Agroforestry in Ontario

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Current Statistics

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Acres</th>
<th>Annual Value ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm woodlots</td>
<td>4,500,000</td>
<td>19.7 million (Agricultural Census, 1996), plus $60 million in-kind use of forest products on farms (e.g. fuel wood, posts, building materials, foods, decoratives, hunting)</td>
</tr>
<tr>
<td>Christmas trees</td>
<td>27,887</td>
<td>8.3 million (ref. Stats Can. Ag Div. 1997)</td>
</tr>
<tr>
<td>Nuts</td>
<td>2200</td>
<td>225,000 (nut &amp; nursery tree sales)</td>
</tr>
<tr>
<td>Maple syrup products</td>
<td>1.1 million taps</td>
<td>15 million, plus tourism and entertainment revenues</td>
</tr>
<tr>
<td>Maple orchards</td>
<td>50</td>
<td>Little tapping yet, demonstration value</td>
</tr>
<tr>
<td>Forest ginseng</td>
<td>1000 - 2000</td>
<td>Most acreage not yet mature. Range in value $250 to $500 / dried pound</td>
</tr>
<tr>
<td>Other forest medicinals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farm windbreaks and building shelters.</td>
<td>8749 windbreaks (#) 67,520 shelterbelts (#)</td>
<td>- 8 to 15% crop yield increase on protected land. - 10 to 15% heating and cooling cost savings. - Difficult to measure value of soil conserved.</td>
</tr>
<tr>
<td>Timberbelts (sawlogs from fencerows)</td>
<td>25 (new technology)</td>
<td>Estimated $5000 per year annual wood growth value, harvestable after 60 to 80 years.</td>
</tr>
<tr>
<td>Hardwood plantations</td>
<td>Not documented</td>
<td>Combines technology in orchard horticulture, forestry and landscape nursery.</td>
</tr>
<tr>
<td>Intercropping - tree fruit and tree nuts</td>
<td>Area not documented</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>---------------------</td>
<td></td>
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</tbody>
</table>

Only practiced in new non-bearing orchards. Traditional orchard practice, combines orchard agriculture with other agricultural crop production practices. This is considered unrelated to agroforestry but is useful for learning techniques.
Christmas Trees

Species selections and markets

Christmas tree production continues to see a shift from white spruce, Colorado spruce and Scots pine towards increased plantings of balsam and Fraser firs. Canaan fir is a recent new cultivar which breaks bud approximately two weeks later than most firs which can help avoid spring frost injury. A number of other named fir selections may soon gain interest for planting. Premium prices of $35 to $50 per fir tree are being realized as consumers learn about the advantages that fir offers including: good needle and colour retention, no sharp needles to avoid while decorating, slow drying rate to reduce fire hazards and an attractive dark green and silver colour. Growers who began planting significant acreage of fir trees within the last 10 to 12 years are seeing good market acceptance. Eastern Canada is the primary competitor for fir Christmas trees.

Fraser firs are proving to be more challenging to grow than other tree types. Fir trees inappropriately located on soils having too high a pH can show significant needle browning. Ideal fir soils are a pH of 5.5 to 6.5. At affected sites, the previous seasons growth becomes yellow in mid-spring and advances to brown and dried by late season. From two affected sites, three samples taken at different times during the 2001 season showed no signs of infection by disease organisms at the University of Guelph pest diagnostic lab. Soil that is moderately acidic is ideal for fir tree growth and helps to maintain a proper nutrient balance. Many soils in central Ontario have a high pH and are unsuitable for fir trees. Fir trees require more attention to nitrogen fertility and good weed management over other Christmas tree types and can easily become spindly in growth with sparse foliage without close attention to management. Christmas tree growers considering to plant fir trees are advised to adequately test soil pH first to determine site suitability.

White pine is showing some increased market interest. White pine is similar to fir having soft needles which is more favorable for decorating (needles don't hurt). White spruce, Colorado blue spruce and Scots pine still have good market demand as well, although Scots pine is losing some ground due to competition from other provinces and due to problems with PSB.

Pest Control

A prominent insect pest problem has been the invasive Pine Shoot Beetle. PSB continues to spread across Ontario through southern counties and most Christmas tree growing areas are now located within infested regions. PSB prefers Scots pine and favors trees that are diseased or are under stress by other factors such as drought. Unlike Christmas tree growers, many foresters consider the PSB preference for Scots pine as favorable since in forest plantations Scots pine is an inferior tree.

