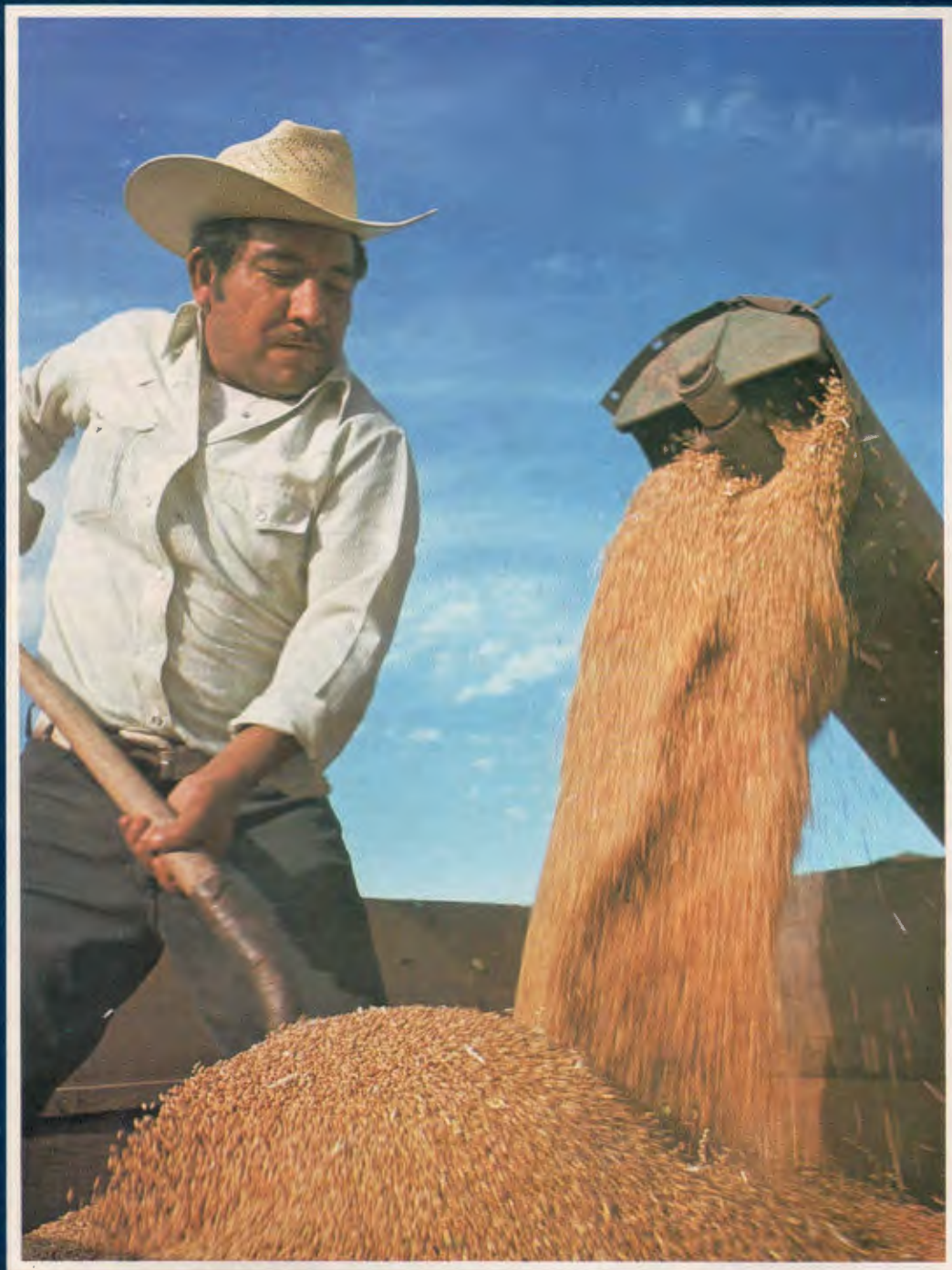


**CIMMYT  
TODAY No. 16**

## **Patronato of Sonora**

**Farmers investing in research and harvesting the profits**



## Introduction

On October 4<sup>th</sup>, 1553, Captain Diego de Guzmán and his fifty Spanish soldiers became the first Europeans to cross the rushing Hiaquimi river, in the desert state of Sonora, Mexico. They marched down from its banks into a windswept valley of cactus and mesquite, peopled by “the hiaqui tribe ... considered the bravest, most advanced and most belicose of the Province.”<sup>1)</sup> About 30,000 hiaqui indians lived in a number of small villages close to the river. They cultivated small plots of maize, kidney beans and squash along the river bank, complementing their diet with prickly pears and mesquite fruit. They also ate fresh fish, brought by couriers from the Pacific coast, and used bows and arrows in day-long deer hunts under the hot Sonoran sun ....

That once arid plain is today a rich mosaic of cereal, cotton, oil seed and legume fields that is known as “Mexico’s Breadbasket.” The Yaqui Valley currently produces close to 20 percent of Mexico’s wheat on approximately 1 percent of the country’s cultivated land—about 231,207 irrigated hectares. The Valley is also headquarters for the Agricultural Research Center of the Northwest (Centro de Investigaciones Agrícolas del Noroeste: CIANO), a mecca for wheat scientists from all over the world.

How did this transformation come about? The irrigation projects begun in 1926 by the National Irrigation Commission

1) Dabdoub, C. *History of the Yaqui Valley*, p. 8



Yaqui Valley’s natural vegetation  
(Photo: CIANO)

(today SARH, the Ministry of Agriculture and Hydraulic Resources) and a hydroelectric dam built in 1952 have been crucial to the Valley’s agricultural development. So has the application of technologies developed through intensive

