

# On-Farm Variety Trial of Maize Under Coconut in Davao del Sur, Philippines<sup>1</sup>

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## *Introduction*

The On-Farm Research and Outreach Program (OFRO) of the Department of Agriculture is a component of the Corn Research and Outreach Program in the Southern Philippines. This Program aims to foster the development of appropriate technology for maize farmers, with the ultimate goal of increasing their incomes. The project described in this paper comes under the auspices of OFRO and was implemented in collaboration with the University of Southern Mindanao Research Center (USMARC) and the International Maize and Wheat Improvement Center (CIMMYT).

In the first phase of project implementation, field trials were limited to rolling, well-drained areas found in two provinces of Region XI, Davao del Sur and South Cotabato, where maize is commonly grown as a monocrop. However, an informal exploratory survey motivated researchers to include areas in Davao del Sur where maize grown is in association with coconut.

## *Description of the Study Area*

The study area is located in the municipality of Bansalan, Davao del Sur, Southern Philippines (Figure 1). In the Bansalan study area, farmers' fields are typically located on well-drained, flat land types. Soils are mostly clay loam, with pH ranging from 5.5 to 6.5. Soil nitrogen levels are low but levels of phosphate and potash appear adequate. Climate is classified as Type II, where rain is more or less evenly distributed throughout the year (Figure 2). Under normal conditions, this allows double- or triple-cropping.

