucoma, varicose veins, hemorrhoids, peptic ulcers, heart disease and cancer.
7. Iron	Is a trace mineral. It can be classified as heme (found in meat, fish, and poultry) and non-heme (found in plants).	Iron is part of the hemoglobin which carries oxygen from place to place in the body. It is also a part of myoglobin in muscles which makes oxygen available for muscle contractions.
8. Nutraceutical	A combination of NUTRITION and pharmaCEUTICAL.	Is used to describe foods that are considered important to health (so important they are like medicines) - eating naturally rather than artificially to preserve good health.
9. Phytochemicals/ Phytonutrients/	Natural compounds found in plants.	They appear to be potent disease fighters due to their antioxidant properties and health promoting actions in the body. See antioxidant.
10. Phytosterols	Also known as plant sterols, phytosterols are a naturally occurring class of compounds found in the cells and membranes of plants.	They block the absorption of cholesterol and reduce blood cholesterol levels.
11. Potassium	Potassium is a major mineral vital to good health.	Potassium plays a major role in maintaining fluid and electrolyte balance and cell integrity. Potassium plays a role in maintaining normal blood pressure. Potassium also appears to reduce the risk of stroke.

<p>12. Pterostibene</p>	<p>A powerful phytosterol that is an antioxidant that helps lower LDL (bad cholesterol) levels in the blood.</p>	<p>By lowering cholesterol and lipid levels in the blood, it may help to alleviate and may even reverse signs and symptoms of heart disease and stroke.</p>
<p>13. Proanthocyanides (PAC'c)</p>	<p>They are a unique, naturally occurring class of flavonoids.</p>	<p>They promote urinary tract health and reduces the risk of infection. They appear to prevent bacteria from adhering to the cells that line the walls of the urinary tract so they cannot cause infection.</p>
<p>14. Vitamin K</p>	<p>Vitamins are organic essential nutrients required in tiny amounts to perform specific functions in the body. The "K" stands for <i>koagulation</i> (the Danish word for coagulation or clotting),</p>	<p>Is responsible for activating different proteins and calcium and causing blood to clot.</p>

Activity 3: Growing Blueberries – A Virtual Tour

Materials/Resources:

- Computers with internet access for a virtual tour of the blueberry industry (this is produced by the US Highbush Blueberry Council but the procedures are the same here so the information is transferrable).

Directions:

1. Take a virtual tour of the blueberry industry. Students can do this individually or in pairs in a computer lab or the teacher can make arrangements to show the slides on a LCD projector.

<http://www.blueberry.org/tour.htm>

Direct students to note all the careers/jobs related to the industry as they view the pictures in the virtual tour

2. Compare their list with the list in “Grow BC” - A guide to BC’s Agriculture Resources p.85

- Blueberry growers
- Field workers (crop maintenance/picking)
- Transporters/truckers
- integrated pest management services
- Researchers
- Market/promotion workers
- Fertilizers and pesticide sales people
- Nursery workers and owners
- Farm equipment dealers

Discuss the contribution of the agriculture industry to the economy of BC, and why it is important to support local agriculture.

- In 2002, BC produced 36.7 million lbs of highbush blueberries with a farmgate value of over \$44.2 million.
- There are approximately 450 blueberry operations in BC.
- The food industry generates approximately 207,000 jobs for British Columbians, this constitutes nearly 15% of the employed labour force of the province.

Activity 4: The Challenges of Blueberry Farming

Materials/Resources:

- Copies of the Blueberry Farmer Challenges Cards
- Poster paper and markers
- *Agriculture Fish & Food in BC* map (order from www.aitc.ca/bc)

Directions:

- Divide the class into 7 groups. Direct the students to number off from one to four and outline the following responsibilities:
 1. Reads the card to the group.
 2. Records the information on the poster paper.
 3. Holds the poster when presenting the information to the class.
 4. Reports the information from the group to the class.

ALL must contribute to the discussion.
- Their task is to:
 1. Explain why this is a challenge to the Blueberry Farmer.
 2. Explain some actions that have or can be taken to address this challenge.
 3. Outline the consequences of the actions for the farmer and the consumer.
- Have each group present their challenge to the class and discuss any questions or issues that arise. Ask students if this helps them to appreciate the work of producing food and engage them in a discussion about the benefits of purchasing and consuming locally produced food.

