3. CORN IN THE PHILIPPINES: ITS PRODUCTION AND RESEARCH ACTIVITIES WITH EMPHASIS ON DOWNY MILDEW

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Corn is one of the most important staple crops in the Philippines. It ranks second to rice in the utilization of agricultural resources. It is used not only for human consumption but also for animal feeds and industrial uses, hence it is a vital crop in the development of the livestock and manufacturing industries.

This paper presents the status of maize production, the economic importance and some research activities on downy mildew.

Production

As shown in Table 1 the annual area planted to corn from 1968 to 1974 ranged from 2,247,860 to 2,827,650 hectares with an annual production of 1,619,153 to 2,104,728 metric tons and an average yield of 0.7203 to 0.8381 metric ton per hectare. The area planted, production, and average yield by region are shown in Tables 2, 3 and 4.

Table 1. Corn (shelled) production, area and yield, Philippines, 1968–1974*

Year	Production (metric tons)	Area (hectare)	Yield/hctare (metric ton)
1968	1, 619, 153	2, 247, 860	0. 7203
1969	1, 732, 834	2, 256, 140	0. 7681
1970	2, 008, 213	2, 419, 600	0. 8300
1971	2, 004, 975	2, 392, 200	0. 8381
1972	2, 012, 607	2, 431, 700	0. 8277
1973	1, 831, 130	2, 325, 410	0. 7874
1974	2, 104, 728	2, 827, 650	0. 8265

* Source: Bureau of Agricultural Economics, Department of Agriculture.

The estimated requirements prepared by the National Food and Agriculture Council (NFAC) for 1974–1975 is 2,789,500 metric tons (Table 5) of which 1,787,000 tons (64.06%) are needed for human consumption, 344,000 tons (12.33%) for feeds of livestock/poultry, 254,500 tons (9.12%) for mixed poultry/livestock feeds, 70,500 tons (9.70%) for manufacture of corn starch, 9,000 tons (0.32%) for other industrial uses, 45,500 tons (1.64%) for seeds and 79,000 tons (2.83%) for wastage. With the national launching of the "Masaganang Maisin" and White Corn and Feed Grains program, an estimated production of 2,721,500 tons is expected in 1974. With the estimated stock-carry-over of 100,000 tons as of June 30, 1974, a surplus of 32,000 tons is anticipated. In addition, about 60,000 tons of sorghum are expected to be harvested this year.

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Table 2. Corn area (ha), by region, 1968–1974 in the Philippines*

Region	1968	1969	1970	1971	1972	1973	1974
Philippines	2, 247, 860	2, 256, 140	2, 419, 600	2, 392, 200	2, 431, 700	2, 316, 410	2, 827, 650
Ilocos	15, 060	17, 310	20, 860	21, 600	19, 770	19, 560	70, 450
Cagayan Valley	133, 520	157, 130	201, 090	238, 500	268, 330	279, 470	328, 950
Central Luzon	58, 450	81, 200	79, 260	82, 300	91, 220	76, 850	62, 490
Southern Tagalog	117, 790	127, 440	161, 420	164, 500	164, 040	193, 560	272, 760
Bicol	95, 980	97, 230	101, 540	99, 400	120, 270	134, 190	158, 910
Eastern Visayas	402, 590	308, 960	333, 230	324, 600	93, 940	104, 130	125, 680
Central Visayas	—	—	—	—	355, 320	345, 730	396, 450
Western Visayas	271, 540	293, 820	303, 990	301, 700	145, 960	152, 200	162, 920
Western Mindanao	—	—	—	—	259, 610	190, 750	214, 260
Northern Mindanao	253, 340	264, 030	260, 700	262, 700	265, 140	243, 200	288, 910
Southern Mindanao	899, 590	909, 020	957, 510	896, 900	648, 100	576, 770	745, 870
% Annual Increase (decrease)	—	0. 36	7. 24	—1. 14	1. 65	—4. 38	21. 59

* Source: Bureau of Agricultural Economics, Department of Agriculture.

