Contribution of a private poplar industry in Chile to sustainable rural development

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Successful integration of the production and processing of poplar wood with agriculture and livestock raising, community development and care for the environment.

CAF EL ALAMO

CAF El Alamo's poplar plantations in autumn

The Compañía Agricola y Forestal El Alamo Ltda (the El Alamo Agricultural and Forest Company Ltd, hereafter referred to as CAF El Alamo) is an example of a large-scale private forest industry contributing to the social and economic development of the community where it is situated. In its poplar plantations covering about 3 000 ha – the largest area planted with poplar in Chile – CAF El Alamo has adopted an integrated system for maximizing the use and rate of return of land through forest, agricultural and livestock production in harmony with the natural and social environment. This involves:

- a forest management system based on the establishment, management, protection and harvesting of forest plantations for roundwood, with the aim of achieving a high-quality, homogeneous product in sufficient quantities to meet the raw material requirements of the company's and other factories;
- use of the space between the plantation rows, as well as other available land, for agricultural production during the first two years after planting, with the aim of maximizing land use and increasing the cost-effectiveness of the forest crop;
- introduction of cattle, starting in the third year after planting, mainly to control weeds and undergrowth in the poplar plantations, which reduces the costs of chemical and mechanical weed control and the risks of fire and also improves soil fertility by adding organic matter.

The company has cultivated poplars

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In CAF El Alamo's sustainable agrosilvopastoral production system, cattle help control weeds and undergrowth in the plantations, fertilize the soil and also haul harvested logs

intensively since 1939 and has been developing this sustainable agrosilvopastoral production system since its start.

In July 2002, CAF El Alamo obtained certification from the Forest Stewardship Council (FSC) as a result of independent evaluations that demonstrated not only the company's efforts to support forest conservation, but also the important role that the company plays in the community and its overall commitment to sustainable rural development.

BACKGROUND

CAF El Alamo is Chile's largest producer of poplar wood, focusing particularly on roundwood production (3.2 m logs with diameters of 16 to 60 or 70 cm). Together with the Compañía Chilena de Fósforos S.A. (the Chilean Match Company) and subsidiaries, CAF El Alamo makes up part of a consolidated industrial timber group involved in the processing and manufacture of wood products such as high-quality safety matches, chopsticks, ice-cream sticks and paint stirrers made from poplar wood for both the domestic and international markets.

The company's forest estates are located in Chile's central valley, between the coastal range and the Andes. The area has naturally fertile volcanic soil, access to irrigation and a Mediterranean climate, marked by cold, wet winters and hot, dry summers. The climate is particularly suited to farming, and the area has therefore experienced the highest level of human intervention in the country. The land is used mainly for agriculture and only occasionally for forestry. The high incidence of frosts during the coldest months and the dryness of the summer season are the main environmental constraints to agricultural activities.

The irrigation system that supplies water for the poplar plantations is fed by the Longaví River and the Bullileo dam. The irrigation system is divided into 20 920 water shares or rights, 1 836.8 of which belong to CAF El Alamo, equivalent to 8.8 percent of the total permanent water rights into which the Longaví river is divided. All of the company's water rights are legally recognized, which has been important for good community relations.

The total forest holdings of CAF El Alamo are about 3 235 ha, including about 2 915 ha of forest plantations spread over 26 holdings located in the VII Maule Region of Linares Province; 86 percent of the forest plantations are made up mainly of *Populus* hybrids. (Table 1). Poplar was chosen mainly because of its growth characteristics and the qualities of its timber, such as its white colour, absence of resin, rapid growth and short rotation. The plantation aims at an even age class distribution; the whole range of ages from 1 to 14 years is found on the company's land, with areas varying from 146 to 259 ha and an average area of roughly 215 ha per age class. Two-thirds of the age classes cover areas greater than 200 ha.

The plantations are established using genetically improved planting material produced directly in the company's 40 ha of nurseries (see Figure). Plantation management consists mainly of pruning, weed control and irrigation carried out between ages 0 and 13 years (Table 2). Pruning allows the production of knot-free timber, while irrigation, together with site-related factors, is a key to rapid growth.