The Canadian Food Inspection Agency, along with the U.S. Department of Agriculture, Michigan State University, private nursery operators and Christmas tree growers have continued to work together to implement a management strategy for PSB. PSB caused significant restriction of movement of trees in 2000 for export markets. A successful program will enable movement and export of susceptible trees out of areas designated as infested to regions not yet affected by PSB. The goal is to prevent further spread of PSB but in reality, will likely serve to slow the spread of PSB. Industries located in areas not yet affected are hoping that slowing the spread of PSB will enable significant control by natural predators to
Herbicide registration for Christmas trees

OMAFRA has begun URMULE applications for new herbicide use on Christmas trees. The herbicides include: Dual Magnum, Goal, Lontrel 360, plus one tank mix of Dual + Roundup + Simazine. A private consultant is conducting the field work. Treatments began during the spring of 2001 at one private farm near Hillsburgh and will be summarized for efficacy in fall of 2001 and late spring of 2002. The trial is expected to last 2 years.

Adoption of new technology

Trials testing the use of trickle irrigation in Christmas trees are now complete. Trickle irrigation is an efficient method of applying water to trees during seasonal drought. Growers who have adopted trickle irrigation will have found use for it during the droughty 2001 season.
2001 nut crop report

The 2001 growing season showed a significant reduction in nut yields for most tree nuts due to the summer drought. Northern pecans flowered well but pollination and nut set was poor. Sweet chestnuts located on good orchard soil had very good nut set this spring. Early ripening chestnuts had good nut sizing and quality while late ripening chestnuts had very poor nut size due to extended dry soil. Late ripening chestnuts with trickle irrigation showed good sizing showing the usefulness of having moisture control and droughty sunny weather. Hazelnuts (filbert) had very low nut set at pollination and therefore low yields. Hazelnuts are an alternate-bearing tree and last years crop was good. For English (Carpathian) walnuts, the extended dry weather was favourable for pollination and nut development however, the crop was somewhat reduced due to poor sizing. For heartnuts (Japanese walnuts) that missed damage by spring frost the heartnut yields were fairly good. For non-irrigated trees, the 2001 drought may affect flower bud formation and health and may negatively affect the 2002 cropping season.

The nut industry

The Ontario nut industry remains small compared to other orchard commodities (2500 acres). However, interest continues to grow as attendance at three annual Society of Ontario Nut Grower's (SONG) meetings and annual meetings of the Eastern SONG chapter increases each year and more growers are establishing small trial plantings. Demand for all nut trees from nurseries is very high. Landscape nurseries also stock a selection of potted nut tree species as interest in hobby plantings continued to rise. On private farms, trial or hobby plantings are the most common nut plantings although there are indications from several farms that commercial efforts are showing profitability.

The Northern Nut Growers Association (U.S. and Canada) is the primary effort behind evolution and promotion of northern (temperate climate) nut culture. The University of Lincoln Nebraska is a key host for the NNGA association. Several key SONG members attend the U.S. session each year. The 2001 NNGA summer conference was held at Cornell University. Ontario producers can benefit by more than 100 years of experience and industry development offered by northern U.S. nut producers, extension and researchers. Nuts remain a healthy and nutritious food and are worthy of attention.

Successful nut cultivars

According to industry representatives, four tree nut species show promise in production and market adaptability including: heartnut, sweet chestnut (see chestnut blight discussion below), Carpathian strains of Persian walnut and selected clones of hazel-filbert hybrids. Other nut tree species that may have future potential, if planted in favorable soil and climate locations, are hardy northern pecan and hardy almond. Northern pecan however may only produce a marginal nut crop in the most extreme southwestern climates (Leamington, Pelee Island) due to pecan requirements for heat, humidity and a long growing season. Pecan may show more value for its wood as sawlogs in floodplain plantations or along drainage ditches. Pecan trees are extremely tolerant of extended flooding during the dormant season and produce a valued sawlog and veneer wood. In the U.S. pecan wood is salvaged from pecan orchards during orchard renovation but does not contribute significantly to profitability for the farmer. Annual pecan nut production determines orchard profitability.
Chestnut Blight Disease - an opportunity

