

Not just a pretty face

The boronization of *el girasol*

Sunflowers, indigenous to what is now northern Mexico and southwestern USA, were used as foods, medicines, and dressings for wounds and stings by Amerindian civilizations before the *conquistadors* arrived. They were one of the American plants brought back to Europe by the Spaniards, but unlike the potato and tomato, they were cultivated for some 250 years solely for their ornamental properties. Europeans loved growing sunflowers in their gardens, but had no notion of their nutritional potential. The uses of sunflower seeds and sunflower oil were 'rediscovered' in the 19th century, and led to the development of the *Helianthus* genus as a major international crop in the 20th century. The oil is used for human consumption, the meal as a source of protein and energy in animal feeds.

Argentina began cultivating sunflowers about 100 years ago, at first using them mainly for chicken feed. They seemed to grow well in the Pampa region, though they were usually relegated to low fertility land as the last crop in the rotation cycle before return to pasture. No one in *la pradera pampeana* considered them decorative or ornamental. The flower heads drooped sadly, the leaves had interveinal crinkling, and the petals were brownish rather than a bright, sunny gold. Nevertheless the seeds yielded good oil and fodder. Production grew rapidly, and after the first wave of development, more than a million hectares were being devoted to *girasoles*.

The development of disease-resistant and pest-resistant hybrids led to a second wave of expansion in sunflower-growing after 1975, and Argentina became the biggest producer in the world, apart from the former USSR. The 80 commercial hybrids now available provide better yields and oil content as well as better resistance to natural hazards.

In line with modern agricultural practice, Argentine sunflower farmers began using insecticides and herbicides in the post-war period - but not fertilizers. The received wisdom was that the pampa did not need artificial fertilization because it was naturally so rich in nutrients. Some experiments with nitrogen and phosphorus appeared to confirm this. These fertilizers did produce a better initial development in the plant, but not one which was translated into increases in yield or



production. NPK treatment merely added to the farmers' costs.

However, one nutrient really was in short supply in many parts of the Pampa - boron. This was discovered almost accidentally, in the following manner. Borax Argentina was making a presentation to farmers on the use of fertilizer borates for certain crops. Sunflowers were not being specifically targeted, but the presentation did include pictures from Europe which compared boron-deficient sunflowers with the bright sunny specimens familiar in France and Spain. Farmers in the audience were astonished.

"I always assumed that interveinal crinkling was genetic in sunflowers," declared one farmer. Others agreed - all thinking it quite normal for the flowers to droop brownly. This led to a series of



studies, trials and experiments which showed that lack of boron nutrition was indeed a serious limiting factor for sunflower production in the Pampa. Foliar fertilization with boron produced an average yield increase of 20 percent, with variations between an extra 200 and an extra 600 kilograms per hectare. Sunflowers are, in fact, one of the most 'boron-hungry' of all major crops.

In the field, producers now apply a first foliar application of *Solubor*[®] plant food borate when the young plants are showing six to eight leaves, usually combined with a grass inhibitor, and using field crop sprayers. A second application is carried out from the air, starting at the first sign of flowering, in combination with insecticides if necessary. Economic analysis of this fertilization shows that an

increase of 20 percent in production gives an increase of 35 percent in net income from the crop. Moreover the use of *Solubor* to correct boron deficiency can produce an increase in return on capital invested of 56 percent: for every \$100 invested in a sunflower crop the average return is \$125.7 if no boron is applied, but \$140.1 with *Solubor*.

Boron also renders the Argentine flowers just as golden and beautiful as any other, if not more so. These considerations have led to a third great wave of expansion in Argentine sunflower cultivation in what almost amounts to a sunflower revolution. With some two and a half million hectares currently under cultivation, Argentina is now far and away the world's leading exporter of sunflower oil.

Oilseeds versus butter and animal fats

At the beginning of this century, butter and animal products represented three quarters of the world's total fat consumption. Today oilseeds provide more than two thirds of the total. In the past 25 years, per capita consumption of butter has declined by 30 percent while consumption of products made from soybeans, sunflower, and rapeseed have doubled.

Major improvements in the palatability of vegetable oil products, including margarine, and serious concerns about high cholesterol levels are perceived as the main reasons for this reversal. Industrial applications of vegetable oils are also increasing, but not at the same rate. Oilseeds can even be converted into diesel fuel, but at about four times the current cost of starting with petroleum.

Source, OECD