Report on Trip to Costa Rica
June 1-9, 2001
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SM-CRSP Project *Decision Aids for Integrated Nutrient Management*

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Rationale and Objectives:

As provided in the contract document, travel was planned and conducted for the purposes of conducting a fifth-year evaluation of the project at the Costa Rica site. The fifth year evaluation focused on tracking and analysis of critical indicators of progress and impact in relation to conditions as previously documented in project years 1 and 3. The methodology of the fifth year review includes surveys of project collaborators and beneficiaries, assessments of available records on nutrient management, and collection of critical market information. As part of the fifth year review, a meeting was held with representatives of all sectors of the peach palm ('palmito') industry. The meeting provided an opportunity for the project to disseminate preliminary research findings and to obtain feedback from participants.

Itinerary:

June 1	Arrived in San Jose late
June 2	Met with Alfredo Alvarado and several staff with regards to preparations for the June 4 meeting.
June 3	Reviewed surveys received and prepared a list of questions for follow-up discussions on surveys of meeting participants
June 4	Travel to Guapiles for a Workshop on Palmito Nutrition. Eight project papers were presented to provide preliminary results and obtain feedback from participants
June 5	Worked with Alfredo Alvarado to analyze survey data and written feedback from participants of the workshop
June 6	Called on key informants to provide critical information for the evaluation report. Worked with staff at CIA/UCR to interpret information gathered and prepare a draft of the evaluation report
June 7	Met with economists in UCR to explore macro-economic context for palmito. Reviewed recent reports and books describing the current conditions of the agriculture sector. Continued work on a draft report with help from Alfredo Alvarado
June 8	Follow-up on information requests with government officials and review of the draft report with Alfredo Alvarado
June 9	Depart San Jose

Fifth-year Socio-Economic Evaluation Report: Costa Rica

Prepared by Frank J. Smith with assistance from Alfredo Alvarado and Jot Smyth

Update of Market Conditions for Palmito

Palmito is a nontradional product for major export markets. While potential for long-term development is regarded as good, short and medium term market instability is likely to continue. Producers better positioned to withstand the instabilities of the market will emerge well positioned to participate in the future growth of the product market. Unfortunately, small farmers at the present are least protected from market related risks. The major processors of palmito are also major producers. As processing demands ease the processors, relying first on their own supplies, buy less from independent farmers. They are therefore buffered against declining demand. As demand increases processors buy palmito from farmers to fill the gap and maintain optimal processing efficiencies. The efforts of the Government to provide better market access and stability helped to establish three farmer cooperatives with processing facilities, but unfortunately in recent weeks these facilities have been closed. Others producers at risk in the competitive market are those carrying debt financing, those without technical knowledge of best management practices, and those whose fields are poorly drained, prone to flooding or with shallow soil profiles.

Export volumes of processed palmito from Costa Rica in the year 2000 declined 10% from the previous year. As a consequence of the weakening demand the profit margins of producers and processors are under pricing pressure. International competition from Ecuador has eased somewhat as Ecuador has restructured its economy. Emergent production of palmito in Peru and Bolivia as an alternative to coca leaf will come on stream in the next few years.

The latest available data from SIM/CNP indicates f.o.b. prices for palmito continued to decline in the period January 1999 to August 2000 (Table 1). The principle buyer of Costa Rican palmito is France (3,656 tons in August, 2000). Sales to Spain, Canada, Israel and Chile were down 683 metric tons in August 2000, while sales to the U.S., Holland, Mexico and Denmark increased during the same period. Some improvement in the pricing conditions are expected in 2002 as international demand continues to grow and as other producing countries (Ecuador) have had to adjust to market factors.

The prices paid to independent farm producers continued to decline during the same period. Average unit prices in August 2000 were 39.77 colones, and the latest available information shows that the prices have continued the downward trend reaching 32.00 colones in May of 2001. According to one leading expert (Hans Bucher of Demasa, as quoted in “La Nacion”, February 2001), the price at which palmito production becomes profitable for producers is 54.5 colones (US$ 0.17).

The internal demand for palmito in Costa Rica has strengthened. According to reports from CNP, the unit price for fresh palmito in local markets ranges between 300-350 colones. The local consumption of processed palmito has also increased via sales in various food stores.

