Sweet Cherry Production in South Patagonia, Argentina

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Keywords: *Prunus avium*, varieties, rootstocks, training systems, frost control, irrigation, labour

Abstract

In South Patagonia, the total sweet cherry (*Prunus avium* L.) area has increased from 176 ha in 1997 to 507 ha in 2004, of which 232 ha are located in Los Antiguos (46°19' SL; 220 m elevation), 158 ha in the Lower Valley of Chubut River (LVCHR) (43°16' SL; 30 m elevation), 52 ha in Sarmiento (45°35' SL; 270 m elevation), 35 ha in Esquel (42°55' SL; 570 m elevation) and 30 ha in Comodoro Rivadavia (45°52' SL; 50 m elevation). The most common varieties are 'Lapins', 'Bing', 'Newstar', 'Sweetheart', 'Stella', 'Sunburst' and 'Van' grafted on 'Mahaleb', 'Pontaleb', 'SL 64', 'Colt' or 'Mazzard' rootstocks. Trees generally are drip-irrigated and planted at high densities, using training systems such as Tatura, central leader and modified vase (2700, 1100 and 1000 trees ha^{-1}, respectively). Growers in Los Antiguos are more traditional, planting mainly as vase (400 to 1000 trees ha^{-1}) or freestanding trees (280 trees ha^{-1}) and irrigating by gravity (74% of the area). Only 4.4% of the area of Los Antiguos is frost protected, as growers rely strongly on the moderating effect of Lake Buenos Aires. Frost control systems are absent in Comodoro Rivadavia because the established orchards are located next to the sea, in an area with low risk of frost. The frost-protected area is 49% in Sarmiento, 35% in Esquel and 57% in LVCHR. Fruit are harvested from November (LVCHR) to the end of January (Los Antiguos and Esquel), and the harvest-only labour demand during the 2004/2005 season was 100,000 h. In that season, seven packinghouses exported 390 t (45% of the total production) to Europe. Most orchards have not yet reached their mature stage and new ones are being established. Therefore, fruit volumes will continue to increase and shortages of labour and packing facilities may become a constraint.

INTRODUCTION

The extra-Andean part of South Patagonia is characterized by annual rainfall between 200 and 500 mm (León et al., 1998; Naumann, 1999). Between 65 and 75% of the time, the wind blows from the W–SW, with maximum speed during the sweet cherry (*Prunus avium* L.) growing season (between September and January) and minimum in winter (Paruelo et al., 1998). Mean annual temperatures vary from 8.2 to 13.5°C in the different growing areas, and at all locations, the chilling requirements of cherries are easily satisfied. Soil heterogeneity, characterized by a wide range in textures, is an important characteristic of the Patagonian valleys where cherries are grown. The main soil limitations are sodicity and/or salinity, insufficient drainage or shallow water tables. Apart from this, agro-ecological conditions in the valleys of South Patagonia (Fig. 1) generally are favourable for fruit production and various stakeholders are interested in development of the fruit sector, especially sweet cherry since it is seemingly the most profitable fruit crop. Moreover, labour demands are about 2000 h ha^{-1} $year^{-1}$ (Cittadini et al., 2006), making it attractive for policymakers in a country with a high unemployment rate.

In South Patagonia, the total sweet cherry area has increased from 176 ha in 1997 to 507 ha in 2004 (Fig. 2), of which 232 ha are located in Los Antiguos (46°19' SL; 220 m elevation), 158 ha in the Lower Valley of Chubut River (LVCHR) (43°16' SL; 30 m elevation) (Sanz, 2005), 52 ha in Sarmiento (45°35' SL; 270 m elevation), 35 ha in Esquel (42°55' SL; 570 m elevation) and 30 ha in Comodoro Rivadavia (45°52' SL; 50 m elevation).