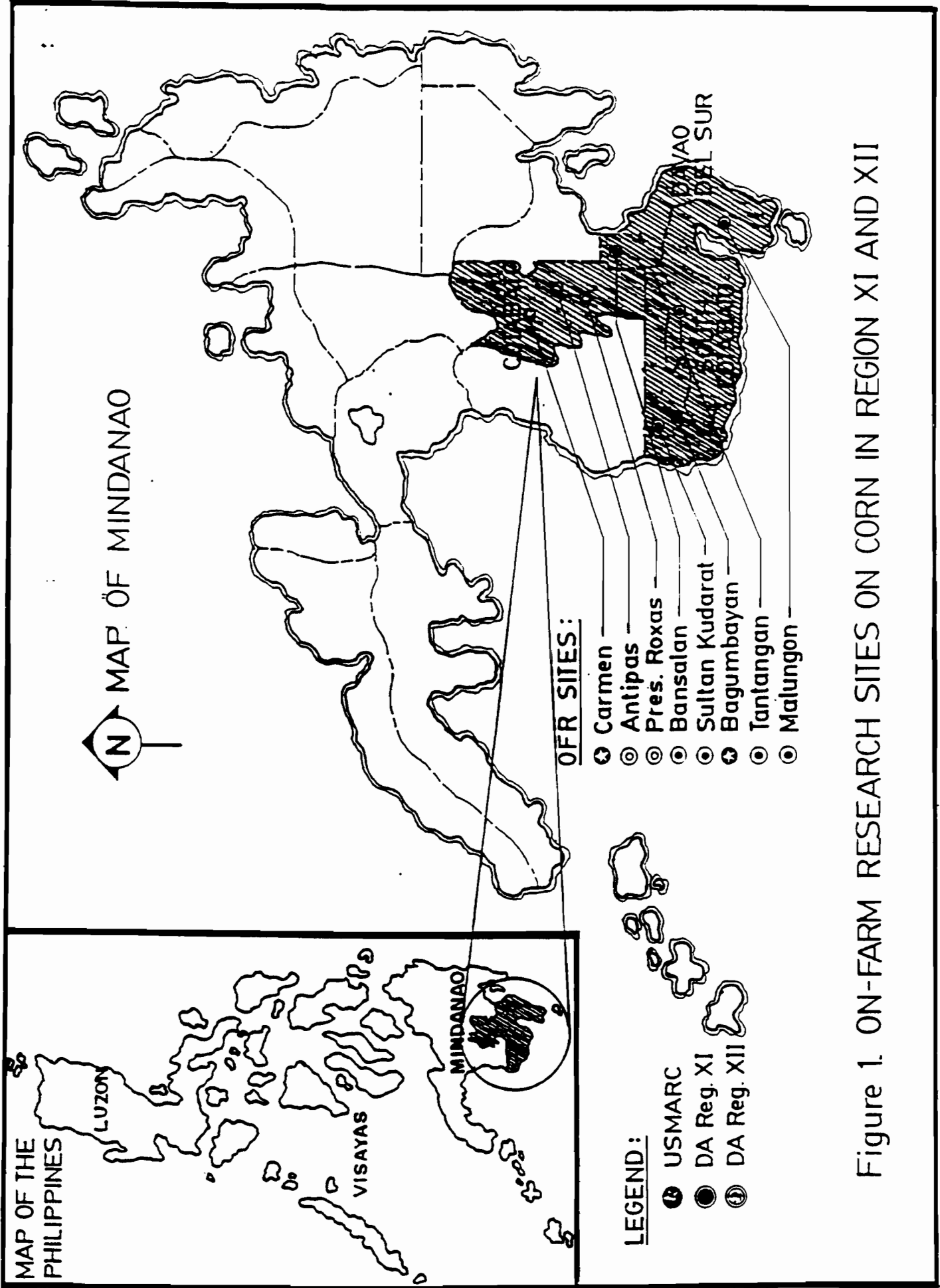
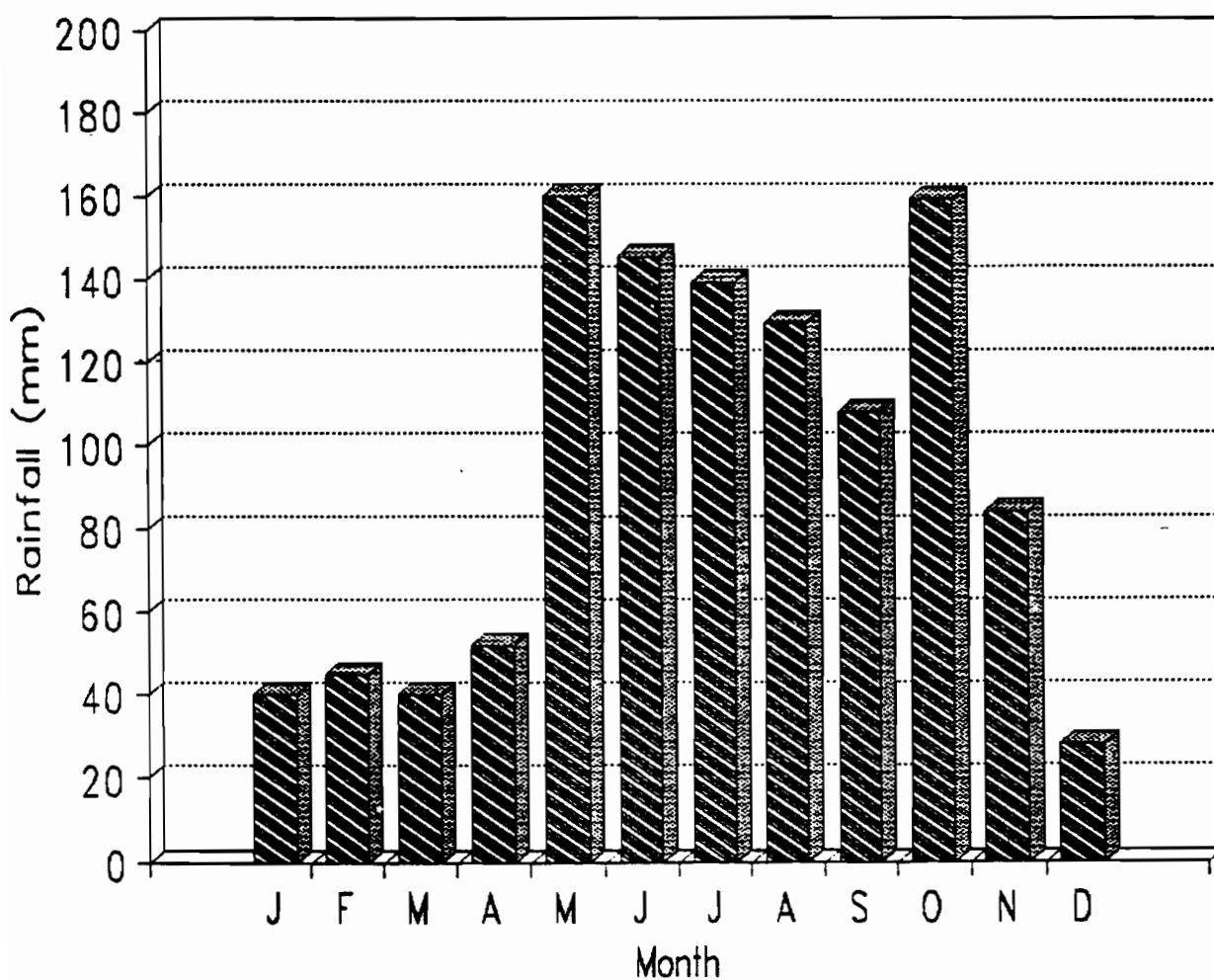