Farmer, Industry and Government responses to the market conditions

Update on Current Values for Farm and Industry Production of Palmito

The total number of producers was 1,983 with a total area in production of 8,895 hectares (PNP, April 2001).

Table 1. National production of palmito in Costa Rica.

			Export	
Year	**Area**	**Production**	**Volume**	**Value**
	hectares	---------- metric tons ----------		million US$
1992	3500	17500	4492	7.9
1993	3822	19110	5843	10.5
1994	3930	20000	3600	6.1
1995	5750	21000	7856	15.5
1996	7370	34000	10986	22.0
1997	10200	86200		25.1
1998	12500	88889		26.3
1999	11005	72000	12078	22.0
2000	8000		10991	24.9
2001	8895			
2002 est.	7500			

Source: SEPSA, http://www.infoagro.go.cr/estadisticas/act_productiva/palmito.html

Changing Product Standards

In the last couple years, the industrial standard unit for palmito has changed as follows:

- the minimum diameter for palmito stems has been reduced to 3cm from 7cm; and
- harvesting should be done when the flag leave is 30-70% open.

The change in the standard reflects the preference in the French market for tender, creamy palmito. The changing industrial standard has implications on harvesting frequency. Previously palmito was harvested every 15-30 days. Now harvesting frequency has been increased to 7 days. The implications of the revised industry standard have yet to be fully analyzed in terms of nutrition management and economics.

Product differentiation is likely in the future, as oriental markets prefer a product with sensory attributes similar to bamboo shoots. Some experts in the field are exploring the possibilities of "organic" palmito. At the present time there is no standard or institutional capacity for certification of "organic" processes. UCR/CIA experts report that there are

insufficient "organic nutrient inputs" available to producers and therefore, fertilizer supplements are necessary to optimize economic efficiency.

Demand for Technical Services

The declining trend in the number of clients seeking soil and plant analysis is a clear response to the deepening "crisis" in palmito (Table 2).

Table 2. Number of soil and plant analyses performed for clients between 1998 and 2000*.

		Number of Analyses		
Year	**No. of Clients**	**Soil**	**Plant**	**Total**
1998	16	33	27	60
1999	8	54	4	58
2000	4	28	0	28

*Based on information obtained from two of the principle laboratories (Cafesa and UCR)

Project research and analysis by CIA/UCR have produced intermediate (preliminary) fertilizer recommendations targeting specific conditions common within the area as shown in Table 3. These recommendations for N and P fertilizers and lime have decreased considerably as project research data replaced recommendations based solely on average local practices. At the start of this project in 1997, Alvarado and Salas (1997) reported annual fertilization rates in kg ha^{-1} of 200-400 for N, 22-44 for P and 50-83 for K and 500-2000 for lime.

Lime and fertilizer N and P recommendations for peach palm by NuMaSS, once completed in 2002, will have a Diagnosis, Prediction and Economics component. The Diagnosis component seeks to determine whether acidity and N or P deficiencies exist. Diagnosis uses soil and plant analytical data, if available, but also consider location, prior production, management history and presence-absence of nutrient deficiency symptoms and indicator plants in the peach palm plantation. Rather than basing lime and fertilizer recommendations on existing ranges of values from soil test results, NuMaSS recommendations will also include considerations about the stage of crop development (plantation age), the targeted yield level and the economic marginal value product for the nutrient inputs. For an effective use of the NuMaSS software in its soil-plant testing programs, the UCR/CIA labs will need to revise the questions and types of information they collect from clients who submit samples for their recommendation services. In return, however, they can provide better service to their clients including multiple recommendations for different scenarios of input/output costs, available nutrient sources and desirable yield levels.

Table 3. Preliminary adjustments to fertilizer recommendations for peach palm by the UCR/CIA soil and plant testing lab ((Eloy Molina, 2000).