Chestnut blight remains active in Ontario. For both managed orchards and forests, there currently are no sources of sweet chestnut trees available that are known to be resistant to blight disease. Chinese-American hybrids are somewhat tolerant but are not resistant to infection by blight. Horticultural research breeder, Dr. Adam Dale of the University of Guelph, has identified a breeding technique of back crossing that may enable full resistance to blight disease in sweet chestnut while maintaining 90% or more pure American genetics in the final strains. If successful, forestry and orchard industries in North America would stand to benefit immensely. Dr. Dale has also identified an additional crossing technique that may enable dwarfing (size control) to be incorporated from several known Chinese species of wild chestnut, more suitable for orchard production. The work would require 20 or more years to complete and would require up-front longterm support. Some forestry work has begun at Simcoe HES due to preliminary funding provided by the Chestnut Society.

Ongoing research at HES Simcoe, University of Guelph

In addition to private land testing by farmers, official research continues at the Horticultural Experiment Station in Simcoe to:

2. Evaluate establishment and management techniques of Layeroka sweet chestnuts plus pollinator trees. Tests include mulching materials for water management and weed control, 2 fertilizer levels and benefits of soil pre-plant fumigation. Graft union incompatibility has been the most significant unplanned problem.

Private land testing of nut cultivars and cultural techniques is ongoing at small plantings on many farms in Ontario. The abilities of farmers to do valid developmental work should not be underestimated. Farmers have contributed almost entirely to identification of existing nut cultivars that are adapted to northern climates, tree planting densities and cultural techniques of nut orchard management. Homemade harvesting and processing equipment developed by imaginative farmers has in some cases gone on to become commercially available equipment. Extension can play a valuable role by integrating technologies from other orchard industries and by helping to speed up the evolution of nut culture to become a profitable venture.

Mechanization of nut production

Mechanization will be a key component of a successful commercial nut industry if one is to develop. Leading nut industry representatives suggest that mechanized harvesting, mechanized cleaning, sorting and cracking (de-shelling) should continue to be addressed. SONG plus financial contributions by one producer resulted in the purchase of a new cleaning and cracking machine from Texas U.S. which will be evaluated with the 2001 harvested nut crop. A new small nut vacuum harvester is also being tested in the 2001 season at one Niagara site after research reports suggested economic success by Italian hazelnut industries using vacuum harvest systems.

Mechanization is advanced in the United States nut producing regions. If conducted by hand, labour will result in excessive cost to the producer. Grower experience also shows significant crop spoilage and consumption by wildlife due to very slow hand harvesting, unlike faster mechanized methods. Mechanization was presented to the Ontario nut producers at the 2001 winter technical meeting.

Expansion of the heartnut walnut industry is currently prevented by lack of an efficient mechanized nutcracker (a problem in the U.S. as well). Heartnut needs to be extracted from the shell without breaking the kernel. Best markets require an intact kernel. The nut has an odd shape and will require some inventive ideas to develop a mechanized cracker. One new device invented by a Niagara grower in 2001 uses a vibration / hammer combination that is working better than a
Crop protection of tree nuts

Pest management for tree nuts will require registration of a number of products including insecticides, fungicides and herbicides. Most tree nuts have no options for registered insecticides. Extension efforts are currently focusing on URMULE registrations for all tree nuts. To date, applications for Neem, Dipel and Superior oil are being made to the PMRA. Nova, Topaz and Simizine may also be eventually included. Requests have been put forward by the nut producers association and in consultation with the fruit pest management research subcommittee. Loss of one key OMAFRA crop advisor in early 2001 made it difficult to pursue URMULE for tree nuts.

The insecticide Carbaryl was rejected by PMRA for URMULE registration for sweet chestnuts in 2001 due to re-evaluation of the product. Significant efforts had been made by OMAFRA to get this effective product registered for use on sweet chestnuts for leafhopper control.