Table 3. Corn production in tons by region, 1968–1974 in the Philippines*

Region	1968	1969	1970	1971	1972	1973	1974
Philippines	1, 619, 153	1, 732, 834	2, 008, 213	2, 004, 975	1, 982, 606	1, 831, 130	2, 104, 728
Ilocos	8, 584	8, 692	10, 174	10, 716	11, 634	9, 262	4, 204
Cagayan Valley	117, 067	119, 614	200, 936	224, 010	252, 983	216, 326	300, 168
Central Luzon	36, 429	38, 931	41, 696	48, 621	67, 471	50, 696	49, 767
Southern Tagalog	72, 213	95, 218	149, 636	161, 937	133, 870	188, 921	226, 621
Bicol	71, 569	65, 320	67, 568	70, 680	70, 543	79, 424	99, 191
Eastern Visayas	203, 684	166, 765	181, 796	179, 550	74, 151	78, 609	99, 038
Central Visayas	—	—	—	—	180, 935	174, 574	221, 194
Western Visayas	156, 248	178, 763	191, 617	209, 703	53, 254	85, 283	107, 981
Western Mindanao	—	—	—	—	149, 750	108, 676	118, 851
Northern Mindanao	177, 623	172, 317	170, 607	159, 714	179, 390	148, 137	173, 633
Southern Mindanao	775, 736	887, 205	993, 909	940, 044	808. 625	691, 222	903, 171
% Annual Increase (decrease)	—	7. 02	15. 89	—0. 17	0. 38	—9. 02	27. 87

* Source: Bureau of Agricultural Economics, Department of Agriculture.

Downy Mildew

Importance—The importance of downy mildew caused by *Sclerospora philippinensis* Weston to corn production in the Philippines is reflected in the amount of loss attributed to this disease. Yield losses at farmers field may range from 15–40%, and in some instances as high as 80–95%. Our studies at the University of the Philippines at Los Baños (UPLB) indicated that yield loss is directly proportional to percentage of infection. For instance, in the wet season of 1971, when Philippine Hybrid 801 had 17, 23, 94 and 100% infection, corresponding yield losses were 27, 30, 90 and 100%, respectively. On UPCA Var. 3 in 1972 dry season, 24, 40, 58 and 75% had corre-

Table 4. Corn yield in tons per hectare, by regino, 1968–1974 in the Philippines*

Region	1968	1969	1970	1971	1972	1973	1974
Philippines	0.7203	0.7681	0.8300	0.8381	0.8272	0.7874	0.8270
Ilocos	0.5700	0.5022	0.4878	0.4961	0.5885	0.4735	0.5985
Cagayan Valley	0.8768	0.7612	0.9992	0.9392	0.9428	0.7741	0.9120
Central Luzon	0.6232	0.4794	0.5295	0.5908	0.7397	0.6597	0.7980
Southern Tagalog	0.6131	0.7472	0.9270	0.9844	0.8161	0.9760	0.8322
Bicol	0.7457	0.6719	0.6654	0.7111	0.5865	0.5919	0.6270
Eastern Visayas	0.5059	0.5398	0.5456	0.5531	0.7893	0.7549	0.7866
Central Visayas	—	—	—	—	0.5092	0.5049	0.5586
Western Visayas	0.5754	0.6084	0.6303	0.6951	0.5704	0.5603	0.6612
Western Mindanao	—	—	—	—	0.5768	0.5697	0.5529
Northern Mindanao	0.7011	0.6526	0.6544	0.6080	0.6766	0.6091	0.5985
Southern Mindanao	0.8628	0.9760	1.0380	1.0481	1.2477	1.1948	1.2084
% Annual Increase (decrease)	0	6.64	8.06	0.98	−1.25	−4.87	5.02

* Source: Bureau of Agricultural Economics, Department of Agriculture.