ORCHARD SYSTEMS x

Varieties and Rootstocks

The most commonly planted varieties are 'Lapins' and 'Bing' (29.9 and 26.4%, respectively), followed by 'Newstar' (9.1%), 'Sweetheart' (6.8%), 'Stella' (6.3%), 'Sunburst' (6.2%) and 'Van' (5.4%) (Fig. 3A). During the 1999s, variety selection was based on self-compatibility and fruit quality, explaining the importance of 'Bing' (a self-sterile variety but with very good fruit quality) in all zones. Rootstocks are much less diverse and their selection has been based on nursery convenience, rather than on growers' preferences. The most common rootstock is 'Mahaleb' (*P. mahaleb* L.) seedling (64.8% of the trees), followed by the clonal mahalebs 'Pontaleb' (13.6%) and 'SL 64' (9.8%), 'Colt' (*P. avium* × *P. pseudocerasus*) (5.4%) and 'Mazzard' (*P. avium*) seedling (3.5%) (Fig. 3B).

Training and Irrigation Systems

With the exception of those in Los Antiguos, practically all orchards are drip–irrigated and planted at high densities, using training systems such as Tatura (V-shape), central leader and a modified vase (2700, 1100 and 1000 trees ha^{-1}, respectively) (Fig. 4). Growers in Los Antiguos are more traditional, training the trees mainly as a traditional or modified vase (500 and 1000 trees ha^{-1}, respectively) or as freestanding trees (280 trees ha^{-1}) (Muñoz, 2004) and irrigating by gravity (74% of the area). Yields of Tatura systems have not yet fulfilled expectations. Some Tatura orchards have occasionally, but inconsistently, yielded 15 t ha^{-1} in LVCHR. The reason could be the excessive care needed to control vigour (summer pruning and intentional limitation of water and nutrient supplies), so that the leaf area index (LAI) normally does not exceed 2.5. Commercial orchards in the same valley, but trained as vase or central leader trees (both ~1000 trees ha^{-1}) have attained an average of 10 t ha^{-1}. In Los Antiguos, mean yields of adult freestanding orchards are as low as 1.8 t ha^{-1} and traditional or modified vase trees, 4.5 and 5.5 t ha^{-1}, respectively. The main limitations to higher yields are design defects and management problems, such as inappropriate pruning, inefficient irrigation, uncontrolled spring frosts and pollination failures.

Wind Protection

Windbreak barriers against strong winds are indispensable in all Patagonian valleys to allow establishment of commercial cherry orchards, although growers do not always take this into consideration when planting. Sweet cherry has been defined as a very sensitive crop with respect to wind effects. High winds negatively affect cherry production, fruit quality and pollination effectiveness and increase fruit abortion. The critical wind speed for cherry (defined as the mean wind speed during the growing period that causes a 10% reduction in crop yield) has been reported to be 1.6 m s^{-1} (Peri and Bloomberg, 2002). Dense windbreaks (porosity less than 15%) of *Populus nigra* and *Salix* spp. have been used to protect cherry orchards. However, in recently developed areas, artificial (plastic) windbreaks have been installed until tree windbreaks reach an effective maturity to protect the area.

Frost Control Systems

Considerable variability exists in the application of frost control systems among the different zones of South Patagonia. For example, only 4.4% of the orchard area of Los Antiguos is frost-protected (sprinkler irrigation and mobile heating machines), as growers strongly rely on the moderating effect of Lake Buenos Aires. However, in reality this effect is not sufficient to avoid frost damage and up to 70% losses have been recorded in unprotected orchards (Manavella and Guerendiain, 1998). Frost control systems are absent in Comodoro Rivadavia because orchards that are already in the productive phase are located next to the sea, an area with low frost risk. The frost-protected area is 49% in Sarmiento (heaters and sprinkler irrigation), 35% in Esquel (mobile heating machines) and 57% in LVCHR (sprinkler irrigation). In the last location, the unprotected area comprises orchards that have not reached their mature stage yet.

