

### 3. MAIZE PRODUCTION CONDITIONS IN THE PHILIPPINES AND FUTURE PROBLEMS

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#### Introduction

Corn is one of the most important staple crops in the Philippines. It ranks second to rice. Corn is grown mainly for human consumption. Part of the produce is used for livestock and poultry feeds and as raw materials in the manufacture of some corn by-products particularly corn starch and corn oil.

With rapidly increasing population and the expansion of the livestock and poultry industry, there has been a great demand for corn. In our endeavor to meet these requirements, the corn program was expanded in 1968. We are also hopeful that we could make corn as one of our export crops in the near future.

#### Statistics of Production

Corn occupies next to rice in the use of agricultural resources. Its hectareage has more than doubled since the early 1950's. The area exceeded even the combined areas devoted to our four important commercial crops: coconut, sugar cane, abaca and tobacco.

Area planted, production, average yield per hectare and value of production are shown in Table 1. The area devoted to corn in 1967 has increased by 56 per cent since 1958. The area in 1959 alone increased by 52.6 per cent. However, the average yield per unit area dropped by 13 per cent. Between 1960 and 1965 the area dropped slightly

**Table 1. Area planted, production, average yield per hectare and value of production. (Philippines, 1958—1967)\***

Crop year	Total area planted (hectare)	Production (tons)	Yield/ha (tons)	Value of production (Pesos)
1958	1,380,620	852,070.2	0.62	106,570,200
1959	2,106,980	1,015,911.0	0.48	132,516,300
1960	1,845,540	1,165,273.8	0.63	149,726,100
1961	2,045,460	1,209,557.1	0.59	187,876,800
1962	2,016,270	1,266,299.5	0.63	171,258,000
1963	1,949,510	1,272,849.9	0.65	188,401,800
1964	1,897,570	1,292,708.7	0.68	262,832,900
1965	1,922,750	1,312,681.5	0.68	272,774,700
1966	2,106,070	1,379,827.5	0.65	310,450,400
1967	2,166,840	1,434,969.3	0.66	322,746,218

\* Bureau of Census and Statistics.

although there was a steady increase in production because of the yield increase per unit area.

The average yield per hectare from 1958 to 1967 ranges from 0.48 ton to 0.68 ton per hectare and in 1967 the yield was only 0.66 ton. This yield level was one of the lowest in Southeast Asia. The contribution of corn to the national income increased by 202.8 per cent since 1958.

**Table 2. Shelled corn production by regions, Philippines Crop Year 1966—1967.\***

Region	YEAR					
	1966			1967		
	Area (ha)	Production (kg)	Average yield (kg)	Area (ha)	Production (kg)	Average yield (kg)
Ilocos	16,100	8,373,300	518.7	15,790	8,259,300	524.4
Cagayan Valley	102,590	65,430,300	638.4	106,030	54,229,800	504.0
Central Luzon	55,030	30,204,300	547.2	58,160	31,270,200	535.8
Southern Tagalog	118,630	64,769,100	547.2	117,930	64,780,500	547.2
Bicol	87,140	59,217,300	678.3	88,030	59,223,000	572.6
Eastern Visayas	419,710	191,274,900	456.0	415,070	185,101,800	672.6
Western Visayas	250,970	121,774,800	484.5	229,720	104,213,100	444.6
Northern and Eastern Mindanao	223,720	156,658,800	701.1	234,690	172,647,300	735.3
Southern and Western Mindanao	832,180	682,124,700	820.8	901,420	755,244,300	837.9
<b>GRAND TOTAL</b>	<b>2,106,070</b>	<b>1,379,828,500</b>		<b>2,166,840</b>	<b>1,434,969,300</b>	

\* Rice and Corn Inter-Agency Committee Report.

Shelled corn production by region is shown in Table 2. More than 50 per cent of the total corn area was grown in Mindanao in both 1966 and 1967. Southern and Western Mindanao alone planted 41.6 per cent in 1967. Luzon which includes Ilocos, Cagayan Valley, Central Luzon, Southern Tagalog and Bicol regions devoted only 18.01 per cent in 1967. Southern and Western Mindanao, a relatively new region on corn production, gave the highest average yield per hectare. The yield was 26.9 per cent better than the national average.

#### Utilization of Corn

Corn is used mainly as food for man and as feed for poultry and livestock. On the average about 59 per cent of the total corn is utilized as food by the population, 27 per cent for the livestock and poultry feeds and 6.3 per cent is used for industrial purposes.

White flint corn is preferred for human consumption and yellow flint for feeds. The white corn is converted to rice corn or corn grits of different sizes which is eaten in places where corn is the staple in the diet. Corn is also used to supplement rice when supply of the latter runs short.