Grafted (native) black walnuts - a production guidebook

Walnut processors and researchers (Horticulture and Agroforestry) in north central U.S. have developed a new production manual to help farmers establish and manage orchards of grafted black walnuts. Listings of higher-yielding cultivars, such as Sparrow, Thomas, Myers and 30 other selections are provided along with yield records, disease resistance results and locations to purchase nursery stock. These cultivars are not wild walnuts that are used by forestry but are specifically selected for orchards and food production. Pest management, nutrition, economics and other cultural requirements for managing grafted walnut orchards are outlined. Although prepared for Central and Northern U.S. regions, the information can be useful in Ontario where orchards are located in areas having a moderated winter and spring climate. Currently no commercial plantings of grafted black walnuts exist in Ontario and it is still not certain whether the business would be profitable. It is important to know that native walnut cultivars were once used in commercial walnut orchards prior to 1920 in central and western U.S. but were out-competed in markets as modern cultivars of Carpathian walnuts were developed. Growers are advised to be cautious about expectations of profitability using native walnut cultivars but are encouraged to test small blocks where there is an interest.

Wild native black walnuts are unprofitable for food production

Problems reported by commercial processors with collected wild black walnuts:

- Low average annual nut yields, compared to grafted cultivars (# nuts / tree).
- Low kernel weight (6.5 to 12 %) to shell. Grafted cultivars are 25 to 35% kernel to shell by dry weight.
- Husk maggot is often present resulting in strong fermented flavour.
- Husk maggot infestation prevents mechanized husk removal.
- Codling moth larva occasionally spoils kernel.
- Butternut weevil larva occasionally spoils kernel or aborts nut.
- Good nut bearers are poor wood producers. Good wood producers are poor nut bearers. Farmers can take advantage of these differences when deciding to plant orchard versus growing sawlogs (consult the Northern Nut Growers Association www.icserv.com/nnga)

Wild walnut nuts are useful as seed for new wild trees or for personal consumption. Wild walnut trees are most suitable as grafting rootstock for higher yielding cultivars or in plantations for sawlog production on land unsuitable for orchards. Selection for vigorous growth and proper site selection is important for sawlog production. Wild walnuts would not be profitable for annual nut production on expensive orchard land and even less productive on poor quality land. Wild walnut trees prefer moist, fertile naturally drained bottomland soils such as flood plains or ditch edges.
Size of Maple Industry

At present, about 2000 maple producers set out 1,200,000 taps annually in Ontario. The highest producing areas are Waterloo-Wellington in Southern Ontario and Lanark County in Eastern Ontario. The industry has grown significantly over the past decade and there are opportunities for continued growth. An available woodlot resource combined with good domestic and international markets should help ensure that the industry expands. However, expansion of the industry will be tempered by the level of capital investment required to establish new operations or expand existing ones.

It is difficult to project how supply and demand will change over the next few years because as markets develop, it is expected that there will be expansion in the number of taps installed in Ontario, Quebec, New York, Vermont and elsewhere. Also, supply of maple syrup can fluctuate greatly over time, depending on weather and other factors.

In 2000, Ontario increased production by 60% to 1,686,360 litres over production in 1999. Production information for 2001 will not be available until November 2001.

The total value of maple products for the 2000 crop year in Canada was 151.4 million compared to $150.3 million in 1999. Maple syrup is produced in Quebec, Ontario, New Brunswick and Nova Scotia with the value of Ontario production ranking second at $15 million annually. The industry may have a comparable value in eco-tourism and spin-off benefits to regional economies.

The effect of the 1998 ice storm on the maple industry in eastern Ontario and western Quebec has not been fully determined. The affected sugar bushes are showing good signs of early recovery but the condition of severely damaged stands is still quite fragile. Recovery of these sugar bushes will take many years. Favourable growing conditions (precipitation) and minimal negative impacts from other stress factors such as insect defoliation should hasten recovery. The results of research efforts should help the affected maple producers develop effective plans for their sugar bushes.

The Organized Maple Industry in Ontario

The main organization for maple syrup producers in Ontario is the Ontario Maple Syrup Producers Association (OMSPA). This organization has about 500 members and these members operate about two-thirds of the taps placed in sugar bushes annually in Ontario. OMSPA supports many initiatives of value to maple producers in Ontario. These include a voluntary quality assurance program (Seal of Quality), public and producer awareness and education functions and support for applied research and marketing initiatives. OMAFRA Agroforestry and Inspection staff work closely with OMSPA and its various committees to support many initiatives of value to the industry. The OMSPA website is: www.ontariomaple.com

Quality Assurance

The production of maple products which are pure and safe for the consumer is critical to the maintenance of a thriving industry in Ontario. Provincial and federal government representatives work closely with OMSPA to monitor the purity
and safety of maple syrup.