Figure 1. ON-FARM RESEARCH SITES ON CORN IN REGION XI AND XII

# Average Monthly Rainfall, Davao del Sur

Five Year Average. Figure 2



## *The Farming System and Maize Cultivation Practices<sup>1</sup>*

Coconut cultivation is widespread in the Bansalan study area, with coconut area increasing near urban centers. Coconut farmers in the study area intercrop their coconut with maize, spices, vegetables, bananas, sugar cane, peanut, coffee or cacao. Nonetheless, coconut is the major source of income. Among the intercrops, spices and tomato are among the most profitable. The cultivation of these crops, however, is limited to a relatively few farmers knowledgeable about markets, and with favorable access to water sources and investment capital. Most farmers intercrop their coconut with maize only. The dominant cropping pattern (in association with coconut, of course) is maize-maize-fallow. When moisture is sufficient for a third crop, farmers typically plant either mungbean or a third maize crop.

Land preparation for maize is done by plowing and harrowing 2-3 times. Most farmers weed only once, between the first and second interrow cultivation (off-barring and hilling-up respectively). This limited weeding is possible because the shading effect of the coconut helps suppress weed growth. Fertilizer is applied once at planting and again at 25-30 days after planting.

### *The Question of Maize Variety*

Most study area farmers use "tiniguib", a low-yielding local variety. A negligible proportion use improved open-pollinated varieties (OPV's) or hybrids. Improved OPV's were introduced in the locality during the 1980's under the Seed Exchange Program of the Department of Agriculture, although priority was given to mono-  
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1. The information in this section was obtained by means of an exploratory diagnostic survey or RRA, conducted by DA staff. The team included a soil scientist and two agronomists who had undergone training on adaptive on-farm research techniques with CIMMYT.

cropped maize areas. Study area farmers are conscious that improved varieties and hybrids have been developed.

Some farmers seem to be reluctant to use improved germplasm because of its cost and concerns about its eating quality (improved germplasm is typically yellow in color, but white grain is generally preferred). It should be noted, however, that farmers sell roughly half of their maize production for cash. For this portion of their maize, grain color and consumption preferences should be less compelling. Other farmers reported lack of available seed of improved materials as a main reason for non-adoption. Hypothesized reasons for farmers' continued use of the local variety are summarized in Figure 3.