Approximately 20.8 per cent of the population is classified as corn eating. In 1960, about 3.9 per cent ate a mixture of rice and corn at varying proportions. Eastern Visayas, with almost one-half (49.9 per cent) of its population classified as corn-eating, leads all regions in the proportions of corn-eating population. Northern and Eastern

**Table 3. Corn production and requirements, Philippines (1958—1967).**

Crop year	Production* (tons)	Consumption**		
		Food	Animal and poultry feed	Industrial uses
1958	852,070.2	609,177.8	186,319.9	56,907.1
1959	1,015,911.0	640,670.3	270,693.6	58,375.9
1960	1,165,273.8	660,645.4	309,777.3	59,307.3
1961	1,209,557.1	681,331.3	338,933.4	60,271.8
1962	1,266,299.5	705,213.1	359,924.2	61,385.6
1963	1,272,849.9	718,906.8	387,696.9	85,243.5
1964	1,292,708.7	741,484.5	395,887.8	94,551.6
1965	1,312,681.5	790,641.3	351,758.4	99,339.6
1966	1,379,827.5	817,619.4	362,160.9	102,457.5
1967	1,434,969.2	845,914.2	367,513.2	98,735.4

\* Bureau of Agricultural Economics, DANR.

\*\* Rice and Corn Inter-Agency Committee Report.

Mindanao have 29.4 per cent, Southern and Western Mindanao 26.4 per cent, Western Visayas 24.1 per cent, Cagayan Valley 21.9 per cent and Bicol 14.7 per cent. Only 6 per cent of the population in Central Luzon, Ilocos and Southern Tagalog are classified as corn-eating. Most of the corn grown in these regions is yellow flint.

Feed uses consist of corn grains given directly to livestock and poultry and corn mixed with commercially prepared feeds. The by-products after milling corn grits are directly fed to the livestock and poultry in rural areas. Corn is also used for silage.

A significant portion of corn is used in the manufacture of corn starch and other by-products such as corn oil, corn syrup, dextrans "AA" and EX, glucose, corn flakes, gluten and germ meal.

### Present status

White and yellow flint corn are the commercially grown corn in the Philippines. Two types of green corn, yellow sweet corn and white glutinous, are commercially grown especially in the provinces surrounding Manila. Glutinous corn is also used as rice corn in the Bicol and Western Visayas. It is usually mixed with grits derived from white flint to improve the texture and quality of the rice corn. Pop corn is also grown but to a very limited extent.

Corn is grown throughout the islands. Farmers grow either two or three crops a year. In most areas of the country there are two regular cropping season, wet and dry. A third crop is planted in some provinces in Mindanao where there is an even distribution of rainfall. Most farmers are also planting a third crop in the Visayas but in general the yield is 50 per cent less than the normal season crop. However, their corn commands higher price at harvest time.

The national average for the past 60 years never exceeded one ton per hectare. The productivity is very low and it hardly pays the cost of production. The low productivity is mainly due to a) low yield potential of native varieties, b) non-adoption of improved varieties, c) farmers are still following the "traditional cultural practices" and d) planting of a third crop which in most cases yields less than the regular wet or dry season crop.

The University of the Philippines College of Agriculture (UPCA) and the Bureau

**Table 4. Hybrids Developed in the Philippines.***Yellow Flint*

1. Philippine Hybrid 1d (Ph9 × Ph11) (Ph13 × Ph17)
2. Philippine Hybrid 3b (Ph1 × Ph9) (Ph15 × Ph17)
3. Philippine Hybrid 5 (Ph21 × Ph17) (Ph1 × Ph3)
4. Philippine Hybrid 7 (Ph1 × Ph9) (F44 × Ph19)
5. Philippine Hybrid 9 (L. 578 × Ph15) (Ph1 × Ph5)
6. Philippine Hybrid 11 (Ph23 × Ph25) (Ph27 × Ph29)

*White Flint*

1. Philippine Hybrid 2 (L. 315 × L. 314) (Ph2 × Ph4)
2. Philippine Hybrid 4 (L. 315 × L. 314) (Ph6 × Ph8)
3. Philippine Hybrid 6 (L. 315 × L. 314) (Ph10 × Ph12)

*Sweet Corn*

1. Philippine Hybrid 801 (PYS4 × MCD10)

of Plant Industry (BPI) developed and released for commercial production several flint hybrids since 1958 (Table 4).

The hybrid yielded better than the native varieties in different location varietal tests and demonstration trials. However, this phase of corn production did not produce any significant impact in increasing corn yield per unit area mainly because of the problems encountered on seed production and distribution. In addition, the agricultural inputs such as fertilizer and insecticides were not locally available in most corn growing municipalities when hybrids were recommended.