HARVEST AND POSTHARVEST

Cherry fruits are harvested by hand from November (LVCHR) until the end of January (Los Antiguos and Esquel). The labour demand for this operation during the 2004/2005 season was ~100,000 h. In that season, 7 packinghouses processed 870 t (requiring another 93,000 h of labour) and exported 45% (390 t) to Europe (during the 2003/2004 season, 470 t were produced, from which 190 t were exported). Another 45% was sold as fresh fruit in the domestic market and 10% went to industrial uses. All packinghouses use hydro-cooling, classification belts, grading machines and cooling rooms for storage. Their potential processing capacity (working in 3 daily shifts) is approximately 1305 t (Table 1). Main export destinies of the fruit have been England, Spain and other European countries. Transport always includes a cooled truck to Buenos Aires (also where the second class fruit is sold for the domestic market). From there, most fruit goes to Europe by air. However, some commercial pilots have used ocean ship transport with promising results.

CONCLUSIONS

Sweet cherry production in South Patagonia is increasing. The potential for development of the cherry sector is high, based on a favourable climate, ample availability of land and water, and most importantly, because harvest and marketing are in a “counter” season compared to the Northern Hemisphere. Most orchards have not yet reached their mature stage and new ones are being established. Therefore, fruit volumes will continue to increase and shortages of labour and packing facilities may become a constraint. The rapid growth of the cherry production area can give the Region in an important position internationally but can also lead to shortages of packing facilities, labour, transportation and sales capacity if not planned properly.

Literature Cited

Cittadini, E.D., Van Keulen, H. and Peri, P.L. 2006. FRUPAT: A Tool to Quantify Inputs and Outputs of Patagonian Fruit Production Systems. Acta Hort. 707:223–230.

León, R.J.C., Bran, D., Collantes, M., Paruelo, J.M. and Soriano, A. 1998. Grandes unidades de vegetación de la Patagonia extra andina. Ecología Austral 8:125–144.
Manavella, F.A. and Guerendiain, F.C. 1998. Control de heladas en el valle de Los Antiguos. Proc. I Argentinean Congress of "Cambio Rural". Buenos Aires, Argentina. 20–21 May.
Muñoz, M. 2004. Relevamiento de lotes productivos en la localidad de Los Antiguos. Technical report, CAP - Delegación Los Antiguos, Argentina p.7.
Naumann, M. 1999. Pequeño Atlas Argentino con el Gran Chaco. Programa de Acción Nacional de Lucha contra la Desertificación. Cooperación Técnica Argentino-Alemana p.85.
Paruelo, J.M., Beltrán, A., Jobbágy, E., Sala, O.E. and Golluscio, R.A. 1998. The climate of Patagonia: general patterns and controls on biotic processes. Ecología Austral. 8:85–101.
Peri, P.L. and Bloomberg, M. 2002. Windbreaks in southern Patagonia, Argentina: A review of research on growth models, windspeed reduction, and effects on crops. Agroforestry Systems 56:129–144.
Sanz, C. 2005. Relevamiento del sector cerecero del Valle Inferior del Río Chubut. Technical report, INTA – EEA Chubut, Argentina. p.8.

Tables

Table 1.Number of current packing facilities, present use and maximum processing capacity in the Lower Valley of Chubut River (LVCHR), Los Antiguos, Sarmiento, Comodoro Rivadavia and Esquel, in Southern Patagonia.

Production Area	Number of packing facilities	Current processing use (t)	Maximum[1] processing capacity (t)
LVCHR	3	560	780
Los Antiguos	2	210	300
Sarmiento	0	0	0
Comodoro Rivadavia	1	80	150
Esquel	1	20	75
Total	7	870	1305

[1]Working in 3 daily shifts.

