LATIN AMERICAN REGIONAL LEGUME PROGRAM

AND

BRAZILIAN COWPEA PROGRAM

IITA/EMBRAPA/IICA

TRAVEL REPORTS AND CONTACTS LIST

VOLUME 3 OF 3

TABLE OF CONTENTS

VOLUME 3 - TRAVEL REPORTS AND CONTACTS LIST

RELATORIO TECNICO DE VIAGEM

RIO BRANCO, AC

FEVEREIRO 20 - 22, 1985

EARL EUGENE WATT

RELATÓRIO TÉCNICO DE VIAGEM

1) DADOS SOBRE O PARTICIPANTE

a) Nome: Earl Eugene Watt
b) Cargo: Pesquisador III
c) Unidade: EMBRAPA/CNPAF

2) DADOS SOBRE A VIAGEM

a) Título: Viagem Técnica
b) Instituição Organizadora: EMBRAPA/CNPAF
c) Período: 20-22/02/85
d) Local: Rio Branco, AC

3) CONDIÇÕES EM QUE PARTICIPOU

Melhorista de Caupi e criador das cultivares que serão lançadas.

4) REUNIÃO EM QUE PARTICIPOU DURANTE A VIAGEM

Não se aplica

5) DESCRIÇÃQ DAS ATIVIDADES

O objetivo foi participar do lançamentos das cultivares de caupi BR-4, Rio Branco, BR-5 e Cana Verde Pela EMBRAPA/CNPAF e UEPAE/Rio Branco.

6) COMENTÁRIOS E SUGESTÕES

Dr. Guazzelli e eu fomos recebidos no Aeroporto Por Dr. Eymard de Lima Mesquita e fomos direto para o Escritório da UEPAE/ Rio Branco onde encontramos com o Chefe da UEPAE Dr. Hugo de Oliveira e o Subchefe Dr. Geraldo de Melo Mauro. Discutimos a Cerimônia do lançamento vimos slides que seriam apresentados e falamos sobre o projeto de caupi para aquele Estado. O fitopatologista do programa de caupi Emilson está fazendo mestrado nos Estados Unidos em Carolina do Norte e retorna após julho de 1986.

Dia 21 de fevereiro (quinta feira), a cerimônia foi realizada no Auditório da EMATER/Acre. Falamos com o Presidente da EMATER, Dr. Francisco Hélio Pimental, antes da cerimônia. O Chefe da UEPAE foi o Presidente da mesa e coordenou a reunião. À mesa também esva presente o Diretor, Dr. José Ramalho da EMBRAPA, Ricardo J. Guazzelli, coordenador do Programa de Caupi do CNPAF, Dr. Eymard, coordenador do Programa de Leguminosas do Acre, representante do Ministério da Agricultura e mais algumas pessoas representando agricultura e associações daquele Estado.

As palestras foram bem atendidas e as apresentações foram boas. Após a cerimônia fomos para um churrasco na Associação dos Empregados da EMBRAPA e após o churrasco fizemos uma visita às instalações da Fazenda, onde estão construindo um novo escritório da UEPAE, agora os escritórios possuem um 2º andar em cima de uma ferragista, mas eles vão transferir tudo para a fazenda.

O potencial do caupi no Estado é muito grande. Eles vão precisar muito mais de apoio do projeto lá, com novos materiais.

Estamos precisando pensar mais no problema da mela e o problema de viroses está crescendo demais e também o problema de vaquinhas.

Goiânia, 15 de março de 1985

Earl Watt

Earl Eugene Watt

EEW/aso
mar./85

TRIP REPORT: SURINAM, GUYANA, AND VENEZUELA

FEBRUARY 25 TO MARCH 08, 1985

BY

EARL WATT

TRIP REPORT BY EARL WATT

SURINAM, GUYANA AND VENEZUELA

FEBRUARY 25 TO MARCH 08, 1985

Monday Feb. 25

Visited IICA offices in Brasilia. Continued on to Surinam.

Tuesday Feb. 26

Met with Ing. Huiswoud and later with Dr. Fernando Klass.

Wednesday Feb. 27

Met with Dr. K. Sahtoe. He is the Director of the agricultural experiment station in Paramaribo. Also met with Dr. Guillermo Villanueva, Director of IICA office. At 11:00, met with with Mr. Esayang. He is the extension officer and took me to see the local farmers fields growing the meter beans (cowpeas). In the afternoon we visited CELOS (Research Institute under the Ministry of Education) and met the director, Mr. Ronald Sweeb.

Thursday Feb. 28

In the morning met with Mr. Reedaer who is the head of Interfoods where they are trying to produce dry beans. At noon, I flew to Guyana where I was met by Mr. Julius Ross and his wife, Patsy, who is a seed technologist. At 4:00 visited Franz Alexander, Director IICA-Guyana.

Friday March 01

At 9:00 courtesy call on Fritz Dorway, who is the Permanent Secretary of the Ministry of Agriculture. At 9:30 met with Neville McAndrew who is the Minister of Agriculture for the Crops and Livestock Department. Also present, Pat McKenzie who is actually the planning cooadinator for the departments of Crops and Livestock. In the afternoon, discussion with staff of NARI (National Agriculture Research Institute) with President Michael Granger.

Saturday March 02

Planned visit to Kimbia to cowpea production area and potential soybean area. Trip cancelled due to engine failure on small plane. Saturday night flew to Trindad Tobago.

Thursday March 07

Travelled to Venezuela. At FUSAGRI in the morning, where Dr. Luis Marcano was in the hospital due to a tumor. Noon, went to Cagua. There at Cagua, met with Dario Boscan who is now subchef Cagua Station. The chief is the son of Dr. Marcano. Also present, Dr. Paulo Nino, Soybean specialist; Simon Ortega and his friend, Alfonso from the Instituto de Investigaciones Agricolas near the University Funia. The afternoon was spent, in general, looking at the cowpea fields and the soybean fields of the Ministry as well as those of FUSAGRI.

Friday March 08

At 8:00 went to the flea market to look at types and prices of cowpeas and beans. Then, went on to the Ministry of Agriculture. Visited an experiment on timing of termination of irrgation. I also visited their computer center and discussed cowpea production and past results with Simon Ortega. At noon, returned to FUSAGRI. Spent the afternoon with Dario Boscan, going through his fields on the cowpea. Even though it had reached maturity and had already been harvested twice I was still able to see the plant type and height to get an idea of adaptability. In the evening, went to airport, returning to Goiania on Saturday, March 09.

SURINAM

Soybean Problems - Potential

The main problem is seed storage, although they do have a cold room for the storage of the breeding seed and germplasm. They are planning to produce their soybeans with small farmers. Estimated need of soybean for local consumption would be about 50 hectares, yield non-specified. Best cultivar is Taiwan AGS 129. Planting is on sandy soils in rotation with peanut. They prefer a small black soybean seed and one with storability. At present, they are using an import balance model such that you can import only as you export. Therefore, at present, they have not made up arrangements for importation of soy cake for cattle feed and chicken feed because they have not found someone to export something in exchange for the import. They are presently using fifty percent rice broken in their chicken rations but production has dropped at times as much as forty percent. Soybean is produced only by the small farmer. It is used locally as sprouts and mostly by people from Java. They feel their present soybeans are low-yielding and difficult to harvest, as it is done by hand. They have no oil processing plant although they need the oil. Soybeans are planted twice a year. The first planting is from December to January, the second from June to July. They would be interested to receive a few lines for observation and suggested sending by embassy pouch with only a phyo-sanitary certificate. I have sent cowpea seed there directly in the past and had no problems.

Cowpeas

The types of seed and seed qualities preferred have been indiciated in previous reports. I will not refer to seed quality. The two main types are, of course, the meter bean, which they call the Chinese cowpea, and the bush bean. They are interested in the 60 day cowpea although they already have Dr. B. B. Singh's early first collection of erect material in their cold store. At present, they are getting ready to plant that out. The agronomist, Dr. Huiswoud, is now the Director of Extension and so, their technician will be in charge of all agronomy trials. The main need is on the meter bean. All the meter bean that I saw was badly infected with virus. The virus is probably the cowpea aphid borne virus. Some web blight was seen but the virus is certainly the most limiting factor. We agreed the best way to help them would be to send populations with the meter bean crossed with resistance to the viruses; let them pick out materials there with the proper type of pod, since they're quite accustomed to staking. Staking is done in the middle of areas where there are a lot of small wood trees. This was no problem. They do have the early maturing short vegetable cowpeas from IITA. They have grown them out but did not express much optimism in their future use. I suggest they at least pass some around to the extension people to see what acceptability might be. They prefer to eat the red kidney bean which is totally imported. They are trying to substitute, to some extent, the cowpea for the Phaseolus. But, they have nothing of any particular size or any seed type that looks even close to the Phaseolus. They are trying to grow a bean which they called a 'brownish kidney'. When I saw the seed, it was actually a small pinto with a seed size of about 25 to 28 g/100 seeds. To replace imported yellow pea they are exploring the use of pigeon pea. They were pleased to get the name of Byth in Australia as a possible contact for importing new seed for testing. They presently eat quite a bit of pigeon pea in the country. They indicate low yield as the principal problem with cowpea. Also, low price and that mechanization is not a possibility because of the small areas, although most farmers use a tobata type tractor. There are several small adaptations that I think could be made such as the IITA rolling punch planter or some of the cutting, harvesting mechanisms that we saw used with the tobaca tractor. These would have to be made locally as even the iron for manufacturing is imported and difficult to pay for.

Dr. Klauss is working on a virus inhibitor which he has isolated from a locally grown plant. He would not identify it because he is hoping to patent it. He thought it would be inexpensive and would not need to be imported. His main justification is no breeder in the country, so the prospect of being able to breed lines with resistance is low. Therefore, he is working on the virus inhibitor which can be sprayed on the plants which are susceptible. He is looking both at tomato and cowpea in this regard. They would be interested in sending their

technician to a cowpea training course. He does speak English thus, it would be possible to send him to Nigeria.

CELOS

CELOS is a research institution under the Ministry of Education. It had stations at Coebiti and Kabo. The agronomist there was Dr. J.F. Wienk. With the loss of funding from the Dutch government, all of the foreign scientists had to be released. CELOS is now essentially nonfunctional and waiting for new monies. However, the Ministry of Education and the National government have prohibited them from looking outside the country for grants. There is no money inside the country. So, the future, at present, of Celos is extremely bleak. They have had some contact with EMBRAPA, particularly with the centers in Belem (CEPATU) and Manaus, regarding silviculture. Physical facilities are new, very nice, and well-equipped. They had several research fields going. However, at present, there is little research being conducted.

Other Notes

I spent some time with the IICA Director, Guillermo Villanueva, who was extremely helpful. In several of his reports, he is pointing out to IICA the problems in Surinam. With their becoming completely independant from Holland, many of the educated people have left the country. About 8 years ago, there were about 20 to 30 scientists in the country and at the present, there are about five. Therefore, research is suffering greatly. It is suggested that IITA send to CELOS the early maturing black eye cowpea which may be mechanically harvested. This cowpea, such as IT 82D-60, could go into their many rice paddy fields after the rice has been harvested. CNPAF could also prepare some of the yard long bean, or meter bean, which has resistance to the viruses. By the time this is ready, in approximately a year and a half, there should be some shaking out and levelling of the process of the Dutch leaving. At such time they will be in a better position to know exactly what they need and how they are going to handle the material, such as the segregating material from the meter bean.

The meter bean has two types of pods, green and white. One person said they export the white and the rest said they export the green, particularly to French Guyana and Holland. Farmers, in general, were very productive. Particularly, people from Java and Indonesia. Therefore, the farming and food production will continue although there will be a great deal of substitution of some of the imported crops by crops that can be produced locally. This indicates that the price of cowpea is going up and that in the future, cowpea will become a higher demand crop. Therefore, viruses will increase. They will be badly in need of material which has better virus resistance.

The final report of Dr. Wienk, section pertaining to soybeans and his research on soybean, groundnut, and cowpea has been included, along with rain figures for the last year as an appendix. Soybean material had been received by CELOS from IITA in Nigeria in the form of 'Jupiter'. Jupiter appeared to be segregating for mixture. Therefore material was selected out of Jupiter and then tested for yield. Many of the selections out-yielded Jupiter or the original population of Jupiter. We have to remember that CELOS was attempting to put soybean and cowpea into the sand savanas more inland where population density is very low and where they were hoping to mechanize soybean for export. With the new change of government they have completely abandoned these hopes. They are now saying that there will be no mechanization and no extension into the interior. In other words, they will be trying to survive. On the cowpea, best material was TVx 3404-012E and VITA 6. However TVx 3404-012E is a taller plant with much better seed quality. It is a slightly larger brown and more erect. It also has a more uniform maturity and therefore, will probably be the one they will be suggesting for seed multiplication in future trials. TVx 1836-013J was also extremely good. However, being tall, it did tend to do a lot of root lodging.

GUYANA

Soybean Production

They have long been considering the possibility of production of soybeans. However the past governments have not seen the need or the possibility to produce soybeans at that latitude. The governments change in January and they now feel that they have the possibility of producing soybeans. They now are being pressed to provide the needed technology. They at present have a plant which used imported soy as baby food and they also have a oil factory which is not yet on-line but which is virtually completed. At present, they're growing between 30 to 38 hectares of soy. However their estimated needs are estimated to be 8000 tons by one person and 12 million pounds from another person. The potential production area would be the Mbina Cattle ranch which has good all-weather roads to that region and electricity. There are problems with drying facilities and seed cleaning. There are projects under process now. One in the Wiruni area which is the savana. This is an area of 400 acres for seed production. They have financing and are hoping to produce about 1 1/2 tons per acre. This would be planted in May using a soybean-maize rotation. The object would be to provide feed supplement for poultry, pig, and cattle. A second project would be a soybean-rice project of 400 to 500 acres near the coast. So far in this region, they have little research on population density, fertilizers, etc. They have problems with storage, seed longevity, stink bugs, and soil erosion and are very interested in looking at low soil fertility screening methods and at present are screening about 20 lines, looking for the best cultivars. However, they would like to improve this methodology for larger screening methods. Present years research

is for four trials, each one containing 16 lines from INTSOY, plus they have about 100 advanced lines in observation trials and these seeds are to planted in June. They would accept material from Brazil to plant jointly with this screening nursery if seeds were available. In later talks with NARI, National Agriculture Research Institute, the Director, Mike Granger, said they already had a production system but lacked high yielding material. The problem of the particular soils is that after two to three crops they have high crusting, loss of organic matter, sub-soil toxicity, particularly aluminium, and very little erosion control. They are starting to look at minimum tillage but lack methodlogy and equipment.

Cowpea Production

Present prices of cowpea in the market, using the parallel market, would run about a dollar a pound or six dollars guyana per pound. A lot of the material is imported, particularly California Blackeye. Quite a bit of red seed is being used and they have recently released 4 cultivars. These lines are Minica 1 (ER-7), Minica 2 (TVx 66-2H brown seeded), Minica 3 (TVx 2907-02D also brown seeded), and Minica 4 (VITA 3). Minica 1 and Minica 4 are having the best success because Minica 1 is white seeded with blackeye, and Minica 4 is red seed which looks similiar to the red Phaseolus bean which is preferred in the country. Cowpea production increased dramatically between 1973 and 1979. When a new government started to control production and pricing cowpeas, they dropped in usage and production.

