

Panama, March 19, 1986

PROGRESS REPORT No.14

PROJECT : AGRICULTURAL TECHNOLOGY DEVELOPMENT IN PANAMA
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PERIOD : OCTOBER 1 TO DECEMBER 31, 1985

This report is submitted as part of the requirements of the USAID contract on the project "Agricultural Technology Development in Panama" for the Technical Assistance Component and provided by Rutgers University to IDIAP. Activities and accomplishments of the project and the Technical Assistance Component for the period covered between October 1 and December 31, 1985 are described here, in detail.

This report is subdivided into four main sections following the reports from each of four (4) specialists components of the Rutgers Technical Assistance Team. This sections are:

- I. Tropical Pastures, Dr. Pedro Argel;
- II. General Agronomy, Dr. Mark Gaskell
- III. Soil Fertility and Management, Dr. Alvaro Cordero
- IV. Agricultural Research Administration and Management, Dr. Carlos A. Neyra.

Dr. José Zorrilla Rios has been appointed as a livestock specialist to the Panama project following the recommendations of a Rutgers Search Committee and agreement by IDIAP and AID/Panama. Dr. Zorrilla Rios will start his new duties on January, 1986.

ATD - PANAMA PROJECT

CONTRACT No. 525-0180-C-00-2015

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| <u>CONTENTS</u> | <u>P A G E</u> |
|---|----------------|
| I. TROPICAL PASTURES..... | 1 |
| Dr. Pedro Argel | |
| A. Background..... | 1 |
| B. Germplasm..... | 1 |
| C. Establishment and Management..... | 3 |
| D. Future Plans..... | 7 |
| II. GENERAL AGRONOMY..... | 10 |
| Dr. Mark Gaskell | |
| A. Background..... | 10 |
| B. Onion Agronomic Problems..... | 10 |
| C. National Onion Production Strategy..... | 13 |
| III. SOIL FERTILITY AND MANAGEMENT..... | 15 |
| Dr. Alvaro Cordero | |
| A. Antecedents..... | 15 |
| B. Training and Technical Assistance..... | 15 |
| C. Field Days, Seminars, Conferences, Work- shops and Field Tours..... | 18 |

CONTENTS

P A G E

D. Research.....24

E. Other Activities.....26

IV. ADMINISTRATION AND MANAGEMENT OF AGRICULTURAL RESEARCH.....27

Dr. Carlos A. Neyra

Background.....27

A. Goal: "To assist IDIAP in the formulation and implementation of institutional objectives, strategies, priorities and evaluation of agricultural research".....27

B. Goal: "To assist IDIAP with the planning of human resources including the elaboration of training plans for staff development.....29

C. Goal: "To assist IDIAP in the identification of research opportunities and development of effective methodologies likely to cause a significant impact on the agricultural sector.....30

D. Goal: "To act as Chief-of-Party and in-country coordinator of the technical Assistance provided by Rutgers University to the ATD project in Panama".....31

E. Future Rutgers Involvement in Panama.....34

F. Other Activities.....35

I. TROPICAL PASTURES

DR. PEDRO J. ARGEL

RE: PROGRESS REPORT No. 14

for the period October 1, 1985 December 31, 1985

Dr. Pedro J. Argel. Pasture Specialist

I. TROPICAL PASTURES

A. Background, Evaluations of tropical pasture species have been underway in Panama. Promising grass genera such as the Brachiarias are now under evaluation in six distinct areas of the country, in search of adaptation to the environment and tolerance to spittlebug. Legume species such as Kudzu, Centrosema and Stylosanthes have numerous valuable characteristics which are important in wide adaptation. Other species have entered a special propagation route so as to have seed available for future evaluations which include on-farm evaluation. Andropogon gayanus is being managed by a large number of producers, primarily in the Central Provinces, and it is hoped that the availability of seed is not a future limit in the utilization of the species. The initial efforts of IDIAP which began in 1983 are beginning to yield results. The Swazi (Digitaria swazilandensis) and the Humidicola (B. humidicola) have also become popular among ranchers, although IDIAP researchers recognize the principal limitations of the species. Nevertheless, IDIAP is becoming recognized by the livestock community for the research gains and the contribution of the above mentioned species.

B. GERMLASM

As a result of the species adaptation experiments - Regional Type A - a summary of the better adapted grasses and legumes are presented in Table 1 for three regions in Panama. A total of 22 grasses and 54 legumes were evaluated since 1983 following the methodology described by the International Tropical Agricultural Center (CIAT) for the International Tropical Pastures Research Network (RIEPT). This reduced number of selected species constitutes the basis for agronomic evaluations, seed production, and grazing trials. These will also serve as a guide for genera with better adaptation to Panamanian conditions and future species introductions should take into account these evaluations. For example, it is clear that species such as A. gayanus, B. dictyoneura 6133, B. humidicola, S. quianensis 184 and P. phaseoloides have a wide range of adaptation; whereas soil factors primarily limit the adaptation of C. ciliaris, D. swazilandensis, B. decumbens 606, S. quianensis 136, S. hamata and S. capitata. Other species such as C. macrocarpum, C. Sp. and S. quianensis 'Tardio' have additional limitations due to diseases.

Based on the adaptation potential shown by the genus Brachiaria, 23 different ecotypes of this genus have been under evaluation in a wide range of ecological conditions in Panama. Nine of the more outstanding ecotypes were established for agronomic evaluation during the months of October-November in Chepo (Eastern Region). At this time, the group of Brachiarias

Table 1. Outstanding germplasm at three sites in Panama after two years of evaluation.

| SPECIE | SITE | | |
|---|---------------|------------------------|---------------------|
| | SONA (FhT) | CALABACITO (FhT-Sd) | LOS SANTOS (FdT) |
| <u>A. gyanus</u> 621, 6200 | E** | E | E |
| <u>B. dictyoneura</u> 6133 | E | E | E |
| <u>B. humidicola</u> 679 | E | E | E |
| <u>C. ciliaris</u> Nunbank, Molopo | - | - | - |
| <u>D. swazilandensis</u> | R | R | E |
| <u>B. decumbens</u> 606 | R | R-B | R-B |
| <u>S. guianensis</u> 184 | E | E | E |
| <u>S. guianensis</u> 136 | R | E | B |
| <u>C. macrocarpum</u> 5434, 5062 | R-B | E | E |
| <u>C. sp.</u> 5112, 5278 | R-B | E | E |
| <u>S. guianensis</u> 'Tardío' 1280, 1283 | R | E | R |
| <u>P. phaseoloides</u> Kudzú | E | E | E |
| <u>S. hamata</u> 147, 118 | - | - | E |
| <u>S. capitata</u> 'Capica' | R | E | M |

* FhT, tropical humid forest; Sd, derived savanna; FdT, tropical dry forest.

** E, excellent adaptation; B good; R normal; M poor.

are under evaluation at Gualaca, Chiriqui Farm, Calabacito, Sona and Penonome, as well as Chepo. In the last case, the established species were B. decumbens 6131, B. brizantha 6298 and 6780, B. ruzuzensis 654 and 6130, B. humidicola 6707, 675 and 6369 and B. dictyoneura 6133 in addition to local material. The establishment has been incomplete due primarily to excess rains during seeding. The species B. ruziziensis, nevertheless stands out for its ease of establishment.

Leucaena Ecotypes

The evaluation of 16 ecotypes of Leucaena established in Divisa have continued in cooperation with the National Agricultural Institute (INA). Cuts have been taken every eight weeks at a height of 40 cm. and the material separated into leaves and small stems (less than 5 mm.) to form the digestible dry matter portion. Table 2 shows the results to date. Variability among and within genotypes was observed. During the dry season, the better yields were shown by L. sp. (hybrid) 17478 with 122 g. DDM/m.², whereas L. leucocephala 17491 had the lowest yield with 36 g. DDM/m.². The L. diversifolia had lower yield ranges whereas the L. leucocephala showed a wide range in productivity with the Cunningham variety in the middle ranges. A similar trend was observed during the rainy season. Still, the L. leucocephala 17488 and the L. pulverulenta 17490 (hybrid) increased their yields to levels comparable to that of the better ecotypes during the dry season. The higher yielding ecotypes in the rainy and dry seasons were L. pulverulenta 17489, L. leucocephala 174678 and L. sp. 17478 (hybrid); the last having lower mimosine content and greater regrowth after cutting. This experiment will continue for one additional year.