Figures

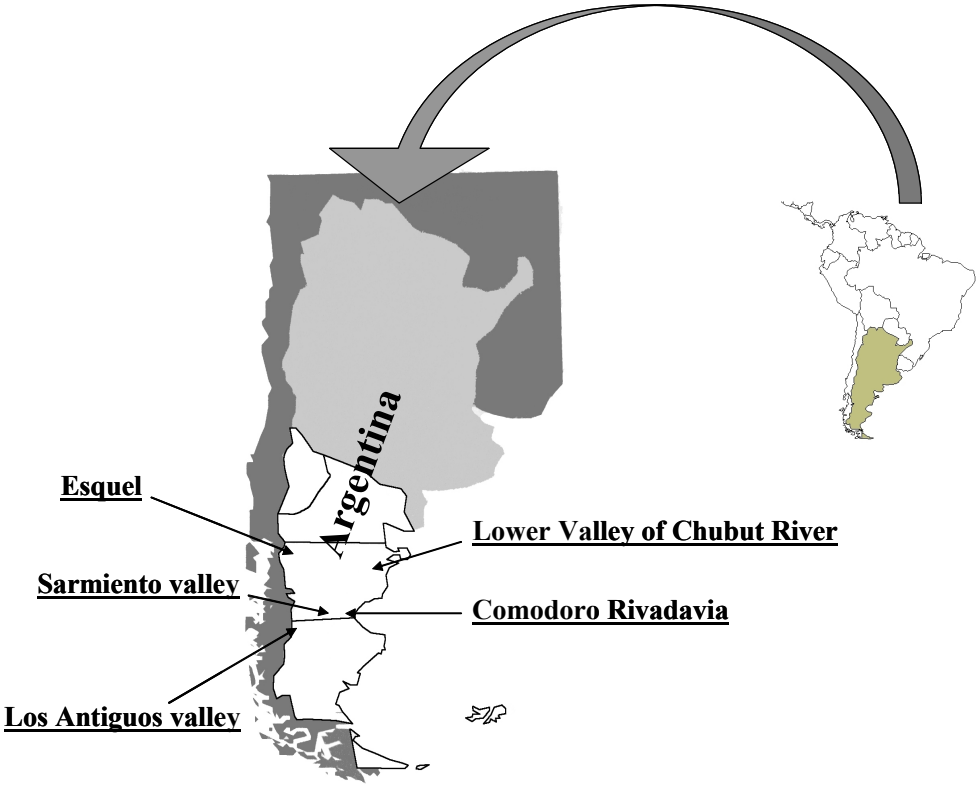

Fig. 1. Location of Patagonia (white area) and the 5 cherry production areas under study.

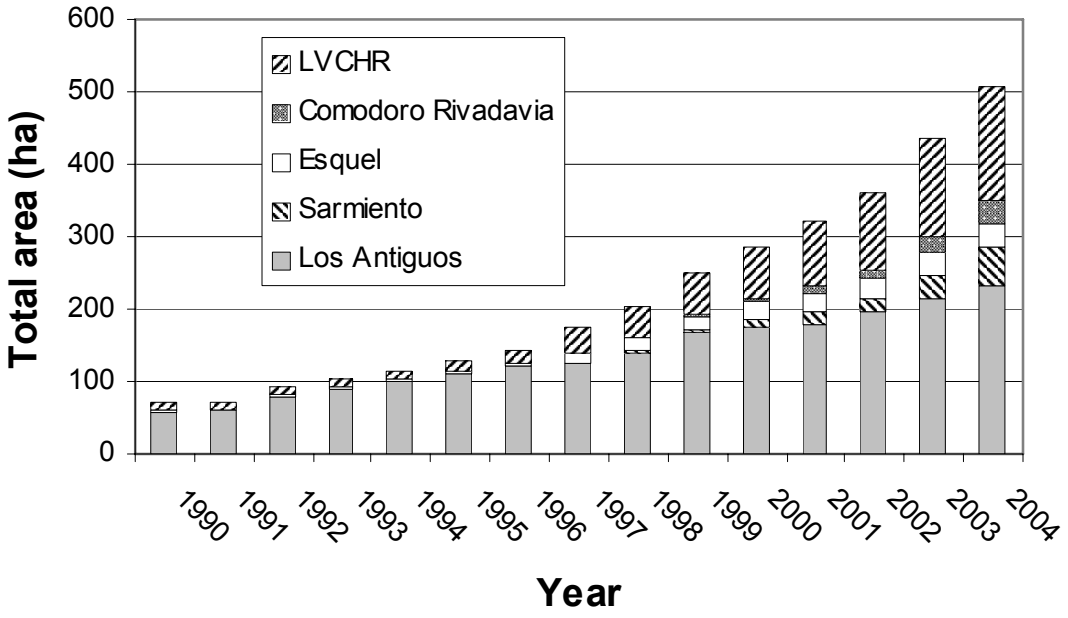

Fig. 2. The increase, from 1990 to 2004, in total area (ha) of sweet cherry orchards in the different production areas of South Patagonia, Argentina.