Blueberry Farmer Challenges Cards

Birds

Blueberries are delicious and not just to us. Birds love them! Every year thousands upon thousands of starlings, crows and song birds descend on blueberry fields all over British Columbia's Fraser Valley - where more than 95% of Canada's highbush blueberries are grown - to feast on the fruits of farmers' labours. This invasion adds up to significant losses to farmers and not just from consumed berries, but also to fruit that is downgraded due to damage by these winged predators. Blueberry farmers use a variety of tools, from noise devices to scarecrows to flash tape to netting, to protect their crop from birds - but all tools have their limitations. Noise devices have proven to be one of the most economically effective tools.

Laws of Supply and Demand

BC blueberry sales are not regulated by a marketing board. Most blueberries are sold to processors or fresh packers that grade, pack, and market the berries. Many growers also sell some of their product directly to the consumer through farm markets and U-pick.

Because of recent high demand for fresh fruit, an increasing percentage of the blueberry crop is sold on the fresh market.

Pricing is largely determined by the supply of highbush (cultivated) and lowbush (wild) blueberries throughout North America. Michigan has a significant influence on the market prices because of its relatively large production of highbush blueberries. Historically, blueberry prices have been volatile from year to year. Over the last 10 years, prices have ranged from 38¢ to over \$1.30 per pound. North American blueberry production acreage has increased significantly over the past few years in response to recent high blueberry prices. Over the next few years, as young plants reach full production, this expansion will greatly increase berry supplies and may eventually result in downward pressure on prices. There is a limited production of organically grown blueberries in BC this means that they generally commands higher prices.

Labour Shortages

The berry industry had suffered from an acute shortage of field labourers. A 2002 labour survey of BC berry producers estimated that the blueberry industry had a shortfall in seasonal labour requirements of approximately 34%. Until 2004, BC was one of the few jurisdictions in North America without a foreign migrant worker program that had alleviated similar labour shortages in other countries. Here in BC, producers had to rely on an aging local workforce that was unable to adequately meet the labour demands of the industry. In May 2004, the Government of Canada Seasonal Agricultural Workers Program expanded in British Columbia. This program allows for the organized movement of foreign workers to meet the temporary seasonal needs of Canadian agricultural producers during peak harvesting and planting periods, when there are traditionally shortages of qualified Canadian workers. The program is not cheap - farmers have to pay travel costs, provide accommodation, medical coverage and must pay migrants the same as domestic workers and there have been difficulties meeting these requirements.

Global Competition

Canada is a net exporter of wild and cultivated blueberries. Berries are sold throughout the world, including the United States, Japan, Europe (primarily Germany), and Australia. BC highbush blueberries compete on the world marketplace with producers of both cultivated and wild (lowbush) blueberry crops from eastern Canada and several growing areas in the United States. Many other growing regions, such as Chile, Eastern Europe and China, are becoming significant blueberry producers and may have an impact on world supplies and prices.

Food Safety

The threat of food-borne illnesses, especially in fresh fruit and vegetables, has received increased attention in recent years. In 2001, the BC blueberry and raspberry councils initiated the development of an on-farm food safety program, including the establishment of food safety protocols and a training program. Growers must keep records that detail their production practices, and processors are currently working on implementing practices that comply with the Hazard Analysis Critical Control Point (HACCP) program, which involves analyzing and monitoring food safety risks and developing an action plan to manage them.

Rural/Urban Conflicts

If you look at a map of BC (***Agriculture Fish & Food in BC map***) you will see that 95% of blueberry farms are located in the Fraser Valley, the most densely populated region of British Columbia. This part of BC is also experiencing an unprecedented increase in residential housing. This rapid urban growth has brought urban and rural populations into close proximity. New residents are often not used to living so close to farms and there have been conflicts over loud bird scaring devices.

Blueberry Scorch Virus

Blueberry Scorch Virus (BLSV) was first found in BC in 2000 and has become a serious threat to the industry. The virus causes severe dieback, blossom blighting and significant yield loss on susceptible varieties. Infected plants eventually die. BLSV is spread by aphids or by planting infected stock. Blueberry farmers must be vigilant in inspecting their fields. Early removal and disposal of infected plants in fields where the disease is limited is one way to control the spread. Aphid control based on monitoring for aphid populations and application of approved pesticides is also used. In planting and re-planting blueberry farmers must be careful to obtain virus free plants.