C. ESTABLISHMENT AND MANAGEMENT

Weed Control

Weed control and herbicide selectivity has been under study with P. phaseoloides (kudzu). Table 3 shows the selectivity of the herbicides oxyfluorfen, alachlor and metalachlor applied pre-emergence and acifluorfen, fluazypop-butyl and pendimethamine applied post-emergence. The population of surviving plants was very similar in all treatments.

Observations 130 days after postemergent herbicide treatment show greater kudzu yield in the manual treatment, followed by methalachlor 1.40 kg. a.i./ha. + manual weeding (Table 4). Other notable treatments include the alachlor 2.24 y oxyfluorfen 0.50, both combined with one manual weeding. Apparently the effect of the herbicides alone was not sufficient for adequate weed control but the time required for weeding was cut in half by the herbicide application compared to the manual control. The low yields observed in the kudzu are due in part to the high incidence of the native legume Calopo (Calopogonium mucunoides), which was not controlled by any of the herbicides in pre or post emergent application; only manual weeding controls this species.

The alachlor + acifluorfen (2.24 + 0.60) and oxyfluorfen +

Table 2. Yield parameters, mimosine content and height of regrowth of 16 *Leucaena* ecotypes in the first evaluation year in Divisa, Panama. 1985.

| ECOTYPE (<i>Leucaena</i>) | CIAT No. | YIELD (g. Dm./m.2) | | Mimosine (%) ** | Regrowth (cm.)*** |
|-------------------------------------|--------------|---------------------|-----------------|--------------------|----------------------|
| | | Dry * Season | Rainy Season | | |
| <u><i>Leucaena</i> sp.</u> | 17478 | 122 | 685 | 3.0 | 89 |
| <u><i>Leucaena leucocephala</i></u> | 17467 | 111 | 931 | 4.1 | 46 |
| <u><i>Leucaena pulverulenta</i></u> | 17489 | 109 | 699 | 3.9 | 51 |
| <u><i>Leucaena shannoni</i></u> | 17487 | 97 | 618 | 4.1 | 57 |
| <u><i>Leucaena leucocephala</i></u> | 17477 | 95 | 423 | 3.1 | 57 |
| <u><i>Leucaena leucocephala</i></u> | 17475 | 94 | 446 | 3.5 | 43 |
| <u><i>Leucaena leucocephala</i></u> | 17502 (Cunn) | 87 | 608 | 4.3 | 56 |
| <u><i>Leucaena leucocephala</i></u> | 17495 | 83 | 404 | 4.8 | 50 |
| <u><i>Leucaena leucocephala</i></u> | 17498 | 76 | 466 | 4.0 | 59 |
| <u><i>Leucaena pulverulenta</i></u> | 17490 | 73 | 640 | 3.7 | 63 |
| <u><i>Leucaena diversifolia</i></u> | 17503 | 69 | 536 | 3.2 | 55 |
| <u><i>Leucaena diversifolia</i></u> | 17485 | 64 | 309 | 3.8 | 75 |
| <u><i>Leucaena leucocephala</i></u> | 17488 | 63 | 620 | 4.6 | 81 |
| <u><i>Leucaena diversifolia</i></u> | 17388 | 52 | 460 | 4.2 | 61 |
| <u><i>Leucaena diversifolia</i></u> | 17461 | 49 | 402 | 3.5 | 43 |
| <u><i>Leucaena leucocephala</i></u> | 17491 | 36 | 313 | 3.6 | 53 |

* Mean of 3 cuttings in dry season and 2 in rainy respectively

** Dry weight basis

*** Regrowth after 8 weeks in rainy season

Table 3. Number of Kudzu (*P. phaseoloides*) plants at 25 days following application of preemergent herbicides at establishment. Gualaca, 1985.

| TREATMENT | DOSIS (kg.a.i./ha.) | | No. Plants/ Treatment* | |
|---|------------------------|----|---------------------------|------------|
| A. PREEMERGENCE | | | | <u>S.E</u> |
| 1. Oxyfluorfen | 0.50 | 14 | | 3.4 |
| 2. Alachlor | 2.24 | 14 | | 1.8 |
| 3. Metachlor | 1.40 | 13 | | 3.7 |
| 4. Oxyfluorfen + Alachlor | 0.50+0.50 | 14 | | 1.0 |
| 5. Oxyfluorfen + Desy. manual | 0.50 | 14 | | 2.7 |
| 6. Alachlor + Desy manual | 2.24 | 13 | | 2.0 |
| 7. Metachlor + Desy. manual | 1.40 | 13 | | 3.5 |
| 8. Oxyfluorfen + Alachlor + Desy. Manual | 0.50+0.50 | 13 | | 1.0 |
| B. PRE + POSTEMERGENCE ** | | | | |
| 9. Oxyfluorfen + Acifluorfen | 0.50+0.60 | 14 | | 1.8 |
| 10. Oxyfluorfen + Fluazyfop-butyl | 0.50+0.50 | 14 | | 3.4 |
| 11. Oxyfluorfen + Pendimentalina | 0.50+1.30 | 10 | | 3.5 |
| 12. Alachlor + Acifluorfen | 2.24+0.60 | 13 | | 0.9 |
| 13. Alachlor + Fluazyfop-butyl | 2.24+0.50 | 12 | | 5.2 |
| 14. Alachlor + Pendimentalina | 2.24+1.30 | 14 | | 2.3 |
| C. POSTEMERGENCE | | | | |
| 15. Acifluorfen | 0.60 | 12 | | 3.3 |
| 16. Fluazyfop-butyl | 0.50 | 16 | | 2.3 |
| 17. Pendimentalina | 1.30 | 15 | | 1.4 |
| 18. Desyerba Manual | - | 15 | | 1.3 |

* planting density = 21 Plants / 6m.2

** Postemergent products applied 35 days after planting

Table 4. Relative yields of Kudzu (P. phaseoloides) and other species 130 days after applying pre and post emergent herbicides for weed control during establishment. Gualaca, 1985.

| TREATMENT | Dosis (kg./ha.) | Yield (Kg.dm./ha.) | | |
|---|--------------------|--------------------|----------------|---------|
| | | kudzu | Calopo weed | other** |
| A. PREEMERGENCE | | | | |
| 1. Oxyfluorfen | 0.50 " | 308 | 705 | 628 |
| 2. Alachlor | 2.24 | 294 | 586 | 892 |
| 3. Metachlor | 1.40 | 368 | 486 | 947 |
| 4. Oxyfluorfen+Alachlor | 0.50+0.50 | 255 | 885 | 774 |
| 5. Oxyfluorfen+Desy.Manual | 0.50 | 560 | 14 | 226 |
| 6. Alachlor + Desy.Manual | 2.24 | 606 | 22 | 424 |
| 7. Metachlor+Desy. Manual | 1.40 | 675 | 0 | 327 |
| 8. Oxyfluorfen+Alachlor + Desy. Manual | 0.50+0.50 | 515 | 0 | 395 |
| B. PRE + POSTEMERGENT | | | | |
| 9. Oxyfluorfen+Acifluorfen | 0.50+0.60 | 240 | 603 | 166 |
| 10 Oxyfluorfen+Fluazifop- butyl | 0.50+0.50 | 350 | 512 | 1060 |
| 11 Oxyfluorfen+Pendimenta- lina | 0.50+1.30 | 280 | 321 | 742 |
| 12 Alachlor+Acifluorfen | 2.24+0.60 | 355 | 564 | 206 |
| 13 Alachlor+Fluazyfop- butyl | 2.24+0.50 | 182 | 662 | 1141 |
| 14 Alachlor+Pendimenta- lina | 2.24+1.30 | 268 | 344 | 1258 |
| C. POSTEMERGENT | | | | |
| 15 Acifluorfen | 0.60 | 356 | 528 | 749 |
| 16 Fluazyfop-butyl | 0.50 | 204 | 308 | 2102 |
| 17 Pendimentalina | 1.30 | 277 | 437 | 1229 |
| 18 Desyerba Manual | CONTROL | 779 | 0 | 390 |

* Calopogonium mucunoides considered a weed in this case

** Weed complex dominated by Croton trinitatis, Borreria alata and Mimosa sp.

+ Postemergent products applied 35 days after planting.

acifluorfen (0.50 + 0.60) treatments applied pre and post emergent respectively, considerably reduced the weed population, but did not control the Calopo and the acifluorfen set back the Kudzu.