Essentially only previously harvested areas are now planted, i.e. the company engages in reforestation, not afforestation. This has led to a policy of very small land purchases, with future projections of between 40 and 50 ha per year.

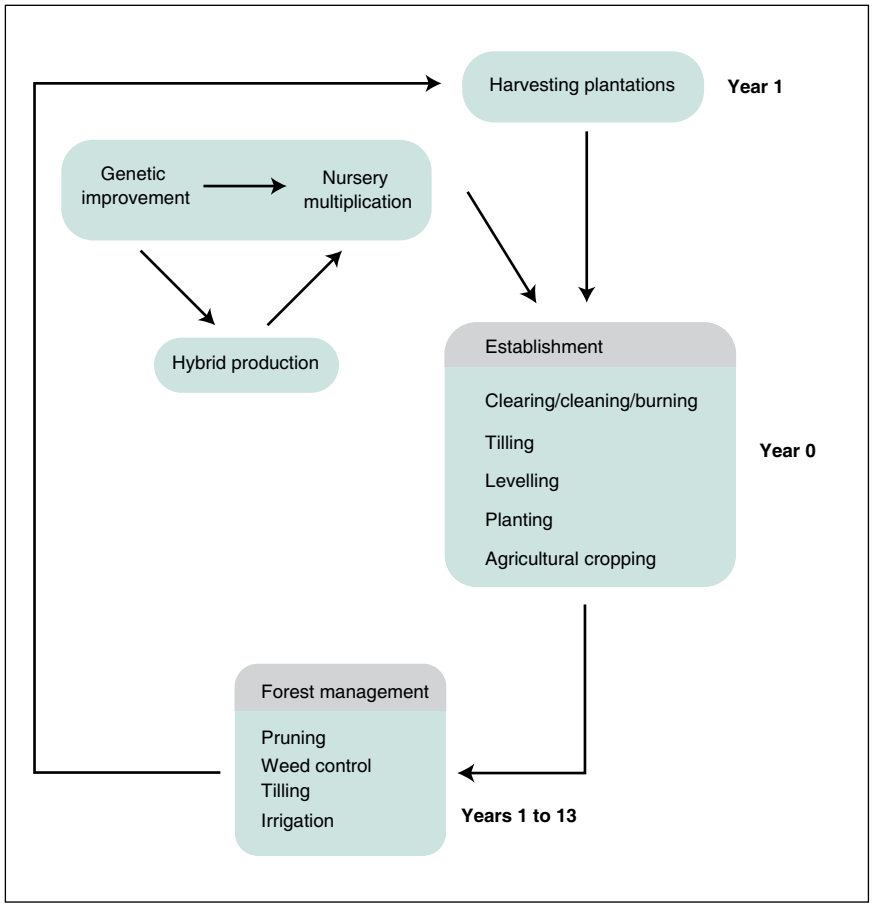
The company also grows eucalyptus and indigenous tree species, raises cattle and carries out production and primary processing of asparagus, maize and bilberry.

WOOD PRODUCTION

Annual harvesting levels are determined mainly by demand and by the availability of the forest resources. The annual availability of timber for harvesting is determined based on factors such as variety, plantation age and average diameter at breast height (DBH). The annual harvest rate for the company's poplar holdings is roughly 38 000 m^3 of timber. Protection zones, watercourses,

TABLE 1. CAF El Alamo's forest holdings

Land use	Area *(ha)*
Poplar (*Populus* spp.)	2 784.0
Eucalyptus spp.	124.4
Walnut (*Juglans regia*)	3.3
Conservation	115.6
Other uses	207.9
Total area	3 235.2



General forest establishment and management plan

TABLE 2. Management plan for the production of high-quality roundwood

Specification	Practice
Spacing and density	6 x 6 m, equivalent to 278 trees/ha
Cutting type	2 years in nursery, with 1 shoot per cutting
Cutting size	8 m in height
Depth of planting	At least 80 cm
Pruning	At the end of the 1st growth period
Pruning height	2 to 3 heights, to obtain 7 m of knot-free trunk
Interplanting	1st and 2nd years: sowing of maize
Tilling	2 to 3 times during the rotation
Weed control	Yearly, both mechanized and chemical, and also with livestock
Irrigation	Gravitational furrow irrigation: once a month during the growth period

trail networks and type of soil are all taken into account in the planning of harvesting operations.