Production in basically by manual labor. They are looking for materials which can be adapted to large scale mechanized production in the savannahs. Machinery is available there as there is some production of soybean, maize, and rice. However, I feel that the potential for mechanization will be somewhat limited but will probably have a much higher potential as soon as proper cultivars become available. Present production is running about 1,250 ton per year. They estimate though that the potential is 4 to 8 thousand tons per year. Production constraints are high price for production and problems with removal of seed coat, as several of the dishes they produce require removal of seed coat. The sauce of the cooked beans from ER-7 has a thicker sauce than most of the other lines. Last year they reported exporting 2 1/2 tons of cowpea to Cuba where the need is very great.

Reported problems are: Pod rot (corynifora), the Cowpea Severe Mosaic Virus, and adequate architecture for mechanical harvest. Problems with ER-7 are: the seed is somewhat small and they prefer a blacker eye. On the other hand, small farmers produce prostrate plant types. They prefer multiple harvests and would prefer the blackeye or the red. The small farmers have more problems with the Cowpea Severe Mosaic Virus. At present they are using VITA 3 and having good success. Small farmers also grow considerable quantities of the meter bean, which they call Bora; it was also heavily attacked by virus. Desired pod

characteristics are dark green pods, slender, although many different types were encountered in the local markets. They have bi-modal rain fall with plantings in June-July, which is their main season and their secondary planting in November. Also reported were incidences of Cercospora and mildew.

The Ministry of Agriculture is planning to produce up to 50% of the seed needed for planting each year. There are 3 major regions which they call region 6, 4, and 3 for cowpea production. In each region they have a 4 hectare field identified for seed production for legumes, not necessarily only cowpea. Seed production comes in the 4 classes of certified seed which they indicate as Classes 1 - 4. With the last class being done on farmers fields paid for by the government with the price being the market price plus a certain percentage. However as of yet, the farmers have not seen the need to pay higher price for certified seeds.

I feel one of the best contacts there is IICA. They were extremely helpful and suggest that each time we visit the country that they be contacted to help us with protocol and to help us with making up the contacts within the country. They're keenly interested in the cowpea and soybean projects which have been indicated by the numerous bulletins which have been produced over the last few years. They do have an annual training course for cowpea in the country. The next one is scheduled for August of 1985. I have picked up 4 small manuals on seed production and distribution in Guyana, the push pull seeder unit, equipment for the small farmer, the pod stripper, low cost grain storage bin for the small farmer. Also, there were the proceedings of Practical Training Workshop on Cowpea, held in 1981, and the proceedings of a seminar on large scale cultivation of cowpea which was held in 1979. Seed to be sent, if possible, should be through the Guyana Embassy with contact person Hubert Jack, at the Embassy in Brasilia. Brasilia telephone number is 248-5358. It should be sent to the Ministry of Agriculture, either to the head of NARI, Mike Granger, or to the head of Agriculture, Crops, and Livestock officer, Neville McAndrew. The training course is in August to September and they have requested if possible for someone to assist, particularly in the cowpea area because it will be for cowpea. The basic topic will be seed technology training course. They would like help in the area of seed selection. I suggested that Julius would be capable of doing this. They didn't like the idea too well and would like to have an international person to give added emphasis to the importance to the training course. They requested information on the proceedings of the World Cowpea Conference in Nigeria as well as the Integrated Pest Management of Grain Legume held in Brazil. Issues of these proceedings are available. If possible, they would like seed for April-May planting of the yard long bean and would handle up to 50 lines. They would also like to have about 0 lines of blackeye with resistance to Cowpea Severe Mosaic Virus as well the virus indicators even though the materials would not be acceptable seed type for the region. Pigeon pea is also of quite importance. I also gave them the name of Don Byth

in Australia as they are quite interested in mechanically harvested pigion pea.

TRIP REPORT - VENEZUELA

Cowpea

March 07: Because Venezuela has been visited several times in the last couple of years this report will be much shorter. (Please see annual report of the IITA/EMBRAPA program for 1984). Cowpea is grown mostly in the central region. There are possibilities of introducing them into Indian reservations where they would be used to supplement casava during the hunting season. A short duration crop is required because of the rainfall patterns in that particular region. Venezuela grows basically three types, the blackeyes, 'whites', which are small white seed with no eye, and the browns. We saw one trial conducted by the Ministry in collaboration with the university near Cagua which was an irrigation experiment. Plants were 45 days old. The farmers tend to discontinue irrigation at 45 days and allow the plants to mature on residual moisture. The soils near Cagua were quite heavy and therefore water retention was very high. They were testing cutting off water at 35, 42, 49, 56, 63, and 70 days. However it was being conducted in an area where little cowpea is grown on a soil that was totally atypical of the cowpea production region. Therefore the second trial will need to test this methodology in an area where cowpea is grown.

Information was requested on the mechanical harvest experiment that had been conducted at CNPAF. They also would like to receive F5 populations with virus resistance. Seed of 3 varieties was brought back into which they would like to see cowpea virus (CSMV and Poty) resistance incorporated . This material has been planted in the greenhouse along with parents for crossing. Data on bean and cowpea production and importation is included in the appendix. Cowpea trial data from Simon Ortega is also included.

Soybean

Soybean production at present is very limited with approximately 70 hectares of Jupiter now planted. The government and private sector are interested in expansion of soybeans. The field observed near Cagua was clean and well taken care of. They were planning on sowing 1500 hectares in July or August which would be good for visiting in September or October. They have seeds for several experiments from Florida, as well as INTSOY (CIAT) program which were in observation nurseries with lines from EMBRAPA/IITA.

Phaseolus

The bean program was basically material of the international bean nursery from CIAT and looking mostly at the blacks. The blacks are the most preferred dry bean. Black beans are called 'caraotas negras' and the term frijole is reserved for cowpea. Cowpeas are grown throughout the country while beans are delegated to the mountainous areas primarily near the border with Colombia. They would be interested in receiving seed of beans from CNPAF if we have anything is particular we would like to send them.

USA

During a weekend stopover in the United States I talked with Dr. Wayne Adams about his AID bean drought resistance program. He suggested that there would be interest in expanding his AID project to Brazil for drought resistance in Phaseolus in anybody has interest in writing up a proposal or a request. He would also be very interested in having some of his material tested on a central line source sprinkler and the material I have seen of his looks like it could be promising; it would be worth taking a look at.

Joint Project of the Agricultural University Wageningen (Netherlands)
and the University of Suriname
Project No. LH/UvS 02

The Permanent Cultivation of Rainfed Annual Crops on the Loamy Soils of the Zanderij Formation

ANNUAL REPORT

January - December 1982

University of Suriname

celos

CENTRE FOR AGRICULTURAL RESEARCH
1983

Table 4. Numbers of Oribatid mite types (species level) in primary forest and cultivated fields. December 1981–January 1982. Sampling depth 0-20 cm. Kabo, Suriname.

	No. of Oribatids per sample	No. of types	Unique types	Shared types
			%	
Primary forest	26.5	54	85	15
Soybean & cassava				
cleared manually	7.7	14	14	86
cleared mechanically	36.6	21	29	71
Soybean^{a,b,c}	26.6	16	31	69
Cassava^{a,b,c}	16.7	17	18	82
Maize^{b,c}	57.6	15	13	87
Soybean^{b,d}	2.4	4	0	100
Total	25.2	70	77	23

[a] Cleared manually.

[b] Cleared mechanically.

[c] Monocropping, manual field operations.

[d] Rotation with maize; mechanized field operations.

3.2. CROPS

3.2.1. Food crops

The food crops research during the year under review was restricted to sorghum, soybean, groundnut and cowpea. The planting date experiments with groundnut and sorghum were continued as was the progeny testing of soybean cv. Jupiter selections. An earlier cowpea variety trial was repeated.

Sorghum; date-of-planting effects

In 1981 a date-of-planting experiment had been started with sorghum cv. IS 2745 (see Annual Report for 1981). By the end of that year sorghum had been planted six times. A seventh planting was made on January 14. Plantings no. 5 and 6, which were made in 1981, were harvested this year. The sorghum planted on October 26, 1981 (no. 5) yielded 935 kg/ha only. A low plant population and unfavourable, wet weather during ripening are the main explanations for this poor result. The crop was heavily infected with *Curvularia* and *Colletotrichum* and the panicles became severely moulded. The same phenomena were observed in the sorghum planted December 15, 1981 (no. 6) and January 14 (no. 7) but yields now were zero. Following these results the experiment was suspended.

Parts of the problems encountered can be attributed to the cultivar's susceptibility to *Colletotrichum* and *Curvularia*. Heavy infection after anthesis causes the leaf area to decline rapidly, thus negatively affecting grainfilling. The individual grains are small and few grains are formed per panicle. The plants seem more susceptible after anthesis and infection is enhanced by rainy weather. The panicles and the grains of diseased plants become readily infected too. When such grain is used for planting the young seedlings appear to be infected and many die soon after emergence. This explains the low plant population in this experiment. In spite of seed treatment many seedlings died. Prolonged rainy weather during ripening promotes the development of grain moulds which can cause complete panicles to deteriorate. Part of these problems may be overcome with resistant cultivars but reliably dry weather during the ripening stage remains essential for successful sorghum production. With the present cultivar there is little point in continuing the experiment. - *JFW*

Soybean; Jupiter selection

In 1979 a number of indeterminate plants were observed in a soybean field with Jupiter (introduction no. 77018) received from IITA, Nigeria. The plants differed from the average Jupiter plants in terms of height, internode length, leaf shape, and yield. Ten selections were made, based on plant height and seed production per plant. The progenies were tested during the short rainy season 1980-'81 and during the late long rainy season 1981. The plants per selection appeared to be uniform in all respects and were taller and more productive than the Jupiter population from which they had been selected (see Annual Report for 1981).

Table 5. Soybean. Performance of the first three progenies[a] of 10 Jupiter selections compared with the original population.

	Plant height					Seed yield			
Line	m[b]	1[c]	2[c]	3[c]	mean	1	2	3	mean
	cm					kg/ha			
77018-2	110	84	93	117	98	-	1650	2670	2160
77018-12	95	80	85	115	93	3700	1590	2600	2630
77018-21	110	84	93	117	98	2450	1610	2730	2260
77018-25	84	77	87	111	92	2000	1760	3440	2400
77018-28	92	73	80	98	84	2300	1310	2620	2070
77018-37	71	56	63	89	69	1660	790	2070	1500
77018-49	72	66	87	102	85	2080	1770	2760	2200
77018-57	102	82	94	117	98	2200	1320	2650	2050
77018-61	84	71	77	112	87	1880	1210	2860	1980
77018-64	75	56	64	76	65	1570	1310	2100	1660
Jupiter (unselected)	-	-	63	61	62	1390	1230	1870	1500

[a] Planted in the short rainy season 1980-'81, the long rainy season 1981 and the short rainy season 1981-'82 respectively.

[b] m = mother plant.

[c] 1 = 1st progeny, etc.

During the short rainy season 1981-'82 the 10 lines were planted for the third and last time, using seed from the second generation. Compared with the Jupiter population the selections were again taller and their yields higher (Table 5). The generally good yield level of this third generation is attributed to an adequate soil moisture supply this growing season.

The relative differences in plant height between the lines were maintained throughout the three successive generations, indicating that these differences are genotypic. Plant height and seed yield were positively correlated in all three generations - r = 0.70, 0.71 and 0.72 for the first, second and third generation respectively. The selection of taller plants may result in higher yields but further evaluation is required to see whether this is not offset by increased lodging. - *WEF*

Soybean; plant density

Emergence in soybean depends very much on the soil moisture regime immediately after planting. Good germination and quick emergence require a well moistened soil but when the soil is too wet germination fails and a poor stand results. As weather conditions vary from day to day, there often is a poor relation between ultimate plant population and sowing density.

The effect of plant distance in the row on crop performance was studied in an experiment with three soybean cultivars differing in plant height. Row distance was maintained at 50 cm. The trial was first planted in the short rainy season 1981-'82 and repeated in the late long rainy season this year. Days to flowering and to harvesting appeared not be affected by plant distance (Table 6).

Table 6. Soybean. Effect of plant distance in the row on the performance of a low, an intermediate and a relatively tall cultivar. Averages of two experiments, planted in the short rainy season 1981-'82 and the late long rainy season 1982.

Cultivar	Plant distance	Seed yield	Plant height	Height of lowest pod	Pods per plant	Flowering	Harvesting
	cm	kg/ha	----- cm	-----		---- DAP	-----
Davis	10	2360	21.4	5.4	30	27	89
	15	1960	20.4	4.9	40	27	89
	20	1700	19.4	5.2	46	27	89
Jupiter	10	1910	55.0	14.1	36	38	98
	15	1780	51.5	12.1	53	38	98
	20	1910	51.9	11.1	60	38	98
Vada	10	1220	112.1	26.5	42	49	99
	15	1100	107.0	23.9	60	49	99
	20	1340	96.2	22.9	85	49	102

Within the range tested, plant distance in the row did not affect yield significantly, except for the very short cultivar Davis where seed yield decreased with increasing plant distance. Plant height slightly decreased with increasing plant distance as did the height of the lowest pod except for Davis. As expected, the number of pods increased with increasing plant distance. As distance decreased more pods were shed or were affected by rot. The results suggest that the cultivars Jupiter and Vada are sufficiently flexible and that, within certain ranges, a reduced plant population is compensated for by a higher production per plant. - *WEF*

Groundnut; date-of-planting effects

The date-of-planting experiment with groundnut cv. Matjan which was started in 1980 and continued through 1981, was completed this year with plantings on January 14, May 25 and July 14, representing the short rainy season, the long rainy season and the late long rainy season respectively. The long rainy season, which is not considered suitable for groundnut, was included in order to see whether groundnut will at all grow and produce during this period of the year not taking harvesting problems into account. The routine use of chlorothalonil against leaf spot disease and rust was expected also to control possible other fungal diseases which have affected long rainy season plantings made previously. No further plantings were made after July and the experiment was discontinued.