Table 5. Estimated corn requirements for 1974–1975

Item	Requirements (metric tons)	%
Food	1,787,000	64.06
Feeds of livestock/poultry	344,000	12.33
Mixed poultry/livestock feeds	245,500	9.12
Manufacture of corn starch	270,500	9.70
Other industrial uses	9,000	0.32
Seeds	45,500	1.64
Wastage	79,000	2.83
Total	2,789,500	100.00

sponding yield losses of 9, 26, 46 and 75%. Control measures are planting of downy mildew resistant (DMR) varieties, roguing, timely planting of corn when inoculum is absent or at its lowest level and to a limited extent the use of chemical protectant such as Duter/Dithane M-45.

Research Activities

Researches at the College of Agriculture, UPLB have been focused on the biology of *S. philippinensis* which geared towards the control of the disease by breeding for disease resistance.

The Pathogen

Oospores and Oospore germination—Oospores of *S. philippinensis* were observed on partially disintegrated leaves and leaf sheaths of downy mildew infected plants which had been kept in a moist chamber of 6 days (Acedo and Exconde, 1967). We also found that oospore germinated with the formation of a single germ tube. However, further attempts to germinate the oospore yielded negative results. In view of this, Pedrosa

(1970a, 1970b) conducted a comprehensive study on the nutritional, chemical and physical treatments affecting oospore germination not only of *S. philippinensis* but also of *S. spontanea, S. sacchari* and *S. miscanthi.* He found that 22 non-synthetic media failed to induce production of germ tubes of 168,680 treated or untreated oospores. No germ tubes were produced by any of the 4 species by varying the pH levels of the media, at different temperature (both constant and fluctuating), by washing with distilled water, washing and grinding to break the oospore wall, and aging. He found that spherical bodies were released from oospores of *S. sacchari, S. spontanea,* and *S. miscanthi* which had been exposed to any of these treatments. Germination of the spherical bodies occurred after oospores of *S. spontanea* have aged in nylon packets for 1 year and 5 months under laboratory conditions and subjected to subsequent incubation in distilled water for 5 weeks. He also found that injecting oospore suspensions into the young stem of corn seedlings gave 28, 26 and 12% infection in the case of *S. miscanthi, S. sacchari,* and *S. spontanea,* respectively.

A detail study on the development, morphology and pathogenicity of oospores is in progress. The study aims to gather information on the size, structure and contents of the oospores, the relative thickness of the exosporium, mesosporium and edosporium of the walls. The pathogenicity and longevity of the oospores also will be studied.

Pathgoenesis and Epiphytology—Barredo and Exconde (1972) studied the relationship of conidial maturity and density to disease development of *S. philippinensis* under controlled conditions using ISCO Growth Chambers. We found that stages of conidial maturity at the time of inoculation affected the incidence of the disease. For instance, when plants were inoculated with conidia obtained 7 hr after the source materials had been exposed to a night condition favorable for conidial formation inside the growth chamber, 47.5% infection was obtained. When harvesting of the conidia and inoculation were made 8 or 9 hr after similar treatment, the infection percentage obtained increased to 97.5, but at 10 hr after, the infection percentage decreased to 87.5.

In the case of inoculum density, we found that an initial density of 65,000 conidia/ml gave 100% infection 12 days after inoculation. When this original concentration was diluted to 1:1, 70% infection was obtained but further dilution to 1:10 and 1:100 gave an infection of 45 and 25%, respectively. The average number of days when systemic symptoms appeared were 7.5, 8.5, 9, and 11 days for inoculum dilution of 0, 1:1, 1:10 and 1:100, respectively.

