The Development of Native Fruit Species as Horticultural Crops in Saskatchewan

Fruit species native to Saskatchewan, and the neighboring Canadian prairie provinces of Alberta and Manitoba, are a valuable natural resource with a potential horticultural future. Some of these native fruit species include the beaked hazelnut (*Corylus cornata* Marsh.), blueberry (primarily *Vaccinium myrtilloides* Michx.), buffaloberry (*Shepherdia argentea* Nutt.), choke cherry (*Prunus virginiana* L.), currant (*Ribes* spp.), highbush cranberry (*Viburnum trilobum* Marsh.), lingonberry (*Vaccinium vitis-idaea* L. var. *minus* Lodd.), pin cherry (*Prunus pensylvanica* L.f.), and saskatoon (*Amelanchier alnifolia* Nutt.). These fruit species are found in a variety of habitats within the prairie, aspen parkland, and boreal forest ecological zones of the prairie provinces and are adapted to the region's harsh winters. The warm, sunny, dry summers enhance fruit quality and help decrease the incidence of disease. The city of Saskatoon (lat. 52°07'N, long. 106°40'W) lies in the south-central region of Saskatchewan, within Canadian plant hardiness zone 2b (Canada Dept. of Agriculture, 1973), and is fairly representative of the prairie climate. Here, the length of the frost-free season is 108 days. The December through February mean minimum is -20.7°C and the extreme was -50°C. The June through August mean maximum is 23.8°C and the extreme maximum was 41°C (Begrund and Wheaton, 1988).

Historically, native fruit species were important to indigenous peoples and European settlers. The fruit's horticultural potential has long been recognized. Patterson (1936) includes an entire chapter on such fruits as meriting cultivation. The saskatoon was first cultivated on the Canadian prairies in 1918 at the Agriculture Canada Research Station, Beaverlodge, Alta., by W.D. Albright (Harris, 1976).

Native fruits are characterized by a variety

of flavors and colors that allow for substantial versatility. Some, such as the saskatoon and blueberry, can be eaten fresh. All can be used in processed products, including jams, jellies, sauces, syrups, juices, ice cream, yogurt, chocolates, muffins, pies, tarts, cookies, pancakes, wine and liquors, raisins, fruit leathers, water-reduced purees, and flavor concentrates. The development of many unique products is important for potential local, national, and international (especially Eastern Europe, Japan, Taiwan, and China) markets.

The cultivation of native fruit species could significantly contribute to the diversification and health of the prairie agricultural economy by enhancing alternative agricultural production, by promoting the development of mixed farming operations, and by providing a more substantive base for a processing industry.

Progress in industry development

The horticultural production of native fruit species appears to have significant commercial potential. Harvests of blueberries from managed wild stands in eastern Canada average 23 million kg·year⁻¹ and return \$162 million in Canadian dollars (CD) to the economies of Quebec and the Maritime Provinces (Brunner, 1990). Relatively small orchards of native fruit species can produce high yields and profits. Estimates of crop yields for mature saskatoon orchards presently range from 2600 to more than 13,500 kg·ha⁻¹ (Fruit Growers Soc. of Alberta, 1989; Harris, 1972). Average prices per 4-liter container (≈2.2 kg of berries) are CD \$7.50 for pick-your-own operations and CD \$11.00 for prepicked (Hausher, 1991). Based on these yield estimates and prices, the potential return per hectare ranges from CD \$8860 to CD \$67,500.

There is substantial interest in the commercial production of native fruit species in Saskatchewan and the other Canadian prairie provinces. Many small saskatoon orchards have been initiated. In 1989, Saskatchewan had ≈39 ha of saskatoons in production and an additional 53 planted. Currently, the demand for saskatoon fruit exceeds the supply. In east-central Saskatchewan, the production of highbush cranberries and associated processed products has been initiated. The wild harvest of blueberries and lingonberries, primarily by native people in the northern region of the province, is becoming better organized, but yields are inconsistent from year to year. The production of processed native fruit products is a viable, expanding cottage industry.

The development of a horticultural industry based on the culture and management of native fruit species is not without difficulty. Development costs can be high (CD \$3600 to

CD \$12,000/ha). The return on this investment may take 10 to 12 years to recoup (Fruit Growers Soc. of Alberta, 1989). For many native fruit species, few if any varieties exist, and it is difficult to obtain sufficient quantities of any given variety to establish a commercial plantation. Contract propagation is often not feasible because propagation companies are not willing to develop or refine the required methods unless there is a substantial market. Cultural information lacking for most native fruit species. Few pesticides are registered for use on these fruits, and effective, alternative methods of pest and disease control need to be developed. Economical methods of mechanical harvesting and grading are also not available for small orchards. Suitable methods for postharvest storage and processing, the establishment of commercial processing facilities, and major marketing efforts are required. Substantial initiatives in these directions have yet to be taken.

