



British Columbia Agroforestry Industry Development Initiative

Agroforestry Workshop and Tour:

Agroforestry with Native Shrubs

August 1 and 2, 2007

Vernon, BC

Final Report

October 25, 2007

Funding provided by:



The Agricultural Policy Framework (APF): A Federal-Provincial-Territorial Initiative

This event was partially funded under the Agricultural Policy Framework's Food Safety and Quality Transition Program, a federal/provincial/territorial initiative, and the BC Agroforestry Industry Development Initiative through the Investment Agriculture Foundation of BC. The Agricultural Policy Framework is a partnership between the BC Ministry of Agriculture and Lands and Agriculture and Agri-Food Canada.

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1 Introduction

From 2003 to 2006, the BC Agroforestry Industry Development Initiative has delivered seven regional agroforestry workshops throughout BC. This latest workshop was designed to serve a growing interest in emerging production/product development opportunities from native shrub species focused on accessing niche markets for specialty foods and natural health products. In addition to general information on agroforestry and the 'Initiative', workshop participants were provided a balance of practical information on production and conservation methods, harvesting and processing technology, product development and marketing with a focus on good agricultural practices and food quality and safety procedures.

As with previous regional workshops, the goals of this workshop and tour included providing both general and regionally specific information to participants as well as collecting information that the Agroforestry Management Committee (AMC) could use in furthering industry development. Specific objectives of this event were to:

1. to provide education and build awareness about agroforestry systems and their economic, environmental and social benefits;
2. to increase specific knowledge of native shrub cultivation practices, harvesting and processing technology, potential products and markets, good agricultural and collection practices, food safety and quality awareness;
3. to increase awareness of the Agroforestry Industry Development Initiative and the opportunity to apply for cost-shared program funding;
4. to highlight results from an Agroforestry Initiative sponsored demonstration project in the West Kootenay providing a forum for promoting and disseminating results from that project; and,
5. to identify new agroforestry development opportunities, gaps and potential partners.

In addition to the Agroforestry Initiative Facilitator, BC Ministry of Agriculture and Lands (BCMAL) staff and the West Kootenay Herb Growers Cooperative provided support for the organization and implementation of the workshop and tour. Planning began in February 2007 for delivery in August. Specific details on the organization, location, objectives, format, and content of the workshop was coordinated by a committee consisting of George Powell (Agroforestry Initiative Facilitator), Dave Trotter (BCMAL), Raman Gill (BCMAL), Lisa Zabek (Greencover TAC) and Jeanette Lee (WKHGC). Chris Zabek provided registration support at the workshop and Lisa Zabek kept detailed notes for the workshop proceedings.

Presentations were invited from a variety of regional stakeholders and provincial specialists to provide examples and to speak about the general environmental, economic and production concepts in agroforestry practices, product development and marketing. These presentations are summarized in section 2.1 of this report. Participant input on both the workshop content and delivery was solicited through a feedback form. Input from the workshop is summarized in section 2.2 of this report.

The final agenda for the workshop was as follows:

Agroforestry with Native Shrubs

Workshop - Wednesday August 1, 2007, 8 am to 4 pm

Kalamalka Forestry Centre, 3401 Reservoir Road, Vernon, BC

- 8:30 Welcome – Opening remarks
- 8:35 Agroforestry overview - *George Powell, BC Agroforestry Initiative*
- 9:00 Berry production and harvesting overview
Mark Sweeney, BC Ministry of Agriculture and Lands
- 9:30 Huckleberry crop development and management
Dr. Dan Barney, University of Idaho
- 10:30 Refreshment break
- 10:45 Black (“choke”) cherry crop development
Al Oliver, Consultant
- 11:15 Siska First Nation berry management guidelines
Michael Keefer, Siska Traditions
- 11:45 Lunch (included with workshop registration)
- 12:45 Hawthorn agroforestry trials
Jeanette Lee, West Kootenay Herb Growers Co-operative
- 13:15 Shrubs and integrated riparian management
Dave Trotter, BC Ministry of Agriculture and Lands
- 13:45 Panel discussion – “Opportunities and Challenges with Native Shrub Production”
- 14:15 Refreshment Break
- 14:30 Natural Health Product Manufacturer’s Perspective
Jim Strausz, Strauss Herb Company
- 15:00 Berry crops: Good Agricultural Practices and Food Safety awareness
Raman Gill, BC Ministry of Agriculture and Lands
- 15:30 Panel discussion – “Processing, Products and Markets”
- 16:00 Session wrap-up

Agroforestry with Native Shrubs

Tour – Thursday August 2, 2007, 7:30 am to 4 pm

Starting from the Kalamalka Forestry Centre, 3401 Reservoir Road, Vernon, BC

- 7:30 Introduction, load bus
- 7:45 Bus leaves Kalamalka Forestry Centre
- 9:45 Hawthorn Agroforestry Demonstration site 1- Edgewood
West Kootenay Herb Growers Co-op
- 10:30 Travel between demonstration sites
- 10:45 Hawthorn Agroforestry Demonstration site 2- Edgewood
West Kootenay Herb Growers Co-op
- 12:00 Lunch (on your own), *Carol's Restaurant* - Edgewood
- 13:00 Leave Edgewood
- 13:30 Monashee Mountains – huckleberry production site
- 14:15 Leave Monashee site
- 15:30 *Okanagan Spirits* (craft distiller, fruit brandy producer), Vernon
- 16:00 Bus returns to Kalamalka Forestry Centre

2. Workshop Summary

2.1 Presentation Summaries

Agroforestry Overview – George Powell, BC Agroforestry Industry Development Initiative

Agroforestry is the intentional, integrated production of trees or shrubs with other crops and/or livestock. In essence it is the blending of agriculture, silviculture and to a large degree conservation practices in the same land management system. There are five land use systems within the agroforestry family: shelterbelts, silvopasture, integrated riparian management, alley cropping and forest farming.

Agroforestry products may include, but are not synonymous with, non-timber forest products (NTFPs). NTFPs can be derived from a range of production systems along a continuum of integration from wildcrafting (opportunistic harvest with no management input or integration) through compatible management (timber and NTFPs are managed to minimize conflicts, or mitigate problems), to fully integrated agroforestry systems that are designed and managed to create synergies in the system.