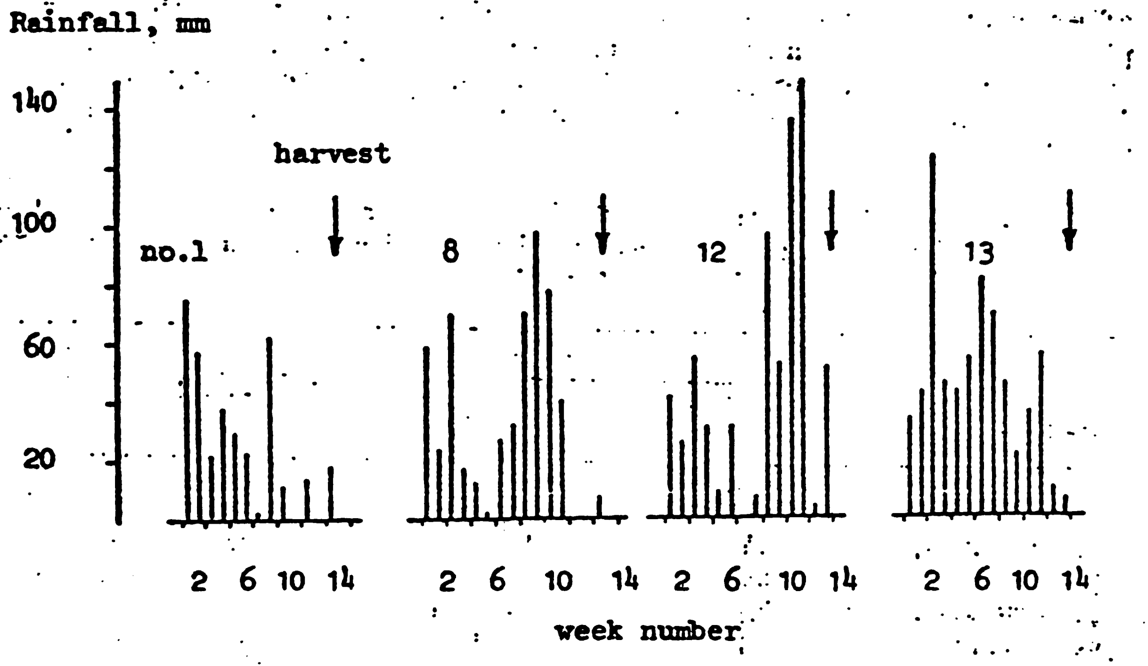
Table 7. Groundnut cv. Matjan. Date-of-planting effects.

No.	Growing season[a]	Planting date	Days till maturity	Pod yield	Pods per plant	1000-seed weight
			DAP	kg/ha		g
1.	LLRS	11 July'80	90	3680	not available	
2.	LLRS	29 July'80	114	3323	17.0	599
3.	LLRS	14 Aug.'80	106	2843	17.8	595
4.	LDS	02 Sept'80	127	774	4.4	741
5.	SRS	29 Oct.'80	90	2019	10.9	643
6.	SRS	14 Nov.'80	90	2448	9.5	602
7.	SRS	05 Dec.'80	90	3324	11.3	648
8.	SRS	18 Dec.'80	103	3596	12.9	704
9.	SRS	08 Jan.'81	90	2336	12.1	517
10.	SRS	26 Oct.'81	93	2811	15.5	546
11.	SRS	15 Dec.'81	91	2817	13.1	684
12.	SRS	14 Jan.'82	98	3676	18.4	730
13.	LRS	25 May '82	100	4250	26.4	632
14.	LLRS	14 July'82	112	1635	10.4	592

[a] LRS = Long Rainy Season
LLRS = Late Long Rainy Season
LDS = Long Dry Season
SRS = Short Rainy Season

From July 1980 to July 1982 groundnut was planted fourteen times. Contrary to expectation the highest yield was recorded for the long rainy season crop, planted in May this year (Table 7). No disease problems occurred and the foliage remained green until harvesting. The relatively high production level is attributed to the absence of drought and leaf diseases. The yield of this year's late long rainy season crop was the lowest but one. An early and fairly abrupt onset of the dry season may explain this poor result. During the first five weeks after planting rainfall was abundant - 226 mm were recorded in this 35-day period. Rainfall then decreased abruptly with only 38 mm recorded during the following five weeks. The relatively wet first five weeks may have resulted in a shallow rooting so that the crop became sensitive to drought. The number of pods per plant and the 1000-seed weight were low (Table 7).

The results for the fourteen plantings (Table 7) show an unmistakable seasonal effect, most of which is likely to be caused by the soil moisture regime. The highest yield was obtained when the groundnut was grown during the long rainy season (no. 13) but high yields (nos. 1, 8 and 12) were also obtained with a less even rainfall distribution (see Fig. 1).



Planting date	11.07.80	18.12.80	14.01.82	25.05.82	
Rainfall	339.5	539.0	691.0	668.3	mm
Yield	3680	3596	3676	4250	kg/ha

Fig. 1. Groundnut. Date-of-planting experiment. Weekly rainfall distribution for 4 different plantings.

Attempts to correlate pod yield with rainfall had no success. No improvement was obtained when different physiological stages were distinguished. On the other hand there appeared some correlation between pod yield and number of pods per plant ($r^2 = 0.684$). A better correlation was found with $\sqrt{\text{pods/plant} \times \text{1000-seed weight}}$ ($r^2 = 0.787$). There was no correlation between pod yield and 1000-seed weight.

The result of this experiment indicate that groundnut yields are affected by the rainfall distribution but that crop failures because of drought are rare. When grown during the late long rainy season the crop is to be planted timely to reduce the risk of drought later in that season. The results suggest that when the short rainy season is used the groundnut should not be planted too early - late planting is conducive to higher yields but the risk of unfavourable harvesting weather increases. The long rainy season is not unsuitable per sé but requires late maturing cultivars to bridge this season so as to avoid harvesting problems. - *JFW*

Cowpea

In the short rainy season 1980-'81 a comparative yield experiment was conducted with IITA cowpea lines. Heavy infestation by leafhoppers soon after emergence caused many plants to die. The growth of the surviving plants was stunted and no reliable production data could be collected. The experiment was repeated at Kabo during the short rainy season 1981-'82 using seed that had been harvested from the plants that survived in the first trial.

Table 8. Cowpea. Performance of nine cultivars introduced from IITA, Nigeria and the local cultivar African Red in the short rainy seasons 1980-'81 and 1981-'82.

	1981-'82			1980-'81
Cultivar	50 percent flowering	Seed yield[1]	1000-seed weight[1]	Seed yield[1]
	DAP	kg/ha	g	kg/ha
TVx 3404-012E	41	1521 a[2]	109	1208
Vita-6	44	1485 ab	108	1281
TVx 1836-013J	42	1444 ab	175	793
TVx 309-1G	45	1441 ab	99	951
TVx 2724-01F	44	1370 ab	117	902
TVx 3072-01E	43	1334 b	128	971
TVx 2394-02F	41	1327 b	94	1005
4R-0267-1F	44	1153 c	75	716
TVx 3428-03E	43	1003 c	94	370
African Red	45	1436 ab	76	584

[1] 12 percent moisture.

[2] Data followed by the same letter do not differ statistically ($P = 0.05$).

Vegetative growth was good because of a favourable rainfall distribution during the growing season. Pests nor diseases of any importance were observed. The number of days to first flower varied between 41 and 45. The first seeds were harvested 71 DAP when most pods were ripe. Twelve days later the remainder was collected. Seed yields (Table 8) were good but generally yield differences were small except for two entries. TVx 3404-012E produced the highest yield. Its pods were relatively large and well filled, and plant type was attractive for mechanical harvesting. Unfortunately, its seeds are considered small. As for seed size, TVx 1836-013J is the best cultivar but some tendency towards lodging was observed. TVx 309-1G lodged heavily and will not further be considered.

When the results of the two experiments are compared there appears some agreement as to the order of production level. In spite of the heavy leafhopper infestation during the short rainy season 1980-'81, both TVx 3404-012E and Vita-6 produced a reasonable yield. The much lower yield for TVx 1836-013J in the first experiment suggests susceptibility to leafhopper damage. - *JFW*

3.2.2. Crops for mulch production

Gliricidia sepium

The *Gliricidia* plants that have been under observation since 1978 were cut back again in April this year, just over one year after the previous cut. The plants now have been cut back six times. Like in 1981 the cut material was not returned to the plants, attempting to impoverish the soil and study its effect on growth and on nutrient content of the regrowth.

Table 9. *Gliricidia sepium.* Dry weights and nitrogen yields for the cuts 2 to 6.

No. of cut	Date of cutting	Days since previous cut	Dry weight	Nitrogen yield	
			tons/ha	kg/ha	kg/ton d.w.
2	27 Jul.'79	219	3.6	68	18.9
3	22 Feb.'80	210	3.8	69	18.2
4	24 Sep.'80	215	12.0	226	18.8
5	21 Mar.'81	181	8.6	166	19.3
6	07 Apr.'82	379	21.4	298	13.9

The amount of dry weight accumulated since cut no. 5, i.e., over a period of 379 days, is about the same as the amount produced by cuts no. 4 and 5 over a period of 396 days (Table 9). The amounts of nutrients removed with the 6th cut were higher for phosphorus and potassium but lower for calcium, magnesium and nitrogen (Tables 9 and 10).

4. RAINFALL DATA

Table 38. Monthly rainfall during 1982 for Kabo and Coebiti Experimental Farms.

Month	Kabo	Coebiti
January	175.9	180.7
February	181.7	126.5
March	262.3	240.9
April	372.2	387.5
May	320.6	373.4
June	254.4	256.7
July	280.0	270.0
August	126.1	109.3
September	75.6	60.0
October	30.4	92.3
November	86.9	68.5
December	134.3	180.2
Total	2300.4	2346.0

MINICA I - a new brown eye cowpea (Vigna unguiculata

1. Minica I was introduced from IITA, Nigeria as entry (ER 7) in the 1977 International Cowpea uniform trials. It was selected after a consistently good performance over four (4) seasons at the Kaduni Agricultural Research Station.[1]

2. Morphology - Leave are pinnately trifoliate, dark green in colour and have a characteristic upwardly cupped display. They have an overall ovate shape with truncate base and acuminate tips. The petiole, petiolule and stem are green whilst the base of the branches is purple. There are usually 3-4 basel branches arising from the main stem.

Fifty percent flowering occurs at 30-35 days after planting at which time the plant is usually 35-45 cm. in height. The standard and keel of the flowers are light cream, whilst the wing is purple. Peduncles are green with splashes of purple.

The pods, which are green when immature and straw coloured at the mature stage, are borne above the foliage at an acute angle to the horizontal when mature. Pods are slightly curved with length of 15-20 cm and width of 8-10 mm. There are 12-16 seeds per pod. The maturity period is 55-60 days as opposed to 65-75 days for the traditional blackeye variety California No. 5.

---

[1] This station is situated at °N Lat. and °W Long ., some 50 m above sea level and has an annual rainfall of 1000 mm which is bimodal in pattern - a long rainy season from May to August and a short one from mid-November to mid-January, and is predominantly Brown Sands - Series 810.

3. <u>Habit</u> - Minica I is determinate in growth habit but it has a tendency to be slight viney in the long wet season and in instances of sunstained high soil-moisture level. The vines, however, usually die back at maturity when the plant goes into a phase of self-defoliation - a feature which makes it extremely suitable for mechanical harvesting without the use of chemical defoliants.

4. Pest and Disease reaction - The variety shows a reasonable level of field tolerance to the pod rot disease caused by <u>Choanephora infundibulifera</u> and seems to escape many of the late occuring pests and diseases e.g. Cercospora leaf spot because of its short life cycle.

5. <u>Seed</u> - Seeds have a cream white testa with a brown speckled hilum (eye). They are oval in shape and 100 weigh 10g. at 12% moisture (i.e. about half the size of California No. 5).

6. <u>Yield</u> - Minica I has given an average yield of 1,400 kg/ha. dry seed. If conditions are good, yields can be as high as 2,000 kg/ha. or as low as 800 kg/ha. under poor conditions. California No. 5 in comparative trials yielded within the range of 600-1,100 kg/ha.

7. Uses - This brown-eye cowpea can be utilised in the same way as the more common black-eye types (california No. 5, Increase peas). The main advantages lie it its high yield potential, short life cycle and determinate, self-defoliating characteristics.

MINICA II

1. Minica II was first tested in Guyana in 1977 as entry TVK 66-2H in the International Cowpea uniform trials from Nigeria. It was selected after consistently high performance over four (4) seasons at the Kairuni Agricultural Research Station.[1]

2. Morphology - Leaves are pinnately trifoliate and dull green in colour. They have an overall lanceolate shape with hastate base and acuminate tips. The petiole, petiolule and stem are all green but the branches are purple at the base. There are usually 3-4 branches arising from the main stem.

Fifty percent flowering usually occurs at 46-48 days after planting (DAP) at which time the plant is 35-50 cm in height. The inner surface of the flower standard is light purple and the outer surface cream. The wing is an intermediate purple and the keel is light cream. Peduncles are green.

The pods, which are green when immature and brown when mature, are borne above the foliage at an acute angle to the horizontal when mature. They are slightly curved, 16-20cm. in length and 8-10 mm wide. There are 12-16 seeds per pod. The maturity period is 70-80 DAP, about one week more than the traditionally grown variety California #5 blackeye.

3. **Habit** - Minica II is basically indeterminate in growth habit. It tends to vine but is much less viney than the local 'increase peas'. The basal branches usually produce new flushes soon after the first set of pods mature especially under wet conditions and it is possible to get a 'second crop' from this variety. Green foliage usually persists after harvest but under extremely dry conditions at maturity some self-defoliation and leaf senescence occurs and the tendency to produce a second flush is markedly reduced.

4. **Pest and Disease Reaction** - Minica II shows a considerable amount of field resistance to the pod rot disease caused by Choanephora infundibulifera as well as to Cercospora leaf spot.

5. **Seed**- Seeds are tan coloured and rhomboid in shape. The weight of 100 seeds is 10-12g. at 10.0% moisture, i.e about half the size of California #5 blackeye.

6. **Yield** - Minica II gives an average of 1,500 kg/ha. ranging from 800 - 2,500 kg/ha. depending on conditions. In comparable trials, California #5 yielded in the range of 600 - 1,100 kg/ha.

---

[1] This station is situated at °N Lat. and °W Long., some m above sea level and has an annual rainfall of mm which is bimodal in pattern - a long rainy season from May to August and a short one from mid-November to mid-January, and is predominantly Brown Sands - Series 810.

7. <u>Uses</u> - This cowpea can be utilised in the same way as the more common "blackeye peas" (California #5 and Increase peas). This variety has the advantage of a high yield potential.

MINICA III

1. Minica III was first tested in Guyana in 1977 as entry TVX 2907-020 in the International Cowpea uniform trials from Nigeria and was selected after consistently high performance over (4) seasons at Kairuni Agricultural Research Station.[1]

2. <u>Morphology</u> - Leaves are pinnately trifoliate and dull green in colour. They have an overall ovate shape with truncate base and acuminate tips. The petiole, petiolule and stem are all green with splashes of purple and the bases of both the petiole and the branches are purple. There are usually 3-4 branches arising from the main stem.

Fifty percent flowering usually occurs at 41-43 days after planting (DAP) when the plants are 35-40cm. in height. The inner surface of the flower standard is light purple and the outar surface is cream. The wing is intermediate purple and the Keel is light cream. Peduncles are green with splashes of purple.