research that began in the mid-40’s and that continues today, largely through Mexican government financing. But perhaps the key to the Yaqui Valley’s amazing productivity is a unique organization born of the Valley farmers’ initiative and determination: PIEAES, the Agricultural Research and Experimentation Board of the State of Sonora (Patronato para la Investigación y Experimentación Agrícola del Estado de Sonora), known simply as “Patronato”.

Patronato is an association of 32 farmers’ organizations from the state of Sonora. It originated in 1964 in the Yaqui Valley to sponsor agricultural research at CIANO, focused specifically on Sonora’s particular production problems. This report covers the origins, functions, financing and structure of Patronato, as well as its possible application as a model in other parts of Mexico and the world.



The Valley transformed by intensive production practices (Photo: CIMMYT)

## The Origins of Patronato

In 1944, Dr. Norman E. Borlaug began the wheat research work in Mexico, under the auspices of a Ministry of Agriculture Rockefeller Foundation cooperative program, that eventually won him the Nobel Peace Prize in 1970. Hearing that there was an agricultural experiment station in the Yaqui Valley, Borlaug travelled there in 1945 ... only to find that the station, founded in 1934, was in a sadly dilapidated state; that the Sonora wheat crop was being destroyed by disease; and that the Yaqui Valley farmers didn't want to risk what little wheat they had on Borlaug's ideas. He would simply have to prove them before the farmers' very eyes.

Housed in a tin shack and literally with his own two hands, Borlaug began working on what land was available at the experiment station. Slowly, the farmers became less skeptical and their interest in



his experiments grew. He finally won them over when much of the area's wheat crop was destroyed by stem rust — except for the varieties he had sown on his experimental plots. The farmers took up his disease-resistant varieties and yields increased notably as more intensive practices became profitable. In 1955, the

appreciative farmers donated the land for what is CIANO today to the Ministry of Agriculture, to conduct wheat research in Sonora in collaboration with Dr. Borlaug and his team of wheat scientists.