The post emergent products had little effect over the weed complex; the flouazifopbutyl 0.50 kg. a.i./ha. showed selectivity toward the kudzu but had little effect on the broad leaved species Croton trinitatis, Borreria alata and Mimosa sp. On the other hand, the residual effect of the preemergent oxyfluorfen 0.50 kg. a.i./ha. was greater than the alachlor 2.24 and methalachlor 1.40 which is reflected in greater broad leaf control and values intermediate and high for Kudzu and Calopo respectively.

The grass referred to as Cabezona (Paspalum virgatum), is a common weed in pastures of medium to high fertility. It progressively invades pastures given to the high seed production capability and its low palatability. Animals such as mules and horses contribute to its distribution because they eat the flowers and distribute the seed with feces. An experiment under the responsibility of IDIAP researchers was established in San Andreas (Chiriqui) to observe the effect of three herbicides on the control of this weed species. The herbicides were: diuron (Karmex), dalapon (Dowpon) and glyphosate (Roundup), the last applied in two ways: foliar spray and with wick applicator. The dalapon was applied at a dosis of 2.0, 3.0 and 4.0% plus a dosage split between 3.0 + 3.0% applied at 20 day intervals; 1.5 and 2.0% was the dosis used for diuron, and for glyphosate, dosages of 0.75, 1.0 and 1.25% were used for the foliar spray and 3.0, 5.0 and 7.0% for the wick applicator.

Control results up to 40 days after treatment are shown in Figure 1. Gains in percent weed control with increasing dosage was observed with diuron, with the 2.0% showing approximately 90% control. Dalapon showed similar results but less overall control during the same period. The split application of 3.0 + 3.0% produced results comparable to the other herbicides. The 3.0% gave little control and that was probably due to the lack of uniformity in the application due to the size of the plants in that treatment and the difficulty in uniform spray application. Spray and wick application were equally effective in the case of glyphosate independent of the dosis. At 20 days after treatment, greater than 80% control was observed. Other observations indicated better selectivity with the wick applicator owing to the fact that an old Swazi (Digitaria swazilandensis) pasture was used and the better Swazi coverage was evident in the wick applicator treatment. The experiment will continue to be evaluated and additional work with different glyposate dosages is also also planned.

D. FUTURE PLANS

Special attention will be given in the next few months to seed harvest of promising species or species enroute to commercial production. Plans are underway to harvest Veranero (Andropogon gayanus) at Chiriqui Farm, Sona, Calabacito, Los Santos and Rio Hato. The management and establishment

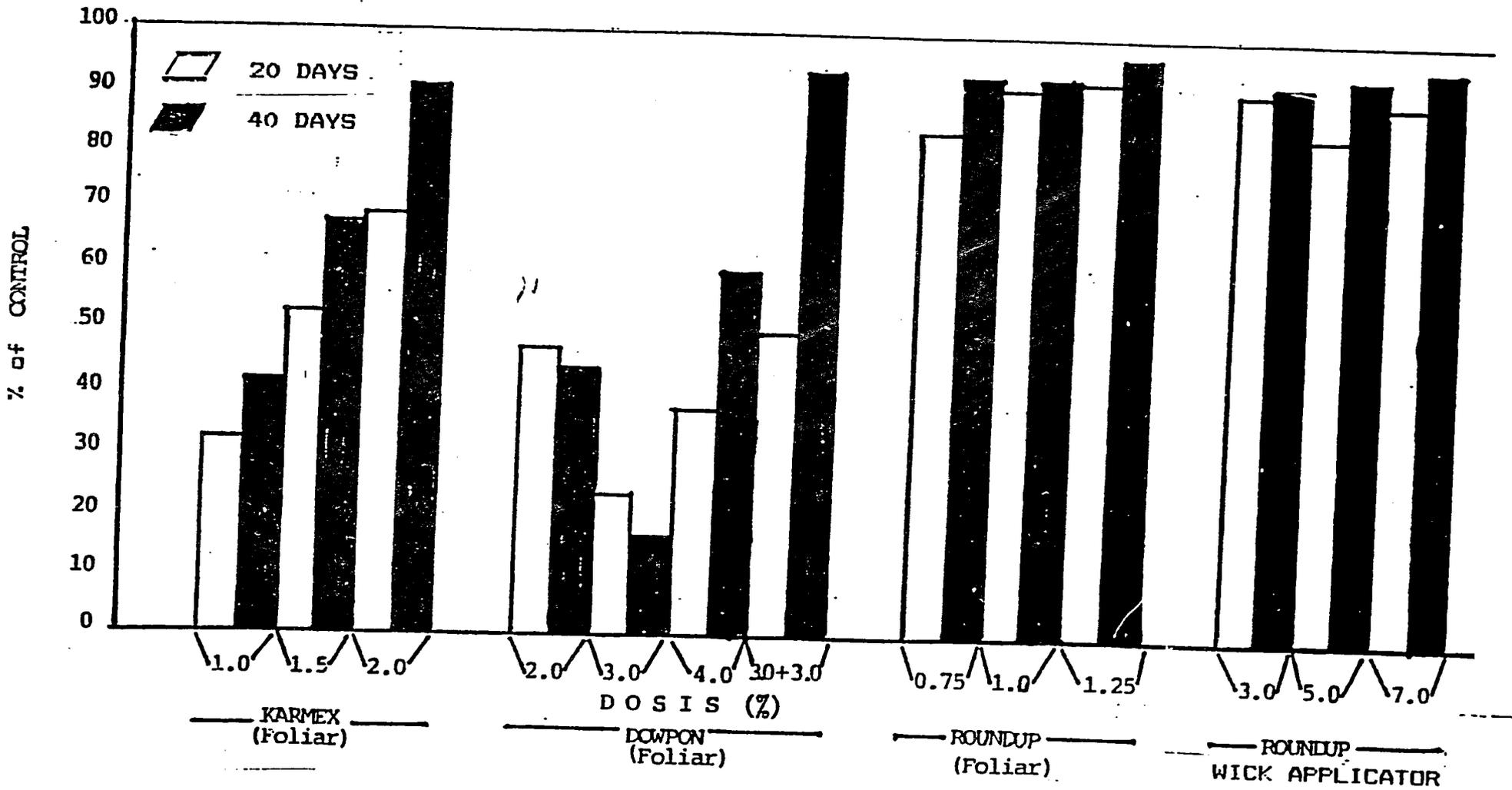


Figure 1. Percent control of Cabezona (*Paspalum virgatum*) at 20 and 40 days after application of three herbicides.

observations will continue in the grazing experiments. The experiment with the Agronomy Faculty has been established and the first weighing of animals is planned. Considerable attention is being given to new 1986 projects based on previous results and discussions with IDIAP and Agronomy Faculty colleagues. The CIAT contacts are continuing for a a workshop over pasture establishment and acid soil management in mid-1986.

Progress Report October 1 December 31, 1985

II. GENERAL AGRONOMY

Dr. Mark Gaskell

A. BACKGROUND

Work activities during the reporting period were concentrated in the onion research program in the highlands. The onion research program is a relatively new program, initiated by IDIAP in the highlands in 1983. Onions in Panama are produced primarily in the highlands areas around Cerro Punta and Boquete and in the lowlands areas around Chitre and Los Santos. Production of onions has traditionally been limited to a harvest period during the dry season from February to May. Since the beginning, the research effort in the highlands, largely under Dr. Gaskell's direction, has concentrated on improving onion production during the rainy season as a means of expanding production opportunities for Panamanian producers and decreasing onion imports.

In August of 1985, IDIAP named a new researcher Ing. Esteban Sanchez, to work in the onion program in the highlands. Since that time, Dr. Gaskell has been working closely with Ing. Sanchez to familiarize him with onion production patterns in the highlands, some of the primary limiting factors in onion production, and the general focus of the research program. Plans are underway for that Ing. Sanchez to have primary responsibility for the highlands onion research effort beginning with the 1986 Annual Plan. Dr. Gaskell will continue to collaborate on several onion experiments and to provide advice and guidance in the management of the research program.

