

1978 ANNUAL REPORT  
CIMMYT REGIONAL MAIZE PROGRAM  
CENTRAL AMERICA, PANAMA  
&  
THE CARIBBEAN

September 1978.

CIMMYT'S REGIONAL MAIZE PROGRAM FOR CENTRAL  
AMERICA, PANAMA AND THE CARIBBEAN

This report summarizes the 1978 activities of the Regional Maize Program for Central America, Panama and the Caribbean and is based upon the work of two CIMMYT maize scientists assigned to work full time for the region. Five Central American countries, Panama and eight Caribbean countries participate in this program. The regional activities are financed through a restricted grant from the Swiss Government.

Dr. Willy Villena  
Maize Breeder - Geneticist

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Maize Agronomist - Trainer

### 1978 ACTIVITIES

Fourteen countries cooperate in the regional maize program sponsored by the Swiss government. In 1978, the interest and growth of activities in the area of maize production research on farmers' fields has increased.

Success shown by programs following the on-farm approach advocated by CIMMYT has led governments to expand programs to a national scale. The PROMYF-PROMYFSA program in Honduras is an excellent example.

#### Consultation by CIMMYT Scientist

CIMMYT's two maize scientists, and one economist, also assigned to the Central America region, made the following visits during 1978.

<u>Central America</u>	<u>Visit days</u>			<u>Total</u>
	<u>Villena</u>	<u>Soza</u>	<u>Martínez</u>	
Costa Rica	25	26	-	51
El Salvador	30	12	43	115
Guatemala	5	-	1	6
Honduras	37	10	7	54
Nicaragua	-	-	-	-
Panama	<u>17</u>	<u>29</u>	<u>21</u>	<u>67</u>
<b>TOTAL</b>	<b>114</b>	<b>77</b>	<b>72</b>	<b>263</b>
<u>Caribbean</u>				
Dominican Republic	-	-	-	-
Haiti	-	17	-	17
Jamaica	<u>4</u>	<u>-</u>	<u>-</u>	<u>4</u>
<b>TOTAL</b>	<b>4</b>	<b>17</b>	<b>-</b>	<b>21</b>
<b>GRAND TOTAL</b>	<b><u>118</u></b>	<b><u>94</u></b>	<b><u>72</u></b>	<b><u>284</u></b>

Other CIMMYT Staff spent an additional 126 days consulting with Central American and Caribbean governments during the same period.

These visits included visits to Ministers of Agriculture to inform on current progress attained in the maize breeding and production programs of the region and to call attention to constraints observed that are retarding the development of national programs.

Visits to directors of national research institutions have proved to be of tremendous value in encouraging decisive actions in support of national maize programs. These meetings have usually included the participation of local maize program leaders and technicians.

At present, most governments of the region and CIMMYT advocate similar concepts to orient and implement national maize research programs. CIMMYT's philosophy is based on three components:

- a) Research at the experiment stations
- b) Research and generation of technology on farmers' fields
- c) Effective demonstrations to transfer technology.

The central concept in this procedure is that production technology is most efficiently developed under the environmental and economic circumstances that surround farmers in target areas. This concept of technology generation on farmers' fields has been widely accepted and is being implemented more extensively each year.

#### Breeding Activities

At the request of governments, experimental nurseries were established for use by national programs. The following maize trials were grown by national collaborators during 1978:

1978 Maize Trials

<u>Central America</u>	<u>IPTT<sup>1/</sup></u>	<u>EVT<sup>2/</sup></u>	<u>PCCMCA<sup>3/</sup></u>
Costa Rica	3	11	9
El Salvador	2	10	3
Guatemala	2	14	3
Honduras	2	18	7
Nicaragua	1	11	4
Panama	<u>2</u>	<u>17</u>	<u>7</u>
TOTAL	12	81	33
<u>Caribbean</u>			
Dominican Rep.	-	3	1
Haiti	1	11	1
Jamaica	-	13	2
Trinidad Tobago	-	2	-
Dominica	<u>-</u>	<u>4</u>	<u>-</u>
TOTAL	1	33	4
GRAND TOTAL	<u>13</u>	<u>114</u>	<u>37</u>

1/ International Progeny Testing Trials, distributed by CIMMYT.

2/ Experimental Variety Trials, distributed by CIMMYT.

3/ Programa Cooperativo Centroamericano para Mejoramiento de Cultivos Alimenticios, Trials distributed by CIMMYT as service to PCCMCA.

A total of 164 experiments were grown in the region during 1978. Nine new experimental varieties were developed: these will be yield tested for the first time during 1979.

New experimental varieties developed in Central America and Panama, tested for the first time in 1978, have shown excellent performance

not only in the region but also in South America, Asia and Africa.