### **On-Farm Experiments**

#### ***Objectives***

A set of on-farm experiments was conducted to look at the performance of improved maize varieties vs. the farmers' variety (tiniguib) when planted under coconut. Trials were begun in the rainy season of 1989 (cycle 1989A) and continued through the post-rainy season of 1990 (cycle 1990B).<sup>1</sup>

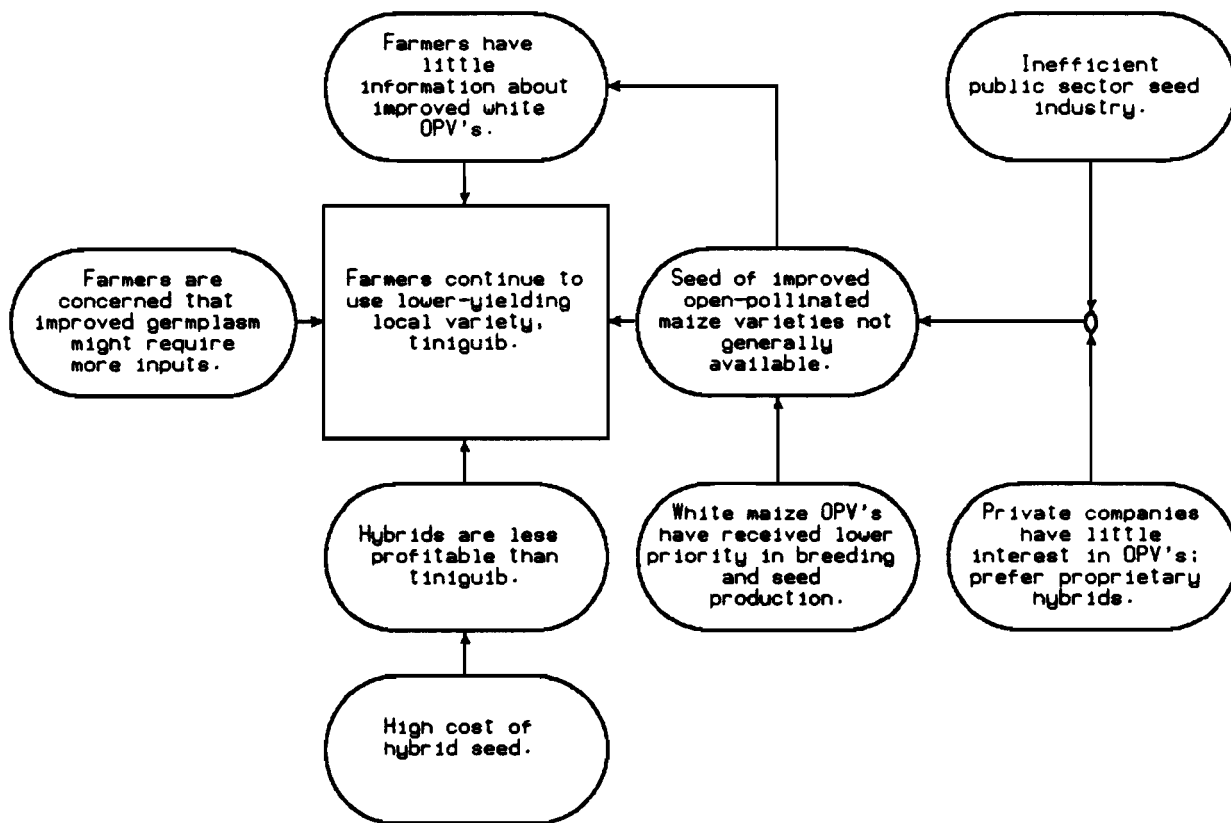
#### ***Treatments***

Treatments were arranged in a randomized complete block design replicated

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1. Cycle A refers to the rainy season planting of maize, typically planted in April or May and harvested between July and September. Cycle B refers to the post-rainy season, planted in August or September and harvested in November or December.

Figure 3: Problem Cause Diagram Concerning Use of Low-Yielding Maize Varieties



four times within locations (Figure 4). Entries were as follows:<sup>1</sup>

- (1) Tiniguib (farmers' practice)
- (2) IPB Var 2
- (3) USMARC 1283 (USM Var 2)
- (4) USMARC 1887
- (5) USMARC 0988
- (6) USMARC 1888
- (7) USMARC 1188
- (8) USMARC 0188
- (9) USMARC 2088 (USM Var 6)

Maize was planted in 4-row plots, with each row 5-m long, with 75 cm between rows and 25 cm between hills, with 1 seed per hill. The fertilizer rate, based on soil analysis, was the same in all plots during all seasons. Care was taken so that shading was similar for all plots (see Figure 4).