Over the ensuing years, the benefits of applied research became readily apparent. Wheat yields in the Valley increased enormously—from 2,100 kg/ha in 1955 to more than 3,500 kg/ha by the early sixties. However, by 1964 few farmers were able to achieve yields greater than 4,000 kg/ha. Meanwhile, the Borlaug research team had been achieving average yields of 7,000 kg/ha on the experiment station with the semidwarf wheats developed in the late fifties. The farmers were convinced that great benefits were still to be derived from applied agricultural research specific to their production problems. By this time, the farmers were fairly well organized; most of them belonged to at least one farm association or credit union. Led by Don Rodolfo Elías Calles, they began searching for a way to accelerate the transfer of technology from the experiment station to their own fields.

The search resulted in Patronato. The organization first came into being in 1964, when representatives of various regional farm organizations met to decide on the best way to fund the



Dr. Borlaug organized farmers' field days to show the results of his work (Photo: CIMMYT)

agricultural research they wanted for the Valley. They decided to raise funds among themselves by self-taxation and by obtaining some contributions from the local agricultural and milling industries to sponsor research complementary to the national wheat research program at CIANO. The station already had a publicly funded program, and this would ensure that research costs would be shared between the farmers and the Mexican government.

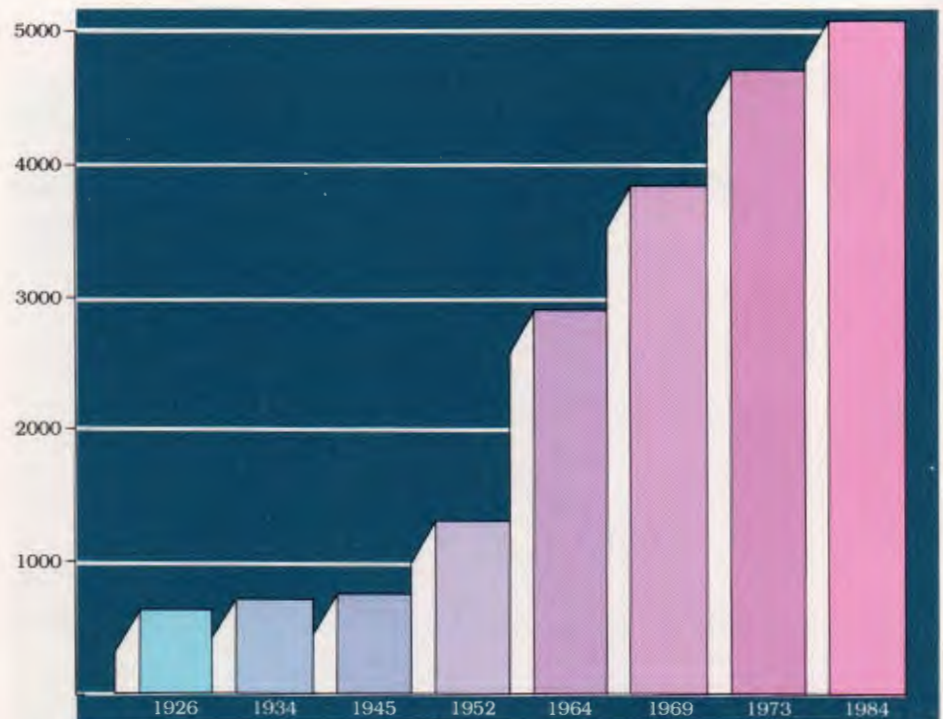
In April 1969, after some exploratory discussions with Government officials and CIANO researchers, the representatives of 24 farm and credit associations from the entire state of Sonora officially constituted PIEAES. Its charter stated that "the objectives of Patronato will be to constitute, increase and administer funding for CIANO ... and to reproduce foundation seed produced by CIANO for the members of Patronato." The only organization of its kind in the world thus came to life—through persistence, teamwork and a strong desire for progress.

Average wheat yields in the Yaqui Valley, kg/ha.