Agroforestry has several potential advantages over conventional agricultural or woodlot systems. The first advantage is the potential for production gains through efficient capture and utilization of sunlight and soil resources. If structured properly, the multiple canopy and rooting layers in an agroforestry configuration can make better use of the production potential of the land and therefore produce more in total per unit area than separating production into single use forestry or agriculture operations. The second area of advantage is based in economics. Agroforestry systems are an option for diversification, and it is prudent for any agricultural or woodlot operation to keep diversified amidst the uncertainty of constantly changing commodity markets and production risks. Agroforestry systems also offer the means to generate annual cash flow. Tree or shrub crops are long-term investments and require some investment early on for planting and maintenance. Inflation through the years means the initial investment reduces the “real” return from these systems in the future. Agroforestry systems blend annual production (and cash flow) with long-term production investments, meaning you can offset some or all of the discounting of future profits from your tree or shrub crop. Because the workload between the “agro” and the “forestry” components are often complementary (distributed to different seasons), agroforestry systems can allow you to make better year-round use of your labour, machinery or other capital. This can allow for year-round retention of skilled labour and better use of machinery investments. The third area of agroforestry advantage is in the environmental services afforded by these systems. Trees and shrubs contribute to the diversity and wildlife habitat of our agricultural landscapes. In addition to the long standing use as wind breaks, trees and shrubs are being used in novel applications to filter dust, odours or noise from agricultural or industrial operations as well as providing a buffer between farms and urban development. Trees and shrubs also have the capacity to fix and hold carbon – the sequestration of carbon through agroforestry systems can contribute to the reduction of “greenhouse” gas emissions.

With these potential advantages in mind, the BC Agroforestry Industry Development Initiative was formulated to capitalize on the opportunities and realize their potential to diversify and strengthen our agricultural and forestry sectors. The purpose of the Initiative is to assist the development and adoption of agroforestry in BC, and thereby increase production opportunities, promote stewardship, increase producer incomes and enhance community stability.

Funding for the Agroforestry Initiative is derived from the Investment Agriculture Foundation of BC (IAF) as trustees of the Agri-Food Futures Funds - a federal/provincial partnership. The Agroforestry Management Committee (AMC), a volunteer group of industry and academic representatives oversees the Agroforestry Initiative; advising this group are agroforestry specialists from our federal and provincial governments. The Federation of BC Woodlot Associations (FBCWA) administers the Initiative.

The goals of the Agroforestry Initiative come from the BC Agroforestry Strategic Plan. This plan was authored using direct input from current and potential agroforestry practitioners and it identifies those areas and issues, which need to be addressed for development of agroforestry. Four areas of strategic importance were identified and form the basis of the funding priorities: *Building Partnerships* to demonstrate agroforestry practices; *Raising Awareness* through supporting education, training & access to agroforestry information; *Improving Linkages* between producers, processors, wholesalers and consumers; and, *Supporting Marketing* with a marketing strategy and brand.

The Initiative began full operation late in 2003, and in that time has hosted or supported a number of agroforestry information sessions and seven full-day regional agroforestry workshops. Other extension and information projects include development of the Initiative's website and a quarterly electronic newsletter, *Agroforestry Update*. The Agroforestry Initiative supported the Boreal Centre for Conservation Enterprise to develop a Boreal Agroforestry Production Guide and the Peace Regional Agroforestry Directory; the Initiative also supported the Quesnel Community and Economic Development Corporation to develop publications and training to support birch agroforestry.

There are ten agroforestry demonstrations underway or completed around the province. The demonstration projects include:

- “Hawthorn Agroforestry Farm Trials” in partnership with West Kootenay Herb Growers Cooperative, Edgewood, to demonstrate the viability of growing hawthorn in BC as a new crop within an agroforestry management system to supply the health products market;
- “Silvopasture: Christmas Trees and Forage” in partnership with Kootenay Tree Farms, Cranbrook, to demonstrate the benefits of integrated production of Christmas trees and forage;
- “Page Creek Integrated Riparian Management” in partnership with Page Creek Farm in Matsqui to demonstrate both the potential for agroforestry to improve riparian protection and the economic viability of small agricultural operations;
- “Hybrid Poplar Alley Cropping – Peace Region” in partnership with the Doig River First Nation to demonstrate growing native and traditional seeds in a hybrid poplar alley cropping system; and,
- “Perigord Black Truffle Production” in partnership with the Truffle Association of BC and the University of BC, is developing agroforestry systems for this high-value gourmet crop at sites in the Okanagan, Fraser Valley and Vancouver Island.

Berry Production Overview – *Mark Sweeney, BC Ministry of Agriculture and Lands*

Why grow berries?

There has been major market growth, especially for blueberries, as consumer demand for food with health benefits grows. Berries are a versatile crop with adaptability to a range of production options, including agroforestry systems.

BC Berry Industry

Berry production generates approximately \$200 million in farm gate sales annually from a production base of 25,000 acres. Production is concentrated in the Fraser Valley, but they are grown all areas of province. The industry is export driven and the primary crop is blueberries. A lot of cultivated berry crops have ‘close cousins’ in the wild that could be managed in less intensive systems. Emerging berry crops include blackberries and currants. They have limited market but European taste and antioxidant potential could expand market potential; a private breeder is developing currant cultivars in BC. Saskatoons are another emerging berry crop. It is not widely grown other than in the Peace region but has large potential.

Berry Markets

From a producer standpoint it is important to look at markets and understand what you are trying to grow for. Direct marketing has a lot of potential, but requires time and skill for sales. Wholesale markets are the focus of the Fraser Valley industry – a very competitive, cost sensitive market segment. The processed market– fruit for freezing, manufacturing – has good infrastructure in Fraser Valley, but not in other areas. Small scale, on-farm processing has some real potential with nutraceutical linkages, but it is very important to understand the value chain. Certified Organic market is there BUT berries as a group are generally very difficult to grow organically. ‘Local is the new organic.’

Climate/Weather

Winter hardiness is a very important consideration and it is not just as simple as matching a crop to your plant hardiness zone. For example, 30% of the blueberry crop was lost last year because cold weather arrived at the wrong time when plants had not ‘hardened down’ yet. It is important to do your homework on crop choices and varieties. Growing season is also important– for example, raspberries don’ t like growing season temperatures above 25°C. Within general climate suitability zones you must also consider your farm’s micro-climate - what is happening on your site (e.g. frost pockets) that directly affects the climate experienced by the berries. Is climate changing? A warming climate is expanding the regions in which crops can be grown. For example, blackberries used to be marginal but are now grown dependably in the Okanagan.