ACTIVITIES DURING THE REPORTING PERIOD

B. Onion Agronomic Problems

Work with on-going experiments continued during October, November and December. This period includes some of the rainiest part of the year in Panama and was an important period experimentally. At the outset of the onion research program it was hypothesized that two potential onion production alternatives exist during the rainy season; the transplant of onions in June from irrigated seedbeds for an August-September harvest (Alternative 1), and the planting of seedbeds earlier than normal for an earlier than normal November-January harvest (Alternative 2). In 1984 preliminary work sought to focus on the first alternative and to develop covered seedbeds to complement the second alternative. Thus, the 1985 October-January period was the first opportunity to test Alternative 2 in the field. Results of a variety test of 28 commercial varieties transplanted in July and harvested in November, 1985 in Boquete are shown in Table 1. This trial was sprayed once weekly with a fungicide during the height of the rainy weather and foliar disease incidence was

Table 1. Results of late rainy season (Alternative 2) yield evaluation of 28 commercial onion varieties in Boquete, Panama. Harvested November 14, 1985.

| Variety | Yield (Mt/ha.) | Observations |
|------------------------|----------------|----------------------------------|
| Ringer PRR | * | |
| Yellow Granex PRR | 11.2 + 1.1 | |
| Granex 33 | 14.5 + 1.5 | |
| Supply | * | foliage tolerant to rains |
| Gold Rush PRR | 13.4 + 0.5 | |
| Henry's Special PRR | * | |
| Early Supreme PRR | # | |
| Gladalan Brown | 22.0 + 3.8 | |
| Colossal PRR | * | |
| Robust White PRR | * | |
| Rowcliffe Brown | * | |
| Early Premium PRR | * | |
| Early Harvest | * | |
| Early Lockyer Brown | * | v. early-sm. bulbs at transplant |
| Burgundy PRR | * | foliage tolerant to rains |
| Tropicana PRR | * | foliage tolerant to rains |
| El Toro PRR | * | |
| Texspan PRR | * | |
| Regal PRR | * | foliage tolerant to rains |
| Paradise | * | |
| Special 38 | * | |
| Early Cream Gold | * | |
| Endeavor | * | |
| N. Mexico Yellow Grand | * | |
| Dessex PRR | 18.2 + 0.6 | |

* did not form harvestable bulbs by harvest date
 # bulbs formed but rotted in the field

marked. Nevertheless, the primary limiting factor in producing onions during or shortly after this period appears to be lack of solar radiation or lack of heat units. Separate data taken from a semi-commercial plot on a nearby field that was sprayed twice weekly and otherwise under high management confirms this observation and showed a yield for the Granex 33 hybrid of 27.5 MT/ha (611 qq./ha.). Data taken during other growing periods on this same farm under the same management and on other nearby farms, indicates a yield potential for this same variety of 54.0 to 76.5 MT./ha. (1200-1700qq./ha.). The results indicate that the rainy, cloudy conditions that predominate during September, October and early November severely limit onion production potential even when the crop is managed well.

Other data is confirming the observation that the period from September 15 to November 15 adds little to heat unit accumulation and onion growth and development. A varietal trial planted at the beginning of the rainy season in June and transplanted in late August on the Martinez Farm near Cerro Punta indicates that varieties that require four months to mature after transplant during the traditional August to March period are not mature after even five months when grown under the June to January alternative. It is now clear that planting one month earlier will not necessarily mean harvesting one month earlier. The cumulative data indicates that the period from November 15 until harvest dictates the length of the growing period for onions harvested after September 15 in the highlands.

A separate experiment in Boquete to evaluate different liming rates with and without chicken manure/rice hull (CMRH) or coffee pulp (CP) application was transplanted in late December. Fresh weight of 100 random transplant seedlings was measured as an indication of vigor of growth in the seedbed. The results suggest that onion transplants do not respond to lime in the absence of CMRH or CP and that maximum growth among the treatments tried occurred with 2.0 Mt/ha of calcium carbonate with 6.0 MT./ha. of CMRH. Both levels of CP evaluated showed a response equal to the CMRH. These seedling vigor observations are complemented by similar subsequent transplant recovery observations. Plots with CMRH plus 2.0 Mt/ha. or more of lime applied recovered more quickly from transplant than control plots or plots with CMRH or lime alone.

The CP was applied wet and dry weight equivalent remains to be determined. If a similar response pattern is observed later with onion yields, it will provide the basis for additional, more extensive experiments with CP. CMRH costs B/45.00 /Ton presently and it is not uncommon for growers to apply 6 T. or more per hectare twice per year. CP is available free and in some cases dumping of the pulp is causing contamination problems in watersheds - particularly in the Boquete area. It is thought that once a relative value for the CP can be established in experimental trials it will serve as a guide for utilizing this valuable resource and could also force a reduction in CMRH prices.

The traditional practice for fertilizing onions in the highlands is to broadcast complete fertilizer over the surface of beds of transplanted onions at 8 and 30 days after transplanting. Application rates of 1.5 - 2.0 T/ha. of 12-24-12 fertilizer are common. The bulk of onion fertilization literature shows that optimal onion yields can be obtained with much lower rates. Experiments designed to evaluate alternative fertilizer application patterns as a means of improving fertilizer use efficiency in onions were transplanted in early October on two farms in Boquete. These experiments seek to determine if band application of triple super phosphate (TSP) below the row at transplanting will improve phosphorus fertilization efficiency and reduce fertilizer application requirements. One treatment also evaluates more frequent application of reduced nitrogen (N) application rates as a means of improving N fertilization efficiency.

C. National Onion Production Strategy

Since its beginning in late 1983 the National Onion Commission was designed to function in such a manner so as to work closely with onion grower groups monitor onion production and to plan and manage onion purchases (in the Central Provinces), storage for subsequent sale, in an effort to decrease importation. The onion research program initiated by Dr. Gaskell in the highlands has sought to complement that effort with research directed at widening the onion harvest period, particularly during the rain season.

Onions in the highlands have traditionally been grown in the period from February to early May. In the lowlands, the traditional onion harvest has come in from March through the end of April. The BDA and the Crop Insurance Institute (ISA) at this time will only approve financing for lowlands onions grown for this harvest period. This presents an obvious market conflict and it was hoped that purchases of large amounts of onions by the Marketing Institute (IMA) from lowlands growers for storage and subsequent resale during the rainy season would resolve this conflict. This has not proved to be an effective policy for two primary reasons:

- 1.) High transport and storage costs and losses incurred by IMA;
- 2.) the discovery by highlands growers that onions could be profitably produced from June to September.

Results of research conducted on onions in the highlands since 1983 has shown that onions can be quite profitably grown in the highlands from February to mid-September. Research has also shown that the period from mid-September to February would be a much less desirable if not unprofitable harvest period for highlands onion growers. In late December, Dr. Gaskell visited with IDIAP researchers in the Los Santos office in the lowlands and was told that the bulk of research there has shown that onions can be quite profitably produced in the lowlands from October to February. This sets the stage for a national strategy

for producing onions in Panama nearly continuously year-around and also means that lowlands and highlands growers will not have to compete for the same market. Selective advantage and an unrestricted market without importation will enable lowlands growers to settle into a October to February harvest and highlands growers to harvest from February to September. Onion areas and per hectare yields are greater in the highlands so both areas should have ample markets in the absence of imported onions.

Dr. Gaskell has begun work with IDIAP lowlands and highlands onion researchers to develop a document that will review the research basis for this strategy and recommend this production strategy to the IDIAP General Directorate. This document could then serve as the basis for needed crop financing, insurance and technical assistance changes particularly in the lowlands to allow this production pattern to establish itself.

Training

The staff of IDIAP's experiment station in Cerro Punta with the assistance of Dr. Gaskell hosted a field day on October 3 to review potato and onion experiments in progress. Area farmers, extension personnel, and crop and bank specialists attended.

Dr. Gaskell and IDIAP researchers Esteban Sanchez and Campos Serrano led a technical field day and tour of experiments in progress for Area Agricultural Development Bank (BDA) and extension (SENEAGRO) personnel on October 6. The day began on the IDIAP Experiment Station in Cerro Punta. As part of a visit to the on-farm drying experiment on the Espinosa farm in Alto Bambito, the group had the opportunity to see and compare the quality of onions which had been harvested in early September (Alternative 1) and dried in the experimental plastic covered onion dryer to the quality of recently imported onions. The quality of the locally grown and cured onions was quite acceptable even though they had been harvested in the middle of the rainy season. Other visits included the varietal trials on the Martinez farm in Alto Trivaldo, and following a trip to Boquete, visits to three farms to see additional varietal trials as well as experiments on seedbed management, improving fertilizer efficiency, and the evaluation of lime and CMRH applications.