1926	(First irrigation project): 646
1934	(Foundation of Yaqui Valley experiment station): 719
1945	(Dr. Borlaug initiates his research): 740
1952	(Inaugural of Alvaro Obregón hydroelectric dam): 1,300
1964	(PIEAES established in Yaqui Valley): 2,900
1969	(PIEAES officially constituted): 3,850
1973	(Large scale implementation of improved dwarf varieties): 4,700
1984	5,100



The organized farmer is the very essence of Patronato (Photo: CIANO)



## General Data, Yaqui Valley

Latitude: N 26° 45', 27° 33'  
Longitude: W 109° 30', 110° 37'  
Altitude: 40 m  
Average yearly rainfall: 270 mm  
Climate: desert [BW (h'), W (c'),  
class. E. García]  
Average temperature: 22°C (min.  
1°C, max. 44°C)  
Soils: clay and alluvial

Wheat area before 1926: 25,531  
ha  
Current wheat area: 140,000 ha  
Average wheat area, 1959-1984:  
120,000 ha  
Total irrigated area in the  
district: 231,207 ha  
Harvested area (including  
secondary crops), 83-84 cycles:  
335,000 ha

Total harvest value, 83-84 cycles:  
35,175 million pesos  
Wheat harvest value, 83-84  
cycles: 17,500 million pesos  
Other crops, in order of  
importance: cotton, soybeans,  
maize, saffron, sesame

(Source: CIANO, Cd. Obregón, Sonora)

Population of Yaqui Valley:  
419,750  
Working population of Yaqui  
Valley: 77,573  
Population working in  
agriculture: 22,536  
Total ejidatarios: 14,178, with  
127,134 ha  
Total colonists: 688, with 9,800  
ha  
Total small landholders: 3,578,  
with 94,272 ha

(Source: Municipal Statistical Agenda 1983  
District of Cajeme, Sonora)

## Dams in Yaqui River Basin:

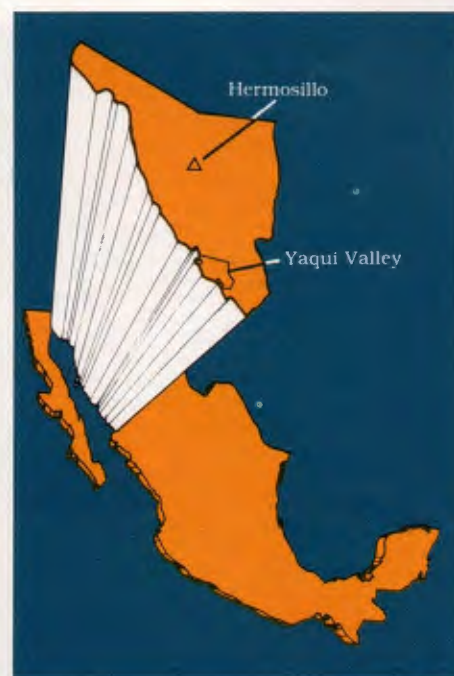
Lázaro Cárdenas: Capacity 921  
million m<sup>3</sup>  
Plutarco Elias Calles: Cap. 3,020  
mm<sup>3</sup>  
Alvaro Obregón: Cap. 3,229  
mm<sup>3</sup>

- Irrigation wells: 336
- Annual extraction: 450  
million m<sup>3</sup>
- Cumulative length of main  
canals: 260 kms
- Cumulative length of  
secondary and tertiary  
canals: 1,395 kms

Source: Irrigation District 041,  
SARH, Cd. Obregón, Sonora)



Spillway of the Alvaro Obregón dam (Photo: CIMMYT)



State of Sonora, Mexico.

## The Agricultural Research Center of the Northwest: CIANO

In the words of Dr. Norman Borlaug, "In the last 25 years, the experiment station at Ciudad Obregón, in the State of Sonora, has had a greater influence on food production than any other research station on the surface of the earth"....

The Agricultural Research Center of the Northwest (Centro de Investigaciones Agrícolas del Noroeste, CIANO) is one of eleven agricultural research centers that form part of the National Institute of Agricultural Research (INIA) network throughout Mexico. CIANO was officially constituted in 1955, when a group of Sonoran farmers, convinced of the benefits that agricultural research could provide, decided to support this activity in the northwestern region of Mexico together with the Federal government.