The breeding work at UPCA was re-oriented in 1963 to develop high yielding synthetics and varieties instead of hybrids. In 1966, the UPCA in cooperation with the BPI developed and released two varieties, UPCA VAR 1 (yellow flint) and UPCA VAR 2 (white flint). This was followed by UPCA VAR 4 (white flint) in 1967 and UPCA VAR 3 (yellow flint) in 1968. The yellow varieties yielded better than the Philippine hybrids while the white varieties yielded as much as the white hybrids. Maturity varies from 105–125 days while the native varieties are from 90–100 days. The UPCA VAR varieties are now being used in the national corn program. A sweet corn single cross hybrid, Philippine Hybrid 801 (PYS4 × MCD10) and two glutinous synthetics, Glutinous Synthetics 4 and 28, which were developed by the UPCA are being recommended for commercial production.

There are two important diseases of corn in the Philippines, downy mildew (*Sclerospora spontanea* Weston and *S. philippinensis* Weston) and rust (*Puccinia sorghi*). Downy mildew is the most destructive disease especially in some provinces in Mindanao where planting is done anytime of the year. Losses up to 90 per cent were observed. There is no chemical yet found which can effectively and economically control downy mildew. The UPCA VAR varieties are susceptible to mildew compared to the native varieties. Rust is a problem in the Visayas. Fortunately the UPCA VAR varieties are relatively resistant to rust while the natives are susceptible.

Corn borer and earworm are the two important pests of the corn plant. There are several available chemicals that can control these pests. Corn weevil is the most destructive storage pest. In some areas, weevil infestation occurs even a week prior to harvesting. The most effective control is direct application of malathion on the seed. This is only good when seeds are used as planting materials.

Corn marketing is controlled by strategically located wholesalers and millers. Every harvest time agents and sub-agents of big wholesalers and millers buy corn from the farmers. To a limited extent, wholesalers, millers, transient buyers and retailers enter

into direct buying from the farmers. Corn traders buy the corn wet, either shelled or in cobs. With this marketing system, farmers are placed at a disadvantage especially at harvest time when prices decline. The Rice and Corn Administration (RCA) have representatives in different provinces to buy dry shelled corn at P13.00 per 57 kilograms to stabilize the price. However, RCA do not have enough money to effectively buy at the government floor price.

### **National Corn Program**

The projected requirement in 1968-69 is 2,061,900 metric tons. There is an increase of 486,990 tons over the 1967-68 consumption. The increase is mainly due to the expanded animal program of the government. The estimated animal consumption in 1968-69 is 47.4 per cent of the total production compared to 27 per cent in 1966-67. To satisfy the increased requirement, the program was expanded to 41 provinces. This programmed area covers 402,806 hectares with an expected average yield of 2 to 3 tons.

The national corn program is being coordinated by the Rice and Corn Production Coordinating Council which is composed of different agencies directly or indirectly involved in food production. The Secretary of Agriculture is the Chairman and Coordinator of the Council. In every priority provinces, a Provincial Director coordinates the representative of the agencies in the implementation of the program.

### **Phases of the Program**

**Research**—All aspect of corn research are the responsibility of the UPCA and BPI. Research staff of the two agencies hold annual meetings sponsored by the Philippine Seed Board to discuss the results of experiments for regional or national recommendations.

**Training**—Production technicians of the Agricultural Productivity Commission (APC) and BPI undergo comprehensive training at the UPCA for four weeks on corn production, extension methods, communication and supervised credit. A total of 187 are already trained and 300 more will be trained this year. In addition, the outstanding production technician in each province undergo further training for 4 months or one crop season as provincial corn specialist.

**Applied Research and Demonstration**—After the training the production technicians are assigned in corn growing municipalities and some are selected to conduct varietal and fertility tests in addition to assisting farmers in all aspects relating to profitable corn production. Series of one-hectare area are also set-up for comparative demonstrations of recommended vs ordinary practices. Some trained technicians are given corn planting kits good for 2,000 square meters which they use for demonstrations.

**Seed Production and Certification**—Each trained technician supervises at least one seed multiplier to provide local supply of seed. Four seed classes are recognized. Breeders and foundation seeds of the UPCA VAR varieties are produced by UPCA. Registered seeds are produced by the BPI and private sectors. While certified and good seeds are produced by selected farmer cooperators.