Since the company practises clear-felling, the annual allowable cut is calculated on the basis of the relation between the rotation age, the annual planting rate and age class distribution. In these terms, the theoretical annual allowable cut is 222 ha per year. The company at present harvests 140 ha per year. With a rotation age of 12 years and an average area of 222 ha per age class, there is an essentially complete supply in terms of age classes.

The annual planting rate, which varies between 182 and 210 ha, enables the sustainability of the company's forest capital, while the difference between the real (140 ha) and theoretical (222 ha) annual felling rates makes it possible accumulate an annual balance of mature plantations.

COMMUNITY RELATIONS PROGRAMME

CAF El Alamo is a major social and economic player in the community of the Retiro municipality where it is situated and is thus highly involved in the area's development. In a survey of the area's inhabitants, authorities and major landowners, more than 80 percent identified strongly with the company, seeing it as an indispensable cooperative element in the district's development (Silvoterra, 2002).

The municipality has an area of 827 km^2 and a population of 19 700, of which 83.5 percent is rural. The past two national censuses have shown that the population of the municipality is growing at a rate below the national, regional and provincial rates. Some 37 percent of the population lives in poverty, and the primarily agricultural economy offers few prospects to the area's youth, as reflected in the negative net migratory balance (–1.9 percent). Against this background, CAF El Alamo is a source of stable employment.

Most of the company's holdings are in rural areas of the municipality, where the people are engaged mainly in farming and animal husbandry, and in general live on isolated farms or in small hamlets or clusters of houses. The urban population accounts for only 16.5 percent of the municipality's total, concentrated mostly in the villages of Retiro and Copihue; the company's largest hold-

CAF EL ALAMO

The plantation aims for an even age class distribution, with the whole range of ages from 1 to 14 years represented

ing, the Copihue Estate, is located within this urban area, so that there are close relations between the company and the urban residents.

Evaluations by the Smartwood company carried out in connection with the certification of the plantations indicated that CAF El Alamo exercises a strong gravitational force for the area in which it is located. The identification of the community with the company extends to the point that the Retiro municipality has adopted the slogan "Retiro, the Alamo municipality".

The company launched a programme of company-community relations in 2003 and 2004, with the aim of establishing harmonious relations with the community and seeking mutual benefits. The company adopted a strategy to participate in five spheres of action – quality of life, environment, culture and recreation, community participation, and development of production – through participation and partnerships involving the whole company, the local government, State agencies, other organizations, other companies producing similar products and the Retiro community in particular. Activities include the following:

- a community newsletter on actions undertaken by the company and other social actors;
- radio programmes and a Web site;
- training in environmental protection, waste recycling and best agricultural practices through the Unión Comunal de Juntas de Vecinos (Municipal Union of Neighbourhood Associations);
- leading the formation of a production development council;
- participation in the municipal emergency committee;
- implementation of measures to mitigate negative impacts such as an information system on aerial application of chemical products and an environmental monitoring system;
- establishing a system for conflict resolution;
- providing benefits to the community such as fuelwood donations, loan of the company's facilities for local celebrations, fundraising for community aid, extension support to professional training institutions and emergency assistance.

ENVIRONMENTAL ACTIVITIES

The landscape in which the company's forest holdings are located has been profoundly modified by human activities. Agricultural, industrial and urban activities have affected the conservation status of the indigenous plants and wildlife, which originally formed a succession of sclerophyllous forests.

Approximately 4.7 percent of the com-

S. BISOHFI

Poplar poles in readiness for planting at CAF El Alamo, against a backdrop of the Andes

B. HÉOIS

High pruning in CAF El Alamo's poplar plantations

pany's total holdings lie in protected areas and in relict indigenous forests, where biodiversity, water and soil protection and other functions of forest ecosystems are conserved.

In 2002, CAF El Alamo organized a series of studies by a multidisciplinary group of experts which provided detailed information on the plants and wildlife present in its holdings, including aquatic wildlife (Silvoterra, 2003). These studies formed the basis for a management programme aimed at constantly enhancing the company's commitment to conserving the environment.

