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FHIA

FUNDACION HONDUREÑA DE INVESTIGACION AGRICOLA

July 17, 1995

Dr. John Daly
Team Leader
Office of Policy and Programs (Research)
Center for Human Capacity Development
Agency for International Development
Room 609 SA-18
Washington, D.C., 20523

Dear Dr. Daly:

Enclosed is a final report on PSTC Project No. 9.396 "High Density Techniques in Palm Heart Production".

Thanks to your funding we have determined that economically feasible yields may be obtained by high population plantings of palms.

Unfortunately, all the original researchers and the USAID technical advisor are no longer in Honduras and all reports (except our copies of trimester reports) have been misplaced.

If you require any additional information, please contact us and we will make every effort to obtain if for you.

You have our thanks for your support and I hope you feel that your funding yielded results beneficial to Central American small-scale farmers who are always looking for a crop that will increase their income beyond the range of subsistence farming.

Sincerely,

H.E. Ostmark, Ph.D.
Director of Research

cc: Mr. A. Merkel
Dr. A. Martínez
Dr. E. Buchner
Ing. T. Ramírez

heo/pd/D.I.#4B/daly

REC'D IN R&D/R
JUL 27 1995

Apartado Postal 2067
San pedro Sula
Honduras
Tel. (504) PBX. 68-2078, 68-2470
Fax: (504) 68-2313

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FUNDACION HONDUREÑA DE INVESTIGACION AGRICOLA

# FINAL REPORT

**PSTC Project No. 9.396**
**"High Density Techniques in Palm Heart Production"**

**Fundación Hondureña de Investigación Agrícola (FHIA)**
**La Lima, Honduras**

**July 17, 1995**

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Apartado Postal 2067
San Pedro Sula
Honduras
Tel. (504) PBX. 68-2078, 68-2470
Fax: (504) 68-2313

CC:BOSTID

## SUMMARY

The purpose of this series of experiments was to determine if palm hearts could be produced under high densities (20 - 100,000 plants/ha).

The study was divided into three main sections:

1. Variety trials: Of four candidate palms, the royal palm outproduced the others and produced palm hearts of excellent quality.

2. Spacing - fertilizer trials: Populations of 60,000 palms/ha fertilized with 200 lbs N/ha in double rows produced approximately 4.5 to 5.0 tons of palm heart/ha.

3. Semi-commercial planting: Discarded because of high leaf infection of the fungus *Helminthosporium sp.* under the high humidity and plant populations of these tests.

Overall, the study proved that palm hearts could be produced at densities up to 100,000 plants/ha. However, to be commercially feasible the problem of high leaf fungal infection must be resolved.

## OBJECTIVES

Commercial palm heart production began in Brazil where the Acai (*Euterpes*) palm was cut out of rainforests. The first commercial plantings for palm heart originated in Costa Rica using pejibaye, *Bactris gasipacs*, a local palm in great favor for its fruit. Neither system produced high yields.

Since palm heart has potential as an export crop from tropical countries, a series of experiments were conducted with funding from PSTC Project No. 9396, "High Density Techniques in Palm Heart Production".

Specific objectives were to:

1. Select the most appropriate species of palm for palm heart production.

2. Determine if palm heart could be produced in populations of from 20,000 to 100,000 palms/ha.

3. Find the optimum density and fertilizer regime for palm heart production in the humid lowlands of Honduras.

4. Test two planting systems, double row and equidistant, to determine which produces higher yields.

## METHODS AND RESULTS

Variety selection

Seeds of four species of palms were obtained from Brazil, Costa Rica and Honduras. These were: Acai, *Euterpe sp.* from Brazil, Pejibaye, *Bactris gasipacs*, from Costa Rica, Fishtail palm, *Caryota mitis* from Honduras, and Royal palm, *Roystonea elata* from Honduras.

Seeds were planted in black plastic bags; all germinated satisfactorily (Table 1).

Table 1. Percentage of germination and period of germination of four palms. La Lima, Honduras. 1990.

| Palm Species | % Germination | Period of Germination |
|---|---|---|
| Royal | 90 | 4-12 Weeks |
| Acai | 96 | 3-5 Weeks |
| Pejibaye | 80 | 4-8 Weeks |
| Fish tail | 90 | 4-12 Weeks |

Growth of the seedlings within the bags was variable with Royal palm showing the best growth.

Table 2. Comparison of the leaf, stalk and root growth after 7 months of seedling grown in bags. Guaruma, La Lima, Honduras. 1990.

| Palm Species | Leaf (g) | Stalk (g) | Root (g) | Total (g) |
|---|---|---|---|---|
| Royal | 51.2 | 18.8 | 27.5 | 97.5 |
| Acai | 23.4 | 5.6 | 21.3 | 50.3 |
| Pejibaye | 18.0 | 2.9 | 21.3 | 42.2 |
| Fish tail | 16.1 | 5.6 | 11.3 | 33.0 |

The fish tail palm, *Caryota*, was eliminated from further testing because it showed little promise.

Table 3. Preliminary variety trials at 20, 40, and 60,000 plants/ha. Growth (in cm) at 13 months. La Lima, Honduras.

| Palm | 20,000 | 40,000 | 60,000 plants/ha |
|---|---|---|---|
| Royal | 126 | 98 | 82 |
| Pejibaye | 41 | 39 | 34 |

**Note:** Acai palm, *Euterpe* was obviously ill adapted to Honduran conditions, averaging 25 cm in growth. Acai palm was thus eliminated from further testing.