Nutrient	Amount	Source	Application
	kg ha^{-1}		
	Soil with moderate fertility, no acidity problems and moderate K		
N	250	10-30-10	6/year: 1 of 10-30-10, 2 of 26-0-26 and 3 of ammonium nitrate
P	22	26-0-26	
K	83	Ammonium nitrate	
	Soils with moderate - high fertility, no acidity problems and low in K		
N	250	10-30-10	6/year: 1 of 10-30-10, 3 of 26-0-26 and 2 of ammonium nitrate
P	22	26-0-26	
K	124	Ammonium nitrate	
	Soils with low fertility, acidity problems and low in Mg and P		
N	250	18-3-10-8-0.4	6/year: 3 of 18-3-10-8-0.4, 1 of 10-30-10 and 2 of 26-0-26 + ammonium nitrate
P	22	10-30-10	
K	62	Ammonium nitrate	
Mg	36		
	Soils with low fertility, acidity problems and low in Mg, K and P		
N	250	18-5-15-6-0.7	6/year: 4 of 18-5-15-6-0.7 and 2 of ammonium nitrate
P	22	Ammonium nitrate	
K	124		
Mg	36		
	Fertile soils		
N	300	Ammonium nitrate Urea Lime-Ammonium nitrate	6/year: 2 of ammonium nitrate, 2 of urea and 2 of lime-ammonium nitrate

Survey of Palmito Specialists in Costa Rica

The workshop was announced in the newsletter of the Costa Rican Soil Science Association (ACCS), and participants expressing interest in the event received an email or fax copy of the survey. In addition, personal invitations were made to 15 professionals that did not belong to ACCS but were heavily involved with palmito production in Costa Rica. Eight members of ACCS who completed the survey were invited to participate in the workshop along with the other 15 professionals. Twenty-one professionals participated in the workshop.

Respondents to the survey included two researchers, two farm owner/managers, a businessman (agricultural supplies) and an agricultural consultant. Their experience with palmito production ranged from 3 to 25 years. Except for the consultant and businessman all devoted considerable time to palmito (25-100%).

Characterization of the farming system (Question 1)

Most palmito plantations range from 4-10 years of age. Planting distances are 2x1 meters. Expected annual yields are 6000-12,000 palmitos/ha/year. The new industry standard for harvested palmito diameter implies more frequent harvesting and production of more than 12,000 palmitos/ha/year to achieve competitive levels. Weed control is primarily chemical but also combined (chemical and mechanical). Under normal conditions producers do not practice pest and disease control, however an emergent disease is forcing producers to use chemicals. Most plantations manage more than six shoots per plant. Drainage, if done, is superficial ditches. All plantations are without trees. Soil fertility is considered to be low to moderate.

Basis for fertilizer recommendations for palmito (Question 2)

Biological parameters are more often used than economic parameters as the basis for fertilizer recommendations. Soil analysis is most important. Other parameters in descending order of importance are price of fertilizers > rainfall distribution = deficiency symptoms > farmgate price of palmito > type of farmer (big/small) > foliar analysis = actual or future production.

Ordering of nutrient importance (Question 3)

Nitrogen is ranked as first priority followed by K > Mg > Ca = P > B = Zn.

Fertilizer recommendations for palmito plantations in Costa Rica (Question 4)

Table 4 provides current fertilizer recommendations and practices of the principal government agencies, fertilizer companies and representative farm managers in Costa Rica. Within the ranges indicated, it should be understood that recommendation for poorer soils are in the upper end of the range and recommendations for better soils are in the lower portion of the range. The values are consistent with the international literature as reviewed by Molina (2000).

Table 4. Nutrient recommendations for palmito (kg/ha) in Costa Rica.

Source	**N**	**P**	**K**	**Lime**	**Mg**	**S**
	---------- kg ha^{-1} ----------					
MAG (1)	200-250	9	133-166	400-500		
MAG (2)	100-150	9-18	83-124	500		
Fertilizer Company 1	180	18-31	58-100	3000	18-30	20
Fertilizer Company 2	200-250	22-26	124-207			
Farmer	250	26	116			
Range	*100-250*	*9-31*	*58-207*	*400-3000*	*18-30*	*20*

Recommendations for fertilizer in palmito nurseries in Costa Rica (Question 5)

Nutrient management during the first stage of growth is critical for healthy plant development. Most professionals didn't have specific knowledge or recommendations about fertilizer applications for recently transplanted palmito plants. Only two participants responded saying they used between 5-10 g/plant/month of a complete fertilizer formula (18-5-15-6-2 or 12-11-18-3-8). The research of the project is laying the foundation for criteria and application rates for nursery plants.