**Agricultural Credit**—Farmers might like to follow all the recommended practices but they do not have enough capital to buy the necessary agricultural inputs. The financing institutions like Agricultural Credit Administration (ACA), Philippine National Bank, Central Bank thru its rural banks and Development Bank of the Philippines provide a maximum production loan of P350 per hectare to pay for seeds, fertilizers, pesticides, the partial cost of land preparation and certain amount for farmer's subsistence. The banks and ACA may also extend to the farmer commodity loan, facility loan and mar-

keting loan.

Marketing — Prices of corn in many places of the country especially during harvest time is low. To stabilize the price of corn the Rice and Corn Administration buys the corn at a government price of P13.00 per 57 kilograms. This would encourage farmers to produce corn. In addition, RCA establish standards for commercial corn to maintain qualities desired in the domestic and international trade.

### Future Problems

Financing is one important problem in corn production. Farmers do not have enough capital to buy the agricultural inputs necessary for increase production. The financing institutions have many requirements such that farmers can not avail with credit facilities. They end up borrowing money from agents or sub-agents of wholesalers and millers who get their corn harvest as payment at a dictated price.

With the expanding animal industry there is more demand for yellow corn. Even the export market would prefer yellow corn. However, farmers in the corn growing provinces in the Visayas and Mindanao want to grow only white corn because of better price and surer market.

The increase corn production envisioned by the government would be hazardous under the present pricing conditions. Increase production would tend to create local surpluses which would in turn lower the prices even outside the province unless schemes to redistribute or proper handling of surpluses are implemented. Consequently, this would create storage and other post-harvest marketing problems, especially at the farm level.

### Discussion

**T. Kajiwara**, Japan: 1. Do you have any observations of resistant varieties to rust? 2. Is other downy mildew, for example *Sclerospora sacchari* distributed in your country?

**Answer:** 1. Fortunately the recommended varieties (UPCA VAR varieties) are relatively resistant to rust compared to native varieties. We are presently screening our collection to identify the resistant one. 2. *S. sacchari* is not widely distributed in the Philippines. Probably we have it but the other two species, *S. Philippinensis* and *S. spontaneous* are very prevalent in the area.

**K. Kaneko**, Japan: Where are the Philippine inbred lines mainly derived from? Did you develop them from local varieties or introduced from the U.S. or other countries?

**Answer:** The Philippine inbreds were derived from local varieties and introduced from South American varieties. All our inbred lines were developed in Philippines by the U. P. College of Agriculture and Bureau of Plant Industry.

**A. Wazir**, Indonesia: To overcome the marketing problems have you ever tried encouraging the producers and the exporters to make a point venture? If any, what is your experience?

**Answer:** There are associations and organization involved in marketing. However, this problem is so complex that there are so many factors involved especially in a developing country.

**N. Mochizuki**, Japan: You mentioned that most of hybrid developed in Philippines are hybrids between local and exotic germplasm. Is it true in breeding synthetic varieties, and are there no trouble on segregation in the advanced generation of synthetics?

**Answer:** The synthetics we are developing are not advanced generation of the hybrids. We are not also using established inbred lines. The materials used are improved open-pollinated varieties.

**D. Sharma**, India: Have you located resistance for downy mildew in some of your

countries? If yes, what are the different cultures?

**Answer:** Yes. The inbreds are: A206 (white flint), Ph16 (yellow flint), and Ph9 (yellow flint). The varieties are: Mimies (white flint), Aroman White Flint and MIT selection (white flint).

**D. Sharma, India:** What is the basic germplasm which is being used in Philippines for the development of composite varieties?

**Answer:** The germplasm commonly used in our breeding work are introduced varieties from South America and of course the native varieties. The origin of recommended UPCA VAR varieties is South America. The native germplasm is used mainly as source of downy mildew resistance and earliness.

**H. Ishikura, Japan:** 1. Regarding insect pests on corn in Philippines, do local farmers use pesticides for control of the corn borer and earworm? 2. I suspect that locust may occur from time to time in Mindanao. Do you have any damage on corn caused by the locust?

**Answer:** Yes, but very small proportion of our farmers are using pesticides for the control of pests. Locust occasionally damages corn in Mindanao. However, this problem is very minor compared to rat damage.

**K. Asano, Japan:** 1. Is your country studying about a high protein content maize variety like "opaque"? 2. Have you any system of agricultural co-operatives?

**Answer:** 1. I am presently working on the development of high lysine varieties. Two sources, opaque-2 and floury-2 are both being incorporated to established outstanding varieties and synthetics. I am hoping to develop double mutants which look like normal kernels but relatively high in lysine. This type will be more desirable for human consumption in the Philippines. 2. There are farmer co-operatives at the provincial level and farmers association at the municipal level. However, there are very few that are functioning effectively.