



# The Role of Extension and Applied Research in Building an Agricultural Industry: the Case of Sunflower Oil in Bolivia<sup>1</sup>

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## Abstract

Sunflower oil production was first introduced in Bolivia in 1950. In the 1990s, plantings increased dramatically, peaking in 1997 at 140,000 hectares. The sudden growth was due to a coordinated effort between the agricultural and industrial sectors and the governments of Bolivia and Santa Cruz. The National Association of Oil Seed and Wheat Producers (ANAPO) used government funds to educate producers, perform marketing studies, and conduct sunflower seed meal animal feeding trials. The feeding trials convinced the soybean mill operators that there might be a market for sunflower meal. Through the combined efforts an industry was developed.

## Introduction

Since the mid-1980s, land grant institutions, especially agricultural extension workers, have been asked to lead the way in searching for alternatives to traditional agricultural production techniques and products, including processed goods.

The development of the sunflower oil industry in Bolivia illustrates the role that a land grant institution may play in a well-planned and coordinated applied research and extension effort toward the creation of new industries and enterprises. The effort in Bolivia was led by ANAPO, which functions as a trade association and extension entity for all producers of crops in which its members specialize. Sunflower production in Bolivia may be divided into three stages:

- the introductory period (1950-1974/5).
- the production-oriented research and extension period (1975-1988).
- the full commercial production and Five-Year Sunflower Seed Plan period (1989-present).

The introductory period is outside the scope of this report and in the interest of brevity will not be discussed.

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## The Production-Oriented Research and Extension Period

The introductory period's sunflower yields were low because the sunflower varieties first introduced to Bolivia were inappropriate for the climatic conditions found in the Santa Cruz Department. From 1975 to 1988, however, the Bolivian Center for Tropical Agricultural Research (CIAT/B) initiated production research on the crop. Research findings indicated that hybrids were appropriate. (Because the Bolivian CIAT is independent of the CGIAR research center, which is also known as CIAT and is located in Columbia, the Bolivian CIAT is referred to as CIAT/B.) Throughout most of that period, there was no commercial demand for sunflower seed, and yields were generally low. During the period 1970 to 1990, soybean oil was the predominant vegetable oil sold in local markets, and soybean meal was the major fat and protein source in poultry ration. In contrast, sunflower production increased slowly due to lack of demand (Table 1). ANAPO was created in 1974 as a result of the rapid growth of soybean oil mills.

## Full Commercial Production and the Five-Year Sunflower Seed Plan

In the late 1980s, the potential for using sunflowers as a counter (dry) season crop to soybeans became apparent. ANAPO increased its efforts related to sunflower production, and the area planted increased markedly from 1989 to 1994. In 1990, at the request of ANAPO, the United States Agency for International Development (USAID) paid for a diagnostic study on the potential for sunflowers in the Department of Santa Cruz. The three objectives of the study were to give technical assistance in sunflower production to extension workers and producers, determine sunflower growth stages and conditions in the various production zones, and identify the principal problems of sunflower production. That study reiterated that sunflowers had great potential as a contra-season crop.

As an outcome of the diagnostic, ANAPO discussed with oil-mill operators the potential of sunflowers as an industrial crop that could be grown counter-seasonally to soybeans. The oil-mill

operators concurred that there was potential. On the basis of those discussions, ANAPO launched its "Five-Year Plan (1992-1996) for Sunflower Production in the Department of Santa Cruz." The plan was developed and implemented with USAID support. The coordinated and directed use of various types of trials, tests, and demonstrations to create an industry may serve as a model for a wide range of programs. The Five-Year Plan set production goals and a plan of action for ANAPO and CIAT/B. While CIAT/B continued to conduct research, ANAPO established both the Technology Transfer Program and a program to promote the use of sunflower meal by poultry producers.

## Production

CIAT/B's research efforts in the 1980s demonstrate that the months of February and March are the best planting dates due to dry conditions from June through September. In 1989, ANAPO started conducting annual demonstration trials as well as field days for 40 demonstration plots (Table 2). Attendance at field days reflects the growth of producer interest in sunflower—field days attendance of 171 in 1992 versus over 980 in 1995. In comparison, technical efforts, regarding production techniques and the cultural practices put forth by ANAPO, declined. ANAPO conducted 13 field trials in 1992 (10 dedicated to variety selection, and three dedicated to cultural practices) compared to five field trials in 1996. Throughout the period, ANAPO published production guides and information sheets, and ANAPO technical staff made individual producer site visits as needed.

## Demand

Although preliminary research by CIAT/B indicated that there was a production potential for sunflowers, research also showed that there was virtually no local market before 1990. Thus, in 1989, ANAPO held discussions with oil-processing producers to determine their ability to process sunflower seeds, and discussions with feed-mill operators to promote the use of sunflower meal in the production of poultry rations. There was a large production increase of sunflower seeds from 1989 to 1990 (Table 1). The increase in sunflower seed production was purchased completely by the

oil-processing plants, and the meal produced from the sunflower seeds was used completely by the feed mills. However, the market for sunflower meal remained a problem because the mill operators stated that if they could not sell the sunflower meal, they would be unable to process the sunflower seeds, because the only domestic market for sunflower meal was the poultry industry. At that time, poultry producers were reluctant to have sunflower meal completely replace soybean meal in poultry rations.

The poultry producers preferred to use sunflower meal to replace only a small amount of the soybean meal. Thus, in 1992 and 1993, ANAPO cooperated with the poultry producers to launch a series of feeding trials in which sunflower meal was a one-for-one substitute for soybean meal. The trials demonstrated that sunflower meal may be completely substituted for soybean meal in poultry rations. No difficulties regarding consumer acceptance of sunflower seed oil in the domestic vegetable oil market were anticipated, and no difficulties were encountered.