Barredo (1972) studied the effect of suscept, age, site of inoculation and environment on disease development by *S. philippinensis* under controlled conditions using ISCO Growth Chambers. He found that the infection percentage on Ph 801 (susceptible variety) seedlings when inoculated at 1, 3, 5, and 7 days after emergence were 97.5, 95, 40, and 15, respectively. On Aroman White (moderately resistant), 47.5%, 30% and 5% infection were obtained when inoculated at 1, 3, and 5 days after emergence, respectively. He also found that the site of inoculation affected the degree of infection. When inoculation was done on the tip of the second leaf, local lesions were observed the next day and none of the plants showed systemic symptoms. Plants inoculated at the remnant of the coleoptile showed systemic symptoms on the 6th day while those on the whorl and whole plant showed systemic symptoms after 9 and 10 days, respectively.

He found further that night condition after inoculation had significant effect on disease development. When inoculated plants were directly exposed to light after inoculation, only 42.5% infection was obtained compared to 87.5% infection when inoculated plants were exposed to darkness for 1 hr after inoculation. Further exposure for 2 and 4 hr in darkness gave 100% infection.

He found that post inoculation moisture affected disease development. For instance, after 12 days, inoculated plants covered with plastic bags for 0, 1, 2 and 4 hr had 35%, 70%, 82.5% and 97.5% infection, respectively. Those that were covered for 4 hr gave significantly higher infection percentage than those covered for 1 and 0 hr.

Dalmacio and Raymundo (1972) studied under field conditions the spore density of *S. philippinensis* in relation to environmental conditions and downy mildew incidence. They found that dew or presence of a thin film of moisture over the leaf surface was a vital factor for conidial production and neither temperature nor relative humidity alone directly affected conidial production. Furthermore, they also noted that a relative humidity of 90% or above for at least 3 hr between 8 PM and 4 AM was required for conidial production. These findings were also supported by the results of the study made by Raymundo and Exconde (1972a) that conidia were produced at relative humidities below 90% but abundant conidia were formed when relative humidity was 90% and above.

The effect of conidial density on infection under field conditions showed that 100% infection occurred 6 days after the highest spore counts (5,522 conidia/4.8 sq. cm) were obtained. However, conidial density range of 400–4,000/4.8 sq. cm. gave infection ranging from 21.5 to 100%.

Preliminary study on the presence of toxic substances in the cells of resistant and susceptible plants and their role on the germination of the conidia of *S. philippinensis* have been conducted. Raymundo and Exconde (1972a) found that germination percentages of conidia on leaf extract (1 g fresh leaves: 10 ml water) from Popcorn, UPCA Var. 3, Phil. DMR 2, Phil. DMR 1, Aroman 206 and MITS 2 were respectively 90.8, 66.7, 62.8, 32.8, 17.9, and 9.9 compared to the control (distilled water) which had 90.5. These findings were also substantiated by Dogma et al. (1972a) who found that leaf extract (1 g fresh leaves: 5 ml water) from resistant corn variety (MIT popcorn) inhibited spore germination in contrast with extract from susceptible variety (Ph 801) which was as effective as plain water in inducing spore germination.

Necessito and Layaoen (1972) studied the leaf moisture content (LMC) of downy mildew resistant and susceptible varieties of corn. They found that the LMC of the resistant varieties (Cebu White Flint and Phil. DMR 1) expressed either as fresh weight or dry weight was the lowest compared to that of the susceptible varieties (UPCA Var. 1, UPCA Var. 2, Synthetic Sweet Cornand La Granja Popcorn).

The study on the nature of resistant in corn to *S. philippinensis* in underway. The study hopes to determine the morphological and anatomical characteristics and chemical constituents of some resistant and susceptible inbreds and to correlate these data with the resistance and susceptibility to the pathogen.

Another study which is in progress is on the spread and development of downy mildew. The study aims to monitor the spread of downy mildew from sources of inoculum, to identify and evaluate the factors affecting its progress.

Nuclear Behavior of *S. philippinensis* and Oospore Formation in *S. spontanea*— Our knowledge on the cytology of the downy mildew fungi attacking corn is very limited. The only cytological information available is what Safeeulla (1970) breifly mentioned during the International Symposium on Downy Mildew Diseases. He said that the oospores of *Sclerospora* are uninucleate while those of *Sclerophthora* are multinucleate.