Activity 5: Cooking with Blueberries - A Consumer Comparison

Materials/Resources:

- Ingredients for the blueberry muffin recipe
- A selection of blueberries – fresh, frozen, dried, organic, low bush, highbush, wild, etc. (when purchasing, keep a record of the cost)
- Copies of the Blueberry Muffin Recipe
- Copies of the Muffin Evaluation Sheet

Directions:

Use the following blueberry muffin recipe, but have part of the class use local blueberries (frozen or fresh), part of the class use an imported blueberry (frozen or fresh), and the rest of the class use a wild blueberry (frozen, might be organic or may not be). Have them taste each of the three different blueberry muffins and evaluate them.

- 1) Can they identify a flavour difference between the muffins? Is one sweeter than the other?
- 2) Does one have more “blueberry flavour” than the others?
- 3) Is there any difference in texture? Again, use this opportunity to talk about the benefits of using a local product and supporting the local farmer.
- 4) A cost comparison can also be done on this recipe at this point. Is there a difference in price for the blueberries? Why? Why might the imported berries be cheaper (or more expensive) than the local berries? Is it really worth the extra expense to purchase wild blueberries?
- 5) Why would one want to purchase organic berries (wild or cultivated)?

Super Blueberry Muffins

Yield 6 Muffins
Source: Unknown

Ingredients:

250 mL flour
80 mL sugar
10 mL baking powder
1 mL salt
125 mL fresh or frozen blueberries
1 egg
125 mL milk
50 mL oil

Method:

1. Preheat oven to 200°C (400°F).
2. Grease muffin tin or use muffin liners.
3. Measure and sift flour.
4. In a large bowl, sift together flour, baking powder, sugar and salt.
5. Stir in blueberries.
6. In a small bowl, beat egg lightly with a fork. Add oil and milk.
7. Make a well in the center of the dry ingredients and add the liquid ingredients to the dry ingredients all at once.
8. Stir the batter only until just mixed (approx. 8 times). Batter will be lumpy.
9. Evenly fill each of the 6 muffin cups with the batter.
10. Bake for 20-22 minutes or until toothpick comes out clean and the muffins are golden brown.
11. Cool on cooling rack.

Muffin Evaluation

Type of Blueberry	Taste	Texture	Sweetness (1 not sweet to 10 extremely sweet)	Cost per 100g

Questions:

1. Of the three blueberry muffins, which one did you prefer and why?
2. Which of the blueberry muffins would be the most cost efficient?
3. Is there a benefit to buying local? Buying organic?
4. Which blueberry would have the least impact on the environment? Why?
5. Which blueberry would be the most likely to contain the most nutrients? Why?

Activity 6: Cooking with Blueberries - Exploring the Diversity of Blueberries

Materials/Resources:

- Access to recipes books

Directions:

The BC Blueberry Council website www.bcblueberry.com encourages consumers to add recipes to their website. This assignment involves students selecting, modifying and testing recipes that either already use blueberries or are modified to include blueberries. Their task is to find/develop a recipe; make it either in class or at home; have a class taste panel to evaluate the product (you could bring in outside evaluators), and then if the recipe is a success, actually load it onto the BC Blueberry Council Website. The Blueberry Council uses the following categories for recipes:

Breads and Rolls

Breakfast

Cakes

Desserts

Condiments

Desserts

Jams/jellies

Muffins

Pasta

Pies

Poultry

Rice Dishes

Salads and Salad Dressings

Sandwiches

Sauces

Seafood

The students could work in partners or individually and could either draw a category or have the opportunity to pick a category.

Normal lab procedures (submitting grocery orders, etc.) would apply.

Exploring the Diversity of Blueberries – Evaluation

Category of Recipe	Name of Recipe	Colour	Flavour	Texture	Overall Rating

Other Extension Activities:

- **Value added simulation** – many of the blueberry producers are looking as “value added” products that allow them to increase their return on the blueberries they produce. From jams, jellies, vinegar, blue berry chips the possibilities are great. Assign students the task of developing a “value added” product and producing a marketing plan to present to a blueberry producer.