These studies indicated that relatively large areas of plantation forests on the company's land provide a refuge for wildlife, especially birds. This benefit is enhanced by a management system that produces a mosaic of poplar plantations of different ages and varieties and thus provides a greater diversity of habitat. The company has carried out thematic mapping of forests with high conservation value and developed specific management plans for them.

A number of areas – including the banks of the Longaví river and the Molino and Copihue estuaries, as well as small remnants of relict vegetation, indigenous forest regrowth areas and alluvial meadows – are now being used as conservation zones.

The artificial water channels – of which there are 55 km on the company's holdings – perform a major function as habitat for fish and other indigenous aquatic species. The company has mapped the watercourses in its holdings and formulated and distributed a watercourse protection plan.

CAF El Alamo's poplar plantations contain a high diversity of wild plants, with 105 species so far identified, 35 percent of them indigenous and 65 percent introduced. The company has identified exemplars of two species with conservation problems in the Maule region: *Crinodendron patagua*, which is classified as vulnerable, and *Sophora microphylla*, which is classified as rare. *Dasyphyllum diacanthoides*, a typical tree species of the Valdivia Forest, and *Nothofagus obliqua*, representing deciduous forests, are also found in the company's holdings.

Similarly, although the CAF El Alamo holdings are modified environments focusing on forest production, they have a significant diversity of wildlife, with a total of 50 animal species having been recorded. The high diversity of wildlife is basically a result of the maintenance of conservation zones. The company has identified a total of nine animal species in conservation categories: black spiny-chest frog (*Alsodes nodosus*), Chilean slender snake (*Tachymenis chilensis*), wreath tree iguana (*Liolaemus lemniscatus*), little grison (*Galictis cuja*), buff-necked ibis (*Theristicus caudatus*), Andean gull (*Larus serranus*), Argentine gray fox (*Pseudalopex griseus*), four-eyed frog (*Pleurodema thaul*) and coypu (*Myocastor coypus*). Various indigenous birds are also present, including the thrush, the goldfinch, the turtledove and the dove, the last of which is classified as endangered.

CAF El Alamo's conservation activities include promoting a general attitude supporting the conservation of endangered wildlife; identifying and mapping the distribution zones of endangered species; training employees in conservation; signposting places where endangered species are found; and monitoring biodiversity with the support of GIS. The company provides the neighbouring community with information through pamphlets on wildlife, habitats and special requirements for the protection of the various species. It also forbids any hunting or trapping of the wild animals found on its holdings.

The company has also developed guides for implementation of the man-

agement plan, safe harvesting methods, watercourse protection, and irrigation water management and control.

MONITORING, MEASUREMENT AND EVALUATION

The company has developed a system for monitoring changes that may occur in each sphere covered by the company's integrated management plan – forest, environmental and socio-economic. The monitoring system addresses the variables to be measured, the intensity and frequency of measurement, the monitoring method, mechanisms for periodic review, systems for reporting results and feedback mechanisms.

The most important variables to be monitored include the following:

- fluctuation in the water table;
- efficiency of irrigation;
- chemical analysis of irrigation water;
- indicators of solid, liquid and organic waste generation, including industrial waste;
- measurement of particulate matter in the air;
- control of water turbidity;
- physical and chemical properties of soil and soil fertility;
- measurement of soil compaction;
- poplar seed production;
- volume of timber harvested;
- forest growth;
- indicators of implementation of the community relations programme;
- job generation indicators;
- work hazards;
- changes in diversity of plants and wildlife, including aquatic wildlife.

CONCLUSION

Poplar has been cultivated in central Chile and specifically in the municipality of Retiro for at least 150 years. During this time plantation practices and management have continuously improved from both the technical and environmental points of view.

Since 1913 CAF El Alamo has fully integrated the production of poplar raw material and its processing into high value-added end products. This activity owes its sustainability (confirmed by FSC certification) to a mix of factors, most notably technical knowledge of the production processes (both raw material and industrial), the cost-effectiveness of the activity, compliance with the regulations, environmental awareness and integration with the community. ◆

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