Investment / Returns

Establishment costs range from \$5,000 to \$25,000/acre with annual operating costs of \$5,000 to \$10,000/acre. Production costs and returns are highly influenced by labour costs; labour costs (and sourcing labour) are approximately 50 to 60% of the total cost of production.

Land Suitability and Management

Soil type, topography, drainage, irrigation and fertility are the primary considerations. Freely drained sites are important! Management of berry crops is very intensive. Weed control one of largest challenges together with lots of pests and diseases. As a rule, berries are extremely

perishable (for example, raspberries and blackberries will ‘melt’ after a few hours in sun). World wide there is interest in intensive fruit production and in particular ‘out of season’ product. Protection from the elements and pests has led to greater use of field tunnels to protect crops and improve the microclimate around the berries.

Harvest considerations include equipment (from low tech, such as a rake, to high tech harvesters), varieties suitable to mechanized harvest, field layout and training, topography, and economy of scale. It costs approximately \$100,000 for a harvesting machine, therefore you need at least 20 or 30 acres in production to justify the investment. Machines lower labour costs, but they can damage the crop plant and affect the fruit grade.

Processing challenges include foreign material such as insects with the berries in machine harvested products. There is a continual need for cleaning equipment to get saleable product. Foreign material in berries raises food safety issues – mechanical sorters use color/metal detectors to isolate contaminants.

Blueberry pollination can also be a challenge and there may be an advantage in agroforestry systems because they encourage wild pollinators.

Questions to Mark Sweeney:

1. How soon after establishment can you expect a mature crop?

With good management of blueberries in the Fraser Valley, from planting to maturity you can pick a crop in the second year, with significant production in 3 to 4 years, and full production in 7 to 10 years. Blackberries in the Fraser Valley reach full production in 3 years.

2. Is it possible to cultivate berries from local planting stock?

Local stock is not used due to diseases and pests. For propagating planting material, it is best to be as far away from planted areas as possible and use clean stock.

Huckleberries and Bilberries: Management Strategies for Agroforesters

- Dan Barney, University of Idaho

The common names of huckleberry, bilberry, and blueberry, are used interchangeably.

Management factors to consider include:

- Huckleberries can be grown in the wild or grown in cultivated situation.
- Are huckleberries already present? If so what species? What is the site elevation, aspect, snow cover, precipitation, soil moisture, soil type, drainage, pH, habitat type, companion plants, shade density and sunlight requirements, depredation by wildlife?

Crop opportunities include:

Evergreen huckleberry (*Vaccinium ovatum*)– grows within 12 miles of Pacific coast; berries are edible and hang on into autumn – real value is in the foliage (for floral greenery markets); it has been cultivated on a small scale.

Red huckleberry (*V. parvifolium*) – is currently in some demand, although not considered overly palatable. Found on the Pacific coast and in the Cascades; easy to grow.

Dwarf huckleberry (*V. caespitosum*) – widely used by First Nations. Wild harvesting methods (e.g. use of hand rakes) can be a point of cultural conflict. Edible fruit and also has ornamental value.

Bilberry (*V. myrtillus*) – High demand from Great Britain and Europe. Berries are small but easy to grow; requires low pH, moist and well-drained soils.

Alpine bilberry (*V. uliginosum*) – commercial wild harvested in Russia and China; not currently harvested commercially in North America. Grows well in boggy, heavy soil sites.

Cascade huckleberry (*V. deliciosum*) – fruit has excellent aroma and flavour. Good potential for domestication and agroforestry applications. Rhizomatous, and doesn't transplant well.

Alaska bilberry (*V. ovalifolium*) – has very little flavor, but high anti-oxidants and anthocyanins with strong market potential as a nutraceutical.

Mountain huckleberry (*V. membranaceum*) – the most widely harvested huckleberry from native stands and widely distributed in the Pacific Northwest. Large berries, good aroma, excellent flavour. Very diverse berry colour, form and flavour.

Huckleberry Site and Management Considerations

Soils – loam-sandy to loam are favoured (83% of sample sites associated with these soil types). pH generally best between 4 and 5; Organic matter ranges from 1 – 80%. Huckleberry sites are not tied to any macro or micro nutrient levels.

Shade – best performance is with 30-40% shade. They can tolerate more shade if other factors for growth are optimal. A dense canopy can delay dormancy onset.

Huckleberries can grow well with fireweed and beargrass (and can be used as companion crops for honey production and floral products), but compete poorly with sod-forming grasses, scotch broom, blackberry, and noxious weeds.

Management options include: management of wild stands, cultivate in containers, agroforestry systems, raised beds or field propagation.

Overstory management is also an important consideration– there is little/no seed reproduction therefore most wild propagation is via rhizomes. Canopy disturbance can spark propagation by stimulating rhizome growth. Thinning the overstory tree stand can be done via selective harvesting or girdling mature trees, but you should avoid soil disturbance. First nations traditionally managed overstory canopy density with fire. Very hot fires however can kill the rhizomes. Irrigation of huckleberries, if possible, provides a big production advantage.

Questions to Dan Barney:

1. *What are the biological soil requirements for huckleberry production?*

Active soil is good; but you can grow in sterile medium.

2. *What is the best container size to transplant huckleberries?*

Start in 1-inch cells, and eventually move up to 3-4 litre pots. You can't keep huckleberries in a container long term; best to transplant before they are 15-20 cm tall. Plant the shrubs a minimum of 30 cm apart in the field.

3. *Is the anthocyanin content of the berries correlated to soil factors?*

No, but anecdotal evidence suggests flavour seems to be.

4. *Is there huckleberry stock available from the University of Idaho cultivar development program?*

No named stock is available yet, but we hope to have releases within 4 years.

Choke Cherries / Wild Black Cherries - Al Oliver, Agri-Consulting Services

Species and Varieties

Prunus virginiana 'melanocarpa' – west of Cascades with red, purple or black fruit.

Prunus virginiana 'demissa' – east of Cascades with black fruit.