The pods which are dark green when immature and straw brown when mature, are borne within the upper 1/3 of the plant at an acute angle to the horizontal when mature. They are slightly curve, 6-22 cm. in length and 8-12 mm. wide. There are 12-16 seeds per pod. The maturity period is 65-75 DAP about the same time as the traditionally grown California #5 (blackeye).

3. Habit - Minica III is basically indeterminate in growth habit. It will produce vines but much less so than the local "increase peas" The plants usually enter into a second phase of flowering as soon as the first of pods mature especially under wet conditions and it is possible to get a 'second crop' from this variety. Green foliage persist at harvest and under extremely dry conditions at maturity some self defoliation and leaf senescene occurs and the tendency to produce a second set of flowers is markedly reduced.

---

[1] This station is situated at °N Lat. and °W long., some m above sea level and has an annual rainfall of mm which is bimodal in pattern - a long rainy season from May to August and a short one from mid-November to mid-January, and is predominantly Brown Sands - Series 810.

4. Pest and Disease Reaction - - Minica III is susceptible to leaf minor attacks but [illegible] considerable field tolerance to the pod rot disease [illegible] by *Choanephora infundibulifera* as well as to *Cercospora* leaf spot.

5. Seed - Seeds are light brown in colour and ovoid in shape. The weight of 100 seeds is 13-15g. at 12.0% moisture i.e., a little more than ½ the size of California #5 blackeye.

6. Yield - Minica III gives an average of 1,600 kg/ha. ranging from 950 - 2,500 kg/ha. depending on conditions. In comparable trials, California #5 blackeye yielded in the range of 600 - 1, 100 kg/ha.

7. Uses - This cowpea can be utilised in the same way as the more common "blackeye peas" (California #5 and Increase peas). This variety has the advantage of a high yield potential.

MINICA IV (VITA 3)

1. Minica IV was released as Vita 3 in July 1975, by the International Institute of Tropical Agriculture, IITA) Nigeria. It was first tested in Guyana in 1977, in the International Cowpea uniform trials from IITA.

2. Morphology - Leaves are pinnately trifoliate and dull green in colour. They have an overall ovate shape with truncate base and acuminate tips. The petiole, petiolule, petiole base and stem are all green and the branches are purple at the base. There are usually 3-4 branches arising from the main stem. Fifty percent flowering usually occurs at 46-48 days after planting (DAP). The inner surface of the lower standard is light purple and the outer surface is cream. The wing is light purple and the keel is light cream. Peduncle are green with splashes of purple.

The pods which are green when immature and brown when mature are borne above the foliage at an acute angle to the horizontal when mature. They are slightly curved 20-24 cm. in length and 10-15 mm wide. There are 14-16 seeds per pod. The maturity periods is 70-80 DAP, about one week more than the traditionally grown California #5 blackeye.

3. Habit - Minica IV is indeterminate. It vines just as much as the local Increase peas (blackeye) under similar conditions. The basal branches (vines) produce flowers and pods continuously. Multiple harvests are, therefore, necessary. Green foliage is maintained but some leaf fall can occur under excessively dry conditions.

4. Pests and Disease Reaction - Minica IV shows considerable field resistance to the pod rot disease caused by Choanephora infundibultifera as well as to Cercospora leaf spot.

5. Seed - Seeds are kidney-shaped and dusty red in colour. The weight of 100 seeds is 18-20 g. at 12% moisture, i.e., about the same size as California #5 blackeye.

6. Yield - Minica IV gives an average yield of 1,600kg/ha. ranging from 900 - 2,000 kg/ha. depending on conditions. In comparable trials California #5 yields 600 - 1,100 kg/ha. and the local 'Increase peas' yielded 900 -1,500 kg/ha.

7. Uses - This cowpea can be utilised in the same way as the more common "blackeye peas". It produce a pleasing aroma and colour to preparations in which it is used. It has a high yielded potential and is especially suited to small farmer who practise multiple cropping with cassava - Manihot esculenta Crantz and perennials.

CUADRO No. 3-3

CARAOTAS NEGRAS.- SUPERFICIE, PRODUCCION, RENDIMIENTO, IMPORTACION Y VALOR DE LA IMPORTACION - 1962-80

Año	Superficie HA	Producción TM	Rendimiento KG/HA	IMPORTACION	
				TM	miles de Bs
1962	47.361	23.030	486	12.158	9.073
1963	54.802	24.010	438	15.788	13.829
1964	64.103	25.052	391	18.915	18.270
1965	65.220	26.130	401	16.406	15.400
1966	69.274	29.788	430	20.042	20.648
1967	72.004	31.754	441	24.252	23.232
1968	79.950	26.328	329	24.656	24.754
1969	83.449	25.098	301	21.071	20.392
1970	70.877	23.804	336	22.062	23.022
1971	75.546	27.253	361	18.504	20.763
1972	64.427	21.397	332	25.867	30.237
1973	42.892	14.728	343	4.201	6.066
1974	63.064	23.646	377	6.892	19.549
1975	63.738	25.038	393	14.949	36.696
1976	51.046	20.967	411	9.394	17.366
1977	48.030	20.172	420	40.046	72.485
1978	52.519	22.958	437	25.603	47.632
1979	49.751	21.644	435	35.327	72.570
1980	50.013	22.714	454	30.000	65.238

Nota: Superficie, producción y rendimiento, 1962-63, B.A.P.; 1964-80, M.A.C.
La superficie se refiere a hectáreas cosechadas.
Importación y su valor, M.F. y D.C.E.I.
La importación se refiere a peso bruto; 1962-72 incluye frijoles y caraotas.
Las licencias efectivas de los años 1964-65 permiten apreciar que aproximadamente el 80% de las importaciones corresponden a caraotas negras.

Fuente: Ministerio de Agricultura y Cría; Ministerio de Fomento; Oficina Central de Estadística e Informática.

CUADRO No. 3-4

CARAOTAS NEGRAS.- SUPERFICIE, PRODUCCION, RENDIMIENTO Y CONSUM EN FINCA SEGUN ENTIDAD FEDERAL - 1980

Entidad Federal	SUPERFICIE HA		Producción TM	Rendimiento KG/HA	Consumo en finca (en cientos de KG 1/
	Sembrada	Cosechada			
T O T A L:	52.819	50.013	22.714	454	59.738
Dto.Federal	62	40	17	425	191
Anzoátegui	1.939	1.912	759	397	2.073
Apure	37	21	17	810	878
Aragua	3.263	3.256	1.538	463	6.476
Barinas	2.079	1.342	541	403	1.720
Bolívar	446	446	328	735	60
Carabobo	7.898	7.893	4.370	554	7.975
Cojedes	529	529	161	304	3.136
Falcón	730	677	230	340	5.526
Guárico	4.715	4.405	3.138	712	6.452
Lara	3.963	6.982	2.055	229	8.673
Mérida	1.276	1.276	706	553	167
Miranda	3.326	3.038	1.504	495	2.539
Monagas	623	568	239	406	1.123
Portuguesa	837	801	345	431	1.177
Sucre	4.936	4.549	2.263	497	5.084
Táchira	1.688	1.658	1.124	666	1.535
Trujillo	4.812	4.152	1.587	382	3.895
Yaracuy	4.531	4.329	1.745	403	896
Zulia	7	7	4	571	60
T.F. Delta Amacuro	102	82	73	890	72

1/ Utilizado por el productor para el consumo familiar y como semilla.

Fuente: Ministerio de Agricultura y Cría.

CUADRO No. 3-5 Cowpea

FRIJOL.- SUPERFICIE, PRODUCCION, RENDIMIENTO, IMPORTACION Y VALOR DE LA IMPORTACION - 1962-80

Año	Superficie HA	Producción TM	Rendimiento KG/HA	IMPORTACION TM	IMPORTACION miles de Bs
1962	21.017	12.428	591	12.158	9.073
1963	25.986	14.143	544	15.788	13.829
1964	23.060	11.475	498	18.915	16.270
1965	22.463	11.004	489	16.406	15.400
1966	21.920	10.553	481	20.042	20.648
1967	21.372	10.121	474	24.252	23.232
1968	20.837	10.480	503	24.656	24.754
1969	20.316	9.308	458	21.071	20.392
1970	19.808	8.926	451	22.062	23.022
1971	20.202	8.333	398	18.504	20.763
1972	18.805	8.171	435	25.867	30.237
1973	23.720	10.411	439	3.297	5.054
1974	17.609	9.248	525	10.147	27.346
1975	25.541	12.031	471	985	1.879
1976	21.613	12.562	582	980	1.683
1977	13.463	8.204	609	8.800	18.822
1978	17.187	10.951	637	4.643	9.904
1979	16.118	9.153	568	3.537	7.782
1980	15.857	10.571	667	3.916	9.639

Nota: Superficie, producción y rendimiento 1962-63, B.A.P.; 1964-80, M.A.C.-

La superficie se refiere a hectáreas cosechadas.

Importación y su valor M.F. y O.C.E.I.

La importación se refiere a peso bruto. 1962-72 incluye frijoles y caraotas.

Las licencias efectivas de los años 1964-65 permiten apreciar que aproximadamente el 20% de las importaciones corresponden a frijoles.

Fuente: Ministerio de Agricultura y Cría; Ministerio de Fomento; Oficina Central de Estadística e Informática.

CUADRO No. 3-6 Cmpea

FRIJOL.- SUPERFICIE, PRODUCCION, RENDIMIENTO Y CONSUMO EN FINCA SEGUN ENTIDAD FEDERAL - 1980

Entidad Federal	SUPERFICIE HA		Producción TM	Rendimiento KG/HA	Consumo en finca, (en cientos de KG) 1/
	Sembrada	Cosechada			
T O T A L:	18.207	15.857	10.571	667	26.796
Anzoátegui	1.874	1.621	836	516	1.946
Apure	6.145	5.154	4.245	824	14.810
Aragua	302	289	141	488	-
Barinas	446	446	425	953	470
Bolívar	1.344	1.313	970	739	2.554
Carabobo	3.938	3.837	2.310	602	1.207
Cojedes	322	195	76	390	120
Guárico	2.238	1.761	1.089	618	3.756
Lara	8	8	4	500	-
Mérida	96	96	27	281	66
Miranda	30	24	12	500	108
Monagas	791	699	234	335	1.156
Sucre	177	142	79	556	285
Trujillo	29	29	11	379	3
Yaracuy	219	-	-	-	-
Zulia	236	236	106	449	225
T.F. Delta Amacuro	12	7	6	857	-

1/ Utilizado por el productor para el consumo familiar y como semilla.

Fuente: Ministerio de Agricultura y Cría.

INFORME ANUAL 1984

Ing.Agr. Simón Ortega Y.

PROYECTO: Obtención de variedades de frijol aptas para la cosecha mecanizada.

INTRODUCCION: El cultivo del frijol adquiere cada año mayor importancia debido a la baja producción de caraota y al hecho mismo de ofrecer una alternativa viable para la sustitución parcial de la caraota en la dieta diaria del venezolano.

Después de la caraota es la leguminosa de grano de mayor consumo e importancia económica y es por eso que se mantiene el interés de producir nuevas variedades con miras al aumento de la producción y productividad.

Los tipos de frijol criollo adolecen de varias fallas entre las cuales las mas importantes son: maduración desuniforme, excesiva producción de follaje, ciclo vegetativo largo y baja capacidad de rendimiento.

El objetivo fundamental de este proyecto es obtener líneas de frijol blanco y bayo con hábito de crecimiento erecto, de poco follaje, de maduración uniforme y altamente precoces. Esto es posible mediante el cruzamiento entre frijoles criollos y variedades de color negro, cenizo y rojo portadoras de los genes que controlan las características antes señaladas.

Actualmente le estamos dando mayor énfasis a la obtención de líneas - de grano de color blanco que son muy apreciadas en el mercado, motivo por el cual orientamos la selección en ese sentido.

Estas líneas seleccionadas deben tener suficiente rusticidad para adaptarse a los suelos ácidos de sabanas, de baja fertilidad y poca precipitación, los cuales abundan en el país y donde el cultivo del frijol debe constituir una buena alternativa de producción.

ACTIVIDADES REALIZADAS

Se programaron 2 actividades una de riego y la otra bajo condiciones de secano, para terminar con la selección de un grupo de líneas de color blanco, dentro del material segregante producto de los cruzamientos realizados en 1981. También se programó una tercera actividad correspondiente a nuevos cruzamientos. Además fueron sembrados 5 ensayos Internacionales recibidos del IITA.

Actividad: 13-1002-0008. "Estudio y selección de progenies F_6 de frijol, bajo condiciones de riego".

Esta actividad fue efectuada en el campo experimental de Sta. Cruz, iniciada en el mes de Enero, bajo riego. La misma tuvo como objetivo fundamental observar la segregación de las poblaciones híbridas con miras a practicar selecciones individuales en la próxima generación.

Los materiales segregantes estudiados en esta actividad aparecen detallados en el cuadro 1.

CUADRO 1. Poblaciones segregantes (F_6) de frijol sembradas en Sta. Cruz en Enero de 1984.

PROGENITORES	GENEALOGIA	KG/HA.	COLOR SEMILLA
I-204 x I-54	1001-M-M-Bo-M-M	1.228	Blanco
I-204 x I-272	1002-3PM-M-Bo-M-M	781	"
I-204 x I-278	1003-M-M-Bo-M-M	442	"
I-204 x I-280	1004-2PM-M-Bo-M-M	1.011	"
I-204 x I-285	1005-3PM-M-Bo-M-M	1.474	"
I-204 x TUY	1006-M-M-Bo-M-M	1.846	"
I-204 x VAINA LARGA	1007-1-M-Bo-M-M	247	"
I-204 x BLACKEYE	1008-1-M-Bo-M-M	991	"
I-225 x I-54	1009-2PM-M-Bo-M-M	891	"
I-225 x I-272	1010-2PM-M-Bo-M-M	1.510	"
I-225 x I-278	1011-8PM-M-Bo-M-M	1.266	"
I-225 x I-280	1012-5PM-M-Bo-M-M	966	"
I-225 x I-285	1013-3PM-M-Bo-M-M	1.225	"
I-225 x TUY	1015-3PM-M-Bo-M-M	1.638	"

En relación a las pruebas de rendimiento con líneas mejoradas recibidas del IITA, podemos concluir que unicamente la línea IT 82E-18 que presenta grano de color bayo fue capaz de superar a la variedad comercial "Tuy". Este comportamiento deberá ser ratificado en nuevos ensayos de rendimiento.

Existen un grupo de materiales introducidos del IITA como son: IT 82E-885 e IT 82D-752 que son de color rojo y por tal motivo no tienen valor comercial; sin embargo, serán utilizados como progenitores para transmitir a los frijoles criollos características de importancia económica como es la maduración uniforme, el porte erecto y altura de carga, característica de gran importancia para la cosecha mecanizada.