In 1998, OMSPA established a voluntary quality assurance program for maple producers called Seal of Quality. The program is early in its development and already has over 100 members. The Seal is already becoming quite visible in communities across eastern Ontario.

The Seal of Quality program requires that maple producers meet certain minimum quality assurance standards. The Program is monitored by OMSPA to ensure that the minimum standards for the seal are being met. The program places emphasis on self-improvement and is modeled from the very successful Canadian Environmental Farm Plan. The Seal is becoming quite visible in communities across rural Ontario. It is very important to recognize that many producers who have not yet subscribed to the Seal of Quality Program follow other standards such as Hazard Analysis and Critical Control Point (HACCP) or other self-imposed standards and produce high quality maple products.

The Seal-of-Quality Program is considered by many participants as a self-improvement program designed by maple producers for maple producers so it has a practical orientation. Subscribers to the SOQ program may also enjoy a marketing advantage over their competitors.

**Pricing and Marketing of Maple Products**

Over time, a growing number of maple producers are recognizing the importance of competitive pricing of their product and the application of creative marketing strategies. This can be challenging and requires a careful allocation of time and financial resources between the production and marketing aspects of the maple business.

Most maple products produced in Ontario are sold at the farm gate, in retail facilities or at farmers markets.

A limited number of producers are involved in the export market since Ontario is a net importer of maple products.

Recently, an Ontario-based study related to the economics of maple syrup production was completed. Insight gained from the study should help producers pay closer attention to pricing and marketing aspects of their business enterprise in the years ahead. There is a growing interest in the production of value-added products from maple syrup (eg. maple butter, maple candy etc.)

**Awareness and Education**

Public awareness and education efforts are critical to maintaining informed consumers who will continue to enjoy the special attributes of maple syrup and other maple products. OMSPA, OMAFRA, the University of Guelph some Conservation Authorities and many individual producers contribute to this effort.

OMSPA maintains an informative maple exhibit at the Royal Winter Fair in Toronto and often places exhibits at local fairs throughout Ontario.

OMSPA and OMAFRA work together in the development of information days for maple producers. These information days usually take the form of indoor meetings and field days. In January of each year, OMSPA hosts a network of information days across Ontario and in July hosts a Summer meeting and tour in some area of the province. In recent years, a Maple Production School has been broadcast by satellite from Cornell University to a limited number of locations in the province. The program is designed cooperatively by Cornell Cooperative Extension staff and OMAFRA Agroforestry Specialists. The emphasis in these information meetings is to transfer the results of research and to share practical innovations and experience.
Packaged and Transferable Information

In recent years, very good progress has been made on a number of fronts. Some highlights include development of a Maple INFO CD ROM, a Maple Orchard Directory, an Economics of Maple Syrup Production Report and Reports on the Use of High Pressure Steam in the Production of Maple Products. Also, a comprehensive package of information designed to assist maple producers with Ice Storm Recovery efforts was published. These packages were developed by OMAFRA with assistance provided by OMSPA, and a number of other agencies.

Other information packages being worked on include a manual on the "Design, Installation and Maintenance of Maple Tubing Systems" and a Manual on the "Establishment and Maintenance of Maple Orchards".

Applied Maple Research

Ontario's involvement in the implementation of maple research has grown significantly in recent years and Ontario is beginning to be recognized internationally for its efforts. Much of the work currently ongoing in Ontario is supported by both OMSPA and the North American Maple Syrup Council. Researchers at the University of Guelph-Alfred Campus and the Ontario Forest Research Institute, Sault Ste. Marie have been responsible for carrying out the work. Securing adequate financing for maple research is an ongoing challenge. OMAFRA and OMSPA are currently evaluating options which may over time enhance financial support for research.

Research projects related to the Sanitation and Cleaning of Maple Tubing, the Use of High Pressure Steam in the Production of Maple Products and Ice Storm Recovery is currently underway in Ontario. Other maple research is located at Centre Acer, Quebec, Proctor Research Centre, Vermont and the Uihlein Research Centre in New York.