III. SOIL FERTILITY AND MANAGEMENT

DR. ALVARO CORDERO

RE: PROGRESS REPORT No. 14

PROGRESS REPORT No. 14

ALVARO CORDERO

SOILS SPECIALIST

PROJECT : AGRICULTURAL TECHNOLOGY DEVELOPMENT IN PANAMA
PERIOD : OCTOBER 1, TO DECEMBER 31, 1985

A. ANTECEDENTS

This quarterly report included activities from October to December, 1985; the Soils Specialist came together his efforts, mainly in the following activities:

1. Training and Technical Assistance, and
2. Research: in this activity we offered collaboration and supported directly the work on soils fertility research that we are leading in the Central Region. The main work on research is carrying out on acid soils in the Experimental Station of Calabacito by the Engineer Benjamin Name. During this period the most important phase on research unfolded was the sowing, maintenance and partial collect of the crop resulting from the field trials.

Also, we worked on the assistance to the Soils Laboratory. We participated on Field Days, Conferences and Meetings carried by IDIAP

B. TRAINING AND TECHNICAL ASSISTANCE

The Soils Specialists of the Project on Agricultural Technology Development offers his collaboration as in technical assistance through the direct assistance to the technical Staff of IDIAP or by means of visits to the Experimental Fields; Sub-Centers; Experimental Stations or to the Soils Laboratory. In comparison to the last quarterly (First Workable Quarterly: June to

September) the activities have evolved gradually as the technical personnel is better acquainted with the field scope of the action of the Soils Specialist.

Practical Training: Practical training was employed and we discussed directly with the technician of IDIAP when they needed assistance on special topics of the Soils Science with emphasis on Soils Fertility.

Technical Assistance: We offered Technical Assistance on different topics approached mainly to the planning and discussion of the results of field trials focused on soils fertility and crops fertility; also in the establishment or institucional organization of the Soils Program at national level.

Members of technical Staff Personnel of IDIAP assisted in a director indirect form we could mention the following list:

| | |
|--------------------------|-------------------------|
| Eng. José A. Aguilar | Eng. Araiz Cajar |
| Eng. Esteban Arosemena | Eng. Jorge González |
| Eng. Lineth Carranza | Eng. Andrés Marquez |
| Lic. Pedro González | Eng. Benjamín Name |
| Eng. Santander Jaramillo | Eng. Rolando Sánchez D. |
| Eng. Luisa Martínez | Eng. Lucas Tasón |

At this point we stand out the assistance provided in the preparation of the following articles or documents:

- a) Engineer Santander Jaramillo wrote a document titled "The role of the supervision on research in the process of generating technology". Upon request by the author the document was revised and we offered pertaining advice.
- b) We revised, partially, an unpublished article of Engineer Santander Jaramillo and collaborators titled "Alfisols of Panama". We suggested verbally that the article would become enriched if he writes chapter five of his document about the use and management of Alfisols Soils.

We suggested a compilation about the actual methods of management of this soils, and that it could be profitable for the readers of the mentioned article at the national and international level. The article is

very valuable and could be convenient for the Institution (IDIAP) that will be in print promptly

- c) Together with Benjamin Name we discuss two documents that we received about soils topics which could be profitable to IDIAP in Panama. The document's titles are the following:

1. "Laboratory Exchange Program" (Labex, document sent to IDIAP by Carlos Burgos (Ph D) from CATIE, Turrialba sponsored by International Soil Reference and Information Center, on the Netherlands (Holland).

Eng. Name as well as the subscriber considered important for IDIAP, particularly to the Soils Laboratory, that we could participate on an information exchange of methods and analytic result of the testing samples collected in the participants countries.

2. Experimental Design and Data Collection Procedures for IBSNAT and the minimum data set for systems analysis and crop simulation. The document was sent by IBSNAT (International Benchmark Sites Network for Agrotechnology Transfer) to Jorge Jonas (Ph D) and referred to Eng. Benjamin Name and to the Soils Specialist, in Santiago city, to collecting experimental data from the fields trials on acid soils of the Calabacito area.

We can observe that not all the minimal data required for the international network can not be considered accurate because of faulty equipment. We must try as far as possible to obtain all the information to increase the experimental results and could be participatns on international soils experiments profitable for the country.

- d) We revised the profiles on fertilization research on industrial tomato and melon submitted by Eng. Araiz Cajar, on request of Eng. Santander Jaramillo, Agricultural Supervisor for the Central Region.

We gave suggestions to enhance the proposal. The recommendations were focused mainly to adequate the objectives to the real scope of the experimental design of the trial employed.

- e) Eng. Rolando Sánchez Díez, Director of the Central Region, Eng. Benjamin Name and the Soil Specialist submitted a document about soils and leaf tissue analysis on Coffee Cultivation about a possible deficiency of Zn on coffee plants of the region of Santa Fe, Veraguas. The analysis judgment is a possible deficiency of calcium (Ca) not a zinc (Zn) deficiency.

The mentioned document included the soils fertility diagnosis by the chemical analysis of soils samples collected on sites selected for Demonstrative Plots with field crops en Alto de Santa Fé.

- f) Together with Eng. Benjamin Name, the Soils Specialist prepared a proposal on onions fertilization for the Garicín region in Coclé carried by Eng. Luisa Martínez and Juan Felipe Díaz. We designed an experiment with a factorial incomplete with 15 treatments to study the effect of N and phosphorus and satellite treatments with K and other micro elements

C. **FIELDS DAYS, SEMINARIES, CONFERENCES, WORKSHOPS AND FIELD TOURS.**

During this quarter (October-December) we conducted 35 visits to field plots; once was a field day and 34 field tours or field works for the sowing, maintenance or evaluation of the field trials. Also we attended 15 workshops and programming of agricultural research.

The following is a list of the most outstanding activities:

1. Field Day in Calabacito:

We went November 19, 1985 to Calabacito motivated by the visit of the new Director of IDIAP, Carlos Morán (Dr.). The Soils Specialist Advisor jointly with Eng. Benjamin Name explained experiments on fertility on acid soils and germoplasm evaluation for adaptation to soils with relative high aluminum. The lineage evaluated were sorghum, cajanus, cassava, forestry species and management of phosphorus fertilization on maize.

2. Field Tours:

- a. On October 4, 1985 we went to Ocu with the partnership of Eng. Rolando Sánchez Díez, Director Central Region; Eng. Benjamin Name and Eng. José A. Aguilar in charge of the Roots and Tubers Research Program at Ocu. We discussed in the field experiments of manuring on cassava, taro and xanthosoma plantations.
- b. On October 16, 1985 we went with Eng. Rolando Sánchez Díez to give assistance on the sowing of onions and maize, on the site "La Candalaria, Potrero Arriba de la Madera, on producers farms. Eng. Ariel Castroverde and Eng. Benjamin Name were present on the field tour. Like on previous occasions we granted recommendations in relation to the management of these soils and their fertility.
- c. On October 16, 1985 we also traveled to the El Coco, in the Plains of Cocre (the Experimental Field of the IDIAP), in order to evaluate the experiment about sources and level of fertilizer N in rice. This experiment is carried out by Eng. Luisa Martínez. By means of the field evaluation, we observed responses to an increasing level of nitrogen (N) to a maximal agronomic rate of 100 Kg. N/Ha and, within the sources we observed that ammonium sulphate was outstanding; it was similar to a possible deficiency of sulfur.

We recommended Eng. Martínez to collect plant samples mainly at the end of maintenance (harvest time) to obtain data of dry matter of the grain and straw; to analyze nitrogen content to study the recovery of this element from the fertilizer.
- d. On October 18, we traveled to Calabacito with the future Advisor on Animal Production, Jose Zorrilla (Ph D) from the Agreement Rutgers University-IDIAP to visit the Experimental Station of Calabacito. Also were present in this visit, Pedro Argel (Ph D), José L. Alba (V. D.) and the Eng. Rolando Sánchez Díez. The intention of the visit was that Dr. Zorrilla could get acquainted with the facilities and the research work that IDIAP is carrying out in Animal Sciences Research in the select site of Calabacito, area of acid soils.