Relation between soil orders and fertilizer recommendations (Question 6)

Most participants provided no specific comments related to the three principle soil orders in Costa Rica (Andisols, Inceptisols and Ultisols). However, two participants responded as follows: Andisols are considered to have moderate fertility with large requirements of P and K. For Inceptisols with a sandy texture, split N applications are required. Clayey Ultisols are considered to have low fertility and need liming, P, and drainage.

Determination of critical levels for nutrients in soil and foliar analysis (Question 7)

For soil sampling most participants considered samples from 0-20cm the most appropriate. For foliar sampling, all considered the third leave to be the best. Only one person provided soil critical levels (pH = 5.5, Al = 0.5, Mg = 4.0, K = 0.2, Ca = 4.0, expressed in cmol(+)/100g and P = 10, Zn = 3 expressed in ppm). Only one participant provided foliar critical levels (N = 2.3, P = 0.1, K = 1.5, Mg = 0.3 all expressed in percent).

Recommendations for foliar fertilization in palmito (Question 8)

Most participants do not recommend use of foliar fertilizer in palmito plantations, however, one recommended the use of foliar fertilizer in palmito nurseries to provide Zn. Another participant recommended 1-2 applications of foliar fertilizer during the rainy season.

Parameters used to evaluate fertilization in palmito (Question 9)

The most important parameter to evaluate the results of nutrient recommendations is the general health and appearance of the plantation and yield (palmitos/ha). Other criteria included the number of harvested palmitos are needed to fill a box. One participant mentioned use of the internal rate of return as part of the analysis.

Estimates of palmito tolerance to soil acidity (Question 10)

Most participants reported tolerance up to Al saturation values of 21-40%.

Recommendations for liming in palmito (Question 11)

The lime recommendation currently used seeks to reduce the Al saturation to 21 %. Dolomite is the most frequently recommend type of liming material, but calcitic limestone and calcium hydroxide are also recommended. Except for one, all recommend the lime to be applied by the broadcast method. Depending on the amount of lime recommended the frequency of application would be either once a year or every two years (for large amounts).

Perceived associations between palmito nutrition and diseases (Question 12)

Only one participant associated a disease problem (Erwina) with low levels of foliar K and Ca.

Knowledge of existing literature related to nutrient management in palmito (Question 13)

The best known references were the ones published in Spanish.

Needs for additional information on nutrient management in palmito (Question 14)

Individual participants wanted to know about one or more of the following: soil critical levels, foliar critical levels, export of N, P & Mg, nutrient recycling, nursery fertilization, better soil maps.

Production Expectations (Question 18)

Most participants expected the levels of production to decline in the next several years. The more optimistic view was that the current levels of production would be maintained. It is further expected that the small-scale producers will be most affected. Some processing plants have been closed, and others are likely to be closed in the near future.

Price Expectations (Question 19)

Most participants foresee a slight increase in prices in 2002 as a result of a better quality product and the elimination of least competitive producers.

Principle risks (Question 20)

Most participants identify market conditions and policies as the greatest constraints to sector growth. Plantation diseases could also become a problem.

Future prospects for palmito producers (Question 21)

Small farmers were considered to be at the greatest risk. Their future prospects are estimated to be poor to medium. Medium and larger scale producers have somewhat better prospects ranging from medium to good.

Feedback/Comments from Workshop Participants

The timing of the workshop was excellent, because palmito producers are now facing critical economic conditions and the information provided may help producers to alleviate their costs of production and better withstand the pressures of global competition. The research and technical support on soil fertility for palmito is essential to revitalize and give encouragement to producers. Regular annual workshops are vital to keep everyone informed about advances in knowledge.