Named varieties for production are mostly available out of Prairie Provinces:

'Pickup's pride'	new release
'Garrington' (Dr. Pearson)	low and bushy
'Red' or 'Lee Red'	red leaves
'Robert'	red leaves
'Boughen's golden'	yellow fruit
'Goertz' (Ag. Canada)	non-astringent

Traditional and Commercial Uses

First Nations have traditionally used chokecherry for food, medicines and tools; for example, stems were used for digging tools to harvest glacier lily bulbs. Potential commercial products are diverse: bark for natural health products; and, jelly, syrup and wine from the berry juice.

Culture and Management

This shrub does not like full shade. It typically takes 5 years from planting until good fruit production. Space 3 - 5 ft between plants and 15 - 20 ft between rows (800 plants /acre = 20ft x 3ft spacing). Wild black cherry prefers fair to good soil.

Many wild selections will sucker profusely. Grafting onto a non-suckering rootstock will give the shrub a "tree" form. Fruiting in southern BC is typically August/September; birds can be a problem, however there are selections that fruit outside of typical fruiting period, which may reduce predation impacts by birds. There are no registered chemical controls for weeds, insect pests or diseases. Poor or irregular fruit set is perhaps the biggest challenge with this shrub crop and is highly dependant on availability of pollinators; Dn' a Gardens in Elnora, Alberta is working on pollination problem and the variety 'Garrington' is mainly self-compatible but may not work here depending on bloom time. All parts of the shrub are toxic to some extent when green; caution should be exercised if planting these shrubs in silvopasture systems to avoid livestock poisoning. Pruning is necessary to keep plants in a designated space, maintain good growth form, remove dead, diseased, dying, damaged, doubles and all other unwanted materials.

If you are considering growing wild black cherry start slow, study and get good varieties, and ensure good fruit set each year through pollination management. Equally important, have a market identified before planting. Berries can be frozen for processing and you must use mechanical harvesting for larger plantings to keep labour costs reasonable.

Questions to Al Oliver:

1. *If you are propagating wild black cherry from seed will they reproduce true?*
Seed reproduction is highly variable, therefore you need to propagate vegetatively. The PFRA is developing a 'super' chokecherry and they are currently in trials.
2. *Are there plant product restrictions on the import of wild black cherry planting stock?*
The Canadian Food Inspection Agency has import restrictions and quarantine requirements for bringing chokecherry into BC to protect the local food industry.

Siska First Nation Berry Management Guidelines

- *Michael Keefer, Consultant for Siska Traditions*

British Columbia has a large diversity of edible berry species, many of which are important to wildlife, First Nations and recreational harvesters, with some being commercially valuable. Many of these species were actively and passively managed by First Nations for millennia. Despite the importance to wildlife and people, there is a scarcity of literature to be found on how to manage for these species. In the interest of developing such guidelines, Siska Traditions Society, the BC Ministry of Forests and Range Research Branch and others are collaborating on two projects, 'Measuring Success in Managing for Saskatoon berries and other NTFPs' and 'Synthesis of Knowledge and Development of Huckleberry Management Recommendations in B.C.'. The former project, being managed by Siska Traditions, also includes an experiment focussed on the management of Saskatoon bushes that incorporates traditional knowledge and disturbance ecology, testing burning, pruning, and control treatments. In its first year the site of the experiment (located in the Fraser River Canyon near Lytton, B.C.) was timber cruised, fuels and fire history assessed, oral history interviews completed, and the relevant literature reviewed. Results to date show good agreement between field and oral data sources on the stand structure and fire history, and have provided a modern context for a number of Nlaka'pamux terms that refer to plant management. Data from these projects are being assembled into a consistent searchable format that includes fields such as aboriginal uses, commercial values, habitat relationships, and management considerations such as response to fire, palatability to wildlife, susceptibility to disease, competition, etc. During 2007, guidelines will be written for the maintenance and enhancement of Saskatoon (*Amelanchier alnifolia*), blackcap (*Rubus leucodermis*), beaked hazelnut (*Corylus cornuta*), and black huckleberry (*Vaccinium membranaceum*). The information being compiled is targeted to resource managers, including First Nations, foresters, agronomists, horticulturalists, and biologists.

Questions to Michael Keefer:

1. *Is there any work with the development of varieties or subvarieties of Saskatoon from the Siska territory?*

We're not there yet.

2. *What are the best beaked hazelnut sites?*

Our data is preliminary, but they appear to prefer slightly moister sites in the Fraser canyon.

3. *How do the Siska use the products they are harvesting?*

The overall purpose is to bring people back onto the land. The Siska have developed a business (Siska Traditions) that processes berries and herbs into jams, soaps, and teas. These are marketed through a gallery on the Siska reserve and other outlets. The business has also encouraged community members' personal use.

Comment from audience member: I believe we have to refine the use of the term "forest manager"; most are actually timber extraction managers. We should reserve the label "forest manager" for more than just timber management.

Hawthorn Agroforestry Trials - *Jeanette Lee, West Kootenay Herb Growers Coop*

These agroforestry trials were designed to determine the economic viability of hawthorn as a new medicinal plant crop in BC. Based out Edgewood in the West Kootenay, it started as a community economic development project in 2003. The project consists of three components:

- Development of an environmentally sustainable agroforestry management framework for production and processing;
- Botanical and chemical evaluation to develop product quality standards; and,
- Assessment of current market demand and promotion of a BC quality product.

Hawthorn was selected for crop development because it has accepted health benefits, it can be used in agroforestry plantings for conservation benefits, and markets already exist for higher end natural health products derived from hawthorn.

The key questions to assess the potential for hawthorn cultivation are: Are the native BC hawthorn species equal or better than the European medicinal species? How do we plant/manage a hawthorn orchard? What are the processing and storage considerations? Is it profitable?

Our project involve five steps: wild sample collection, trial production of native and European species, evaluation of processing and storage needs, chemical and botanical evaluation of wildcrafted and cultivated hawthorn.

Production Trials

Production trials are being conducted at three sites in Edgewood employing integrated riparian management and alley crop designs. Each site contains four production treatments: a control, irrigation, and two fertility treatments simulating the conditions optimal for pears and raspberry production. Pear and raspberry nutrient requirements were selected because hawthorn rootstocks are used for pears, and raspberry and hawthorn typically grow side by side in the wild. If hawthorn responds favourably to either treatment, the management information already developed for pears and/or raspberries may be adopted for hawthorn crops. Two herb crops - arnica and skullcap - have been interplanted in the alley crop area.