- e. On October 30, we evaluated together with Eng. Jorge Jiménez from CATIE and Eng. Benjamín Name adaptation variety trials of Taro, on acid soils of Calabacito. We observed that in spite of soil constraints (principally the edaphic conditions), some lineages show adaptation to the acid and infertile soils.
- f. On November 6 and 7, members of the staff personnel of IDIAP, Eng. J. González, Eng. Santander Jaramillo and Eng. Miguel Ríos jointly with members of the staff personnel of MIDA, DITE-DRI and the subscriber visited the Guaymie region in Los Valles, Veraguas with the principal objective to study the agricultural production systems relevant to the future planning of agricultural research on this area.
- g. On occasion of the visit of Eng. Blas Morán from CATIE and Eng. Amable Gutiérrez from RENARE-MIDA on November 14, 1985, we carried out an evaluation of the adaptation of forestry varieties on acid soils at Calabacito.
- h. On December 6, we evaluated responses to fertilizer on trials of *Dioscorea alata* (name) and mandioca on the area of Océ. Eng. José Aguilar and Eng. Benjamin Name were also present with the Soils Specialist. Previously we had carried with the same technicians another evaluation on fertilizer effects on roots and tubers at Océ.
- i. On December 11, 1985 we appraised initial flowering stage of the new variety of rice CR-1821 introduced from Costa Rica by Alvaro Cordero (Soils Specialist), granted by the Ministry of Agriculture and Livestock of Costa Rica by initiative of the phyto-geneticist of rice of Costa Rica Eng. José Israel Murillo V., Head of the Agronomic Department from this Ministry. The lot of rice seeds introduced was sowed by Eng. Eric Quirós from the Sub-Center of Soná.

In spite of the soils constraints of the field where we sowed the variety of CR-1821, it was found clean of infection by *Piricularia Oryzae*, however it was affected by insects and a slight infection of *Helminthosporium* and *Rhizosporium*, similar results were observed on a previous visit.

- j. During the same day we profited by the field tour to South of Soná to collect soils samples for

greenhouse studies at two selected sites, La Trinchera y La Soledad.

- k. Jointly with Agr. Nelson Gratacós from MIDA and Eng. Benjamin Name during three diferents field days we evaluated the Pineapple trials on Fertilization and Lime. We observed already at six months, the profitable effect of lime together with middle levels of fertilization in relation with the high levels traditionally employed on the area. Pineapple plants showed a normal vegetative development at this stage.
- l. Many visits to the Experimental Station at Calabacito with Eng. Benjamin Name were programmed to attend the maintenance and periodic evaluation of the fertility trials on acid soils as part of the research sponsered by Rutgers University-IDIAP Agreement.

3. Conferences:

On request by the Rotary Club of Santiago we spoke to the members for an hour about the special theme "The resource soil in the development of a country"

The participants showed a great interest with the subject that we explained; outstanding by means of questions and requesting additional explanations at the conclusion of the conference.

The principal objective of this conference was to increase the interest of a selected public on the resource soil in the development of a country and the efforts needed for good practices of management and soils conservation.

We compared examples of lands with soil partially damaged in another areas near Panama, for example soils with copper pollution of the South Pacific of Costa Rica.

4. Workshops:

- a. Workshop of the Rural Integrated Development Project of the Guaymies communities carried out with the objective of discussing the

guide-lines of a research proposal in that area. Present were Staff Members of CATIE, Carlos Burgos (Ph D); Margarita Mesequer (Ms); Eng. Washington Bejarano. Participantes of MIDA, DITE-DRI; Eng. Alfredo Artavia and by IDIAP: Jorge Jonas (Ph D), Eng. Alfonso Martínez; Eng. Domiciano Herrera; Eng. Miguel Ríos; Eng. Santander Jaramillo; Eng. Benjamin Name; Eng. Jorge González; Eng. Rolando Sánchez Díez and the suscriber. The workshop of Rural Integrated Development Project of the Guaymies Communities was during two days: October 22-23 and we made decisions about the normalization of the proposal. Also we agreed that IDIAP Staff personnel, MIDA-DITE-DRI and the Soil Specialist from Rutgers University will visit the two pilot areas of influence, selected sites of the Resarch Proyect with the goal of studying the componentes of the cropping systems employed by the Guaymies communities.

- b. On October 24 we profited with the visit of Raul Moreno (Ph D) from CIAT (Colombia) who visited the mandioc project, and we requested his agreeable offices to get the CIAT and their international connections in order that we will obtain germplasm of grain legumes that could be adapted to acid soils.
- c. On October 23, taking advantage of the visit of Jorge Jonas (Ph D) to the Central Region we met with some members of the Soils Group of IDIAP.

The staff members present at that meeting were: Jorge Jonas (Ph D), Eng. Rolando Sánchez Díez; Eng. Santander Jaramillo, Eng. Benjamin Name, Alvaro Cordero (Ph D) Soils Science Advisor from Rutgers IDIAP Agreement. We discussed about the lines to establish the National Program of Soils and we agreed that the Soils Group will be meeting soon to produce a document to be submitted to the proper authorities at IDIAP.

- d. The new General Director of IDIAP, Carlos Morán (Dr.) met with members of the Technical Administrative Staff and auxiliar personnel of IDIAP on the Central Region, to explain summarily the actual statement of IDIAP and his politic lines

to follow as new (General) Director. This meeting was realized on "Compa MIDA Clubhouse" on November 12.

- e. On November 14-15, we received the visit of the CATIE's lecturers and the graduate student and member of the staff personnel of IDIAP, Eng. Araiz Cajar. We discussed subjects related to the Advisory Committee and completion of thesis of Magister degree by Eng. Cajar.

The Professors present were Carlos Burgos (Ph D), Marciano Rodríguez (Ph D), Eng. Washington Benjarano, Eng. José Arze and Alvaro Cordero (Ph D) as Ex-Director of the Pos-Graduate Program of CATIE.

We decided the reorganization of the Advisory Committee and we advised the student that he must prepare a summary on the advance of his thesis for the magister degree.

We agreed that the Soils Specialist be part of the Advisory Committee of Eng. Cajar, because the main subject of his thesis is focusing to aspects of soil fertility.

- f. Two outstanding meetings were realized on the Central Region to make the out-line of the POA 86. The first was realized on December 4, with all the technical staff personnel on the Central Region and with the National Planning Director of IDIAP.

The second meeting was realized with the Director of the Central Region and the Agricultural and Livestock Directors and technical staff members.

The meeting was performed on December 12 and the principal objective was the planning of the POA-86 and the introduction of the strategic guide lines of IDIAP for the next few years.

- g. On three different opportunities the Soil Specialist, participated on meeting assembled by Eng. Rolando Sánchez Díez, Regional Director and his assessment technical personnel. On those meetings we discussed relevant topics on the agricultural and animal research that IDIAP is carrying out on the Central Region.

We discussed important points, for example;

- Marking of the influence areas of IDIAP on the Central Region to 1986.
- Planning the POA-86, etc.

D. RESEARCH

During the period of October to December, 1985 the activity displayed on supporting research that IDIAP is carrying out was increased, in the process of sowing, maintenance and collecting field data. The research activities displayed was performed mainly on the acid soils of Calabacito and Lola de Las Palmas where Eng. Benjamin Name is working on his research program in collaboration with Eng. José A. Aguilar on the site Los Llanos of Océ and with Lic. Pedro González from the Soils Laboratory.

The main experiments on course are listed on the following pages:

- a. Adapting forestry species to acid soils. Leader on research: Eng. Benjamin Name-IDIAP; as collaborators Eng. Blas Morán from CATIE, Eng. Amable Gutiérrez-RENARE and Alvaro Cordero (Ph D)-Rutgers University-IDIAP.
- b. Adapting mandioc (cassava) varieties on acid soils. Leader on Research: Eng. Benjamín Name-IDIAP with the Collaborator Alvaro Cordero (Ph D). Soils Specialist from Rutgers-IDIAP.
- c. Adapting cajanus varieties on acid soils. Leader on Research: Eng. Benjamin Name with the collaborator Alvaro Cordero (Ph D). Soils Specialist from Rutgers-IDIAP.
- d. Adapting sorghum varieties on acid soils. Leader on Research: Eng. Benjamin Name, Collaborators: CIAT and Alvaro Cordero-University of Rutgers-IDIAP.
- e. Liming of cane sugar on acid soils. Leader on Research: Eng. Benjamín Name, Collaborator: Alvaro Cordero (Ph D)-University of Rutgers-IDIAP.
- f. Management of phosphorus on maize cultivation on acid soils. Leader on Research: Eng. Benjamin Name,

Collaborator: Alvaro Cordero (Ph D)-University of Rutgers-IDIAP.

- g. Lime and fertilization of pineapple on acid soils located on Lola de Las Palmas. Leader on Research Eng. Benjamin Name, Collaborators: Agr. Nelson Gratacós-MIDA, Alvaro Cordero (Ph D)-University of Rutgers-IDIAP.
- h. Fertilization on Mandioc (cassava) on acid soils. Leader on Research: José A. Aguilar-IDIAP, Collaborator Eng. Benjamin Name-IDIAP, Alvaro Cordero (Ph D) University of Rutgers-IDIAP.
- i. Fixation of phosphorus on acid soils of Panama. Leader on Research: Lic. Pedro González. Collaborators: Soils Group-IDIAP, Alvaro Cordero (Ph D) University of Rutgers-IDIAP.
- j. Introduction of the new rice variety CR-1821 on the South of Sona region. Leader on Research: Benjamin Name-IDIAP. Collaborators: Eng. Eric Quirós-IDIAP, Alvaro Cordero (Ph D) University of Rutgers-IDIAP.