PROGENITORES	GENEALOGIA	KG/HA.	COLOR SEMILLA
I-225 x PI-354586	1014-6PM-M-Bo-M-M	1.146	Blanco
I-226 x I-280	1016-8PM-M-Bo-M-M	2.224	"
I-226 x I-285	1017-5PM-M-Bo-M-M	1.312	"
I-226 x PI-354586	1018-4PM-M-Bo-M-M	411	"
I-241 x PI-354586	1023-2PM-M-Bo-M-M	532	"
I-204 x I-272	1002-3PM-M-Ba-M-M	1.344	Bayo
I-204 x I-285	1005-3PM-M-Ba-M-M	850	"
I-204 x TUY	1006-M-M-Ba-M-M	700	"
I-225 x I-54	1009-2PM-M-Ba-M-M	1.558	"
I-225 x I-278	1011-8PM-M-Ba-M-M	987	"
I-225 x I-280	1012-5PM-M-Ba-M-M	856	"
I-225 x I-285	1013-3PM-M-Ba-M-M	772	"
I-225 x PI-354586	1014-3PM-M-Ba-M-M	543	"
I-225 x TUY	1015-3PM-M-Ba-M-M	423	"
I-226 x I-285	1017-5PM-M-Ba-M-M	787	"
I-241 x PI-354586	1023-2PM-M-Ba-M-M	670	"
I-241 x TUY	1024-M-M-Ba-M-M	814	"

Los datos que aparecen en el cuadro 1 indican que los rendimientos no fueron altos, siendo que algunos materiales produjeron por debajo de los rendimientos habituales. La explicación de este fenómeno se encuentra en la cantidad de agua suministrada al cultivo en forma de riego por gravedad, que fue en exceso y eso conlleva a un aumento de producción de follaje por la planta en detrimento de la floración y fructificación.

La segunda actividad realizada en este proyecto corresponde la siembra de la generación F_7 del material segregante.

Actividad: 13-1002-0009. "Estudio y selección de progenies F_7 de frijol, bajo condiciones de secano".

El mismo material que aparece en el cuadro 1 fue sembrado en parcelas de 5 hileras de 5 metros de largo cada una para proceder a realizar las selecciones individuales necesarias para la obtención de nuevas líneas.

La selección se orientó tomando en cuenta cuatro caracteres fundamentales que deben estar presentes en una buena variedad de frijol, ellos son: a) hábito de crecimiento erecto con poca ramas laterales, b) maduración uniforme, c) precocidad y d) alta capacidad de rendimiento.

Se realizaron un total de 120 selecciones individuales en el campo, quedando pendiente para el próximo año testar las progenies para seleccionar las mas promisorias.

La tercera actividad desarrollada en este proyecto corresponde al código: 13-1002-0010" Cruzamientos intervarietales entre tipos criollos y tipos arbustivos de frijol".

En el presente año se iniciaron una serie de nuevos cruzamientos con miras a obtener mayor cantidad de material segregante y de este modo aprovechar la variabilidad genética creada para continuar seleccionando líneas promisorias que superen a las variedades comerciales en aquellas característica de mayor importancia económica.

Para tal fin se procedió a realizar una serie de hibridaciones - entre frijoles de grano blanco con fenotipos arbustivos. Los tipos - blancos se utilizaron como progenitores femeninos y los arbustivos como progenitores masculinos:

Progenitor femenino	Progenitor masculino
I-8	BULK P 81-2
I-14	BULK P 81-10
I-11	CNCX 97-0IF
APURE	CNC 0434

El método utilizado es cruzamientos simples de todos los tipos de grano blanco con cada uno de los frijoles arbustivos.

En relación a los Ensayos Internacionales recibidos del "International Institute of Tropical Agriculture" (IITA) de Nigeria debemos añadir lo siguiente: 1) 2 ensayos fueron sembrados en octubre de 1983 y no fueron reportados, por falta de tiempo, en el Informe Anual de ese año - 2) Tres ensayos fueron recibidos en junio de este año y sembrados en septiembre y se reportan en este informe.

Los ensayos fueron sembrados en el campo experimental de Santa Cruz, bajo condiciones normales de secano utilizando el diseño de Bloques al Azar con 4 Repeticiones y 10 tratamientos por ensayo. La unidad experimental - fue de 4 metros cuadrados, integrada por 2 hileras de 4 metros de largo separadas a 50 centímetros. A continuación se presenta el resumen de cada - uno de ellos.

Actividad: (Sin código) Ensayo Internacional de frijol de maduración - temprana.

Este ensayo está formado por líneas de ciclo corto y los resultados del mismo aparecen en el cuadro 2.

CUADRO 2. POBLACION Y RENDIMIENTO DE 9 LINEAS DE FRIJOL Y LA VARIEDAD UNARE EN SANTA CRUZ EN OCTUBRE DE 1983.

RANGO	MATERIAL	COLOR SEMILLA	PLANTAS/HA	KG/HA	% TESTIGO
1	IT 82E-32	ROJO	94.375	1.997	226.9
2	IT 82E-18	ROJO	109.375	1.945	221.0
3	IT 82E-16	ROJO	106.250	1.868	212.2
4	IT 82E-60	BLANCO OJO NEGRO	91.875	1.755	199.4
5	IT 82E-9	NEGRO	113.125	1.696	192.7
6	IT 82E-41	BLANCO OJO NEGRO	106.250	1.693	192.3
7	IT 82E-77	BLANCO OJO NEGRO	108.750	1.692	192.2
8	IT 82E-56	BLANCO OJO NEGRO	103.750	1.547	175.8
9	IT 82E-13	ROJO	113.125	1.486	168.8
10	UNARE (T.L.)	BLANCO	123.125	880	100.0

C.V. = 8.9% MDS al 5% 359 Kg/Ha.

En este ensayo los rendimientos fueron ajustados por covariancia lo que perjudicó, a nuestro juicio, al cultivar 'Unare'. Este cultivar, usado como testigo, es de color blanco y por tal motivo siempre su rendimiento es inferior a las variedades de otros colores que son mas rústicas y rendidoras. Las tres líneas de color rojo que ocuparon los primeros puestos tienen maduración uniforme, son de porte erecto y muy precoces.

Actividad: (Sin código). Ensayo Internacional de Frijol de Maduración Intermedia.

Este ensayo está formado por líneas de ciclo vegetativo intermedio entre las mas precoces y las mas tardías. Los resultados del mismo aparecen en el cuadro 3.

CUADRO 3. POBLACION Y RENDIMIENTO DE 9 LINEAS DE FRIJOL Y LA VARIEDAD UNARE, EN SANTA CRUZ, EN OCTUBRE DE 1983.

RANGO	MATERIAL	COLOR SEMILLA	PLANTAS/HA	KG/HA	% TESTIGO
1	IT 81 D-1064	ROJO	106.875	2.143	292.7
2	IT 81 D-1032	ROJO	104.375	1.823	249.0
3	IT 81 D-1157	BAYO	103.125	1.755	239.7
4	IT 81 D-1007	ROJO	100.625	1.262	172.4
5	IT 81 D- 985	BLANCO OJO NEGRO	101.875	1.217	166.2
6	IT 81 D-1020	BLANCO OJO MARRON	107.500	1.209	165.2
7	IT 81 D-1137	BLANCO OJO MARRON	100.625	1.167	159.4
8	IT 81 D- 994	BLANCO OJO NEGRO	95.000	1.163	158.8
9	IT 81 D- 988	BLANCO OJO NEGRO	98.750	1.090	148.9
10	UNARE (T.L.)	BLANCO	96.250	732	100.0

C.V. = 25.9%　　DMS al 5% = 424 Kg/Ha.

En este segundo ensayo todas las líneas superaron a Testigo Local por amplio margen. Se puede hacer la misma observación del ensayo anterior en

relación al rendimiento de los frijoles de color blanco y del comportamiento de las líneas en cuanto a porte erecto y maduración uniforme. Las líneas IT 81 D-1064 e IT 81 D-1157 de grano rojo y bayo respectivamente presentaron el mejor comportamiento.

En septiembre de 1984 se sembraron tres nuevos Ensayos Internacionales, recibidos en junio del mismo año, en el campo experimental de Santa - Cruz. La técnica y el diseño experimental fue igual al de los ensayos anteriores, o sea, Bloques al Azar con 4 repeticiones, 10 tratamientos por ensayo y el área efectiva de la parcela fue 4 metros cuadrados. A continuación se resumen dichos ensayos.

Actividad: 13-1002-0011. Ensayo Internacional de frijol con resistencia al ataque de gorgojo.

Este ensayo está integrado por líneas que poseen resistencia al ataque del gorgojo, se usó la variedad 'Tuy' de grano color bayo como testigo local. El resultado de este ensayo aparece resumido en el cuadro 4.

CUADRO 4. POBLACION Y RENDIMIENTO DE 9 LINEAS DE FRIJOL RESISTENTES AL GORGOJO Y LA VARIEDAD TUY EN SANTA CRUZ, EN SEPTIEMBRE DE 1984.

RANGO	MATERIAL	SEMILLA	PLANTAS/HA	KG/HA	TESTIGO
1	TUY (T.L.)	BAYO	102.500	2.337	100.0
2	IT 81 D-1007	ROJO	96.875	2.331	-
3	IT 81 D-1064	ROJO	100.625	2.079	-
4	IT 82 D-600-5	BLANCO OJO MARRON	100.625	1.814	-
5	IT 81 D-1151	BAYO	107.500	1.710	-
6	IT 81 D-1137	BLANCO OJO MARRON	87.500	1.634	-
7	IT 81 D-1032	ROJO	106.250	1.569	-
8	IT 82 D-703	BLANCO OJO MARRON	82.500	1.178	-
9	IT 82 D-716	BLANCO OJO MARRON	95.000	1.116	-
10	IT 81 D-985	BLANCO OJO NEGRO	91.875	884	-

C. V. = 38.3% MDS al 5% = 770 Kg/Ha.

Este ensayo no presentó ajuste de rendimientos por covariancia; la población se considera deficiente para el cultivo y la explicación de este fenómeno radica en la poca cantidad de semilla que envía el IITA y la recomentación del espaciamiento entre plantas debe ser 20 centímetsos. La variedad comercial Tuy ocupó el primer lugar aunque no presenta diferencia significativa con las 4 líneas que ocuparon los lugares siguientes. Esta observación debe ser confirmada en nuevos ensayos regionales.

Actividad: 13-1002-0012. Ensayo Internacional de Frijol de Maduración - Temprana.

Este ensayo lo integran 9 líneas de las cuales se repiten 5 que aparecen en el cuadro 2 de este mismo informe. El material es bastante precoz, alrededor de 70 días de siembra a cosecha. Los resultados aparecen resumidos en el cuadro 5.

CUADRO 5. POBLACION Y RENDIMIENTO DE 9 LINEAS DE FRIJOL MUY PRECOCES Y LA VARIEDAD TUY EN SANTA CRUZ EN SEPTIEMBRE DE 1984.

RANGO	MATERIAL	COLOR SEMILLA	PLANTAS/HA	KG/HA	% TESTIGO
1	IT 82E-885	ROJO	112.500	2.601	138.7
2	IT 82E-18	BAYO OSC.	112.500	2.340	124.8
3	IT 82E-32	MARRON	113.750	2.207	117.7
4	IT 82E-16	ROJO	108.750	2.156	115.0
5	IT 82E-812	BAYO OSC.	108.825	1.957	104.4
6	IT 82E-729	BAYO	111.250	1.926	102.7
7	TUY (T.L.)	BAYO	128.750	1.875	100.0
8	IT 82E-9	NEGRO	112.500	1.866	-
9	IT 82E-889	ROJO	106.250	1.785	-
10	IT 82E-60	BLANCO OJO NEGRO	91.250	1.567	-

C.V. = 6,5%   MDS al 5% = 319 Kg/Ha.

En este ensayo la línea IT 82E-18 que es de color bayo superó al testigo Tuy en casi 25% más en rendimiento dando una diferencia estadisticamente significativa al nivel de 5% de probabilidad. Las otras líneas: IT 82E-812 e IT 82E-789 que también son de color bayo rindieron algo mas que la variedad testigo pero sin presentar diferencia estadísticamente significativa.

Actividad: 13-1002-0013. Ensayo Internacional de Frijol de maduración intermedia.

Este ensayo lo integran un grupo de líneas promisorias de maduración alrededor de los 80 días. Los resultados del mismos aparecen resumidos en el cuadro 6.

CUADRO 6. POBLACION Y RENDIMIENTO DE 9 LINEAS DE FRIJOL DE MADURACION INTERMEDIA Y LA VARIEDAD TUY, EN SANTA CRUZ, EN SEPTIEMBRE DE 1984.

RANGO	MATERIAL	COLOR SEMILLA	PLANTAS/HA	KG/HA	% TESTIGO
1	TUY (T.L.)	BAYO	101.875	2.900	100.0
2	IT 82D-752	BAYO OSC.	103.125	2.606	-
3	IT 82D-786	MARRON CL.	96.250	2.324	-
4	IT 82D-975	BAYO	99.375	2.307	-
5	IT 82D-713	BLANCO OJO MARRON	101.250	2.249	-
6	TVX-3236-016	BLANCO OJO MARRON	93.750	2.134	-
7	TVX-4659-03E	BLANCO PINT. MARRON	99.375	2.098	-
8	IT 82D-709	BLANCO OJO MARRON	101.250	2.023	-
9	IT 82D-716	BLANCO OJO MARRON	101.875	1.840.	-
10	IT 82D-744	MARRON	102.500	1.440	-

C.V. = 18.4% MDS al 5% = 488

Nuevamente la variedad Tuy ocupó el primer lugar, lo que indica la gran adaptabilidad de ese material a nuestras condiciones agroecológicas.

PERSPECTIVAS PARA EL PERIODO SIGUIENTE

1) Sembrar la semilla de cada planta seleccionada, en forma individual, en hilera por planta para seleccionar las mejores progenies.

2) Aumentar las mejores progenies seleccionadas para pasarlas a ensayos preliminares de rendimiento.

3) Concluir la segunda etapa de cruzamientos previstos de acuerdo a lo expuesto en este informe.

4) Seleccionar las mejores líneas introducidas del IITA y realizar ensayos preliminares de rendimiento.

Ing° Agr°(M.S.) Simón Ortega Ybarra

SOY/bb.
24.12.84.

RESUMEN

Siguiendo con el cumplimiento de objetivos y metas de este proyecto de obtención de nuevos cultivares de frijol, precoces, erectos y de maduración uniforme, se programaron tres actividades que están detalladas en este informe.

La primera actividad corresponde a la siembra de la generación segregante F_6 obtenida mediante cruzamientos hechos en 1981.

Esta siembra se realizó en el Campo Experimental de Santa Cruz en Enero de 1984. Se observó el material se descartaron una serie de fenotipos no deseables y se preparó la siembra de la nueva generación.

La segunda actividad corresponde a la siembra de la generación F_7 también en el Campo Experimental de Santa Cruz donde se procedió a la selección de 120 plantas en forma individual para posteriormente seleccionar las mejores progenies originadas de cada selección. Los criterios utilizados en la selección fueron: hábito de crecimiento erecto, precocidad, maduración uniforme y capacidad de rendimiento.