Pedrosa (1970c) studied the nuclear behavior of *S. philippinensis* and the effect of its passage through sugar cane on the number of nuclei and nuclear diameter. He found 2–5 nuclei which were spherical and spindle shaped in the bulb like conidiophore initials. Just before the formation of bifurcate branch of conidiophore, this number of nuclei increased to about 25–50. Nuclear counts from 50 conidiophores with sterigmata before formation of conidia showed 98–160 nuclei. He found further that the nuclei of the conidiophore were drawn singly into the conidia until each conidium contained an average of 22–25 nuclei. The conidia were abstricted from the sterigmata and germinated almost immediately after abstriction and conidial nuclei were all drawn out into the germ tube during the germination process. Furthermore, he found that the nuclear diameter and number did not vary after passage through sugar cane. Dogma et al. (1972b) also studied the nuclear content of *Sclerospora* isolates on *Miscanthus, Saccharum officinale, S. spontaneum* and *S. philippinensis* on corn. They found that the number of nuclei of the conidia of *S. philippinensis* ranged from 8–24, *Miscanthus* isolate, 13–22, *S. spontaneum* isolate, 9–19, and *S. officinale* isolate, 9–24. Furthermore, they found that the size of the conidium was proportional to the number of nuclei it contained. In the *Miscanthus* isolate, elongate conidia had on the average 6 nuclei more than that of the oval ones with 14.

Pedrosa (1970b) studied the relation of leaf shredding in *Saccharum spontaneum* to oospore production by *Sclerospora spontanea.* He found that the oospores developed from the oogonial initials which appeared as swelling of short hyphal branches. The anth eridium was firmly appressed to the oogonium during the early stages of oogonial development. Enlargement of oogonia had caused the adjacent cells to become distorted and eventually collapsed. He also found that the oospores were arranged in a linear array along the inter-vascular mesophyll of the leaf. Extensive disorganization of the mesophyll cells caused browning of the tissues. Furthermore, he found that the subsequent increase in size of the oospores produced internal pressure which cause the splitting apart of two vascular bundle strands, thus shredding of the infected leaves. Mature oospores from shredded leaves had a diameter range from 32.2 to 60μ, with 60 of the 100 oospores measured falling within 48.0 to 55μ.

Yield Loss Assessment

Accurate information on actual loss in corn yield due to downy mildew is an important guide in making decisions on whether or not the application of control measures using chemicals or other control practices will accures economic benefits to the farmer. Our field experiments attempted to determine yield losses at varying degrees of downy mildew infection at different seasons of the year.

A preliminary study conducted by Exconde and Advincula (1969) showed that yield reduction on sweet corn amounted to 78.3% while on Aroman White, a resistant variety, infection up to 38% caused a subsequent loss of 20%.

Later study (Exconde, Akiew, and Dalmacio, 1971) revealed losses of 20, 43, 72 and 100% at disease rating of 25, 50, 75 and 100%, respectively on sweet corn. On UPCA Var. 3, infection percentage of 27, 50, 73 and 100 accounted for 15, 21, 44 and 88% loss in yield, respectively. Statistical analysis showed to significant loss in yield at the 25% infection. However, highly significant losses were obtained at the 50 and 75% levels.

Exconde and Raymundo (1972a) likewise reported considerable losses due to the disease. On sweet corn, yield reduction of 27, 31, 90 and 100% were recorded at infection percentage of 16.7, 23.4, 93.7 and 100, respectively. On UPCA Var. 3, infection percentage of 16.1, 24.9, 82.5 and 100 corresponded to 22.5, 25.8, 86.4 and 100% yield loss.

Further study by Raymundo and Exconde (1972b) on the effect of time of symptom appearance on corn yield have shown that zero yield was obtained when symptoms on Phil. DMR 1, a moderately resistant variety, appeared 9–14 days after emergence. When symptoms appeared 24 days after emergence, yield was reduced by 66.3%. UPCA Var. 1, a susceptible variety, sustained even a greater loss, 89.7%.