CIANO's main objective is to identify and resolve, through the

application of science and technology, problems that limit agricultural production in the states of Sonora and Baja California so as to accelerate agricultural development in the region. CIANO receives most of its financing from the Mexican Ministry of Agriculture through INIA. Other important contributors are the PIEAES, the Patronato of Baja California (established in 1980), and the Sonora and Baja California state governments.

Throughout its first years of operations, CIANO focused its research activities on the Yaqui Valley, where the Center originated. In later years, CIANO established agricultural experiment stations throughout the region: in the Mexicali Valley, the coast of Hermosillo, the Mayo Valley, the Caborca region and in 1975, the coast of Ensenada.

Today, the results of CIANO's research are implemented over approximately 1.5 million hectares in NW Mexico, 75 percent of which are irrigated. In 1984, CIANO's research personnel consisted of about 130 scientists.

The Center's research activities began on wheat, barley, cotton, maize, sorghum, saffron, kidney beans and vegetable crops. The soybean program was consolidated in 1960, along with crop diversification programs in regional production systems. The vegetable crop program has been furthered particularly on the Mayo, Mexicali and Ensenada experiment stations. In 1963 a forrage program was established, and the fruit crop, vineyard and jojoba programs were strengthened in 1975. The wheat, maize and triticale programs operate in close collaboration with the International Maize and Wheat Improvement Center (CIMMYT).



CIANO's facilities at its headquarters in Ciudad Obregón, Sonora (Photo: CIMMYT)



Commercial wheat field in the Yaqui Valley sown to CIANO semi-dwarf varieties (Photo: CIMMYT)



Dr. J.A. Valencia (left), current director of CIANO, and Dr. N.E. Borlaug (Photo: CIANO)

Among the most important contributions that CIANO's research has made to world agriculture is its wheat production technology. To date, CIANO and the institutions that preceded it have released over 50 varieties of wheat, some of which currently cover 100 percent of the region's wheat-growing area. These varieties are also planted in other parts of Mexico and the world, with a total of approximately 45 million hectares planted to Mexican wheats worldwide. The semidwarf wheats that increased world wheat production dramatically in the 1960s were developed at CIANO in the Yaqui Valley.

Source: "The Evolution and Contributions of Agricultural Research at CIANO" Dr. Ernesto Samayoa Armenta, Director of CIANO Proceedings of CIANO's XXV Anniversary, 1980. INIA Cd. Obregón Sonora 1984



Cotton is another important focus of CIANO's research (Photo: CIANO)



CIANO experiment stations in the states of Sonora and Baja California.

## Organizational Structure

Born in the Yaqui Valley, Patronato soon extended its sphere of influence throughout the state of Sonora, encompassing the Hermosillo coast and the Mayo Valley in 1966, and the Caborca region in 1969. The state's "ejidatarios"—lifetime or hereditary holders of government