The following varieties developed within the region will be increased locally and further tested on farmers' fields during 1979-1980:

<u>Variety</u>	<u>Country of Selection</u>	<u>Yield kg/ha</u>	<u>No. of Expts.</u>
Omonita 7643	Honduras	4602	12
La Maquina 7721(1)	Cuatemala	4167	12
San Andres 7622(2)	El Salvador	4326	12
Tocumen 7728	Panama	4660	15
La Calera 7728(1)	Nicaragua	4678	15
Santa Rosa 7624(2)	Nicaragua	3889	17
San Andres 7530(2)	El Salvador	4177	15

### Seed Production

The system and procedures used in the region for seed increase vary from country to country. El Salvador and Guatemala have well organized programs. In most of the other countries, seed production programs are not as well developed. The maize regional program will place more emphasis on encouraging more dynamic seed production programs over the next few years.

In 1978 seed of the following varieties was commercially produced:

Commercial Maize Seed Production in 1978

<u>Country</u>	<u>Variety Local Name</u>	<u>Original Name</u>	<u>Seed Produced quintals *</u>
Guatemala	La Maquina	La Maquina 7422	7660
Guatemala	ICTA B-1	Tuxpeño-1	7550
Guatemala	ICTA T-101	Eto Bl. x Tuxpeño	5250
Panama	Tocumen 7428	Tocumen 7428	2200
Honduras	Hondureño p.b.	Tuxpeño-1	3500
Honduras	Serena No. 1	Tocumen 7428	100
Honduras	Guaymas 501	La Maquina 7422	100
Nicaragua	NB-1	Tuxpeño-1	726
El Salvador	H-8	Eto Bl. x Tuxpeño-1	528

The Costa Rican National Council of Production (CNP) plans in 1979 to begin increasing seed of Tlaltizapan 7422 and Tocumen 7628; Haiti will also increase Tocumen 7428.

Cooperation with national breeding programs

Breeding for specific characteristics is being developed in the region utilizing materials distributed by CIMMYT.

Tuxpeño-1 short plant is widely accepted in Honduras. However, this variety has a poor husk cover. New selection schemes began in 1977 to modify this trait. The characteristics of husks - thickness and coverage - are highly inheritable; progress in modifying these traits has been successful.

Less ear rots are observed in the advanced generations of selection. This same trait is being modified in ICTA B-1 in Guatemala. A combined selection scheme of full-sib and modified ear-to-row selection is being used.

Lodging is a major problem in Panama, due to heavy rainfall and strong winds. Very short plant types are being selected by introducing

\* 1 quintal= 100 lbs.

the brachytic 2 gene ( $br_2 br_2$ ) to a yellow CIMMYT population. The segregating  $F_2$  and advanced generations are being selected for the brachytic 2 characteristic combined with narrow leaves. The brachytic 2 gene is linked with a broad leaf-trait and, as such, does not respond favorably to an increase in plant density. Selections made for narrow leaves do respond to increase in plant density.

Eto Blanco and Tuxpeño-1 are used as parents of the intervarietal hybrid H-8 in El Salvador. A reciprocal recurrent selection scheme based on half-sib family selection is being used to improve the performance of the parental varieties per se, and to improve the  $F_1$  cross.

Tocumen 7428 is being further improved for shorter plant height by maize researchers in Panama.

#### Research on Farmers' Field

There has been an increased interest in Central America and the Caribbean in reorienting production research in such a way that it is more consistent with the needs of the farmers. Governments are aware of the urgent need to increase production and productivity to satisfy the demands of their rapidly growing populations for basic food crops. As an example, population projections for the year 2000 for El Salvador estimate that the population will be about 8.5 million, compared to 4.3 million people in 1977. (World Population Data Sheet of the Population Reference Bureau, Inc.). To satisfy maize market demand in the year 2000, assuming present yields of 1.7 tons/ha, El Salvador would have to plant all of its arable land to maize. Another alternative would be to double the production per hectare, to 3.4 tons. We believe this alternative is more appropriate.

In past years, the production technology generated at experiment stations in the region often was not accepted by farmers because:

(1) The agro-ecologic conditions at experiment stations were not representative of the areas in commercial production.

(2) Transfer of technology agents and farmers did not participate in the selection of technology alternatives developed for a given area of production.

(3) Research at experiment stations was seldom analyzed from the economic point of view and magnitudes of risk associated with a particular technology were not considered.

The emerging production research in Central America and the Caribbean is based squarely on generation of technology in farmers' fields.

Research on farmers' field is based on the following trials:

- 1) Limiting factors of production
- 2) Varieties
- 3) Fertilizer levels and plant density
- 4) Weed control
- 5) Insect control
- 6) No-tillage
- 7) Alternatives of production technologies
- 8) Grain storage on farms

The agronomy trials include limiting factors of production, fertility levels, plant density, weed control, insect control and soil preparation.