- **Field Trip or guest speakers** - Unfortunately, the blueberry season does not coincide very well with the school year. Harvest normally is in the summer months when we are not in school. Some, years, however, harvest can begin as early as the beginning of June, and can last, with some late harvest varieties, into October. Ideally it would be best to visit a blueberry farm and have them take the students through the fields to see how blueberries grow, explain how blueberries are harvested (mainly by hand!), what happens after harvest with regards to processing (cleaning, packaging, shipping or even possible freezing or production of other blueberry products). The BC Blueberry Council would be best at providing this information and providing contacts of farmers that may be interested in having small tours or who might be willing to come to the school to talk about their farm.

- **Researching nutrient loss** - Students could research are what happens to the nutrients in the blueberry when it is processed? Frozen (IQF or traditionally)? Made into juice? Cooked? Any difference in the nutrition of a wild blueberry versus a cultivated blueberry? Any difference in the nutritional value of a lowbush variety of blueberry versus a highbush variety of blueberry (B.C. grows the highbush variety)?

- **Investigating market forms** – Students could visit a local supermarket and take note of all the various market forms and products that contain blueberries. They could follow up with another consumer comparison where they find a convenience product (e.g., blueberry muffin mix) and compare it to home made (in terms of taste, cost, time, nutritional value, amount of blueberries, etc.)

- **Viewing the movie Deconstructing Supper** - Prior to the movie, students could brainstorm the reasons they choose to eat the foods that they do. Collate the list on the overhead or the front board. Even though this movie does focus on Genetically Modified foods, it looks at the broader picture of “What are our Food Choices”. After the video has been viewed a response paragraph could be done by each student asking them about their feelings now, about the food choices that they make and if they have even thought about the issues that have been brought up in the film. Do they really know where their food comes from and what may have been done to it?

- **ABC’s of Apples in BC** – to follow up with another fruit, try this unit also available from BC Agriculture in the Classroom Foundation.

- **Book Reports** – there are several books out that discuss issues related to the food we eat. Depending on the reading level of your class you might consider having them read one of them (e.g., Omnivore’s Dilemma by Michael Pollan; The Way We Eat: Why our Food Choices Matter by Peter Singer and Jim Mason; Fast Food Nation and Chew on This both by Eric Schlosser).

- Have students research other “best” or so called super foods.

Resources

Video:

Deconstructing Supper, a documentary film directed by Marianne Kaplan and produced by Marianne Kaplan and Leonard Terhoch. Looks at Chef John Bishop and his journey of exploring what our food choices really are today. Can be ordered with Public Performance Rights through: Moving Images Distribution. www.movingimages.ca

Books:

Jacobi, D. (2005). *12 best foods cookbook*. Rodale

Millang, T. (2003). *The Joy of Blueberries*. Cambridge, Minnesota: Adventure Publications, Inc.

Pollan, M. (2006). *The Omnivore's Dilemma: A natural history of four meals*. New York, New York: The Penguin Press.

Schlosser, E., & Wilson, C. (2006). *Chew on this: everything you don't want to know about fast food*. Boston, MA: Houghton Mifflin.

Singer, P., & Mason, J. (2006). *The way we eat: why our food choices matter*. Rodale.

On the world wide web:

There are many websites that have information on blueberries, their nutritional information, and production information. Websites that I found that were particularly good were:

www.agf.gov.bc.ca/aboutind/products/plant/blueberry.htm

- Ministry of Agriculture and Lands for B.C. Information on this website on all types of B.C. grown agriculture products.

www.bcblueberry.com

- This is the BC Blueberry Council website. Lots of information about the industry in B.C. and recipes. Contact information is also given if more information is needed.

<http://en.wikipedia.org/wiki/Blueberry>

- The free encyclopedia online. Good general information about blueberries.

www.uga.edu/fruit/bluberi.html

- The University of Georgia website. Good information on blueberries especially about the botanical descriptions, the different types and what they need to grow.

www.blueberry.org

- The North American Blueberry Council Website. Extensive information. From lesson plans for teachers (mainly for elementary), to recipes, health, current research, industry information, and information for food service institutions.

www.whfoods.org

- This website is done by The George Mateljan Foundation. It is a non-profit organization free of commercial influence, which provides this website for you free of charge. Their purpose is to provide you with unbiased scientific information about how nutrient-rich World's Healthiest Foods can promote vibrant health and energy and fit your personal needs and busy lifestyle

www.wildblueberries.com

- information on the wild blueberry crops

www.nabcblues.org

- the North American Blueberry Council website

www.blueberries.com

- the Michigan Blueberry Growers Association (they currently produce the most blueberries in North America)