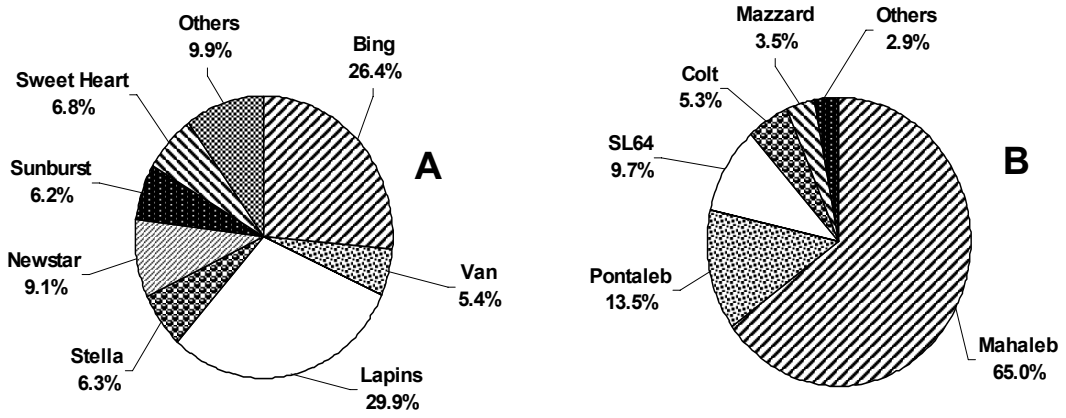

Fig. 3. Variety (A) and rootstock (B) distribution of sweet cherry trees (% of total number of trees) planted in South Patagonian orchards, Argentina.

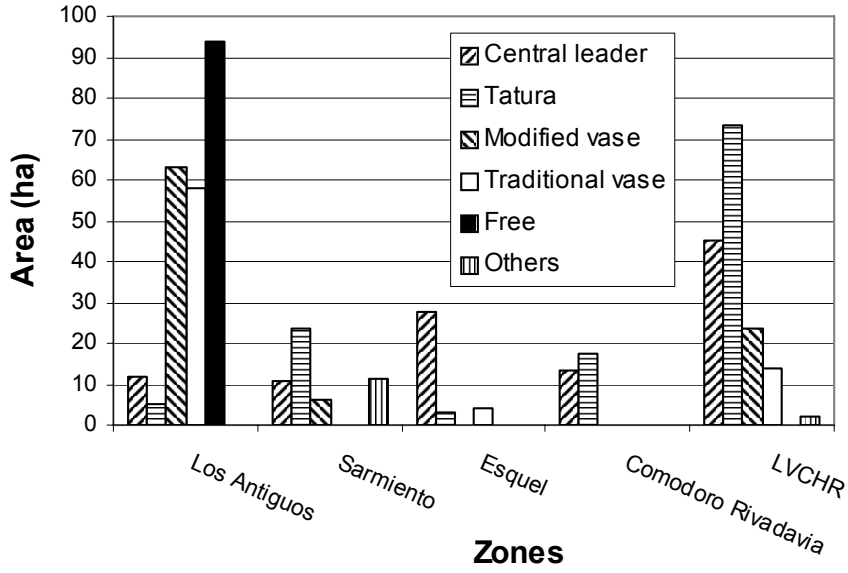

Fig. 4. Sweet cherry orchard area planted to various training systems in the different production areas of South Patagonia, Argentina.