Results obtained in national programs are showing the efficiency of the on-farm research strategy. Technological alternatives for maize production have been developed, which have a lower cost of production when compared to the ones developed on experiment stations. The trend toward research on farmers' field is shown in Table No. 1.

Table 1. Production Trials in Central America and The Caribbean.

Country	Varieties		Agronomy		Technology of Production		Total		Production plots (1 ha)	
	1977	1978	1977	1978	1977	1978	1977	1978	1977	1978
Guatemala	3	25	263	371	140	169	406	565	-	-
El Salvador	4	3	23	10	7	28	34	41	49	52
Honduras	10	40	72	160	35	30	117	230	500	3,000
Nicaragua	29	20	21	24	13	6	63	50	369	694
Costa Rica	11	22	32	51	20	34	63	107	3	5
Panama	12	10	6	20	85	60	103	90	10	20
Jamaica	5	4	7	10	2	2	14	16	-	-
Haiti	2	2	6	18	20	40	28	60	-	-
Rep. Dom.	5	6	9	8	4	14	18	28	3	8
West Indies	2	4	-	-	-	-	2	4	-	-
<b>Total</b>	<b>83</b>	<b>136</b>	<b>439</b>	<b>672</b>	<b>326</b>	<b>383</b>	<b>848</b>	<b>1,191</b>	<b>934</b>	<b>3,799</b>

The Honduras maize production program is a very good example of this strategy. It shows that production technologies generated on farmers' fields are quickly adopted by farmers in the area. Table No. 2 shows the result of a survey made in 1974 for the area of Danli, Honduras. The weighted yield average in 1974 for maize was 1211kg/ha. Fertilizer recommendations for maize production were 150kg/ha of N, 80kg/ha of  $P_2O_5$  and 60kg/ha of  $K_2O$ . Herbicide was not recommended, weeding was done by hand and required 60 man-days/ha. Costs of production associated with this technology were too high.

Table 2. Maize Production in Danli Project Area, Honduras, 1974.

Municipality	Area Ha	Production Metric tons	Yield Kg/ha
Danli	11,557	18,021	1,560
El Paraiso	1,138	1,194	1,049
Jacaleapa	511	413	808
Weighted Average	-	-	1,211

Results of on-farm trials generated the following alternative technology for the area:

Variety:	Tuxpeño-Hondureño P.B.
Fertilizer:	80 kg/ha of N
Herbicide:	Gesaprim 2 kg/ha
Insect control:	Furadan 5 kg/ha
Plant density:	53,000 pts/ha

The technology alternative was rapidly adopted by the farmers. Results of a 1978 survey made in one zone of the Danli project are shown in Table No. 3. This survey was made with individual farmers and with farmers' groups belonging to cooperatives.

On the average, yields have increased 300 per cent (with the individuals) to 380 per cent (for the groups). The difference among individuals and groups is due to the fact that herbicides were used by the cooperative groups, while about 50% of the individuals did not apply herbicides because this item was not always available in local markets.

Experience in the Danli Project has motivated the government to use this strategy on a larger scale. In 1978, 50,000 hectares were incorporated into the program. During 1979, it is estimated that 75,000 hectares will be incorporated into the program. The strategy will also be used for other basic food crops such as beans, rice and sorghum.

#### Workshops

In April 1978, CIMMYT invited to Mexico seven production program directors from El Salvador. The purpose of the visit was to observe the strategy advocated by CIMMYT to develop production technology for maize. The maize production training program in the Poza Rica-Tuxpan area was visited. (See program, Appendix A.)

Table 3. Production Survey on Costs and Net Benefits for  
Farmers Growing Maize, Zone No. 7, Danli,  
Honduras, 1978. \*

	Number of Farmers	Area ha	Yield kg/ha	Price 1,000 kg.	Gross Income	Cost of Production ha	Net Income ha	Rate of Return %
Groups	65	155	4,600	211	995	316	678	213
Individuals	42	295	3,750	224	838	281	557	198

\* Price, costs and income figures in Lempiras, 1L=\$0.50 US.

El Salvador has decided to implement a maize research and production program similar to the PROMYF program in Honduras. A group has been created that will link researchers at the experiment station with the extension service. This group, called INVEST (Investigation - Extension), will be working on farmers' fields to generate appropriate maize production technology for each maize region of El Salvador.

A workshop was held in San Salvador, June 9-15, 1978. Maize researchers reviewed 1977 research results and made plans for 1978 activities. This meeting was held in coordination with the PCCMCA. Eight heads of maize breeding and production programs participated.

From August 28 to 31, 1978, eleven heads of national maize programs from Central America and the Caribbean visited CIMMYT, Mexico, and the PROMYF program in Honduras from September 1-2, 1978. (See program, Appendix B.)