Maple Orchards

In Ontario, maple orchards are defined as intensively managed plantations of sugar maple and/or black maple established with the objective of producing high volumes of sweet sap. The definition also encompasses row or line plantings along fields and road corridors. At present, the number of maple orchards in Ontario is small and most orchards are less than 20 years of age. While the trees in most orchards are not yet large enough to tap, the young orchards demonstrate the potential for planting maple in the future and have an important educational value. A Directory containing performance information for over 20 maple orchards in Ontario has been prepared by the Ontario Maple Syrup Producers Association with the support of OMAFRA.

Maple orchards are normally established on lands which have been removed from other forms of agricultural production and have a high productive capability for tree growth. In order to be successful, orchard growers must make a commitment to intensive management of the orchard until the trees are free-to-grow.

The supply of sugar maple and/or black maple seedlings suitable for orchard establishment is still quite limited in Ontario. A good alternative is to obtain vigorously growing maple saplings from a managed local sugar bush or other maple woodlot. It is better to plant maple trees of local origin so as to ensure that they are well suited to the local climate.

Over the past several years, OMAFRA in cooperation with the University of Guelph, has attempted to produce rooted maple scions from branch cuttings collected from maple trees in the spring of the year.

While good success was achieved with rooting the cuttings, over-wintering losses were almost complete. There was no sign of winter injury caused mortality of the cuttings however, it is believed that the cuttings may not have had enough
starch reserves to survive the dormant period. Possible remedies include a shorter cold period, perhaps bringing the cuttings out of clod storage in late December into a greenhouse facility to allow sooner growth. Another remedy would be to apply growth hormone gibberellic acid to initiate new shoot and leaf growth during the initial rooting period before the first winter dormancy to enable the delicate cuttings to store more food reserves.

**Maple Production Agriphone**

The Maple Production agriphone was operated by OMAFRA's Agroforestry Specialists for a third season in the spring of 2001. Maple Producers and others can dial a toll free number and listen to a short pre-recorded message. Messaging focuses on providing an update on the status of production in the different parts of the province and providing weekly projects on weather and sap flow.

Technical information related to sugar bush management and maple production is often included in the message.

Maple producers find the weekly synopsis of provincial sap flows as well as sap and syrup quality experiences to be useful. They also find sap flow predictions, based on 5-day forecasts to be very useful. It can be challenging to predict sap flow patterns on a provincial or regional basis.

Producer situation

Landowners producing woods-grown ginseng (or wild-simulated ginseng) remain very secretive about the existence of their ginseng gardens. Forest ginseng, both wild and woods-cultivated, is highly susceptible to theft where locations of plantings become known. As a result of the very high market value for dried forest roots, growers want to see the market demand remain high and the supply remain low to maintain the very high prices for dried forest roots.

Producers of forest ginseng and gatherers of wild roots generally do not share experiences openly as other traditional farm crops or commercial ginseng gardens under artificial shade. Extension efforts to teach techniques in forest ginseng production may be met with disfavour by active growers.

Plant interactions in forests

There is interesting effort to study plant species interactions in a forest situation. Remarkable observations have been made of interactions between ginseng plants and other forest plants (e.g. poke weed) which somehow prevent disease and insect pest problems with wild-simulated ginseng production. Cornell University has been studying these plant interactions for several years. It may result that some use of chemical is required e.g. for slug and forest vole control.

Legitimate efforts to restore the endangered wild ginseng may also be challenging due to very high demand for the illusive root.

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Potential expansion

There is potential for expansion of private land plantations on marginal and good quality land. Profitability is the primary reason of landowners to establish plantations and will likely remain the best avenue to encourage new plantations. Tree cutting bylaws may or may not apply to plantations on private lands and depends on the objectives and terminology that is chosen by the landowner.

Three disciplines of plantation management

Three distinct disciplines contribute to technology in plantation management on private lands. Disciplines include: orchard agriculture, forestry and landscape nursery. Professional landscape architects also contribute significantly to urban forestry. Knowledge gained from private landowner experiences provides an additional and significant learning opportunity for anyone interested in plantation management on private land.

All three disciplines involve management of trees but differ by the interim or final products to be marketed. Orchards are hardwood plantations that are managed specifically for food production with end products of firewood and small salvaged sawlogs. Korean pine nuts represent unique 'softwood' orchards. Landscape nurseries manage hardwood and softwood plantations for ornamental tree markets and may use native or exotic plant species. Forestry teaches plantation technology for multiple wood products. Many private landowners also place value on wildlife, water quality and other environmental benefits. Environmental benefits are limited in orchards and nurseries due to the need for pest controlling pesticides.