### PIEAES Associates

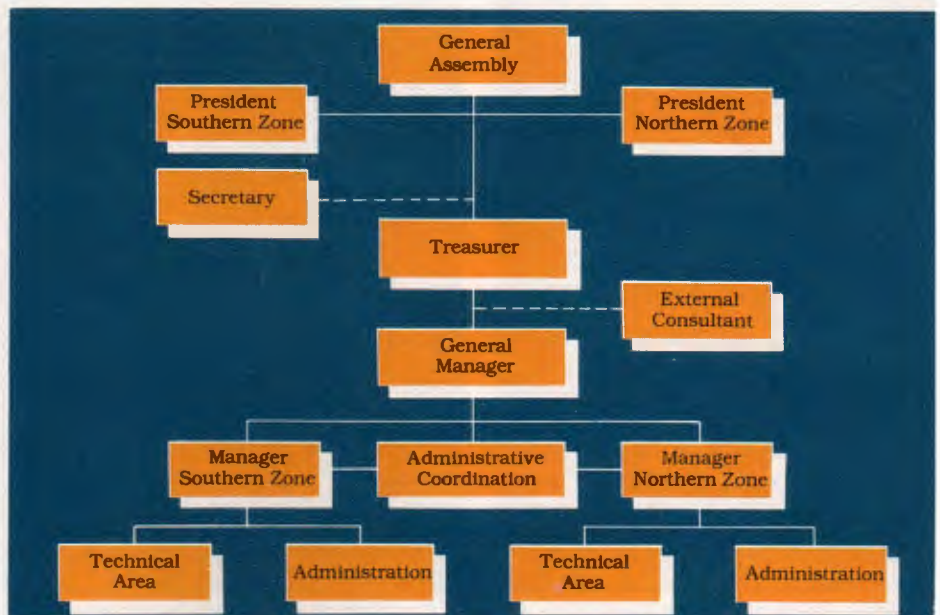
Cajeme Agricultural Credit Union  
 Yaqui Agricultural Credit Union  
 Yaqui Valley Agricultural and Industrial Credit Union  
 Agricultural and Industrial Credit Union of the Northwest  
 Agricultural and Industrial Credit Union of Southern Sonora  
 Agricultural and Industrial Credit Union of Sonora  
 Yaqui Valley Farmers' Association  
 Rural Credit Bank of the Northwest  
 Association of Agricultural Organizations of Southern Sonora  
 South Sonora Union of Rural Production Societies  
 Mayo Agricultural Credit Union  
 Navojoa Agricultural Credit Union  
 Huatabampo Agricultural Credit Union  
 Maximiliano R. López Rural Association of Collective Interest  
 Yaqui and Mayo Valley Union of Ejido and Agricultural Societies  
 Independent Farmers Center  
 Regional Committee No. 3 CNC  
 Union of Ejidos, Societies and Solidarity Groups of the Mexican Labor Union  
 South Sonora Workers and Farmers Federation  
 Yaqui Valley Workers and Farmers Federation  
 Independent Farmers Front  
 Common Fund of the Yaqui and Mayo Collective Ejido Coalition  
 Guaymas Valley Agricultural Credit Union  
 San José Agricultural Credit Union  
 Regional Union of Yaqui and Mayo Valley Societies  
 Agricultural Credit Union of Hermosillo  
 Hermosillo Agricultural Credit Union  
 Agricultural and Industrial Credit Union of the Pacific  
 Agricultural and Cattle Credit Union  
 North Sonora Association of Agricultural Organizations  
 Mayo Region Vegetable Growers' Union  
 San Luis Rio Colorado Consumption Cooperative Society "Alfredo V. Bonfil"  
 Agricultural Research Center of the Northwest  
 Ministry of Agricultural and Hydraulic Resources

land—joined Patronato in 1976. Today, Patronato is a non-profit organization made up of all the small landholders, colonists and ejidatarios of Sonora, each one of whom is represented in Patronato's General Assembly through their respective organizations. The Assembly is therefore made up of the 33 representatives of Patronato's member groups and is the organization's governing body, meeting once a year to vote on general Patronato policy. Each member organization names a consultant to the Board of Directors to keep the directors fully informed of the needs and interests of member farmers, and to keep the latter informed of Patronato and CIANO activities.

Patronato's Board of Directors comprises the president of the northern and southern zones of Sonora, respectively, a treasurer and a secretary. The latter is invariably appointed by the Ministry of Agriculture.

Patronato's two presidents are elected every two years by the General Assembly, and the Board of Directors selects the General Manager and office staff.

CIANO's activities encompass all of Sonora as well as the state of Baja California. The Center follows the agricultural policies outlined by the Mexican government, which finances most of CIANO's work. Patronato streamlines the implementation of these policies through a fairly simple procedure: CIANO presents a project outline and budget to the Patronato management, who then try to finance the projects they have approved. Ing. Rafael Angel Fierros, current president of Patronato (southern zone), says: "New operations are financed by Patronato while we implement procedures to pass these costs on to the federal budget. This allows us to seek solutions to regional problems without having to wait for federal funds."