The project is a good example of what is needed: Long-term research that is comprehensive, field-oriented, and environmentally appropriate. The project is based on criteria and key fertility parameters necessary to develop a complete fertility management system. The soil and foliar data generated by the project is similar to findings on oil palm research (Duran, Lopez & Chinchilla, 1997), and has the effect of extending knowledge of fertility management in palms. Some of the results presented reconfirm prior research and current management practices, while other research results are new. For example, many farmers in the past three years have started to split the N fertilizer applications as is consistent with the project's recommendation.

All the research components contribute knowledge that will enable farmers to reduce costs of production. In cases of nutrient recycling, for example, the information can be used to design an organic farming system for palmito, which will provide an opportunity to receive a premium price in international markets. Given the preliminary results showing accumulation of carbon in palmito plantations, participants mentioned that producers may qualify for future benefits (e.g., emission abatement subsidy or other instruments) under the national environmental services program, "Servicios Ambientales", or international programs. The results presented also allow producers to synchronize fertilizer applications with plant needs and thereby reduce contamination and improve fertilizer use efficiency. The allometric equations developed will

help producers to better predict yields and economic returns to palmito. Some of the results can be further improved by adding new research elements such as: alternative N sources (urea, organic); using other criteria (Al saturation); relating research findings to costs of production; additional experiments in the field (liming). Further interpretation of the research findings are needed, particularly in relation to their implications for future impact.

In the future, participants would like to see research findings on K and minor elements, better site characterization, drainage and soil classification need more consideration, the relation between nutrition and diseases, nutrition and plant density or spatial arrangements.

Partial Findings from Collaborative Research and Their Implications

- Efficiencies in N utilization can be improved with the result that costs of production can be reduced and N pollution can be reduced.
- Recommendations can be adjusted for plantation density and age (establishment, rapid growth, mature) resulting in greater efficiencies in fertilizer use.
- Carbon accumulation in the palmito plantation contributes to plantation sustainability and C sequestration
- Understanding the rate of release of nutrients from palmito field residue under conditions of high and low rainfall allows producers to adjust downward the need for chemical nutrient supplements and reduce costs of production. The latter is especially critical for low-income producers.
- Target recommendations for fertilization to palmito plantations of different varieties and rainfall conditions.
- Use of different Ca and Mg sources(CaSO4, CaCO3, & MgCO3) can be used to achieve improved results in initial stage of growth.
- Target the P requirements of palmito in different soil orders and during different stages of plantation growth. P supplementation is indispensable in the early growth and the requirement for Andisols is greater than that of Ultisols.

Activities in Progress

- Additional field sampling in support of N and P studies will continue through May 2002. Analyses and interpretation of results will follow.
- Twelve month on-farm trials will be initiated at six different locations to test the Diagnosis predictions of NuMaSS for peach palm.
- As an extension of the N experiment, a color chart will be developed to provide a tool for field diagnosis (principally by farmers) of N deficiency.
- An international meeting is programmed for January 2002 with participation from Latin American scientists to demonstrate, evaluate and disseminate project findings and products for decision support in palmito nutrient management.
- Publication of the primary project results (in Spanish and English) are currently under review by journals.

Building Institutional Capacity for Decision Support

Capacity building continues to be an essential part of the development process. Many of the technical problems are being managed with improved methods and coordination between professionals.

Conclusions

- Research is generating findings valued by farm producers and agricultural professionals.
- New knowledge will enable farmers to achieve greater efficiencies in palmito production and better withstand the competitive pressures of the international markets.
- Improved nutrient management will reduce non-source N pollution of water resources and protect environmental resources.
- The value of the project's impacts cannot be fairly assessed in the current context of an economic downturn for the targeted commodity.

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Participants in the Workshop on Nutrition of Palmito

Name	Institution	Location in Costa Rica
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Marco Corrales Soto	CAFESA	San Jose
Sergio Delgado Matamoros	Fertica	Guapiles-Pococi
Jose Luis Rivera Ramirez	MAG	Diamantes Pococi
Pedro Guzman Leon	MAG	San Jose
Walter Calvo Pinar	Fertinazel S.A.	Cartago
Norberto Duran Chaves	Palma Tica	Coto 87
Sander Lopez Jimenez	Palma Tica	Quepos
Rafael Salas	CIA/UCR	San Jose
Alfonso Vargas	CORBANA	Pococi
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