The Native Fruit Development Program

The Native Fruit Development Program (NFD) at the Univ. of Saskatchewan provides expertise in research and development for the cultivation and management of native fruit species. The program is supported by the Agriculture Development Fund, Government of Saskatchewan, as part of a program of economically strategic funding.

A schematic overview of the role of the NFD in the process of industry development illustrates the various components and interactions involved (Fig. 1). The program's activities represent a mix of short- and long-term objectives and include germplasm collection, characterization, selection, and evaluation; the development of effective propagation protocols; the study of biology and culture of native fruit species; problem diagnosis for growers; and information transfer to growers. The development of effective propagation methods, the primary research focus of the NFD, is central to most of the components of industry development. Although breeding is an important long-term component of new crop development, to date little effort has been devoted to breeding because of limited resources, ill-defined breeding objectives, and limited knowledge regarding patterns of inheritance. For most native fruit species, substantial variability exists in wild germplasm, and simple selection of superior genotypes has been effective in crop improvement.

Specific projects of the NFD include: 1) the initiation of a saskatoon variety evaluation trial at seven sites within the province in cooperation with interested growers; 2) the establishment of small native fruit orchards at four locations within the province that are designed to demonstrate the culture of various species including the choke cherry, highbush cranberry, pin cherry, buffaloberry, and sea buckthorn (*Hippophae rhamnoides* L.), a Eurasian import; 3) the release of the new, late-blooming

(continued on inside back cover)

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Front Cover: Common native fruit species of the Canadian prairie provinces (left to right from the top). Lingonberry (*Vaccinium vitis-idaea* var. *minus*), high-bush cranberry (*Viburnum trilobum*), pin cherry (*Prunus pensylvanica*), saskatoon (*Amelanchier alnifolia*), blueberry (*Vaccinium myrtilloides*), beaked hazelnut (*Corylus cornata*), choke cherry (*Prunus virginiana*), low-bush cranberry (*Viburnum edule*). Photographs by Richard St. Pierre.

(continued from inside front cover)

Development Of Native Fruit Species As Horticultural Crops

Fig. 1. Schematic overview of the development of native fruit species as horticultural crops. Arrows indicate the flow of information or products between components. Solid rectangles indicate components of the Native Fruit Development Program at the Univ. of Saskatchewan.

saskatoon variety Nelson; 4) an on-farm demonstration at two locations of an effective system, developed by Nelson (1987), for the propagation of saskatoon varieties through the production of cuttings from etiolated shoots; 5) the development of a genetic fingerprinting technique that will allow accurate identification of saskatoon varieties that are difficult to distinguish morphologically (Weir et al., 1991); 6) experimentation on flower and fruit production in the saskatoon so that appropriate management practices can be developed and consistent yields produced; 7) an investigation of the use of plant growth regulators for increasing rhizome production and growth in the lingonberry, which may lead to a quicker method for establishing lingonberry plantations; 8) the development of a method for screening saskatoon seedlings for resistance to the juniper-saskatoon rust (*Gymnosporangium nelsonii* Arth.) (Kabaluk and St. Pierre, 1992); and 9) the development of manuals on the biology and culture of native fruit species

(St. Pierre, 1992; St. Pierre and Campbell, 1992).

Preserving genetic diversity in native fruit

The NFDP is increasing awareness of the importance of wild plant species as sources of food, medicine, ornamentals, and other products. Deforestation, clearing of marginal land for agricultural purposes, and urban expansion have contributed to the loss of genetic diversity in many native fruit species. Fortunately, many farms on the prairies harbor varieties of native fruit species that have been selected from local wild germplasm. Prairie rural gardens are often analogous to the so-called peasant agroecosystems found in developing countries (Altieri et al., 1987) and represent an excellent way of maintaining grass roots interest in the preservation of genetic diversity and patches of natural ecosystems. Cultivating native fruit species as crops will also help relieve the pressures of large-scale harvesting from wild populations. As Payne (1990) sug-

gests, such an awareness and renewed interest may be critical to the long-term preservation of native fruit species.

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