Processing and Storage

Storage for medicinal crops is of paramount importance – active ingredients can be degraded by light, high moisture, contaminants, etc. On-farm processing is conducted to dry raw product to specific moisture content levels such that the product can be stored without molding. It is equally important not to over dry; drying reduces weight and the product is sold by weight. The West Kootenay Herb Growers Coop is using a scaled-down version of a ginseng dryer for drying our harvested hawthorn. For drying cabinets it is important to have clean air coming in (free of dust or other contaminants) and water used to wash the product must be potable. Store clean and dried product in a dark, cool and dry environment to maintain quality.

Chemical and Biological Evaluation

Hawthorn fruit, leaf and flower samples are being evaluated for nine key flavanoid constituents with HPLC profiling at the BCIT Herbal Evaluation and Analysis Laboratory. The sampling is focused on hyperoside, vitexin and vitexin 2-O-rhamnoside content. Relative comparisons are being conducted to identify trends in constituent levels based on geography, species/variety, and season of collection. To date, our native hawthorn leaf samples have higher levels of flavenoids

than European products. The 'pre-ripe' stage of red hawthorn fruit has the highest level of bioactive compounds and samples from more northern regions tend to have higher levels. In general, flower and leaf samples from native species are very promising and comparable levels in market samples (European species) with wild harvested native BC species.

Tim Dickinson of the Royal Ontario Museum is verifying the species identification of all species sampled.

Questions to Jeanette Lee:

1. *Is a steam distilled hawthorn product possible?*

Yes, extraction of essential oils from hawthorn with steam distillation is possible.

2. *With respect to bioactives, are you producing the hawthorn specifically for bioactive content?*

Yes, and we are refining management practices to produce higher levels. We will be testing differing stress practices next year to look at ability to increase bioactive levels.

3. *What is the cost of the BCIT HEAL lab services?*

Over a four-year time frame the lab costs are about \$80,000 to \$90,000; a lot is reference material costs.

4. *Are there intercrop interactions?*

We're not looking at interactions from a bioactive levels perspective. There are only so many variables you can look at in a controlled manner with limited resources. Intercrops (e.g. *Arnica*) are beneficial to our operations because they provide short-term cash flow while we wait for full production from the planted hawthorn.

Integrated Riparian Management and Shrubs

- Dave Trotter, BC Ministry of Agriculture and Lands

Riparian refers to the zone of direct physical and biotic interactions between terrestrial and aquatic ecosystems. Even very small riparian buffers can provide for a large proportion of ecological function. It is therefore possible to mitigate more intensive practices in neighbouring upland zones.

Integrated riparian management (IRM) systems are employed within riparian areas to manage for crops and ecological function. Thus, they have the dual goals of crop production and environmental enhancement. Most IRM plantings will look the same as those planted for ecological function alone and many of the plants will be the same plants being planted in riparian areas now. Why IRM? Because they blend production and conservation there is increased landowner engagement; there is the potential for economic diversification; to reduce conflict and the need for enforcement; and, dramatically increase the amount of riparian areas that are managed for environmental functions.

Potential crops from IRM systems include: woody decorative florals (e.g. corkscrew, red dogwoods, flowering branches, and pussy willow) for florists, floral greenery, foods (e.g. fiddleheads, mushrooms, nuts, berries, fruit, seeds), medicinals and nutraceuticals, timber, seeds / cuttings for restoration plantings and nurseries.

Examples of IRM systems include:

- Washington Creek – Ontario (Dr. Andrew Gordon et al., Guelph University)
- Bear Creek – Iowa (Dr. Richard Schultz et al., Iowa State University)
- Blue River Basins – Nebraska (Dr. Scott Josiah et al., Univ. of Nebraska)
- Fraser Valley / West Kootenays, BC (Agroforestry Development Initiative projects: West Kootenay Herb Grower's Coop; Page Creek Farm; Fraser Harrison SmartGrowth)

Whether cultivated, produced in agroforestry system or wild harvested, products in the market place need to incorporate GACPs (Good Agricultural and Collection Practices).

- Understand food safety and quality issues;
- Critical control points;
- Written operating procedures; and,
- Risk assessments.

For broader IRM adoption there is the need for

- Renewal of the Agroforestry Industry Development Initiative;
- Further development of the strategic MPB/agroforestry framework for BC agriculture;
- Additional demonstrations for crop production and system specifics, economic information, awareness / on-site tech transfer;
- Tech transfer: workshops, tours; and,
- Collaboration with policy makers.

Questions to Dave Trotter:

1. *Have you looked at species like cottonwood for wildlife?*

Yes, but we also need to design IRM systems with the producer; the purpose is to come up with a better model than currently exists, an optimal model rather than systems maximized for only one value.

Comment from participant: If there are species landowners don't like we could look at what value they impart and determine if that value can they be achieved in some other manner. For example, cottonwoods are messy. Cottonwoods have ecological value by depositing coarse woody debris (CWD) into streams – therefore you could replace the function of cottonwood by bringing CWD in and adding into streams.

Comment from participant: There is an idea of management by group leasing or management agreements of multiple properties as opposed to individual producers each managing their own riparian area. This would create 'contract agroforestry services'.

2. *Was water quality measured in the project examples cited in the presentation?*

Yes – see the Bear Creek website. IRM *decreased* soil loss, pesticide runoff, etc.

3. *Any ideas of economics of the Ontario project (establishment and maintenance costs)?*

None have been reported.

4. *How could one small section of stream revitalization in the Washington Creek project Ontario instigate the biological changes cited (e.g. fish returns)?*

Work was done along the whole watershed – the example was the most intensively managed section.

5. *Are there concerns with introducing exotic species onto public lands?*

These case studies were conducted on private land, but there is a lot of potential with native species. We need to work with agencies under whose jurisdiction the land may fall.

6. *Are there funding sources for IRM?*

Yes: the BC Agroforestry Initiative for demonstration; BMPs in the Environmental Farm Planning programs can fund restoration of riparian areas.