In many cases private landowners combine discipline technologies and devise unique profitable ideas. For example, plantations designed for forestry products may also benefit by marketing young trees to landscape markets as an alternative to cutting trees down during thinning. Orchard trees can be managed for annual food and for sawlogs (e.g. English walnut top / black walnut roots) by grafting higher up the rootstock. Ideas are inspired by private landowners. Many farmers generously share their experiences with extension and with other landowners.

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Intercropping

Orchard agriculture

Intercropping food-bearing fruit or nut trees with agricultural crops is a traditional practice in orchard agriculture. The multi-use combination of trees and crops is well-established. Extension continues to deliver intercropping technology among orchard managers. Intercrops in orchards range from vegetable crops, small fruit, nursery, landscape, flowers/ornamentals, field crops and livestock grazing. The inspiration to combine annual crops within non-bearing orchards is a result of the business orientation of farmers and their need for annual profitability.

Agroforestry

Agroforestry researchers are interested in learning techniques of intercropping and are welcome to learn from the orchard industry. Farmers remain excellent teachers of applied intercropping and are generally more than willing to share their knowledge. As a relatively new discipline it is important for agroforestry practitioners to connect with farm associations to learn from leading producers and to determine what is needed for research. For example, orchards are sometimes grazed by livestock after harvest is complete. Agroforestry researchers may gain silvopasture knowledge from experienced farmers and are welcome to participate.

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Feedback and technical inquiries to: crops@omafr.gov.on.ca
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Windbreaks and Riparian Buffers

There is growing interest among some landowners to find profitable ideas from management of riparian buffers and perimeters around farm fields. Marketable products may include sawlogs, landscape trees, maple syrup.

Not considering protection provided by natural woodlots, an ideal land area of windbreak for the province may occupy 2 to 4 percent of all agricultural land, including field crops, forages, pasture and horticultural lands. Evidence has shown that sugar bushes protected by outer conifer windbreaks are also more productive and healthier as a result of wind protection.

Shelterbelts around farm buildings can reduce heating and cooling cost by an estimated 10 to 15% annually. Shelterbelts around barns have shown to reduce the spread of agricultural odors from livestock operations. Rural road windbreaks, although lacking, can significantly reduce the cost of winter snow removal from roads and help to reduce the incidents of automobile accidents caused by white-outs and drifting conditions.

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Pasture trees (Silvopasture)

Trees in pastures

There is significant documented and undocumented field experience available on establishing trees within and around livestock pastures. Any new research projects in silvopasture should account for this information prior to project planning. Perimeter field plantings may be more successful with livestock farmers than encouraging them to plant trees within pastures. Landowners of horse industries likely have the most experience in adding trees to pastures although farmers of other livestock industries have also made efforts to provide shade and shelter.

Toxic trees

Agriculture Canada maintains a useful listing of plant species known to cause toxic reactions in certain types of livestock. Other websites are also maintained by several U.S. Universities on toxic plants. The following trees should not be planted or should be removed from the vicinity of pastures:

- Black cherry (forest and orchard species) - leaves, shoots contain cyanide and can be lethal if ingested by any livestock. Autumn leaves pose a high risk.
- Red and white oaks - nuts and leaves contain levels of tannins that can cause toxic reactions in livestock if ingested.
- Black locust - leaves, shoots, bark and seed pods are very toxic to livestock if ingested. Young children should also be instructed to avoid black locust.
- Red maple - leaves and stems are highly toxic to horses and ponies. Blood thickens to cause quick lethal results. Other red coloured maples used in landscape industries are not known as to whether there is toxicity but should be avoided near horse pastures as a precaution.
- Black walnut - horses and ponies develop acute laminitis if hooves contact live walnut roots, husks, nuts, wet soil under walnut trees and dry or wet bedding materials which contain walnut shavings. Other juglone producing trees such butternut, also cause laminitis. Pollen of walnut is known to cause respiratory problems in livestock in general. Ingestion of juglone in plant materials is also known to cause respiratory reactions.