## **Summary and Outcomes**

As a result of the early analyses, ANAPO staff recognized that sunflowers was a potential production alternative to soybeans for its members. The advantages of sunflower production included favorable climatic conditions, minimum new investments for producers, and a known production technology. The disadvantages to sunflower produciton becoming a viable commercial alternative included low yields due to unestablished production techniques, the unavailability of good quality seeds, and low demand. In conjunction with the public agricultural research entity, oil mills, and poultry producers, ANAPO established a multifaceted program to respond to all aspects of the situation.

In Bolivia, sunflower seed meal has replaced soybean meal completely in poultry rations. Because of this product substitution, Bolivia now exports soybean meal while consuming its replacement domestically. Simultaneously, the domestic vegetable-oil market has the choice of sunflower oil. At present there is no price differentiation in that market, and all oils (except olive oil) sell at the same

price. Thus, the vegetable-oil mills may choose to export whichever oil, or combination of oils, that will earn them the most without a penalty in Bolivia. Bolivian oil and meal prices are strongly tied to international prices for analogous soybean products. Thus, the price for sunflower seeds has not fared well in recent years, but the production of a counter season crop to soybeans helps to reduce overhead costs for soybean production while yielding a positive cash flow.

## **Conclusion**

The ability of ANAPO to plan and execute a multifaceted, interdisciplinary applied research and extension program is impressive. ANAPO orchestrated the conversion of a crop that was little more than a curiosity into a major commercial crop in a very short time. It did so by developing a good plan that kept all the stakeholders involved, but concentrated in a systematic way on the sector that required special effort. First, through making information and seeds available, production was stimulated. Second, by making hybrid and improved seed available while initiating production field trials, ANAPO assured that the necessary ingredients for sunflower production were provided. Third, by using sunflower seed trials to train extension workers in sunflower production. Fourth, by working with the private sector to assure that there would be a demand for the increased sunflower production, while simultaneously working with the soybean mill operators to assure that they would buy sunflower seeds, ANAPO created a successful market for sunflower seed production. Fifth, by addressing the concerns of the mill operators to sell sufficient quantities of sunflower meal to poultry producers, ANAPO was able to guarantee sunflower meal as a low-cost alternative to soybean meal in poultry rations. And finally, through seamless planning and research, ANAPO was able to work on both the supply and demand side of sunflower seed production and marketing. Those who work in economic development often overlook one side or the other. The Bolivian sunflower experience is an example of what may happen when both supply and demand are included in a project.

Institutions, and those who work for them, must take an entrepreneurial approach to addressing the problem of determining new crops that lend themselves to "value-added" processing. An appropriate role for extension would be to lead in planning efforts and give guidance to research. An analysis such as SWOT (strength, weaknesses, opportunities, threats) should be conducted to initiate a planning effort that focuses on the resource base of the current situation. (It is possible, however, that there is no single solution to the economic and resource problems faced by producers.) Next, the impediments to adoption of the identified potential enterprises must be ascertained. It is at this point that extension and applied researchers must assume the critical leadership positions, helping to define researchable problems, designing research projects with those who would apply the results (e.g., sunflower producers and oil-mill operators in Bolivia), and, if necessary, conducting production techniques and demonstration trials. A formal review should be conducted to make sure the initial assumptions and diagnoses are relevant. If not, or if a new set of impediments has been uncovered or is anticipated due to the changing situation (e.g., lack of knowledge on part of poultry producers leading to lack of demand for sunflower meal), a new round of applied research should be designed. In conclusion, there is a role for extension and applied research, but caution must be used to remain within the areas of expertise of the institution.

## **References**

The analysis is based on information obtained from various *Annual Sunflower Reports* and the Sunflower Five-Year Plan prepared by ANAPO. ANAPO staff and oil-mill operators were also interviewed.

**The Role of Extension and Applied Research in Building an Agricultural Industry: the Case....****Table 1.** Sunflower production in Bolivia, 1987-1998.

<b>Year</b>	<b>Area (hectares)</b>	<b>Yield (MT/ha)</b>	<b>Production (MT)</b>	<b>Price (US dollars/MT)</b>
1987	40	0.60	24	NA <sup>a</sup>
1988	80	0.80	64	NA <sup>a</sup>
1989	350	0.80	280	NA <sup>a</sup>
1990	10,217	1.16	11,870	140
1991	21,500	1.36	29,500	130
1992	20,155	1.26	25,572	140
1993	23,031	1.22	28,055	160
1994	60,000	0.96	57,300	155
1995	41,000	0.80	33,000	160
1996	89,000	0.91	80,700	180
1997	143,350	0.80	114,680	180
1998 <sup>b</sup>	107,500	0.93	99,735	167-170 <sup>b</sup>

Source: ANAPO (National Oil Seed and Wheat Producers Association), Annual Sunflower Report, Santa Cruz, Bolivia, 1998.

<sup>a</sup> NA = Not Available

<sup>b</sup> 1998 data include hybrid seed and confectionary production

**Table 2.** Annual extension and outreach effort by ANAPO, 1991-1999.

<b>Year</b>	<b>Demonstration Plots (number)</b>	<b>Field Days and Seminars (number)</b>	<b>Participants (number)</b>
1991	3	3	60
1992	14	13	235
1993	5	21	726
1994	9	21	906
1995	5	15	273
1996	4	34	400
1997	7	37	437
1998	7	7	115
1999	14	11	323

Source: ANAPO (National Oil Seed and Wheat Producers Association), Annual Sunflower Report, Santa Cruz, Bolivia, various issues.