Comment from participant: there are also local opportunities; for example, the Langley Environmental Partners (LEPS) funds and works with the agencies to help establish/implement IRM systems.

Panel Discussion: Opportunities and Challenges with Native Shrub Production

Panel: *Mark Sweeney, Dan Barney, Michael Keefer, Al Oliver*

Moderator: *Dave Trotter*

Panel members were asked to comment on what they believed were the primary strengths/key opportunities and the challenges with native shrub production.

Mark Sweeney

Strength: there is market interest for alternate berries thus makes it of interest to produce; there is a huge variety of potential crops/varieties to work with.

Challenge: reliable plant material – we don't know very much and need to learn how to manipulate the material; need to find right fit from highly managed system to more extensive production. The labour cost linkage to profitability can't be emphasized strongly enough.

Dan Barney

Strength: we can grow almost anything here – production potential is not the problem.

Challenges: we don't have a lot of great cultivar selections - something that the processor knows the parameters. Producers often become over extended; start small and keep focused; market development is the top barrier to a viable shrub enterprise.

Al Oliver

Challenges: marketing is most difficult part of production - most farmers are good growers, but not savvy marketers or interested in direct marketing. You need to know what you are planting and where you are going 20 years from now. Integrating native shrubs into agroforestry systems is not the hard part.

Michael Keefer

Opportunity: There is a growing amount of agricultural land not in intensive production – what do we do with it and how do we move it into production?

Challenge: First Nation's concerns regarding plant development and usage. It needs to be respectful, in the right places (not from sacred locations) and sensitivity shown for how it is marketed.

Comment from floor

For the natural health products market, if you can guarantee volumes year after year, manufacturers will buy, but you cannot do that with wild harvest – you need cultivars or dependable varieties.

Response from Mark Sweeney

Point is well made; even with managed cultivars we see wide swings in production levels.

Comment from floor

We need cooperative organizations to share equipment, facilities in same area and thus facilitate enterprise development.

Response from Jeanette Lee, West Kootenay Herb Growers Coop

Coops allow the farmer to focus on growing and utilize shared resources for processing and marketing. The WKHGC is working toward a larger facility with potential for expanded services. Members have varying skill sets to share including marketing expertise.

Moderator: Could the panel comment on wild harvesting pressures?

Michael Keefer

Commercial interests are competing with First Nations' traditional uses for berries in the Kootenays. An idea from one of the elders is that areas are intensively managed in suitable lands to decrease competition in traditional areas. Currently, huckleberries harvested in Canada can move freely across the border to the USA (and are not tracked) because they are not classed as a food product, rather they are classified as wild plants. Thus, we have no idea of the volume or value of product leaving the area or the Province.

Dan Barney

In areas the hillsides are stripped by wild harvesters– berries leave with no economic gain to the local area. One goal of cultivar development and cultivation is to protect resources for First Nations and local communities.

Question from participant

Given the over use by some unethical wild harvesters it creates a “tragedy of the commons” situation. Is there a future for wildcrafting?

Response from Dan Barney

Progress is being made as we are beginning to share information.

Comment from participant

There are land use policy questions that need to be addressed but the ‘industry’ needs to have legitimacy with policymakers before we can move ahead.

Comment from participant

The issue is similar to ethical marketing methods for coffee – a code of ethics is needed for wild harvest and then base product marketing awareness on that.

Comment from Moderator

Build values into the product and work back to the production level. In other words, what characteristics does that product need to have to secure a spot or premium in the market place and what management is then necessary to meet those market criteria?

Berry Crops, a Natural Health Products Manufacturers' Perspective

- Jim Strausz, Strauss Herb Company

The “Strauss Herb Company” is a trademark – a number of related manufacturing, marketing and distribution, and food companies operate under this trademark. Our medicinal line of products are high efficacy, high price, but low volume (we’re working on increasing volumes).

Why is Strauss interested in berries? There is large demand for healthier foods combined with escalating safety issues, and an increasing market size for premium products. The major trends supporting these interests include:

- Demographics: a new generation of the aging are determined never to get to the prescription medication dependencies of their parents. Younger generations are interested in healthier foods and lifestyles; the 35+ demographic doesn’t intend on getting old or sick, they want to take care of their bodies now through foods, exercise, and natural health products (NHP).
- Foods – healthy teas and foods are popular.
- Safety issues exist: bacteria; allergens; pesticides and herbicides; counterfeit brands; adulterated drugs through drugstores; diethylene glycol in toothpaste; fatal pet foods; heavy metals; genetically modified foods (no major issues yet, but concerns expressed).

All of above are drivers for interest in healthier foods and natural health products.

Canada has tremendous assets for a NHP industry: Available land and water; significant domestic markets; favorable international image; high level of education, talented people; high level of food safety and effective management; excellent framework of NHP regulations.

The “Framework for NHP regulation”, since 2004 has created middle ground between a food and a drug that is livable for industry. All food has some health benefit. Before NHP regulations, mention of that benefit turned the food into a drug requiring a Drug Identification Number - DIN. Now, some health claims are allowed on food, others require NHP licensing (e.g. Sauerkraut).

With NHP regulations safety and efficacy of a product are vouched for – this is a major strength for marketing. Wild harvested, organic foods have various attributes of regulated NHPs but limitations with respect to safety and efficacy assurances. There are food/NHP crossover opportunities: a likely direction is the creating of a new category along the lines of ‘tested’ or ‘pedigreed’ food. This could be a defined category, with higher effective standards than Certified Organic, but not as regulation intensive as NHPs.

Questions to Jim Strausz

1. *Do you know what kind of plants you need to fulfill your product development needs?*

Material comes in three months prior to its needed use for all appropriate testing. Our major supply is currently from the USA, but we would much prefer to have a Canadian supply for these products.

2. *Do you have a list of needed herbs you would be looking for from Canada?*

I can put one together. Security and dependability of supply are the key to manufacturers.

Berry Crops: Good Agricultural Practices and Food Safety Awareness

- Raman Gill, BC Ministry of Agriculture and Lands

Key points from earlier talks:

- Branding is key for capturing value, especially when going for niche market and the key to brand development is consumer trust of your brand.
- When looking at any product – raw or processed – food safety is immensely important to the trust factor. It takes a long time to build trust, but it can be lost in a single incident.
- Demand for berry products is increasing because of interest in healthy, fresh and ready-to-eat, simple solutions. When thinking about potential markets, think about convenience.
- Do your homework before you invest; part of that process involves understanding food safety risks.