Patronato's organizational chart



## Patronato's Operations

Patronato targets most of its resources for CIANO's most urgent needs in its four experiment stations throughout Sonora: construction, equipment, machinery, transportation vehicles, and land. Patronato has donated 745 ha of prime agricultural land to CIANO: 425 ha in the Yaqui Valley, 200 on the Hermosillo coast, 80 ha in the Caborca region and 45 ha in the Mayo Valley.

One of Patronato's main contributions is the direct financial support it provides for young scientists working for CIANO. Patronato understands the value of developing a cadre of quality agricultural researchers who will find it professionally satisfying to stay in Sonora. Eduardo Castelo, Patronato's general manager, explains: "We provide incentives and compensations that will draw top professionals to Sonora. We want these people to take root here, giving

our programs drive and continuity... the number one priority of Patronato funds is, and always will be, the agricultural researcher." Patronato provides scholarships for postgraduate study, research grants, travel grants for attending lectures, symposia and language study in Mexico and abroad, and a number of other awards on the basis of a researcher's productivity and potential.

Another key area of Patronato's activities is seed production. Through an agreement established in the seventies, the Ministry of Agriculture—in recognition of Patronato's work—provides Patronato with 50 percent of the breeder seed pertaining to the improved varieties developed and released by CIANO. (The other 50 percent goes to Productora Nacional de Semillas, PRONASE, the government seed company). Patronato multiplies the breeder seed and then distributes the

seed at a small profit among its member organizations, who multiply it further; the funds derived from this transaction help finance Patronato's other operations. With this system, Sonora's farmers have quick and direct access to the new varieties put out by CIANO, eliminating middlemen and the subsequent higher cost. Castelo explains the organizations' policy: "We're not in it for the business; we simply provide our members with the seed they require as quickly as possible". Indeed, Patronato can change the wheat variety dominant in the Valley in a matter of two years. This speed is essential not only for providing higher yields, but also to protect the harvest should the dominant variety become susceptible to constantly mutating pathogens.

Patronato also acts as the administrator of state funds in the irrigated, partially irrigated and rainfed areas of Sonora. In 1984, Patronato administrated 238 million pesos (1.1 million dollars) (2) in state government funds for research on rainfed and partially irrigated agriculture here. Patronato's experience and constant presence in the area and its experience in administering resources, along with the farmers' trust and cooperation, help to ensure the efficient use of federal funds.

2) 1984: 1 dollar = 200 pesos



Patronato seed multiplication system



Patronato helps finance laboratories and training at CIANO (Photo: CIANO)

## Finances

Patronato has developed a variety of mechanisms to finance its operations. The most important source of funds is the voluntary contributions made by Patronato member organizations. These contributions were originally set as fixed quotas per harvested ton of a given crop. The quotas were voted on by the General Assembly, and varied according to the crop, the market and the currency. In 1979, for example, the quotas were of 7.50 Mexican pesos (0.28 US dollars) per ton of grain and cotton fiber and 2.00 US dollars per ton of export crops (3). The wheat milling industry contributed 2.50 pesos (0.1 dollars) for each ton of wheat purchased from CONASUPO, the government grain-buying agent, to be used for research on improving the grain's industrial quality.

Member contributions were collected for Patronato by grain-buying companies designated as retainers. Patronato, however, received all these contributions *after* harvest, and was therefore faced with the need to borrow short-term funds during the crop cycle to finance its activities. In 1980, the General Assembly voted to make their contributions *before* the crop cycle, on an estimated yield basis. Farmer contributions are made by the farmers when they purchase the irrigation water they will need for the next crop cycle.

However, fluctuating currency values and market prices have instigated a change in the quotas and in the method for calculating them. As of 1984, the quotas will be 0.10 pesos for each 100.00 pesos (0.50 dollars) income per



The milling industry's contributions to PIEAES go towards improving milling and bread-making quality (Photo: CIMMYT)

crop, or 1/10 of 1 percent. The wheat flour industry has also increased its contribution to 15 pesos per ton of grain.

Further contributions have come from the National Service of Inspection of Certified Seed, the Ministry of Finance and the Mary Street Jenkins Foundation, a private, non-profit institution based in Mexico. In addition, various manufacturers have donated fertilizers, tractors and other agricultural supplies.