En relación con el caracter hábito de crecimiento se seleccionaron aquellas plantas erectas, con ausencia de ramas o tallos laterales y con una buena distribución de las vainas, las cuales deben conservar una posición alta en la planta y lo mas cerca al eje o tallo principal.

La tercera actividad desarrollada consistió en el inicio de nuevas hibridaciones para darle una continuidad en el tiempo al proyecto, como se acostumbra en estos programas de Mejoramiento Genético para cultivos anuales.

Los progenitores seleccionados en este caso fueron los tipos de frijol criollo: I-8, I-11, I-14 y "Apure" con las variedades exóticas introducidas de Brasil: Bulk-P81-2, Bulk-P81-10, CNCX-97-OIF y CNCX-0434. Los dos últimos progenitores son resistentes al mosaico severo del frijol.

En relación a las pruebas de rendimiento con líneas mejoradas recibidas del IITA, podemos concluir que unicamente la línea IT82E-18 que presenta grano de color bayo fué capaz de superar a la variedad comercial "Tuy". Este comportamiento deberá ser ratificado en nuevos ensayos de rendimiento.

Existen un grupo de materiales introducidos del IITA como son: IT82E-885 e IT82D-752 que son de color rojo y por tal motivo no tienen valor comercial; sin embargo, serán utilizados como progenitores para transmitir a los frijoles criollos características de importancia económica como es la maduración uniforme, el porte erecto y altura de carga, característica de gran importancia para la cosecha mecanizada.

TRIP REPORT

E. A. KUENEMAN

CEARA AND MARANHAO STATES OF NORTHEASTERN BRAZIL

MARCH 04 - MARCH 11, 1985

Trip Report - E. A. Kueneman

Ceara and Maranhao States of Northeastern Brazil (March 04 - March 11, 1985)

Objectives: Visit the regions in the Northeast where mechanized cowpea production occur with view to test uniform maturing cowpeas. To assess cowpea production constraints and to see EMBRAPA soybean trials.

March 04 Monday

Went to the EPACE office in Fortaleza and met with the Technical Director, Dr. Helio Machado. I then met Paulo Diogenes (cowpea scientist from Barbalha) and EPACE statistician, Francisco Ivaldo Oliveira Melo. EPACE has recently obtained a Polymax 201 micro computer and the staff are very keen to get software packages for statistical analysis. I informed them about the M-STAT package and they were very keen to have it. If possible, Dr. Watt should copy the package for EPACE. I was told that EPACE would pay for photocopy and disc costs.

In the afternoon, I drove from Fortaleza with Paulo Diogenes to Crateus via Caninde and Sucesso. Cowpeas seen in route to Crateus were disease free; most plantings were in the pre-flowering stage.

March 05 Tuesday

Paulo Diogenes and I met with the EMATERCE program Director, Jose Ailton Pereira, in Crateus and then spent the rest of the morning at the EPACE experiment station near Crateus. CNPAF cowpea trials were only about a month old; stands were fair and plants were disease-free. Many of the local farmers near the station had planted earlier and we made observations in several fields; cowpeas were free of virus. Smut was observed, but in low incidence and severity.

In the afternoon, we drove south to Novo Oriente, a major cowpea production region. Most of the cowpeas in this region are sown by tractor-pulled planters. Most of the weed cultiviation is also mechanized. Cowpeas were frequently sown in consortium with maize and sometimes,castor bean was also in the consortium. In this case, castor bean was sown in November; cowpeas and maize were sown in the same row (mixed seed in the planter box) in January.

Root rot is a major problem in this region. We were told by Jose Ailton that about 40% of the farmers have serious problems with plant death due to root rots. Fusarium is generally considered to be the principal disease agent but a thorough study of the root rot problem still needs to be undertaken before a breeding effort can be initiated. It is my impression that root rot problems in Ceara and Piaua States (principal cowpea production areas) are serious enough to warrant a breeding effort. I suggest that CNPAF look seriously into the root rot problem with the view to develop varieties with resistance or tolerance.

Another problem in the area, is the low selling price at the farm level. It is not clear to me whether mechanized cowpea production is economically viable. If we develop cowpeas for mechanized agriculture, will the selling price justify investment in a combine? How big is the market? Would 10,000 Ha of pure stand cowpea at 1,500 Kg/Ha (aprox. 15,000 tons) affect the market price?

March 06 Wednesday

Returned to Fortaleza via Independencia, Quixada where we visited EPACE experiment station to leave plant samples with pathologist.

We saw a substantial amount of cowpea planted in route to Fortaleza, mostly intercropped with maize. Plants were generally very clean, only a few virus infected plants were observed; a few plants with typical Poty virus symptom and a few with 'Mosaio Dorado'. To my surprise, I saw no plants with symptoms of 'Cowpea Severe Mosaic Virus'.

March 07 Thursday.

Flew to Sao Luis.

March 08 Friday

Waited to meet Dr. Stefano of CNPSo; prepared travel reports.

March 09 Saturday

Dr. Stefano and I flew with the Secretary of Agriculture for the State of Maranhao, Dr. Waldemar, to Balsas in a six passenger plane belonging to the State of Maranhao. We had some difficulty due to poor weather conditions but we arrived in Balsas before noon. Dr. Stefano and I drove approximately 40 Km south of Balsas to the farm of Mr. Philipsen where Dr. Stefano had established CNPSo soybean trials. We evaluated trials until night fall (see tables 1-3).

Soybean production in southern Maranhao state is very new, but is expanding. This region and contiguous with southern Piaui state is probably the only region in the north and northeast of Brazil where soybeans have a great potential. Soils are acidic (pH from 4 to 5) but when limed, tropically adapted soybeans, such as 'Tropical', 'Terezina', and 'Carajas' do quite well. Yield potential with good management is close to 3 tons per hectare on the better lands. Mean yields for the region should be close to 2 tons. There are nearly 2 million hectares in the region suitable to soybean production. The rainfall is about 1500 mm per year beginning in mid October and ending in March or early April. Upland rice is the prodominate crop but soybeans are becoming increasingly more important. In 1984, about 5000 Ha were sown to soybeans and estimates for 1985 are from 10 to 12,000 hectares, all sown to 'Tropical', the only variety adapted to the region with seed available. Due to seed storability problems with 'Tropical', seed is transported about 1000 Km from Goias State. Dr. Waldemar tried to keep seed last year, but by planting time, germination had dropped to 25%. He can irrigate part of his farm and plans to produce seed during the dry season.

The major constraints to soybean production are foliar cercospora, pod sucking insects, and seed longevity. A number of new lines being tested by EMBRAPA showed good resistance to cercospora but none of the lines have yet been carefully evaluated for seed longevity. I think some IITA lines would perform well in this region but must have resistance to foliar cercospora. Some crosses being made at EMGOPA should produce lines with good seed longevity and resistance. Late maturing segregates should be tested near Balsas. Farmers showed interest in having a tall, early maturing variety for late planting which can occur if the rains are late.

Management of trials near Balsas is problematic. Several trials were not weeded and stink bugs had not been controlled. Management was supposed to be carried out by EMATER-MARANHAO but the situation was far from satisfactory. The staff responsible for the trials have been recently transferred to Balsas but it is evident that for the 1985 season the staff was not well established. If the situation does not improve, EMBRAPA will need to place someone under their own control in the region to care for the trials.

Other problems in the region that require research is weed control and soil management. After 4 to 5 years of production (rice or soybeans), weed control becomes a major constraint. At present, farmers use no or little herbicides, partly because herbicides are very expensive and partly because herbicide studies in the region are non-existant. Rice farmers frequently abandon their land after five years due to weed competition. I think CNPAF and CNPSo should look into this problem. According to Adalberto Lima, a local farmer, the major weed problem is a grass Capim Colchao. I would also suggest that CNPAF rice scientists travel to Balsas in 1986 to evaluate the potential of the region with the view to give assistance. It is probable that this region will become very important for northern Brazil in the future.

On farm prices of comodities near Balsas were as follows:

Cowpeas:	1100 CR/Kg
Soybeans:	700 CR/Kg
Rice:	850 CR/Kg

In the market, Phaseolus was selling for double the price of cowpea.

If a cowpea variety was available that could be mechanically harvested, I am quite sure that a number of farmers would be interested in large scale production. Mr. Philipsen agreed to test several lines in 1986. Other farmers showed interest in the trial. The merits of cowpeas are: less fertilizer required, no liming of soils, and it can be planted after the soybean or rice crops because of its short duration (70 days). Because cowpeas are important in the region and because larger farmers already have combines available to harvest rice and soybeans, I believe it is one of the best regions in Brazil for introduction of fully mechanized cowpea production. Several small cowpea fields were seen near Balsas; no disease problems were observed. Both white- and brown-seeded cowpeas were observed in the market, seed size was only about 13 to 15 grams/100 seeds.

March 10 Sunday

Visited soybean and cowpea fields in the region. Returned to Sao Luis late afternoon in Maranhao Goverment plane.

March 11 Monday

Went to VASP office in Sao Luis to cancel unused ticket. Returned to Goiania at 8:30 pm.

CONTACTS

Dr. Francisco Helio Machado
Director Tecnicò
EPACE
Av. Rui Barbosa 1.246
Bairro Aldeota
60.000 Fortaleza, CE
Fone: (085) 244-4166

Paulo Diogenes
EMBRAPA
Barbalha

Jose Ailton Pereira
EMATER-CE
Crateus, CE

Leonardas Philipsen
C.P. 11
Balsas, MA
65.800
Fone: (098) 741-2446

Adalberto Lima
Av. Antonio Leitao, 1500
Balsas, MA
Fone: 741-2133, 741-2208

Table 1

Observations (09-03-85) on EMBRAPA Soybean Ensaio Preliminar A, Balsas Maranhao, sown 27-11-84.

Line	Lodging	Habit	Foliar Cercospora	Comments
BR-83-8892	1	D	R	Good
BR-83-8899	2.5	D	R	Good
BR-83-8912	1	D	R	Fair
BR-83-89-19	1	D	R	Fair
BR-83-8920	1	D	R	Good
TROPICAL	1	D	S	Good
BR-83-6847	1	D	R	Short, poor
BR-83-9194	1	D	R	Medium to fair
BR-83-9196	1	D	R	Short
BR-83-9297	1	D	R	Short
BR-83-9307	1	D	R	Medium/fair
BR-83-9440	1	D	R	Mixed
BR-83-9444	1	D	R	Medium/fair
BR-83-9447	1	D	R	Short, poor
BR-83-9790	1	D	R	Mixed
BR-83-6596	1	D	R	Fair
TEREZINA	2.5	D	S	Good
BR-83-9053	1	D	R	Very good
BR-83-9062	1	D	R	Short, fair
BR-83-9021	1	D	R	Short, early
BR-83-9024	1	D	R	Okay, small seed
BR-83-9031	1	D	R	Good but small
BR-83-9037	1	D	S	Okay
BR-83-9044	1	D	-	Short, early
BR-83-9046	1	D	-	Short
CARAJAS	1	D	S	Good
BR-83-9218	1	D	R	Tall, very good
BR-83-9220	1	D	R	Tall, very good
BR-83-9221	1	D	R	Tall, very good
BR-83-9222	1	D	R	Tall, good
BR-83-9240	1	D	R	Tall, good
BR-83-9241	1	D	R	Tall, good
BR-83-9247	1	D	R	Tall, good
TIMBIRA	1	D	S	Mixed (?)

Table 2

Observations (09-03-85) on EMBRAPA Soybean Ensaio Preliminar B, Balsas Maranhao, sown 27-11-84.

Line	Lodging	Habit	Foliar Cercospora	Comments
BR-83-6651	1	D	(?)	Short
BR-83-9273	1	D	S	Okay
BR-83-8967	1	D	R	Okay, large seed
BR-83-8970	1	D	R	Okay, large seed
BR-83-8976	1	D	R	Fair
BR-83-8977	1	D	R	Fair
BR-83-8981	1	D	R	Okay, large seed
BR-83-2331	2	S.D (?)	R	Good
TROPICAL	2	D	S	Good
BR-83-6712	1	D	R	Good
BR-83-9162	1	D	?	Early, short
BR-83-9163	1	D	?	Early, short
BR-83-9172	1	D	?	Early, short
BR-83-9090	1	D	R	Good
BR-83-9396	1	D	R	Late, good
BR-83-9399	1	D	R	Good, tall
BR-83-9406	1	D	R	Good, tall
BR-83-9512	1	D	R	Medium to fair
BR-83-9524	1	D	R	Medium to fair
BR-83-9536	1	D	R	Short
CRISTOLINA	1	D	R	Short
BR-83-9550	1	D	R	Short
BR-83-9581	1	D	R	Fair
BR-83-11102	1	D	R	Fair
TERESINA	2	D	VS	Good
BR-83-10792	1	D	R	Good
BR-83-11140	2	D	VS	Okay
BR-83-10800	1	D	VS	Good
CARAJAS	1	D	VS	Good
83-SG-247	1	D	R	Short
BR-83-8908	1	D	R	Good
BR-83-9249	3	D	R	Good

Table 3

List of several promising lines out of 150 new introductions tested at Balsas 1985

1. BR-83-10493
2. BR-83-10497
3. BR-83-10498
4. BR-83-10073
5. BR-83-10364
6. BR-83-10373
7. BR-83-8938 (early, tall)
8. BR-83-10507
9. BR-83-10512
10. BR-83-10570
11. BR-83-10571
12. BR-83-10121
13. BR-83-10740
14. BR-83-7067
15. BR-83-7069
16. BR-83-10545
17. BR-83-9441
18. BR-83-6227
19. BR-83-6192 (early, tall)
20. BR-83-8883
21. BR-83-10382
22. BR-83-10305
23. BR-83-10389
24. BR-83-10396
25. BR-83-10405
26. BR-83-10615
27. BR-83-9389
28. BR-84-13
29. BR-84-123

TRIP REPORT: STATES OF PIAUI AND CEARA, BRAZIL

MAY 13 - MAY 16, 1985

BY

EARL WATT

TRIP REPORT TO THE STATES OF PIAUI AND CEARA

STARTING 13TH OF MAY, 1985

DNOCS

The DNOCS contact person was Maria Lourdes, who is working with research on the irrigated perimeters. The area was partially under water and contrary to information recieved prior to the trip, the experiments will only be planted in July. Therefore the trip to Terasina was cut by one day making it possible to arrive in Fortaleza one day early. While speaking with Otavio Ferreira Gomez Martins, the pathologist, he reported an incidence of rust (Urimicedes) infection in 1984 on the perimeters of Luzilandia and Piripiri with cultivars Pendunga and Pituiba being the most syseptable. Some resistance was noted in lines CNCx 36-5E and VITA 7. The incidence was mostly in the month of October and November.

The German group is still in DNOCS, still headed by Dr. Hans Rudat. There are presently two other people, Hubert Reofels, an agronomist, and an animal pasture specialist by the name of Reinhils. Reinhils and Rudat will probably be leaving next year to be replaced by a different group of people. The project at present is still working out agreements with EMBRAPA for the Chipada areas and with EMATER people for the Versia areas. Seed was never received of the varieties BR 1-Poty and CNC 0434 two years ago, so I gave Hans two cultivars, CNCx 187-22D and CNCx 252-1E, which he said he would be planting next week to take a look at their production and their resistance to the virus. Their biggest problem in cowpea is the crop is continually

being hammered by virus.