Good Agricultural Practices (GAP) are “common sense” practices that reduce the risk of contamination from:

1. Chemical hazards (e.g. pesticides);
2. Misidentified plants (e.g. mushrooms);
3. Physical hazards (e.g. glass shards); and,
4. Microbiological hazards (e.g. *E. coli*).

Why are GAPs important? The entire industry suffers when an incident occurs; individual operations need to be able to distinguish their practices from the business triggering the incident; this is done with GAPs. Microbiological hazards are one of biggest contaminants in fresh food industry. There is growing consumer awareness of food safety and quality issues and because of a growing “fear factor” relatively small incidents can have large ramifications. For example, last October one lot of approximately 400 bags of spinach contaminated with *E. coli* caused an international recall on fresh spinach and the industry still trying to recoup.

Very few consumers can tell you what “organic” means with regards to the standards, but all have their definitions of organic, natural, green, environmentally friendly; markets are based on the ‘feel good’ concept of these labels.

Key Areas of Consideration in GAP:

1. Plant identification
 - Understand what your planting, propagating & harvesting
 - Assurance from material suppliers or identifier (training/experience)
 - Certification may be needed depending on end market / use
 - Records are needed
2. Chemical application/storage
 - Use only products that are registered for your crop
 - Pest control (use Integrated Pest Management - IPM where possible)
 - Fertilizer
 - Equipment cleaning
 - Store products in a locked location and as per label specifications

- Keep records: what you are using, when you used it
- 3. Production Site: know your location and identify all potential hazards at your location
 - Understand the risk from: wildlife (e.g. geese weeding leafy greens), adjacent field use, integrated systems (e.g. livestock with horticultural crops)
 - Access to hand washing / sanitary units for workers (harder to manage when wild harvesting)
 - Proper storage to maintain quality – bioactive compounds may be affected by storage conditions.
- 4. Water quality
 - Washing/Cleaning equipment or products
 - Always use potable (free of pathogens) water for final rinse
 - Test water (three times per year is ideal: prior to season, mid season, end of season). If you are on city water have the city send information to you)
 - Water treatment
 - Records for treatment
 - Include: when, how it was done (SOP), who did it
- 5. Harvest
 - Employee training – do they know what they are harvesting?
 - Proper identification of plant or crop
 - How to harvest and handle properly
 - Tools and equipment used
 - Hygiene
- 6. Post harvest activities
 - Drying/processing: understand the process and how it affects safety and quality
 - Pest control: bait station vs. other trapping devices and chemicals
 - Packaging material, storage facilities
 - Cleanliness of reusable materials
 - Transportation: cleanliness, distance, location – use of ‘reefer’ or dry run?
 - Records and traceability (records are a means of proving due diligence)

Traceability includes letters of assurance from suppliers as to material identification, chemical application, permits, equipment calibration, etc.

Available Tools & Resources

Good Agricultural and Collection Practices Workbook – Canadian Herb, Spice & NHP Coalition

National Herb & Spice Coalition: <http://www.nationalherbspice.com>

Saskatchewan Herb & Spice – Plant identification:

<http://www.saskherbspice.org/Good%20Practices%20for%20plant%20identification.pdf>

Panel Discussion: Processing, Product Development and Marketing

Panel: *Jeanette Lee, Jim Strausz, Raman Gill*

Moderator: *George Powell*

Panel members were asked to comment on what they believed were the primary strengths/key opportunities and the challenges with developing native shrub products.

Jeanette Lee

Opportunity: there is huge market potential and demand in berries; there are macro market drivers of berries of all sorts – especially those dark coloured, rich in anti-oxidants.

Challenges: getting the planting stock. There is a lack of varieties, lack of planting stock. Partnerships and linkages are a huge learning curve; connect with people from every perspective, as you will find you need them all. The WKHG Co-op started with 5 members and now have 11. We work with other people and growers to produce the minimum needed supply for secondary processing.

Moderator comment

Sufficient product to supply processors can be a challenge for small operations. For example, Sunrype is BC's biggest fruit beverage manufacturer and in order for them to guarantee supply to their clients (big grocery chains) they need a guaranteed, year round supply of raw product. To put it in perspective, BC's blueberry industry has just reached stage where can meet Sunrype's supply requirements such that Sunrype now offers blueberry products.

Jim Strausz

Opportunity: market interest; berry interest is not new, rather it has been building over the past several years in North America and longer in Europe.

Challenge: how to not just export raw product. We need value-added capacity and this can be a long process. From the time an idea for product to time hits shelf is typically two years (with proven ingredients).

Raman Gill

Opportunity: interest in health products; an opportunity if you can meet volume requirements of manufacturers. Agri and ecotourism are an underexplored opportunity with respect to agroforestry and shrub usage.

Challenge: building partnerships and creating and maintaining linkages; understanding what those connections might be.

'Value added' can mean lots of money and lots of resources but it can also be simple (e.g. BC Bundles). Partner with businesses and people in other locations with resources – what facilities exist, where are they and is there room for cooperation, contract processing, facility rental?

Questions from floor:

1. *If I want to produce 'x' and sell in farmers market or farm gate - does the government need to know?*

No, but, if food processing is involved you need to meet CFIA standards.

2. *Who has liability surrounding harvested food products and pesticide contaminants?*

CFIA –at store front level does random audits; CFIA sets standards of residue levels; PMRA – application levels which result into tolerable levels of contaminants.

3. *Crop variability – is it feasible to blend different species or varieties to achieve average product quality?*

Yes, but traceability is paramount. For safe, appropriate, well managed product – consumer confidence is key.

4. *Would you comment on joint/cooperative product development?*

It is definitely an opportunity. Start by building that relationship with manufacturer – the manufacturer has vested interests and trust in existing product sources so it will take a lot for them to source raw materials elsewhere.

There is a need for an umbrella organization – industry group. Government recognition will be limited without one and it will be difficult to find development funding, etc.

2.2. Participant Feedback

The workshop participants were provided with “participant feed back ” forms to relay their rating of the workshop content and delivery, as well as to provide information on regional agroforestry practices to assist the Agroforestry Initiative to develop and prioritize support for agroforestry in the province. Twelve workshop participants submitted full or partially completed feedback forms. Questions and responses received are listed below.