### *Results*

Results of the experiments in four crop cycles (1989A through 1990B) indicate that maize yields were significantly increased by the use of the improved OPV's. In crop cycle 1989A, yields of USM Var 2, USMARC 1887 and USMARC 0983 were comparable, but significantly higher than tiniguib. In the rest of the crop cycles -- 1989B through 1990B -- yields of virtually all OPV's were comparable, but significantly

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1. Entries were not consistent over crop cycles as seed for all varieties was not available during all cycles. Seed was supplied by the University of Southern Mindanao Agricultural Research Center (USMARC).



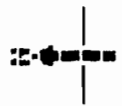
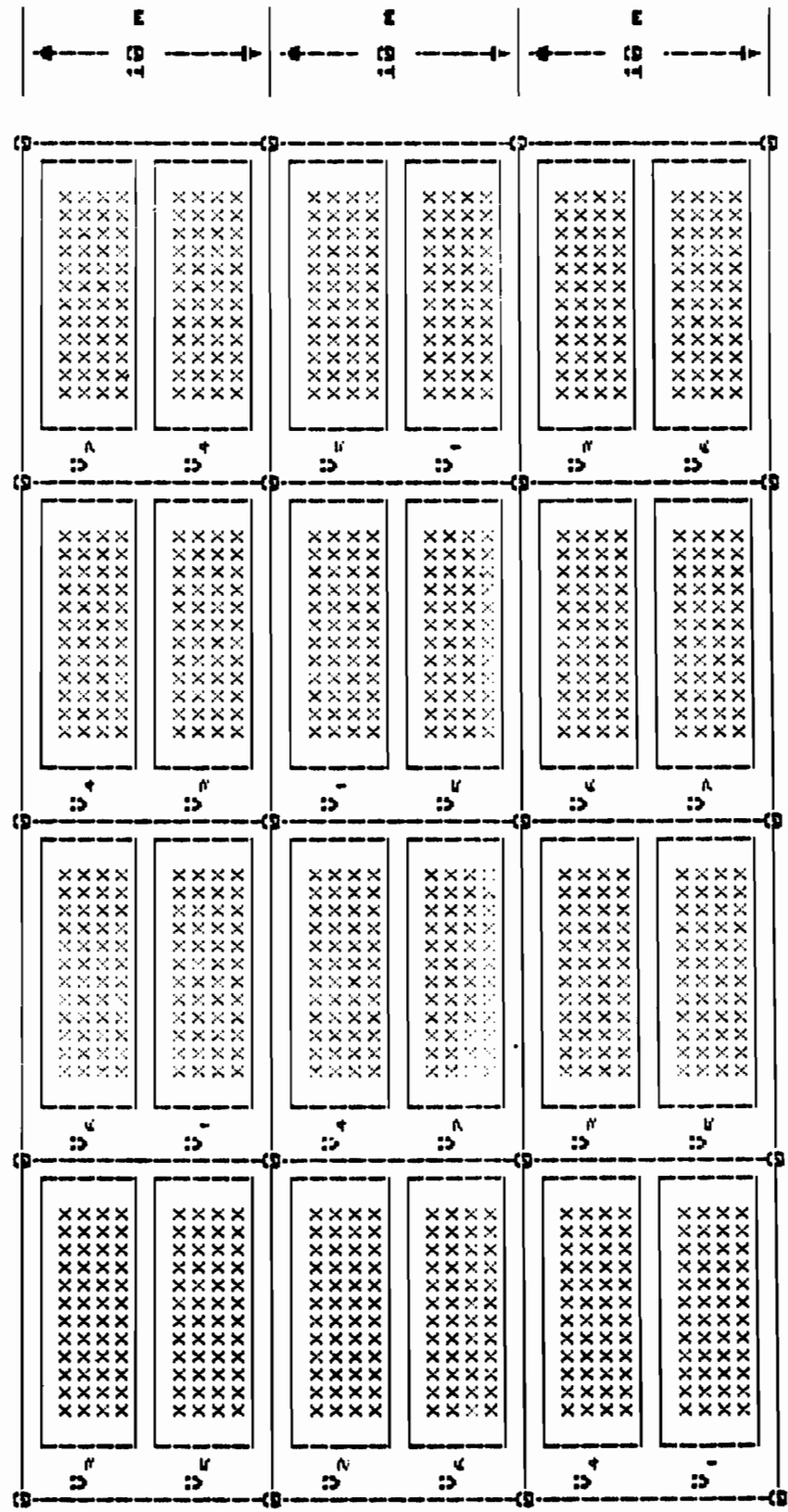
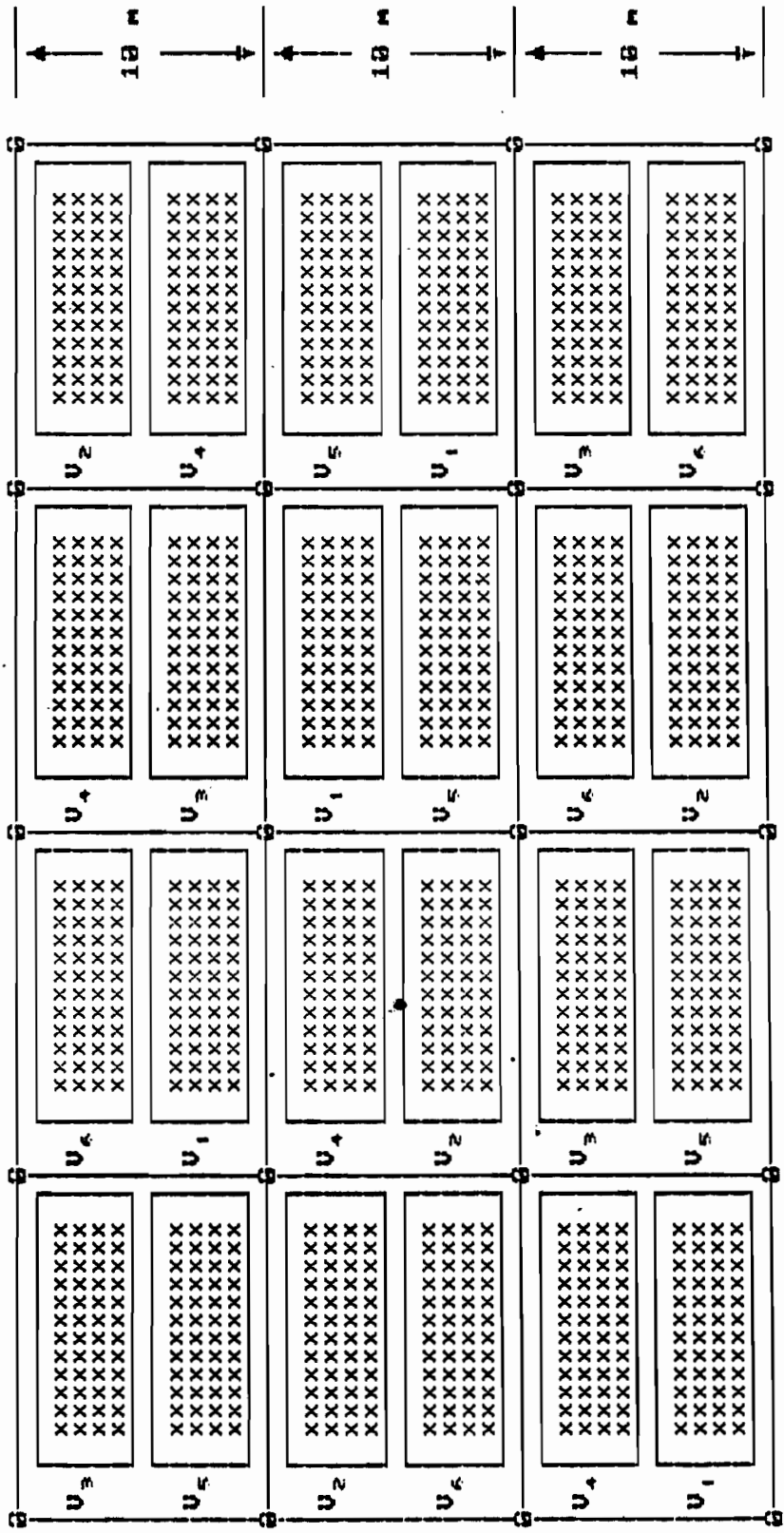