* For a complete list of toxic trees, shrubs and plants, readers should contact Agriculture Canada's listing. Livestock veterinarians are also excellent sources of information pertaining to toxic trees and plants since fast diagnosis of medical problems is critical for livestock.

Other issues for silvopasture

- Pasture land may or may not be tile drained. To prevent tile plugging, extension efforts will not promote the planting wet-site tree species on tile-drained lands. Dry site tree species cause very few problems with tile.
- Pastures may require renovation or timely mechanized maintenance. Trees within pastures should be placed in a fashion which will not hinder renovation or switching to non-pasture agriculture if desired by the farmer.
- Trees require fencing protection to keep larger livestock away from trees.
- It has been observed that not all sheep breeds avoid eating conifer trees.
- Agroforestry researchers might ensure they differentiate between afforestation (e.g. silvopasture in B.C. conifer plantations) versus sustainable pasture management before initiating silvopasture projects.
- Ensure production capabilities of pasture forages are adequately maintained for sustainable livestock production. In England studies, 10% pasture tree cover reduced forage growth by more than 30%.

Return to State of the Industry Report, 2001 Agroforestry in Ontario
Private Woodlands

The Ontario Woodlot Association is the primary voice for farm and non-farm woodlot owners in Ontario. The organization has its office in Kemptville and has recently hired a full time Executive Director. This organization has established Locals in eastern, southern and central Ontario. The emphasis of this organization is on lobbying on behalf of private woodlot owners as well as supporting education, sales and marketing initiatives related to forest values. The Ontario Forestry Association also represents the interests of woodlot owners. This organization is more centralized and emphasizes public awareness and education initiatives. Both of these organizations are supporting the implementation of the Managed Forest Tax Incentive Program.

Scale of farm woodlands

The last Agricultural Census, which reported the area of farm woodlands, was published in 1986. At that time the area in farm woodlands was estimated at 1,450,000 acres (587,045 hectares). Over the past 14 years there has been some land clearing for alternative farm crops. At the same time other areas of cleared land have been removed from cultivation and some of these areas are regenerating to woodland. In the absence of updated census information, it is believed that the area in farm woodlots has not changed significantly since 1984. These woodlands are owned by an estimated 55,000 farmers (Agricultural Census, 1996). It is estimated that 18% of farmers do not own woodland areas.

Value of farm woodlands

In 1995, there was $19,717,000 generated in the sale of forest products, excluding maple, from 3,343 farms (Agricultural Census, 1996). In this year, about 6% of farmers owning woodlands sold forest products from their farm. This consisted of sales of fuelwood, posts, sawlogs and veneer logs. Stumpage prices for high quality sawlogs and veneer logs are moderate to high and are projected to increase over the next few years, especially in southwestern Ontario. There was a 69.5% increase in the sale of forest products between 1991 and 1996.

In Ontario, the number of farms reporting income from forest products is the second highest in Canada, after Quebec. Ontario has the fourth largest income value reported after Quebec, Alberta and British Columbia. The on-farm use of harvested timber (veneer, sawlogs, posts, poles and fuelwood) also provides considerable cost savings to farmers.

Managed forest tax incentive program

The Managed Forest Tax Incentive Program will require adjustment for future success. It will apply to non-farmers and farmers not eligible for a Farm Business Registration Number, a qualifying criteria for eligibility for the Farm Tax Incentive Program.

Indiscriminate harvesting of timber

Some counties are experiencing problems with indiscriminate harvesting of forest crops without regard for maintaining a sustainable resource. At present, a combination of awareness/education initiatives, tax incentive programs and municipal tree cutting by-laws are only partially effective in limiting this activity. High stumpage prices tend too exhaborate the
problem. It is noteworthy that Renfrew County cancelled their Tree Cutting By-Law in 2000 because elected officials felt that the program was ineffective. Perhaps more attention could be placed on certifying the activity of commercial logging including inspection and validation of professionalism of any work conducted and less focus on the landowner or certification of the private forest itself.

**MNR Stewardship Council**

The provincial network of Stewardship Councils continues to support a number of initiatives beneficial to farm woodlot owners. Emphasis is on landowner awareness, self-empowerment, education and the establishment of demonstration sites. Some of this work is being done cooperatively with staff in the OMAFRA Agroforestry Program.