With Royal palm the leading candidate, a field trial was set up using populations of 30-70,000 palms/ha. Three levels of nitrogen fertilizer 0, 200 and 400 kg/ha were superimposed over the population trial.

Table 4. Effect of five population levels on gross plant weight and net weight of palm heart from royal palm. La Lima, Honduras.

| Population/ha | Gross tons/ha | net tons/ha palm heart |
|---|---|---|
| 30,000 | 52 b[1] | 1.5 c |
| 40,000 | 69.9 b | 2.1 b |
| 50,000 | 95.1 a | 2.5 a |
| 60,000 | 95.5 a | 2.6 a |
| 70,000 | 102.9 a | 2.9 a |

[1] Duncan P=0.05

There was a constant, but non-significant increase in palm heart production up to 70,000 palms/ha population. Drought and rabbit damage severely curtailed palm growth.

Table 5. Effects of nitrogen on length and diameter of palm heart. Average of all populations.

| Nitrogen (kg/ha) | Length (cm) | Diameter (cm) |
|---|---|---|
| 0 | 26.7 c[1] | 2.2 b |
| 200 | 28.2 a | 2.3 a |
| 400 | 27.6 b | 2.3 a |

[1] Duncan P=0.05

Nitrogen fertilizer at 200 kg/ha had a modest positive effect. Additional N did not increase length and diameter of palm hearts.

Table 6. Yield of palm heart from royal palm planted at three populations under irrigation and 200 kg N/ha. Harvested at 13 months. La Lima, Honduras.

| Palms/ha | Yield/ha (tons) | Ave. length (cm) | Ave. diameter (cm) | Ave. wt (g) |
|---|---|---|---|---|
| 20,000 | 4.00 a[1] | 31.1 | 2.5 | 200.0 |
| 40,000 | 4.54 ab | 23.8 | 2.0 | 112.5 |
| 60,000 | 5.16 b | 21.7 | 1.8 | 86.6 |

[1] Duncan P=0.05

Since yields consistently increased up to 60,000, palms/ha another field trial was set up testing 60, 80, and 100,000 palms/ha.

Table 7. Yield of palm heart from royal palm planted at three populations under irrigation and 200 kg N/ha. La Lima, Honduras.

| Palms/ha | Yield/ha | Ave. length (cm) | Ave. Diameter (cm) |
|---|---|---|---|
| 60,000 | 4.48 a[1] | 1.7 a | 4.5 a |
| 80,000 | 4.74 a | 1.6 b | 4.7 a |
| 100,000 | 4.80 a | 1.6 c | 4.8 a |

[1] Duncan P=0.05

There was an increase in yield up to 100,000 palms/ha, but the average diameter of palm heart decreased to 1.5 cm which is slightly below the desired diameter of palm heart for canning.

To determine it equidistant or double row planting gave better results, royal palms were planted at an average 80,000 plants/ha in both systems.

Table 8. Yield of palm heart from royal palm planted in double row and equidistant systems. La Lima, Honduras.

| Plantain system | Ave. length (cm) | Ave. diameter (cm) | Gross wt. (t/ha) | Net wt (t.ha) |
|---|---|---|---|---|
| Double row | 20.6 a[1] | 1.6 a | 219.0 a | 5.0 a |
| Equidistant | 19.5 b | 1.5 a | 174.6 b | 4.3 b |

[1] Duncan P=0.05

Double row planting with a space between the double rows resulted in higher yield than when the palms were planted equidistant.

**Note:** A fungus, *Heminthosporium sp.* invaded the plots and required heavy applications of fungicides to preserve the experiment. This fungus is probably the limiting factor to raising palm heart in the humid lowland tropics.

## DISCUSSIONS AND CONCLUSIONS

Palm heart can be produced at densities of 20 to 100,000 palms/ha. When densities exceed 60,000, the resultant palm hearts lose quality i.e., become too thin. Therefore 60,000 palms/ha should be considered ideal.

Royal palm, *Roystonea elata* produced the highest yields (4.5 - 5.0 tons/ha) and quality of any palm tested. The commercial yield in Costa Rica for pejibaye, the only palm currently grown in plantations for palm heart production is 1.3 tons/ha.

In addition, royal palm can be harvested at 13-15 months while only 25% of pejibaye was ready to harvest 30-32 months after planting.

Double row planting with palms planted in rows 25 cm apart with plant 33 cm apart (60,000 plants/ha) appears to outproduce equidistant planting with palms 41 cm apart with 41 cm between rows.

Severe drought will reduce yields although palms will recover, but require longer to reach marketable size. Irrigation eliminates this restriction to growth.

There was a surprisingly low response to nitrogen fertilizer. A total of 200 kg/ha raised production somewhat and is recommended.

The fungus, *Helminthosporius sp.* infected the last (largest) plots and burned over 80% of the palm leaves that were not protected with fungicides. This fungus has slowed interest in palm heart production and will probably require relocation of palm growing to a less humid environment.

In summary, the royal palm has the potential to produce yields of up to 5 tons of palm heart/ha and, pending a market study, could become an export crop for Honduras.

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