

Good Fertilizer Management Is Profitable for Resource Limited Farmers in Honduras and Nicaragua

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Mr. Miguel Cruz of Candelaria, Honduras is proud to say he lives and farms in a ‘green county’. He and his neighbors no longer practice slash-and-burn agriculture thanks to at least ten years of agriculture research and community planning by FAO, CIAT and various local and international NGOs. Mr. Cruz has found an alternative for producing maize, bean and sorghum. It is quesungual management. Quesungual is a combination of management practices aimed at reducing soil, nutrient and water loss under steep land conditions, while keeping crop yields at or above levels achieved with slash-and-burn.

Over 80 percent of the land where quesungual is practiced has slopes greater than 50 percent (Figure 1). The steepness of the land presents challenges to farmers due to nutrient, soil and water losses. Mr. Cruz described the quesungual system as, “Manually clearing steep land of trees and vegetation with the exception of local tree varieties that I recognize as regenerating. The branches of these trees are cut and become mulch for the land. So, instead of slash-and-burn to clear the land, I am allowing the cut vegetation to remain on the soil to act as mulch. I can bring my animals onto the land to feed off of the harvested crop residues and help with the decomposition of the fresh mulch” (Figure 2).



Figure 1. Steep land farming in Honduras. Slopes are often greater than 50 percent.



Figure 2. Honduran farm that uses quesungual management. Regenerating trees are left on the property, as is crop biomass. Animals graze the land after crop harvests.

Mr. Cruz also discussed the differences in soil erosion under the quesungual system and the slash-and-burn he had been practicing for the past few decades, mentioning that the erosion under the quesungual system was about the same as under natural vegetation. But, when slash-and-burn was practiced, he was concerned about the abundance of soil loss from his field.

Two years ago, Mr. Cruz volunteered to participate in research using the Nutrient Management Decision Support System (NuMaSS) software. NuMaSS was developed by the Soil Management Collaborative Research Support Program (SM CRSP) and is a tool that diagnoses soil nutrient constraints and selects the appropriate remedial practices, based on agronomic, economic and environmental criteria, for location-specific conditions. The purpose of the NuMaSS test on Mr. Cruz's farm was to compare yields using his nutrient applications with those recommended by NuMaSS.

Mr. Cruz was concerned whether the NuMaSS recommendations provided an economic benefit to him and his family. An economic analysis of the fertilizer costs and net return to Mr. Cruz was performed (Table 1, Field number 2). Fertilizer costs for NuMaSS recommendations were calculated based on the current local prices of N in urea and P in triple superphosphate. Costs of fertilizer in the producer systems were based on prices in each community for the N, P and/or K fertilizers used. Market value of yield was based on the current price of maize per hectare and the yield from each treatment. Net return was calculated as the difference in fertilizer costs and market value of yields. Mr. Cruz applied much less fertilizer with the NuMaSS recommendations. Though the yields and net return were higher with the producer treatment, the profit for each unit of added fertilizer was much higher with NuMaSS (\$13.36/kg fertilizer with the producer treatment versus \$25.09/kg fertilizer with NuMaSS). Mr. Cruz reported that he would continue to use the quesungual system and the recommendations of NuMaSS that produce yields comparable to the traditional management, but require lower fertilizer inputs.

Other locations in Honduras and Nicaragua that participated in on-farm NuMaSS evaluations, but without the quesungual system, are shown on Map 1 and in Table 1. The producer fertilizer treatment consists of the fertilizer amounts each farmer traditionally applied while using the traditional planting density. The NuMaSS treatment was based on the farmer's desired corn yield and consisted of much lower fertilizer amounts, including no recommended potassium, and higher planting densities. Figure 3 shows a research trial on a farmer's field in Nicaragua.



Figure 3. Research trial with maize on farmer's field in Nicaragua.

The net returns under the NuMaSS system were greater than the producer treatment in nine of the 12 field trials. Fertilizer recommendations, and therefore, costs were usually much lower with NuMaSS. When the low input was coupled with a yield comparable to or higher than the producer treatment, a positive net return was achieved. Economic savings could allow farmers, such as Mr. Cruz, to collect soil samples from their land and use accurate field data in their land management decisions each year. On average, a soil sample analysis costs \$20 in Honduras and \$40 in Nicaragua. All of the 12 fields in this study have a net profit in excess of the soil sample costs. Fertilization based on frequent soil test analysis avoids wasting fertilizer and ensures that other future nutrient problems will be identified and corrected before they limit crop yields.

Those at the national institutes (INTA) and NGOs (CCD, CISP, 'Grupo Guia', ICADE, 'Movimondo' and 'Vecinos Mundiales') who conducted the tests are very excited about these results and are working towards expanding NuMaSS-based fertilizer requirements among farmers within their respective communities. It will be up to each of the NGO technicians to develop ingenious strategies within their farming communities. In Candelaria, for example, the municipality is paying for the soil tests and farmers' children in the high school are collecting the soil samples and explaining the analytical results and fertilizer recommendations to their parents. As a result of this community effort, NuMaSS recommendations have expanded from four farms last year to 20 farms this year.

Table 1. Maize yields in Honduras and Nicaragua in 2007. Producer yields were achieved under producer fertilizer amounts and traditional planting densities. NuMaSS yields were achieved with NuMaSS recommendation and higher planting densities. Economic analysis was calculated from current market prices of fertilizers and maize in Honduras.

Locations	Field	Maize Variety	Fertilizer (kg ha ⁻¹)			NuMaSS		Yields (kg ha ⁻¹)		Economic Analysis			
			N	P	K	N	P	Producer	NuMaSS	Producer	NuMaSS	Producer	NuMaSS
Candelaria, Honduras	1	D. guay ¹	126	40	0	18	15	1103	2434	29.42	5.85	158.00	348.00
	2	D. guay	126	40	0	34	15	2745	1525	29.42	8.69	393.00	218.00
	3	D. guay	126	40	0	18	13	1590	1110	29.42	5.49	227.00	159.00
Las Cuch, Honduras	4	D. guay	126	40	0	50	12	1545	2771	29.42	10.99	221.00	396.00
	5	HB104	37	18	0	13	4	2180	2368	9.75	3.01	312.00	339.00
Guinope, Honduras	6	D. Guay	53	11	10	114	8	1927	713	13.12	21.62	276.00	102.00
	7	S. Marta ²	56	12	12	51	0	5279	6071	14.18	9.04	754.90	868.00
Jmotega, Nicaragua	8	Nblanco ³	66	8	5	113	0	3609	3953	14.00	20.03	516.00	565.00
	9	Nblanco	67	8	5	77	0	3619	4321	14.18	13.65	518.00	618.00
S. Dionisio, Nicaragua	10	NB6	60	0	0	90	0	3224	4354	10.63	15.95	461.00	623.00
	11	NB6	60	0	0	90	7	3109	3590	10.63	17.19	445.00	513.00
Mean	12	Nblanco	60	0	0	34	5	3111	4059	10.63	6.91	445.00	580.00
		Mean	80	18	3	59	7	2753	3106	18	12	394	444

¹ Dicitá guagyape

² Santa Marta

³ Nutrinta blanco

⁴ Net Return calculated as the difference in fertilizer costs and market value of yields. Fertilizer costs were based on local costs of urea and triple superphosphate for NuMaSS and N, P and/or K fertilizers for the Producer's system. Market value of yield was based on the current price of maize per hectare times the yield under each treatment.



Map 1. Communities in Honduras and Nicaragua that participated in on-farm NuMaSS evaluations.