Varietal Improvement

The corn breeding program of the University of the Philippines, College of Agriculture at Los Baños was reoriented in 1964 with the broad objective of developing high yielding varieties, synthetics and composites. The inbred hybrid program was not successful in the Philippines because of the problems encountered in seed production and distribution (Carañgal et al. 1970a). Since then efforts have been directed towards the development of resistant varieties or synthetics against *Sclerospora philippinensis* by population improvement of S_1 progeny selection and mass selection. As a result of this breeding methodology, 6 Philippine Downy Mildew Resistant (Phil. DMR) synthetics have been developed. These are Phil. DMR 1* (MIT Var. 2×Cuba Gpo. 1), Phil. DMR 2 (College White×Tuxpeño), Phil. DMR 3 (MIT Var. 2×Flint Comp. Amar.), Phil. DMR 4 (MIT Var. 2×Flint Comp. Amar.), Phil. DMR 5 (MIT Var. 2×Cupurico), and Phil. DMR 6 (Eto Blanco×Aroman WF) (Carañgal et al., 1970a, 1970b, 1971a, 1971b). Evaluation of their yield and reaction to downy mildew in Indonesia, India, Philippines and Thailand showed that the average infection percentages were 3.7, 4.2, 6.3, 6.4, 6.7 and 6.9 for Phil. DMR 5, Phil DMR 3, Phil. DMR 6, Phil. DMR 2 and Phil. DMR 1, respectively while the check had 18.3. The mean grain yield (kg/ha) were 3,740 for Phil. DMR 4; 3,509 for Phil. DMR 3; 3,501 for Phil. DMR 2; 3,370 for Phil. DMR 6; 3,130 for Phil. DMR 5 and 2,800 for Phil. DMR 1 (Carañgal, 1972).

Breeding for high yielding and early maturing varieties with resistance to downy mildew and borer is in progress. Fifteen advanced generation crosses between late and early maturing varieties developed at the College of Agriculture, UPLB were evaluated for their yield performance and other agronomic characteristics at the different testing stations during the 1972 wet and 1972–73 dry seasons. Results showed that ten entries gave numerically higher grain yield than Aroman WF, the check variety. The highest yielding entries were Tuxpantigua×Ph 9 DMR and the early selection of Cuba Gpo. 1 ×Cupurico with average yields of 81.3 and 80.3 cav./ha, respectively. Both entries silked in 52 days. Aroman White Flint yielded 60.3 cav./ha and silked in 48 days.

Several plant to plant crosses were also made among the high yielding, early maturing varieties and the downy and borer resistant populations. Crosses are presently planted ear to row at the testing stations for evaluation of their agronomic characters and resistance to downy mildew and borer.

Downy Mildew Action Program

Recognizing the importance of downy mildew in the production corn, the downy mildew action program was launch on July, 1971 with the objectives of developing high yielding downy mildew resistant varieties with good agronomic and quality characteristic, to develop effective and economical chemical control methods against downy mildew, and to develop efficient and practical systems of production. Very briefly, the strategy of implementation are varietal improvement, screening of fungicides, cultural management and seed production and distribution (Aday, 1973).

Intensified Corn Production Program

To promote and hasten farmers adoption of recommended package of production technology, the Intensified Corn Production Program, which is monitored at UPLB coordinates with Bureau of Plant Industry and Bureau of Agricultural Extension these activities 1. applied research-variety and fertilizer trial are conducted in farmers fields through applied research kits and adaptability of recommendations are demonstrated on

* Odd number is yellow.