Maria Lourdes reported they had made agreements with CNPAF people at the program meetings held in Teresina but as of yet have failed to receive a response to initial discussions. She would like very much like to have a more organized plan for improving materials on irrigated perimeters, including help in setting up special trials which Dr. Ferieri was doing when he was preparing state trials before leaving to study at Pericaba.

There are two materials which she reported as doing well in the state; TE-570 (a selection from TVx 3777-04E) and Parananiba (CNCx 39-3E). TE 570 is well accepted and has good seed size and color. However, it was not doing well in the irrigated areas. It is reportedly quite good for intercropping. The old line CE 315 has excellent seed quality in the irrigated regions, although it is not as well adapted to the higher-dry land areas. A new cultivar from Ceara, CCA, from Jose Julio Duponts, called Otilia, has been released by the Federal University. It comes from a cross between Macaibo and 40 Days. It is resistant to the Mosaic Rugozo virus, Mosquiado severo, and Mosaico moderado. This is extremely interesting since neither of the parents have resistance to any of these viruses. Macaibo does have strong resistance to the Cowpea Severe Mosaic Virus but Otilio was not showing resistance to the CSMV. The cultivar, Paranaiba, is a release of CNCx 39-3E. In my notes in Goiania, Paranaiba has been spelled Paranhyba and called a release of line CNCx 24-015E. This confusion needs to be corrected.

UEPAE-Teresina was visited and discussions held with

Apoliano, Antonio Gomez and Lourdes. The breeding program (segregating material, crossing, etc) is suspended at present. Apoliano's program with resistance to viruses and other diseases is continuing. In some crosses he is doing selection for cowpea severo, mosaic dourado, rugos mosaic, mosquiado severo, and pepino, using CNC 0434 and TVU 612 as parents. He reports TVU 612 as being susceptible to cowpea severe mosaic virus but has better resistance to more fo the Poty viruses than the cultivar CNCx 27-2E.

Antonio Gomez reported that the best lines are: Pendunga, Pituiba, 40 dias, and Sempre Verde. Hans Rudat reported the best cultivars as being: Pendunga, 40 dias and VITA 7. Lourdes reports CE 315 and Sempre Verde as being a cultivars with excelent seed color and cooking qualities. The ideal cultivar for the state would necessarily have a large light cream colored seed such as Sempre Verde but with resistance to the viruses. Rust is now a potential problem. If anyone else is to visit Teresina, the visit would have to be in the month of September as planting of trials in Luzlandia will probably be in July.

A scientific note on rust resistance and rust occurence in Brazil has been sent to PAB, as well as a short paper to be presented at the pathology congress in July of this year.

May 13

I returned to EMBRAPA and held conversations with Maria Lourdes , Matias, and Apoleano. The discussion was mostly on viruses which seem to be bad this year although less than normal. They did report heavy attack of viruses in farmers fields. Best

material for irrigated areas seems to be CE 315, which does have good resistance to the Poty virus. They report better resistance than the variety BR 1-Poty. I have suggested sending seed of TVu 612 to them as they report this variety being highly susceptible to the cowpea severe mosaic virus which Gerson and Lima report as being immune to the cowpea mosaic virus.

DNOCS is preparing a special trial for irrigated cowpea. They will be testing 100 lines in a 10 x 10 lattice, prelim trial, 2 rows, 5 meters each. They have requested material for resistance to the viruses. They are also requesting that I prepare for them the randomization and field book which I have done using MSTAT while at EPACE.

Time was spent with the statistician who has several packages of statistics but so far has been unable to use any of them. I picked up a copy of Microstat from him along with the manual. I will attempt to reinitialize this for the Polymax system. A copy of MSTAT along with manuals was sent to them from Fortaleza which they will be able to use for their data analysis.

An evening flight was taken to Fortaleza.

May 15

Paulo Diogenes arrived late from Barbalha due to bad roads and washed out bridges which were being repaired. Therefore, the morning was spent with the statiscian, helping him with problems with MSTAT and a computer statistics program called "Microstat" which he has been unable to use because of inability to use the data entry part of the program. Paulo Diogenes arrived at noon.

It was decided that it was not wise to go to Pacajus that afternoon. So, the afternoon was spent entering his data into MSTAT and doing some preliminary analysis on his state yield trials.

May 16 Pacajus:

In Pacajus, there are two experiments planted, the advanced trial 1 and the state trial. Both had been harvested once. In advance trial 1, the best material was treatment number 11 CNCx 167-14F. It is of note that treatment 7 is segregated for flower color as it did in Goiania and Quixada. In the state trial treatment number 6, CNCx 163-60G, was quite good. Treatment 8, CNCx 189-02G, is extremely systepable to Cercospora, both in Pacajus and Quixada. It was suggested that it be eliminated from future trials as it was being totally defoliated in both locations. Plants in general had poor growth because of low soil fertility and extremely sandy soil. Virus was apparent only in the local check, Sempre Verde. Other diseases important were web blight, bacterial blight, and Cercospora. Rust was there but not extremely important although it was reported being important in later plannings for seed multiplication.

Other experiments they have planted are: A) An intercropping experiment with cowpea (cultivar Pitiuba) and sorghum, 3 spacings for cowpea and 3 spacings for the sorghum plus a mono crop of cowpea and sorghum. This is the third year that this will be planted. B) A similar experiment using millet. The cultivar with millet was BR 1-Poty.

Quixada. In Quixada principal diseases were: web blight,

Cercospora, and some viruses (in the prelim. trial only). Advance trial 1 had been harvested. Best treatment acording to Mary Ann was number 8, CNCx 153-3E. In general it was difficult to take accurate notes because of the lateness of the visiting the trial. In general growth was much more vigorous than in Pacajus because of higher soil fertility. The plants had closed in between rows. The state trial was so advanced that no notes could be taken. The local checks were Sempre Verde and Roxinho. Sempre Verde was extremely late. In Preliminary trial 1 a general note was taken for visual acceptance of the line, taking into consideration virus, growth, podding, and maturity. Among the IPA material, the only material which stood out was L-2113 and 2017 both of which are in demonstration plots at Serra Talhada. The local checks BR 1-Poty and CNC 0434, both looked quite good. Among the experimental lines, CNCx's 251-65E (very erect), 279-2E, 279-6E, 252-9E, 252-6E, 252-3E, and 252-1E were all outstanding. Two materials which were extremely poor were CNCx's 284-53E and 251-56E, both of which obviously should be eliminated from any future trials.

Requests were made for some seeds of feijao de metro for quick evaluation. Julio in Pacajus requested a list of parents for the crosses made and the attributes of the parents (why they were selected). Paulo requested that 20 copies of Bulletin Tecnico No. 18 should be sent to him such that 8 copies would be distributed to the people in EPACE who work with cowpea and 10 copies be given to the regional coordinators for EMATECE and 2 copies be held in reserve for any other people comeing

there.

Discussions were also held with Leane Tixera (pathologist) about the problem of root rots, and the project of Dr. Lima at CCA. She, of course, works with many different products but reports her most interesting crop to be cowpea and would prefer to dedicate more time to it. She requested assistance from the center for any way we could help her to be able to dedicate more of her time to cowpea. Mary Ann Kindre is now posted in Quixada. Her background is also pathology but with a strong intrest in entomology. She would like to initiate some work with bruchids and also requested methodology and assistance in preparing a project for bruchid resistance.

Notes:

The trip in general was extremely worthwhile. It was of note to me, the problems of the droughts and the present problems of flooding. Hunger, I thought, was more apparent in the region. Sixty percent of the bean crop will be lost in the state this year due to flooding as many of the highly productive bean areas, such as the Litoral and the Vale de Jaguaribi, are under water.

TRAVEL REPORT

E. A. Kueneman

Colombia, Guatamala, Honduras
Jamaica, Haiti, AID-Washington, D.C.
University of Florida, and Mexico

May 27 to August 12, 1985
With Homeleave (July)

ITINERARY

May 27	Mon.	Visited Dr. Miranice G. Sales of the Federal University of Ceara (Fortaleza, Brazil) to explore interest in collaborative studies on acceptability of new cowpea varieties in Brazil.
May 28	Tues.	Flew to Manaus.
May 29	Wed.	Flew to Bogota and on to Cali.
May 30	Th.	Met with Dr. Camacho (INTSOY) and later with Dr. Schoonhoven (CIAT Bean Prog. Dir.). In the afternoon Dr. Camacho and I went to the ICA-Palmira experiment station to see cowpea and soybean trials with Gilberto Bastidas.
May 31	Fri.	Drove with Dr. Camacho to Tolima Valley to see new soybean production (soybean in rotation with rice.) Visited ICA trials with Carlos Arturo Varon Rodriquez at Nataima in the afternoon. Spent the night.
June 1	Sat.	Visited farmers fields in the morning and returned to Cali during the afternoon.
June 3	Mon.	Spent the morning with Dr. Camacho doing library research for a joint paper for IITA soybean workshop. In the afternoon we evaluated soybean trials at ICA.
June 4	Tues.	Spent all day in soybean nurseries.
June 5	Wed.	Traveled to Guatamala.
June 6	Th.	Went to ICTA offices, met with Director Astulso Fumagalli. Danilo Augustin Gonzalez, soybean project leader, had traveled so I spent time with the principal researcher, Eduardo Menendez. In the afternoon we visited a soybean seed company (Germinaguate) run by Alvaro de la Pena.
June 7	Fri.	Eduardo Menendez Bolanos and I went through soybean trial data in the morning and visited several local produce markets in the afternoon to see if cowpeas were available . No cowpeas were seen.

June 8 Sat. Flew to Tegucigalpa, Honduras.

June 9 Sun.

Flew to San Pedro Sula and met Pablo Soto, ex IITA maize entomologist now working for AID funded Fundacion Hondurena de Investigacion Agricola (FHIA). Sunday night I met with Julio Romero who did early soybean breeding work; he selected all the 'SIATSA' lines often seen in INTSOY ISVEX trials.

June 10 Mon.

Drove with Ing. Sergio Castro, soybean production agronomist in the ministry stationed in San Pedro Sula, to Comayagua to meet with the Jefe Proyecto de Soja, Ing. Jose Ramon Ramirez. We visited a local cooperative that is encouraging farmers in the Camayagua area to plant soybeans. In the afternoon Jose gave a slide presentation about their research. I returned to San Pedro Sula late.

June 11 Tues.

I gave a seminar to about 100 people including sugarcane growers interested in planting soybeans, ministry people, and to a representative to the Banco Centroamericano; the bank is interested in stimulating soybean production in Central America. I also gave a TV interview. After lunch I met with Dr. Mario Contreras, Director of Research (FHIA). Late afternoon I flew back to Tegucigalpa. I met briefly with Dr. Jorge Chang, Head of Agronomy Dept. for Escuela Panamericana, El Zamorano.

June 12 Wed.

I flew to Kingston Jamaica via Panama City. I met that night with Idelle Brown (soybean project), Adet Thomas (CARDI), and Gene Dickson (Botany Dept., Univ. West Indies).

June 13 Th.

Went to Jamaican Soybean project with Idelle Brown and met the project coordinator, Hue Wright. We went with Dr. Marshal McGlamery (INTSOY Weed Scientist) to see several soybean farms near Old Harbour. I had dinner with Mr. Fred Anderson (Dir. of Jamaica Soybean Products).

June 14 Fri. Went to CARDI with Adet Thomas and met with Dr. Suah, Head of Unit, CARDI. I also met with CARDI's Agric. Engineer, Mr. Joscelyn Grant, who would like to visit IITA F.S. program. In the afternoon I gave a seminar at CARDI on GLIP. After the seminar I visited the microbiology laboratory of Dr. Hussain Ahmad; he had worked on IITA/Boyce Thompson

cowpea project.

June 15 Sat.

I drove with Adet Thomas and Idelle Brown from Kingston to Trelawny on the north coast where CARDI and the ministry are releasing VIAT-3 cowpea. We saw several fields of seed multiplication with Mr. Parkinson, extension agent promoting VITA-3.

June 17 Mon.

Flew to Haiti and went to AID office and met with Dr. Abdul A. Wahab, program officer for several projects. I also met Gus Menager and Joc Sorel who took me out to Damien (Min. of Agric. and Faculty of Agric.) where I met Dr. Richard Swanson, Univ. of Arkansas contract agronomist with AID's large farming systems program at Cayes, Haiti. Swanson was a socio-economist with ICRISAT in West Africa; he is familiar with IITA.

June 18 Tues.

In the morning I went to CIDA's office and met with Jenny Donovan to discuss CIDA's on-farm corn trials run by CIMMYT and to explore possible support for cowpea trials. In the afternoon I drove with Richard Swanson to Cayes on the southern peninsula.

June 19 Wed.

Attended AID's farmers' field day for rice. I also met CIMMYT's man, Michael Yates and Faculty of Agric. personel, Lionel Richard, Directeur Projet D'APPUI au Developpement Agricole, and Dr. Paul Saint-Hilaire, training officer. Returned late afternoon to Port-au-Prince, stopping at several fields of maize and cowpeas en route.

June 20 Th.

Visited several local markets in Port-au-Prince during the morning and worked on travel report during the afternoon.

June 21 Fr.

Went to Damien and met with Paul Saint-Hilaire (Faculte d'Agronomie et de Medecine Veterinaire) to discuss training, with Jean Fenel Felix , Legume Specialist, (Faculte d'Agronomie, Damien), and with IRAT Agronomist, Liverato Jean Marc, who is working on maize-cowpea-sorghum farming systems in a dry region on the southern peninsula. I also discussed activities in Haiti with Michael Yates, CIMMYT project leader.

June 23 Sun. Flew to New York City.

June 24 Mon.

Went to Standard Charter Bank to get clarification on IITA account and obtain travelers checks. Shopped for typewriter for IITA project. Visited IIE and went to travel agency during the afternoon.

June 25 Tues.

I went to Executive Health Examiners for yearly physical exam, and flew to Washington, D.C.

June 26 Wed. Met with AID officials; seeking funds for training. Contacts included: Dr. Loren Schultz (soybean), Harvey Hortik (CRISP), Robert Bertram (CG), Joyce Kaiser (US-Training), Bob Walters (Fragil Lands Initiative), Bob Mowbray (State Dept. L.Amer. Bureau).

June 27 Th. Flew to Seattle to begin homeleave.

Aug. 1 Th. Flew from Boise, Idaho to Gainesville, Florida.

Aug. 2 Fri. Met with Drs. Hinson and West to discuss their work on soybeans for the tropics.

Aug. 3 Sat. Visited trial plots with Dr. Hinson.

Aug. 4 Sun. Flew from Gainesville to Tampico, Mexico.

Aug. 5 Mon.

Met with Dr. Nieto, coordinator of soybean research for southern Mexico, and with Ing. Maldonado, soybean breeder.