In 1984, Patronato's funds for supporting research at CIANO reached 418 million pesos (2.09 million dollars). The Federal government invested an additional 873 million pesos (4.3 million dollars) in CIANO through the National Institute of Agricultural Research (INIA), for a total of 1,292 million pesos (6.46 million dollars) invested in agricultural research for Sonora (4).

## Looking Towards the Future

There are many factors that affect agricultural productivity: socio-economic and climatological change, insufficient water, salinization, insects, mutating pathogens ... the list goes on. One must also consider a notable rate of population growth, which in Mexico runs at 3.2 percent (5). Suitable technologies must be applied in search of both short and long term solutions to problems that exist or may result from the interaction of these factors.

Over the next ten years, Patronato's support of agricultural research in Sonora will focus on the following programs established by CIANO:

- Consolidating research programs for basic crops to help ensure a supply of food and raw materials.
- Promoting research to achieve the efficient use of available natural resources such as water and soils within the existing climatological framework.
- Support for research in rainfed areas currently under subsistence agriculture.
- Crop diversification for an improved cost/benefit ratio.
- Implementing long-term development programs for CIANO's four experiment stations to maximize the potential of the Center's technology.

3) 1979: 1 dollar = 26 pesos

4) Source: PIEAES, Cd. Obregón, Sonora

5) Source: SARH, *Información Agropecuaria*, 1982

## The Patronato Model

Dr. Norman Borlaug, who has been an integral part of Patronato's development, strongly believes that the experience can and should be repeated elsewhere. He feels that Patronato has been successful because its budgets and expenses are regularly and clearly explained to members, because Patronato leaders leave the technical decisions to the scientists, and because the members have always selected extremely capable professionals to manage Patronato funds. In addition, the two-year limit for Patronato officials ensures the regular introduction of fresh points of view. "What's important", Borlaug states, "is that farmers get involved to protect research from the vagaries of political pressure."

Patronato's success is based on the voluntary participation of its member farmers, who have grasped the importance and the responsibility of supporting agricultural research and of keeping it focused on their particular production problems. As Borlaug underscores: "in the 20 years since Patronato began operations, not a single Sonora farmer has refused to pay his quotas..." These contributions are not viewed as an expenditure, but rather as an investment. However, this voluntary participation is the result of experience. Farmers are skeptical by nature, and must see results *before* they can be expected to contribute their hard-earned money to further research. Farmers are often wary of adopting new technologies because in so doing, they may risk everything they have.

Another element basic to Patronato's success is the close ties it has forged with national agricultural research programs. These ties are mutually beneficial, although independence is crucial to maintaining a healthy mutual respect. INIA's impact is stronger in the regions of Mexico where a patronato is in operation, because the latter channels and focuses information, funds and technology with maximum efficiency in minimum time. As stated by Dr. Ramón Claverán, INIA's Director General: "Our work is more effective in the areas that have a farmer's organization such as the Patronato." There are a number of other patronatos at various stages of development throughout Mexico. The Patronato of Baja California was established in 1980, and is currently the most similar to PIEAES.

Patronato makes a point of keeping all its members up to date on CIANO's latest technologies. All extension workers are strongly encouraged to visit CIANO regularly, a practice that helps speed the technology transfer from the experiment station to the farmers' fields.

Perhaps the key element of Patronato's success is the remarkable team spirit of its members, all tightly bound by their commitment to a common goal. PIEAES is a living example of what can be achieved through organized agricultural production. It provides a solid, sensible framework for developing monetary, fiscal, trade and food production policies that turns even marginal investment projects into significant links in the foodchain.



Dr. Carlos Torres of CIANO (left); Ing. Fernando Durazo and Ing. Rafael Fierros, presidents of PIEAES northern and southern zones, respectively; Mr. A. Gándara Astiasarán, Director of the Confederation of Farmers Organizations of the State of Sonora, and CIANO technicians in a seed multiplication plot in Ciudad Obregón (Photo: CIMMYT)

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