Previous experimental data appeared on University of Rutgers-IDIAP Agreement Report on Progress (Panama) for July-September, 1985 (Report No. 13).

Also we collaborated with another experiments mainly on the assessment aspect on planning, as follows:

Management of nitrogen on rice, selected site of Los Llanos de Coclé. Researcher: Eng. Luisa Martínez.

Experiment on melon fertility at Los Santos. Leader on Research: Eng. Araiz Cajar.

Experiment on industrial tomato fertilization at Los Santos. Leader on Research: Eng. Araiz Cajar.

Experiment on onions fertilization at Coclé. Leader on Research: Eng. Luisa Martínez and Eng. Juan Felipe Díaz.

Exploratory experiment on Sulphur Sources on Kudzu (Pueraria phaseloides), at the Experimental Station of Calabacito. Leader on Research: Eng. Estaban Arosemena.

E. OTHER ACTIVITIES

At the present time we are collaborating with the Technical Members of the Project of Development of Agricultural Technology in Panama US-AID-University of Rutgers IDIAP. We invited and carried from Panama City to Santiago to José Zorrilla (Ph D) who was introduced to the technical staff-personnel of Animal Science Direction of the Central Region and the Regional Director.

We participated on three social acts very important, two related with the change of the General Director, Eng. Ezequiel Espinosa and a welcome of the new General Director, Dr. Carlos Morán. The third act was the participation on the parade of the country days. We paraded on companion of the remainder members of the staff during the country days of Panama.

We carried through Carlos Neyra (Ph D), a request for traveling technical personnel of the staff of IDIAP and the Soils Specialist of the University of Rutgers to Costa Rica. Considering that travel was approved by IDIAP and by AID, yet the travel did not come through. This travel was planned by the Soils Advisor during three opportunities in verbal form (by telephone) with the authorities of Costa Rica.

During the month of December field activities of the Soils Advisor was limited partially, due to the vehicle assigned by the project was stopped by mechanical damage and our labour was affected during 15 days while the damage was repaired.

IV. ADMINISTRATION AND MANAGEMENT OF AGRICULTURAL RESEARCH

DR. CARLOS A. NEYRA

RE: PROGRESS REPORT No. 14

IV. ADMINISTRATION AND MANAGEMENT OF AGRICULTURAL RESEARCH

DR. CARLOS A. NEYRA

PERIOD: OCTOBER 1 TO DECEMBER 31, 1985

BACKGROUND

The services of the Agricultural Research Administration specialist was requested for the purpose of helping improve resource use and the overall management and administrative capacity of IDIAP. The specialist is also acting as chief-of-Party of a five-person research team placed in-country by Rutgers University as part of the technical assistance component of the ATD project.

The activities of the Ag. Research Adm. specialist are organized according to the following specific goals:

- A. "To assist IDIAP in the formulation and implementation of institutional objectives, strategies, priorities and evaluation of agricultural research"
- B. "To assist IDIAP with the planning of human resources including the elaboration of training plans for staff development".
- C. "To assist IDIAP in the identification of research opportunities and development of effective methodologies likely to cause a significant impact on the agricultural sector.
- D. To act as Chief-of-Party and in-country coordinator of the technical assistance provided by Rutgers University to the ATD project in Panama.

Activities and accomplishments on the components (goals) described above are included here in this report.

- A. Goal: To assist IDIAP in the formulation and implementation of institutional objectives,

strategies, priorities and evaluation of agricultural research".

Activities

1. A document outlining the objectives, projections and strategies for Agricultural Research by IDIAP was officially submitted to the Director General of IDIAP on October 1. The document was submitted by Lic. Miguel Cuéllar as National Director of Planning of IDIAP and Coordinator of the Committee.
2. The same document was later send on October 21, 1985 to Dr. Reynaldo Pérez, Sector Planning Director of the Ministry of Agricultural Development (MIDA). The contents were later discussed on a meeting organized at MIDA, for this purpose.
3. Future activities include the preparation of a complete paper for a Five Years Plan for IDIAP (1986-1990). On this lines, action has been initiated in the form of preliminary discussions and gathering of information. Further details should be advanced on the next quarterly report.
4. Preparations are underway for the implementation of an evaluation of the ATD project to be carried out during the first or second quarter of 1986. An internal evaluation procedure will be set in first followed up by an external evaluation with the participation of outside reviewers appointed by USAID/Panama. The Ag. Research Administration and Management Specialist will help to coordinate actions for both the internal and external reviews and will prepare a working document that includes the terms of reference for both evaluating procedures. For this matter, Dr. Carlos Neyra will coordinate activities with Lic. Miguel Cuéllar, National Director of Planning at IDIAP and Dr. Donald Drga, Project Manager, USAID/Panama.

- B. Goal: "To assist IDIAP with the planning of human resources including the elaboration of training plans for staff development".

Activities

1. A training program was implemented at IDIAP as one of the components of the ATD project to help strengthen the capability of IDIAP to identify and solve problems affecting Panamanian agriculture and to help with the strengthening of each of the three regional centers: Central, Eastern and Western.
2. Under the ATD project, thirty-five (35) fellowships were made available for graduate work towards MSc. and Ph.D. degrees. Until 1985, twenty-seven (27) fellow staff members were placed at Universities in the U.S.A. (20) Mexico (5), Brazil (1), Puerto Rico (1) and Phillipines (1). Three additional fellowships have been awarded for 1986/1987 raising the total number of trainees, under this program, to thirty-one (31). This makes about 90 percent of the project goal.
3. A list of IDIAP fellows graduated between 1982 to 1985, under the ATD program, is presented in Table 1. The listing indicates that more than fifty percent of the participating long-term trainees have completed their degree requirements, to date. Ten additional fellows are expected to complete their graduation requirements between 1986/1987. Six of them are placed at U.S.A. University; three (3) in Puerto Rico and one (1) in Mexico.
4. The overall success rate (degree completions/ No. of fellowships) is anticipated to be above 90 percent of fellows obtaining graduate degrees, MSc and/or Ph.D. The high figure of graduating fellows speaks highly for the success of the training program and selection of candidates for graduate work. Nevertheless, it should be pointed out that IDIAP still lacks a well structured document spelling out regulations and procedures for planning, selection and evaluation of scientific/technical training.

5. The Agricultural Research Administration and Management Specialist has prepared and submitted to the Central Administration a "Working Document" to spearhead and help IDIAP with the preparation of an institutional training manual and reporting of training progress. The document was submitted to the Director General of IDIAP on December 5, 1985 and requested the implementation of an Ad-Hoc Committee for this purpose.

C. Goal: "To assist IDIAP in the identification of research opportunities and development of effective methodologies likely to cause a significant impact on the agricultural sector".

Activities

1. In the opinion of many experts and evaluating teams, Panama has not been able to develop and exploit all the existing economic potential in the Agricultural sector. Accordingly, Panama has excellent possibilities to increase the volumen of production, improve productivity and reduce its international commercial deficit of agricultural products. However, for this to happen it is necessary the development of effective programs for the generation and transfer of technology, complemented with the implementation of adequate policies by the public sector and the definition of priorities that take into account the potential comparative advantages of production and opportunities for domestic and international markets.
2. In line with the above mentioned concepts the Ag. Research Adm. Management specialist suggested the following:
 - a. The need for a new action plan and strategies to improve the outlook of vegetables, tropical fruits and beef as export commodities. Adequate support should be given to allow a better balance between domestic and exporting market activities at IDIAP (See Report No.12 ATD Project). Support for this contentions has been provided by:

Truitt, G.A., H.J. Mannion and A.V. Villafuerte. 1984. In: "Assesment of Agribusiness Potential in Panama". Abt. Associates, Inc.

Conklin, F.S. 1985. In: "Panama Agricultural Sector Assessment". Draft, USAID/Panama (October 18).

CGIAR/TAC. 1985. Tac Review of CGIAR Priorities and Future Strategies. TAC Secretariat FAO/UN.