How did you hear about this workshop?

- No response =1
- Agroforestry Initiative mailing list=4
- Other producer/professional association mailing list=3
- Personal communication/third party reference =4

Overall, how would you rate this workshop?

(1= poor, 2=below average, 3=average, 4= good, 5 =excellent).

- Seven responses; average = 4.3 (± 0.2), median response =4.

What elements of the workshop content did you find the most informative? The least?

Most (12 responses)

- All presentations informative (3)
- Berry production and harvesting overview
- Siska First Nation berry management guidelines (3)
- Huckleberry crop development (2)
- Wild Black cherry crop development
- Integrated riparian management
- Market development topics

Least (3 responses)

- Good Agricultural Practices and Food Safety awareness
- Wild Black cherry crop development
- Natural health products manufacturers perspective

What additional content, if any, would you like to see in future workshops?

Ten responses:

- Additional producer/agroforester testimonials.
- More cultural diversity.
- Public land management policy discussion.
- Break into discussion groups around specific interests.
- Elderberry management
- Investment, processing and marketing information (2)
- More information on grants and opportunities for support
- Medicinal plant and other traditional knowledge of First Nations
- Native plant breeding

How would you rate the following elements of the workshop delivery?

(1= poor, 2=below average, 3=average, 4= good, 5 =excellent)

Venue?

Twelve responses; average = 3.5 (± 0.3), median response =3.7.

Poor air conditioning and hard chairs were common concerns expressed about the facility.

Catering?

Twelve responses; average = 4.4 (± 0.2), median response =4.3.

Registration process?

Twelve responses; average = 4.7 (± 0.2), median response =5.

Do you have any other suggestions to help us deliver future agroforestry information and training?

Two responses:

- Agroforestry list-service to allow users to post information.
- More tours of value-added products made in BC from native crops.

What regional agroforestry practices and opportunities exist? Do you have some specific examples that would be suitable demonstration sites?

Six responses:

- Siska traditions (2)
- “Environmental Farm Plan as it relates to agriculture”
- Maple syrup production on Vancouver Island
- Hazelnut producers near Harrison Hotsprings using intercropping
- BC Hydro/Restoration projects with fish (salmon spawning channels)

Who are the current and potential regional partners for developing agroforestry?

Thirteen responses:

- Malaspina University College
- Mr Seeds Society
- First Nations
- Community Forests
- BC Hydro
- Tourism businesses/restaurants with demand for native foods
- Nutraceutical companies and growers/producers
- Government
- Academia (general)
- Ministry of Forests and Range
- Agriculture and Agri-food Canada
- Local people
- Canadian Food Inspection Agency

What are the markets for agroforestry products?

Seven responses:

- Agri-tourism in BC
- Exports to European Union
- Broad – “up to imagination and marketing”; “huge”
- Grocery stores, tourist gift shops, wholesalers
- Farmers markets
- Restoration projects needing native plants
- Japanese export market for health products

What agroforestry information and extension needs exist?

Five responses:

- Agroforestry list-service to allow users to post information.
- Information on native plant pharmacopoeia
- Website for research projects for agroforestry in BC
- Means to connect pharmaceutical and nutraceutical companies with local producers
- Workshops to First Nations communities

What are the marketing challenges and needs for agroforestry products in British Columbia?

Six responses.

- Information on where to get shipping and packaging materials (e.g. boxes, jars, processing equipment).
- “Small scale producers are challenged”
- Not knowing the minimum product volume needed to meet market requirements
- Lack of information on exact product specifications of various wholesale buyers/manufacturers
- Lack of transparency of market prices
- Standards for certification of agroforestry products

3 General Themes and Conclusions

Based on formal and informal feedback from the participants, both the format and range of content provided a good balance of information. Most expressed that it was an excellent forum for discussing all aspects of enterprise development (primary production through marketing) and valued the integrated nature of the presentations and topics.

Five general themes emerged over the course of the workshop and tour and form the basis of industry development needs to advance agroforestry with native shrubs.

- There is tremendous consumer interest in native shrub products (berries and NHPs) creating a very strong impetus for further industry development. The primary production challenges are the lack of readily available, proven planting stock and the need to manage labour costs as labour input is the single largest factor in determining the profitability of berry production.
- Product (food/NHPs) quality and safety is of the utmost importance to access and maintain markets. Safety and quality controls begin at the very earliest stages of production and must be adhered along the entire value chain. Good agricultural/collecting practices (GACP) involves a systemized approach to assessing risks, adequate worker training and supervision and good record keeping at all stages of production.
- First Nations have traditionally used agroforestry principles to manage native shrubs for food, medicines and building materials (implements, baskets, etc.) for millennia. Native shrubs represent economic development opportunities for First Nations' communities and there is much to learn from their traditional uses and management techniques. Sharing of traditional knowledge however must be done with cultural sensitivity and with respect for the spirituality of certain uses and places.
- Partnerships are important to enterprise development. Research and development needs are costly, can be technically complex and need to involve producers, manufacturers (food and beverage, NHP) and academics. Many existing opportunities require a volume and quality of raw product that can be difficult for small/new producers to achieve. These market barriers can be overcome with co-operative producer ventures to undertake investments in primary processing (e.g. drying and packaging) as well as assisting with marketing, production and product development, and lobbying government.
- Agroforestry has an important place in native shrub production, as both an option to improve production and thus take pressure off increasingly overused wild harvest sites and as a means to integrate production and conservation practices.

The workshop format was well received and in particular, pairing the workshop with a tour was seen as a valuable delivery model. The lack of a formal feedback session allowed for a wider variety of workshop presentations but may have contributed to a lower intake of information and needs through the voluntary feedback forms. A brief breakout session for participant feedback could be included in future workshops. Future workshops should also continue to include a mix of speakers, including those with production experience and local knowledge, and covering the range of environmental, economic and social considerations. In general agreement with previous feedback, participants identified a lack of readily available information about agroforestry practices and opportunities as limitations to agroforestry expansion. Additional workshops in the region and elsewhere in the province to raise awareness and provide basic agroforestry education were suggested.

Appendix: Participants

The following workshop and tour participants consented to having their contact information included in this report.

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