Figure 4 - FIELD LAYOUT



**LEGEND:**  
 O - Coconut Tree  
 X - Maize Plant  
 U - Variety

Figure 4 - FIELD LAYOUT



**LEGEND:**  
 B - Coconut Tree  
 x - Maize Plant  
 U - Variety

higher than tiniguib. Maize yields were low in all trials, however, due to shading from the coconut (Table 1).

### *Economic Analysis*

Partial budget analysis of the trial was conducted in accord with standard procedures outlined in CIMMYT, 1989. Yield adjustments, gross benefits, costs that vary and net benefits were calculated for each treatment in each cycle, then marginal rates of return were estimated.

Given that there were typically no significant yield differences among the different improved OPV's within a trial, however, rates of return were not calculated for each cost increment. Rather, tiniguib (the least cost treatment) was compared with the average of those improved OPV's showing a significant yield difference from tiniguib for that cycle. Marginal rates of return were estimated in this fashion as 315% for 1989A; 259% for 1989B; 71% for 1990A; and 300% for 1990B (Tables 2-5).

### *Non-Yield Factors*

Little information is currently available, beyond that gathered during the exploratory survey, on non-yield factors that affect study area farmers' preferences for different maize varieties. This paper has focused on yield and average profitability as major factors, but other factors have been suggested, e.g., grain color and seed availability. At the present time, seed of improved OPV's is becoming widely available, largely due to accelerating efforts by farmer cooperatives and private sector firms (Oliva *et al*, 1990). Nonetheless, further information is needed to ascertain the overall acceptability to study area farmers of improved OPV germplasm by examining other factors such as husk cover, competitiveness with weeds, insect tolerance, storability,

Table 1. Yield (t/ha) across cycles of maize varieties tested at Bansalan, Davao Del Sur, Philippines April 1989 to January 1991

VARIETY	1989 A	1989 B	1990 A	1990 B
Tiniguib (local variety)	1.96 <sup>a</sup>	0.763 <sup>a</sup>	1.042 <sup>a</sup>	0.905 <sup>a</sup>
IPB var 2	2.17 <sup>ab</sup>	1.417 <sup>b</sup>	1.107 <sup>ab</sup>	
USM var 2	2.32 <sup>bc</sup>	2.339 <sup>b</sup>	1.237 <sup>bc</sup>	1.417 <sup>b</sup>
USMARC 1887	2.57 <sup>bc</sup>	1.276 <sup>b</sup>	1.303 <sup>c</sup>	1.542 <sup>b</sup>
USMARC 0988 (yellow)	2.76 <sup>c</sup>	1.151 <sup>b</sup>		
USMARC 1888		1.343 <sup>b</sup>	1.305 <sup>c</sup>	1.483 <sup>b</sup>
USMARC 1188 (yellow)			1.237 <sup>bc</sup>	1.597 <sup>b</sup>
USMARC 0188	2.06 <sup>a</sup>			
USM var 6				1.438 <sup>b</sup>

In a column, means followed by a common letter are not significantly different at the 5% level by DMRT.