farmers field through production kits, 2. seed production-recommended varieties are made available locally by encouraging farmer cooperators to produce recommended varieties for their own use and at same time provide seeds to neighboring farmers. These farmers are supervised by corn production technicians and seed inspectors in the area. The networks of seed distribution are government providing high quality seeds for seed cooperators and corn growers and seed distribution on a farmer to farmer basis, 3. training-corn production technicians are trained on the latest and improved cultural practices at UPLB and in regional training centers. These technicians later become corn production supervisors in their area and likewise train corn farmers in the area, 4. extension and information drive-bulletins, brochure, newsletter and posters are continuously prepared and updated and made available to technicians and farmer leaders. Informational materials are broadcast regularly in 23 radio stations in the corn priority provinces, 5. credit and financing-production loans are made available to corn farmers by the Philippine National Bank, Rural Bank and Agricultural Credit Administration through their agricultural credit supervisor. Loans are extended to farmers only after presenting the Farm Plan and Budget prepared by him and the corn production technicians. A production loan of ₱500/ha is extended, ₱350 for production inputs and ₱150 for labor. 6. price support and marketing—the government fixed the floor price of shelled corn at ₱0.65/kilo with 15% moisture content or at ₱0.35 on cob at harvest (Mercado, Carañgal and Aday, 1973).

Masaganang Maisan

The increasing demand of the corn-eating populace, the expanding industrial corn uses and needs, and the growing poultry and livestock industries requires for a well directed program for developing white corn and feedgrains industries. Unfortunately, domestic supply of feedgrains has never been sufficient to meet local demands.

In response to well recognized production and marketing contrainst that jeopardize self-sufficiency goals plus the worldwide shortage of grains and its upward price trends, the Philippine government launch on March 7, 1974 at UPLB a massive white corn and feedgrains program called "Masaganang Maisin".

The aims of the program are to satisfy the increasing demand for white corn for human consumption, to produce sufficient yellow corn, sorghum and soybeans to meet the feed requirements of the poultry and livestock industries, to produce enough corn for export in the form of corn starch and other-by-products, and to study and establish joint ventures, multilateral feedgrains projects with foreign investors.

Three sectoral production models are conceived, the small farmers, commercial and/or integrated plantation type concept and development of big scale projects involving hundreds of thousands of idle government or private lands into feedgrains plantations.

In a nutshell, the strategies of implementation are 1. concentration of production in major corn-producing and consuming areas and in geographic compact areas (42 priority provinces), 2. arrange and provide credit facilities to the farmers under the supervised credit scheme (provisions of credit are arranged with Rural Bank, Philippine National Bank, Agricultural Credit Administration and Development Bank of the Philippines. Credit needs of large-scale commercial plantations are handled by Development Bank of the Philippines and Philippine National Bank), 3. provide and facilitate supply and distribution of fertilizer, chemicals and other inputs to programmed provinces, 4. intensify information campaign and extension work, 5. involve local officials in the provincial action committees and municipal action teams, 6. seed production distribution in the provincial level and develop seed production centers, 7. creation of national management committee, 8. formulate marketing programs and establish price support for white corn and feedgrains, 9. increase manpower employment and train unskilled technicians to improve their managerial skills and cover the increased targets, and 10. facilitate the provision of credit facilities for grain dryers, threshers and other farm equipment and machineries through the Development Bank of the Philippines.

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Question and Answer

R. Kenneth, Israel: It has been reported in the literature this year (Fuchs & Drandarewski) that *S. philippinensis* was "very well controlled" by seed treatment with TRIFORIN (=CELA). They say you did the work. My preliminary experiments with this fungicide on *S. sorghi* (seed treatment) was negative. Could you please comment on your work?

Answer: Probably the information obtained was misunderstood. I stated in my report to the company that supplied me with the sample of CELA that the chemical (CELA) provided protection only for 10 days. After 10 days the plants became systemically infected.

K. M. Safeeulla, India: The lines of corn like Phi. DMR-1 and DMR-5 are found to be highly resistant to Sorghum downy mildew of maize in Mysore, India.

Answer: We are glad to hear that the Philippine downy mildew resistant varieties are holding their resistance to *S. sorghi*. With this finding, we hope that these materials will help to solve some of your problems in controlling the disease.