- b. Development a new action plan that highlights an integrated Research-Production-Marketing concept with focus on both horticultural crops and livestock. For this purpose, the Ag. Research Adm. Management specialist prepared a draft for Concept Paper and discussed personally with IDIAP's Director General, Dr. Carlos Morán and other members of the Administration by mid-November. The document proposed to focuss on three main components: 1) Horticultural crops; 2) Livestock production and 3) Agricultural Technology Management. The initial reaction by IDIAP to this proposal was positive. The Concept Paper was further agreed by both IDIAP administration and Cook College Administration (Rutgers University) to be used as the basis for the preparation of a Proposal for Expansion and Reorientation of the Agricultural Technology Development Project. The Concept Paper was further discussed and fine tuned jointly with Reed Hertford and the International Agriculture and Food Programs office at Cook College on occasion of my visit to Rutgers in early December. Upon my return, a copy of the Concept Paper was presented to IDIAP on December 6, 1985. An immediate step in the process will require submittal of the Concept Paper to AID for reactions to it and consideration for funding.

- D. Goal: "To act as Chief-of-Party and in-country coordinator of the Technical Assistance provided by Rutgers University to the ATD project in Panama".

Activities

1. The specialist in Agricultural Research Adm. and Management used about 50 percent of effective time in activities related to Project Coordination.
2. The coordination activities can be grouped as follows:
 - a. Keeping records of activities and reports of each member of the Rutgers Technical Assistance Team.
 - b. Review and editing, in Spanish and English, of the quarterly reports and work plans prepared by the TA team.
 - Organization of report No. 13 covering July to September, 1985.
 - c. Participate and assist in the coordination of visits by Rutgers faculty to Panama and the ATD project.
 - Arrangements were made and a detailed agenda prepared for the visit by Dr. José Zorrilla-Ríos to Panama for interviews in relation to the Livestock Specialist position in the ATD/Panama project. Activities included visits with:
 - IDIAP administration and staff personnel at the headquarters and regional offices.
 - AID - Agricultural sector office
 - Rutgers TA team members in Chiriqui and Santiago.

At the end of this tour, the project coordinator in Panama informed back to Rutgers on the success of the interview process and that contract negotiations should follow.

3. Acting as a liasson person between Rutgers, IDIAP and USAID/Panama:

- a. Arrangements were made and a detailed agenda prepared on occasion of the visit to Panama by a seven-member Rutgers Presidential Study Team on Environmental Affairs in Panama from December 10 to 19 1985. For better success of the tour an Ad-Hoc Coordinating Committee was set-up in-country, integrated by:

Dr. Carlos A. Neyra, Rutgers Chief-of-Party/ATD project

Dr. Rudolph Vigil, USAID/Panama

Dr. Jaime Espinosa, Member of the Plan Protection and Environmental Quality National Directorate at IDIAP.

- b. Dr. Carlos A. Neyra was also appointed as a team member by the President of Rutgers University, Dr. Edward J. Bloustein and escorted the team throughout.
- c. The Rutgers Team accomplished most of the programmed activities including:
- Meetings with GOP (Government of Panama) institutions and representatives:
 - University of Panama
 - RENARE (Renewable National Resources)
 - IRHE (Institute of Electric and Hydraulic Resources)
 - IDIAP (Institute of Agricultural Research)
 - MIPPE (Ministry of Planning and Economic Policy)
 - IDAAN (Potable Water Resources)
 - Meetings with Environmental Sector Institutions:
 - Panama Canal Commission
 - Smithsonian Research Institute
 - CONAMA (Comisión Nacional del Medio Ambiente)
 - ANCON (Asociación Nacional para la Conservación de la Naturaleza)
 - Fundación Panama (Private non-profit organization)

- USAID/Panama
 - Director General
 - Agricultural Division
- American Embassy; Courtesy visit to Everett Briggs, USA Ambassador to Panama.
- Field trips to illustrate characteristic environmental problem areas.

In brief, the agenda of activities was prepared and carried out to help the Rutgers team have the broadest possible exposure to: National and International institutions dealing with environmental problems in Panama; top U.S.A. representatives in the country; selected individuals and groups concerned with environmental affairs; representative ecological areas associated with the Panama Canal and other environments (i.e. Zarigua Desert, Azuero Province). Activities were also planned accordingly to help the Rutgers team identify opportunities to assist Panama in dealing with specific environmental problems and Management of Natural Resources.

E. Future Rutgers Involvement in Panama

During this quarter, the Ag. Research Adm. and Management specialist was called back to Rutgers on two occasions (October 10 to 22 and November 25 to December 3), for new rounds of discussions and consultation on issues related to "Future University Involvements in Panama". These activities were highlighted by the visits to the University on October 13 to 15 by Ron Levin, Director of USAID/Panama and Ezequiel Espinosa, Director of IDIAP. Of particular concern to Cook College were the identification of two areas with potential for expansion:

1. Expansion and Reorientation of the ATD project with IDIAP. Currently, we have placed in-country a five members team and an expansion to

a 15 TA team is being proposed.

2. Natural Resources and Watershed Management. A project paper (PP) is in preparation by USAID/Panama and a request for Proposals (RFP) should be forthcoming in the next few months.

On the first issue, Ron Levin encouraged us to prepare and submit a "Concept Paper" which would sharpen the focus of our current ATD project with IDIAP. Initial discussions were carried out separately with the Director of IDIAP, Ing. E. Espinosa to laid out the basic components for an expanded project. Neyra followed up at Panama with the preparation of a working document agreed with IDIAP represented by Dr. Carlos Morán the new General Director. The proposal was presented and discussed with Cook College Faculty and Dean Kleinschuster on November 27. It is my understanding that Cook College is fully supportive of our efforts to seek an expansion of the technical Assistance provided to IDIAP. A plan of action that calls for an increase from 5 to 15 faculty assigned to the Panama project was discussed and agreed, in principle.

On the second issue, Cook College and the University Central Administration has responded effectively with the nomination of a Presidential Study Team of Environmental Affairs in Panama. The visit to Panama and activities by the seven-persons team was described in detail above.

F. Other Activities

1. I invited speaker to the Third National Congress of Chemistry-Chemistry for Development-organized by the Panamanian Chemical Society. This specialist was invited to give a Magister Conference on: "The Development of Chemistry and Biotechnology". Meeting were held from November 7 to 9, 1985.
2. Invited to contribute with a scientific article to the series published by the Panamanian Chemical Society. Title article: "Biotechnology and the Development of Biological and Chemical Sciences". In Press.

TABLE 1. IDIAP fellows graduated between 1982-1985 and currently working in Panama. All of them were supported by fellowships provided by the ATD/Panama Project.

| Staff | Degree | Place | Graduation |
|---|--------|--------------------------------|------------|
| 1. Alejandro Delgado Administración Rural | MS | Instituto Tecnológico | 1982 |
| 2. Jorge Jonas Suelos | Ph D | Univ. de Filipinas | 1982 |
| 3. Domiciano Herrera Nutrición Animal | MS | Chapingo, México | 1984 |
| 4. Román Gordón Entomología | MS | Puerto Rico | 1984 |
| 5. Marcos Navarro Malezas | MS | Louisiana State | 1984 |
| 6. Susana Pons Fisiología/Cultivo de Tejidos | MS | Cornell | 1984 |
| 7. Manuel H. Ruiloba Nutrición Animal | Ph D | Florida | 1984 |
| 8. Medardo Peralta Acuicultura | MS | Alabama | 1984 |
| 9. Edilberto De León Biometría | MS | Univ. Antonio Narro, México | 1984 |
| 10. Beyra Jaén Sociología | MS | Missouri | 1985 |
| 11. Lineth de Lambo- glia Horticultura | MS | Rutgers | 1985 |
| 12. Hermel López Economía Agrícola | MS | Rutgers | 1985 |
| 13. Arnold Muñoz Economía Agrícola | MS | Rutgers | 1985 |

Table 1. Cont...

| | Staff | Degree | Place | Graduation |
|-----|---|--------|-------------|------------|
| 14. | Alfonso Singh Suelos | MS | Rutgers | 1985 |
| 15. | José A. Yau Agronomía/Semillas | MS | Mississippi | 1985 |
| 16. | Lourdes Charles Riego | MS | California | 1985 |
| 17. | Said Caballero Microbiología | MS | México | 1985 |
| 18. | Elizabeth de Ruiloba Comunicaciones/Educ. | Ph D | Florida | 1985 |
| 19. | Tomás Vásquez Silvicultura | MS | Idaho | 1985 |