The objective of these visits were:

- 1) To observe CIMMYT's maize production training program and to interchange opinions with the trainees from their respective countries. These trainees, once back in their home countries, will be working in maize production programs using procedures similar to those employed in the CIMMYT training program.

- 2) These same visitors spent three days in Honduras, where they had the opportunity to see a national maize program developed using the production research strategy advocated by CIMMYT. Four heads of maize programs from El Salvador and Nicaragua joined the visitors in Honduras.

#### Other Short Visits

Between October 25 and November 3, 1978, two outstanding field technicians from Honduras and Panama (on-farm trials researcher and

a breeder) visited the Costa Rica Program. The objective of the visit was to show the research being conducted in Costa Rica on minimum and zero tillage systems in maize production.

From May 29 to 31, 1978, six trainees from CIMMYT, after finishing their training program, visited the PROMYF Program in Danli, Honduras for two days.

### Training

During 1978 CIMMYT regional staff interviewed candidates for the in-service training program in maize breeding and production at CIMMYT; twelve candidates from the region were accepted for this six-month training program.

### Short training courses

In 1978, several training courses to prepare local personnel who are involved in on-farm research and transfer of technology were carried out.

From April 10 to 14, a training course for maize production was given in Costa Rica; 60 trainees attended. (See program, Appendix C.)

From May 8 to 13, a course was given in Haiti; 40 trainees attended the course. (See program, Appendix D.)

These short training courses were developed in cooperation with national technicians who previously had been trainees at CIMMYT. In addition, CIMMYT's training program staff cooperated in these courses.

### Visits to evaluate progress

Between November 30 and December 3, 1978, five CIMMYT staff visited Costa Rica to evaluate a production research program headed by Ing. Gilberto Araya and Ing. Mario Saenz in the South Pacific area

(San Isidro General). A tour was organized to visit various on-farm trials. Twenty representatives from local institutions participated (Ministry of Agriculture, National Bank, National University, National Council of Production, and CATIE).

Between February 15 and 17, 1978, an evaluation and programming seminar for the PROMYF project was held in Danli, Honduras. (See program Appendix E.)

The objectives were:

- 1) To assess the activities of the program in its second year.
- 2) To formulate research and production plans for 1978.

CIMMYT and CIAT staff (maize and beans researchers, respectively) contributed to the development of maize, bean and maize-beans association programs for PROMYF.

#### Resistance to Corn Stunt Research

Nine populations distributed by CIMMYT are under a selection procedure for corn stunt resistance. Selection is done in cooperation with El Salvador and Nicaragua. Substantial progress has been attained for resistance to corn stunt. Selected progenies from these populations will be yield tested in 1979. All Central American countries and Panama, Haiti and the Dominican Republic will be developing experimental varieties based on selections from these populations. Selection will be made among full-sib families from  $S_1$  parental lines. Only yellow seeded populations will be tested in Panama, Haiti and the Dominican Republic. White and yellow seeded populations will be grown by the rest of the cooperating countries.

Previous information developed in El Salvador has shown outstanding results in achieving greater resistance to corn stunt and higher grain yields. CIMMYT expects that this program will contribute to solving the problem of low maize yields in areas where corn stunt is endemic.

Economic Studies

A CIMMYT economist is also contributing to the development of maize programs in the region. This economist is working with national researchers on survey techniques to produce the needed data to efficiently orient on-farm research. To date, Panama and El Salvador are the countries where this type of activity has been initiated.

Attachments to 1978 reporting to Switzerland (Sept. 78)

Metodología del Programa de Producción de Maíz para Centroamérica, Panamá y el Caribe, Soza & Villena, PCCMCA, July 1978

"Cero-Labranza" en el Cultivo del Maíz, Soza, Violic, Kocher & Stilwell, PCCMCA, July 1978 (English and Spanish versions)

Algunos Comentarios sobre la Investigación Propiciada por CIMMYT en el Contexto de los Programas Regionales, Martínez, Soza, Villena, Winkelmann, PCCMCA, July 1978

Problemas en la Producción de Maíz en Costa Rica, Villena, Costan Rican Congress, July 1978

Transferencia de Tecnología Agrícola: Un Breve Comentario, Johnson, PCCMCA, July 1978

Instructivo General para la Conducción de Ensayos Agronómicos y Descripción de Estrategias de Producción del Programa Nacional de Producción del Programa Nacional de Maíz y Frijol del Sector Agrícola (PROMYFSA), 1978, Secretaría de Recursos Naturales/Banco Nacional de Fomento/Instituto Nacional Agrario, Honduras

Modelos de Implementos Simples para Ensayos de Investigación, Soza and Villena

Red Internacional de Ensayos Agronómicos - Instructivo General, 1978

Control Químico de Malezas

Almacenaje de Granos