1989 A - April - August 1989  
 1989 B - October - January 1990  
 1990 A - April - August 1990  
 1990 B - October - January 1991

Table 2. Partial budget for variety trial of maize under coconut at Bansalan, Davao del Sur, Philippines, 1989 A

Particulars	Variety					
	Tiniguib (local variety)	USMARC 0188	IPB var 2	USM var 2	USMARC 1887	USMARC 0988
Yield (t/ha)	1.96	2.06	2.17	2.32	2.57	2.76
Adj. yield (%)	1.764	1.854	1.953	2.088	2.313	2.484
GFB (F.P. = P3.00/kg)	5,292	5,562	5,859	6,264	6,939	7,452
TCV (Pha)	100	380	380	380	380	380
Net Benefits (Pha)	5,192	5,182	5,479	5,884	6,559	7,072
NBT	3,479	3,472	3,671	3,942	4,395	4,738
MRR (Tiniguib - Average of Sig Different OPV's)	=					314.18%

Table 3. Partial budget for variety trial of maize under coconut at Bansalan, Davao del Sur, Philippines, 1989 B

Particulars	Variety					
	Tiniguib (local variety)	IPB var 2	USM var 2	USMARC 1887	USMARC 0988	USMARC 1888
Yield (t/ha)	0.763	1.417	1.339	1.276	1.151	1.343
Adj. yield (%)	0.6867	1.2753	1.2051	1.1484	1.0359	1.2087
GFB (F.P. = P3.00/kg)	2,060	3,826	3,615	3,445	3,108	3,626
TCV (Pha)	100	400	400	400	400	400
Net Benefits (Pha)	1,960	3,426	3,215	3,045	2,708	3,226
NBT	1,313	2,295	2,154	2,040	1,814	2,161
MRR (Tiniguib - Average of Sig Different OPV's)	=					314.18%

Table 4. Partial budget for variety trial of maize under coconut at Bansalan, Davao del Sur, Philippines, 1990 A

Particulars	Variety					
	Tiniguib (local variety)	IPB var 2	USM var 2	USMARC 1887	USMARC 1888	USMARC 1188
Yield (t/ha)	1.042	1.107	1.237	1.303	1.305	1.237
Adj. yield (10%)	0.9378	0.9963	1.1133	1.1727	1.1745	1.1133
GFB (F.P. = P3.00/kg)	2,813	2,988	3,340	3,518	3,524	3,340
TCV (Pha)	100	400	400	400	400	400
Net Benefits (Pha)	2,713	2,588	2,940	3,118	3,124	2,940
NBT	1,818	1,735	1,970	2,089	2,093	1,970
MRR (Tiniguib - Average of Sig Different OPV's)	=					70.67%

Table 5. Partial budget for variety trial of maize under coconut at Bansalan, Davao del Sur, Philippines, 1990 B

Particulars	Variety					
	Tiniguib (local variety)	IPB var 2	USM var 6	USMARC 1888	USMARC 1887	USMARC 1188
Yield (t/ha)	0.91	1.42	1.44	1.48	1.54	1.60
Adj. yield (10%)	0.81	1.28	1.29	1.33	1.39	1.43
GFB (F.P. = P3.50/kg)	2,851	4,464	4,530	4,671	4,857	5,031
TCV (Pha)	100	440	440	440	440	440
Net Benefits (Pha)	2,751	4,024	4,090	4,231	4,417	4,591
NBT	1,843	2,696	2,740	2,835	2,690	3,076
MRR (Tiniguib - Average of Sig Different OPV's)	=					299.48%

etc. (Galt, 1989). Farmer assessment of varieties and farmer participatory trials are the next logical step.

Nonetheless, it should be noted that a large proportion of farmers' maize is sold for cash, and that yield and profitability should be a compelling factor for this share of production.

### Summary

On-farm trials were conducted in the Bansalan study area during four crop cycles to compare improved open-pollinated maize varieties with the farmers' variety, tiniguib, for maize intercropped with coconut. Trial results indicate that improved OPV's yield significantly more than tiniguib, even when shaded by the coconut intercrop, and that this yield difference is profitable. Future research should focus on non-yield factors, e.g., grain color, husk cover, seed availability, that might influence farmer adoption of maize germplasm.

### References

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