Aug. 6 Tues. Returned to Mexico City.

Aug. 7 Wed. Flew to Merida, Yucatan and met with Director of CIAPY-INIA for southern region, Dr. Jesus Martinez.

Aug. 8 Th. Toured cowpea growing region with Jose G. Laris.

Aug. 9 Fri. Cont'd. tour with, J.G. Laris, cowpea agronomist.

Aug. 12 Mon. and Aug. 13 Tues.

Flew to Mexico City and took afternoon flight to Rio via Manaus. Arrived in Rio on Tues. morning and took a connecting flight to Goiania, arriving late Tues.

COLOMBIA, June, 1985

Cowpeas

I had hoped to travel to the northcoast to see cowpea production and trials, but the rains were late and trials on the north coast were just planted. According to Dr. Camacho the best time to see cowpeas is in November. Dr. Bastidas of ICA had planted out 20 Brazilian (EMBRAPA/IITA) lines in replicated trials at Palmira and at Nataima (Valle de Tolima). The vegetative growth of most materials was excessive and pod set was rather poor except for Vita 7 which was good at both sites. At Palmira, CNCX 188-02E looked quite good, and at Nataima on lishter soils, CNCX 177-014E, 177-013G, and CNCX 171-09E both looked fairly productive. The Colombian line ICA Cabacita Negra (large seeded blackeye with rough tests) was attractive at both sites. It is a rather erect plant with a long terminal runner. Lines that did less well were: CNCX 159-03G, 171-07E, 161-01E, 176-03G, 171-09E, 176-02E, 177-024E, 171-03E, 231-04E, 164-01G, 177-02G, 177-013E, 15-7E, 24-15E, 10-4D, and BRI-Poty. Neither disease or insects were limiting.

Four bush-type vegetable cowpea varieties from Dr. PN Patel, Univ. of Calif.-Riverside, were also sown at both sites. These materials were agronomically superb. I believe IITA should have a look at these materials (UCR 193, 194, 264, and 206A).

Cowpea Severe Mosaic Virus is, I am told, a problem on the north coast where cowpeas are grown. Bastidas said he would send a trial of Brazilian materials to the region for testing. He said he would like to test IITA materials from Nigeria and Brazil. Prefered seed types are blackeyes and creams. He would also like to look at IITA's vegetable cowpeas and would like to receive bulk popultions from Brazil. Seed sent should be sent to: Director General-CIAT, for Gilberto Bastidas-ICA, Apartado 67-13, Cali, Colombia.

Soybeans

Soybeans became a significant crop in the Cauca Valley between 1960 and 1970 with a current area of between 50 and 80 thousand Ha spread between two growing seasons. Soybeans are often grown on fields where they can receive supplemental irrigation. There is recent interest to grow soybeans as a rotation crop for rice farmers in the Tolima Valley located between Cali and Bogota. Currently they are planting about 2500 Ha in both rainy seasons. The first season is March to July; the

second season is September to November. There is a cotton seed pressing plant in the area which is paying a fair price for beans, so there is a good chance that production will expand in the Tolima Valley. There is also an effort to develop production in the north near Monteria as a rotation crop for cotton farmers. They need a very early maturing variety with superb seed longevity. Even though Colombia grows some soybeans, they are importing large quantities and importation appears to be increasing. In 1981 they imported 122,000 MT of soybean and in 1985 they imported 170,000 MT.

The biggest constraint is an adequate price for locally grown soybeans. Pod sucking insects are occassionally a problem as are leaf-feeders, especially Anticarsia gemmatalis. Colombia has a sophisticated pesticide industry and pesticide application by air is common. ICA is developing improved varieties, but still do not have good, early varieties for the north coast where seed longevity is a big problem.

Soybean Research

ICA and INTSOY have integrated their programs at Palmira and they had about 8 Ha of experimental plots. Interesting materials observed are described below:

Line	Description
ICA-N21	New release for Tolima region. Good, but some problem with lodging.
555-2-M-12-M	Derived from ICA Tunia x Acc 2120; Acc 2120 is from AVRDC.
489-4-1-M	Derived from L-124 x L-119; L-119 is a selection from Jupiter.
684-M-(2)	Derived from (2611 x Acc 2120) x (L-121 x L-124)
773	Derived from (IAC-2 x IAC 7025) both Brazilian
778	Derived from Jupiter x IAC-2
720	---
743	---
746	Tall, determinate
578	Tall, determinate
PR-212-(26)-20-M	Tall, determinate; from PR-142(3) x Foster
PR-215-(14)-1-M	Derived from Rosales x Alamo; Alamo is a selection from Jupiter

PR-216-(52)-4-M	Rosales x PR 15-(14); Rosales is from Mexico
PR-225(24)-3-M	BM-2(N) x Jupiter; BM-2(N) is from Mexico
PR 235-(13)-24-M	Derived from IAC-73-4074 x Alamo

AVRDC lines that looked good at Palmira were:

AGS-8
AGS-29
AGS-31
AGS-47
AGS-57
AGS-66
AGS-79
AGS-103
AGS-120
AGS-158
AGS-159
AGS-160
AGS-167
AGS-179
AGS-212
AGS-214

Dr. Camacho made crosses involving a number of IITA lines. He had F5 populations advanced by single pod descent. Most of the progeny looked rather poor. The crosses were:

TGX 252-71	x	Alamo
TGX 252-71	x	Supreme
IAC 73-1385	x	TGX 442-01C
TGX 306-036D	x	Davis
TGX 306-036D	x	Duocrop
TGX 332-019D	x	IAC 73-1385
TGX 442-01C	x	Duocrop
Duocrop	x	TGX 322-019D
Davis	x	TGX 442-01C (some good plants)
TGX 306-036D	x	Duocrop (some plants OK)
IAC 73-1385	x	TGX 322-019D
Davis	x	TGX 322-019D (some good plants)

Dr. Camacho also planted a few IITA lines at Palmira. Palmira is at 3 degrees N. and about 1000 meters. Growth of many lines was peculiar; plants were late, but short.

TGX	
330-054D	short (30cm)
330-019D	short
306-036D	late, but only 40-50 cm
442-01C	late, but short
533-7[illegible]C	weak stem
2[illegible]7-35D	late
744-02E	late, good height
744-01D	good height, pod set fair
716-01E	late, vigorous growth, but no pods set
536-03D	good growth, but weak stem
713-09D	not adapted (?)
536-02D	OK, slightly weak
442-01D	tall, determinate, pod set fair
711-01D	acceptable growth; pod set fair-poor
330-04E	growth OK, pod set OK

Contacts in Colombia

Dr. Luis Camacho
INTSOY - CIAT
Apartado Aereo 6713
Cali, Colombia
Phone: 680111 Cable: CINATROP Telex: 05769 CIAT CO

Dr. Schoohoven (CIAT Bean Program Leader)
CIAT
Apartado Aereo 6713
Cali, Colombia
Phone: 680111 Cable: CINATROP Telex: 05769 CIAT CO

Gilberto Bastidas Ramos (Ing. Agronomo)
ICA
Apartado Aereo 233
Palmira, Valle
Colombia
Phones: 28162 - 66
Home Address: Calle 33 No. 25-65

Carlos Arturo Varon Rodriguez
ICA
C.R.I. Nataima
Apartado Aereo 40 Espinal
Tolima
Colombia

GUATAMALA, June, 1985

Soybean Production

Soybean production in Guatamala is in its infancy, but could become an important crop in the local economy. Guatamala imports about 30,000 MT of soybean cake annually. More importantly, about 3000 MT of soybean oil are imported which is expected to increase sharply due to recent reduction in cotton seed production. If cotton seed production does not increase, the deficit in vegetable oil could reach 42,000 MT by 1990 (personal communication, Eduardo Menendez Bolanos, ICTA soybean agronomist).

There are approximately 640,000 Ha along the Pacific coast with rich volcanic soils that would be highly suitable for soybean production. At present, only about 4000 Ha are sown to soybean. While Guatamala has several oil extraction plants capable of processing soybean, government policy has favored importation of vegetable oil such that local processors and potential growers have not been able to compete. Should government policy change, Guatamala could rapidly become self sufficient in vegetable oil production because, 1) adapted varieties such as Jupiter and UFV-1 have been identified, 2) a local company is already producing seed, some of which is being exported to southern Mexico, and 3) processing plants are established and in need of raw product.

Soybean Research

The Instituto de Ciencia y Tecnologia Agricolas (ICTA) has been conducting varietal tests in several ecological regions of the country, primarily evaluating germplasm made available by INTSOY. Several commercially available lines such as Alamo (to be released as ICTALAM 85, Jupiter, Duocrop, Ecuador II, and UFV-1, to name a few, have performed consistently well in the coastal ecologies. Varieties such as Crawford, Sparks, Lawrence, and Braxton have done well in the mid-elevation ecologies. Recent selections from breeding materials provided by INYSOY, USDA-Florida, and IITA have given very promising preliminary results. These new lines will be extensively evaluated in 1985.

Production of quality seed in the coastal region is somewhat problematic due to field weathering of seed if rains continue into harvesting period. However, if quality seed is harvested, it can be kept in the cool highlands with little problem of vigor loss. In recent years infestations of stinkbugs have also become a factor in seed production.

Contacts in Guatamala

Astulso Fumagalli (ICTA Director)
ICTA
Av. Reforma Zona 9 8-60 3er Nivel
Edificio Galeron
Guatamala City, Guatamala

Danilo Augustin Gonzalez Arauz (Soybean Project Leader)
ICTA
Av. Reforma Zona 9 8-60 3er Nivel
Edificio Galeron
Guatamala City, Guatamala

Eduardo Menendez Bolanos (Principal Researcher)
ICTA
Av. Reforma Zona 9 8-60 3er Nivel
Edificio Galeron
Guatamala City, Guatamala
Home address: 4 Av. "A" 12-11, Zone 13
Pamplona Phone: 65874

Alvaro De La Pena (Head of Germinaguate)
Germinaguate
7A Avenida 14-44 Zone 9
Ed. La Galeria, Oficina 22
Telex 6215 ANAVI-GU
Phones: 314239, 314470, 314489 Ext. 152, Director: 314704

HONDURAS, June, 1985

Cowpeas

There is no commercial production of cowpeas in Honduras. Dr. Jorge Chang, Jefe, Dept. Agronomia, Zamorano - Escuela Agricola Panamericana, P.O. Box 93, Tegulcigalpa, is interested in running cowpea trials (attention Dr. B.B. Singh). I suggest IITA send full range of trials.

Soybeans

Soybean production is in its infancy. In 1984 only 800 Ha were sown to soya. But I believe it has a bright future because local oil and meal industries are offering an attractive price (approx. 17 cents US/per lb.) for locally grown beans and because considerable applied research has already been conducted by the Ministry of Agricultura. Furthermore, sugar cane and cotton farmers are looking for alternative crops.

Julio Romero, currently a maize breeder, was the principal soybean researcher in the country. Under his leadership the Ministry released two varieties, SIATSA 31 (selected from segregating lines sent from Mississippi) and SIATSA 194 which he believes came from a natural outcross between Beloxi and Hardee or between Hardee and Improved Pelican. In more recent years research efforts are spirited primarily by Jose Ramon Ramirez based at Comayagua. Ramirez has selected DARCO-1 from a population sent by AVRDC (30151-1-1). He is also excited about a selection 50206-3-4 from AVRDC and Honduran line 7804 derived from Jupiter x SIATSA 194. Numerous varietal and agronomic trials have been conducted in several regions of the country.

Soybeans are currently being pushed in two regions: 1) the central plain near Comayagua (planting in mid-October) and 2) coastal plains near San Pedro Sula (planting in November). Seed produced in one region is used to plant the other. However seed grown along the coast in generally of poor quality and it may be more reasonable to grow all the seed near Comayagua and to store seed in the dry highlands near Esperansa. I suggested that Jose Ramon evaluate this possibility. He will also test IITA germplasm with superior seed longevity. I will send seed from Brazil; Ramon also would like samples of Brazilian lines: Doko, Tropical, Teresina, Savana, Cristalina, and Timbira. Varieties should have resistance on tolerance to frogeye leaf spot and to soybean mosaic virus.

A new foundation, Fundacion Hondurena de Investigacion Agricola, funded by AID has been established at La Lima, near San Pedro Sula at the old United Fruit research station. The foundation is to develop agricultural systems for export to assist the country in obtaining foreign exchange. Dr. Mario Contreras (Ph.D from Cornell) is the director of research and Pablo Soto is the principal entomologist. Although the

foundation will focus primarily on citrus, vegetables and cacao, they felt, after my visit, that they might look at soybeans as a component in some farming systems.

I met Enrique Borjas, Leonard Miller, and Arnold Bueso of the new Federacion de Asociaciones de Productos y Exportadores Agropecuarios Agroindustriales de Honduras (FEPROEXAAL). This federation was created to assist with marketing and production (including extension and training) of Agricultural products. I have subsequently received a letter from Leonard Miller requesting assistance in organizing a visit of 6 federation members to Brazil to observe production and industrial processing of soybeans. I believe this visit would be very helpful to Honduras, but I'm not certain how funding for the trip would be arranged.

Honduras would like to become a regional supplier of vegetable oils to Central American countries; they currently export some palm oil regionally.

Contacts in Honduras

Dr. Jorge Chang (Jefe, Depto. Agronomia)
Depto. Agronomia
Zamorano - Escuela Agricola Panamericana
P.O. Box 93
Tegulcigalpa, Honduras
Phones: 33-3173, 33-2717 Zamorano; 32-8543, 32-4317 Tegucigalpa

Julio Romero (Principal Soybean Researcher in Country)
Apartado Postal 459
San Pedro Sula, Honduras
Phone: 56-46-40 office, 53-06-03 home

Jose Ramon Ramirez
Estacion Experimental Agricola (MAG)
Comayagua

Dr. Mario Contreras (Director of Research FHIA)
FHIA-Fundacion Hondurena de Investigacion Agricola
Apartado Postal 2067
San Pedro Sula, Honduras
Telex: 8303, FHIA-HO Phones: 56-2244, 56-2470, 56-2078

Dr. Pablo Soto (Principal Entymologist FHIA)
FHIA-Fundacion Hondurena de investigacion Agricola
Apartado Postal 2067
San Pedro Sula, Honduras
Telex: 8303, FHIA-HO Phones: 56-2244, 56-2470, 56-2078

Enrique Borjas
FEPROEXAAL - Federacion de Asociaciones de Productores y Exportadores Agropecuarios Agroindustriales de Honduras
8a Calle - 19 Avenida S.O. No. 48
P.O. Box 1442
San Pedro Sula, Honduras
Telex: 5643 TROPIC HO Phone: 52-37-93

Ing. Leonard Miller (Assesor de Productividad)
FEPROEXAAL - Federacion de Asociaciones de Productores y Exportadores Agropecuarios Agroindustriales de Honduras
8a Calle - 19 Avenida S.O. No. 48
P. O. Box 1442
San Pedro Sula, Honduras
Telex: 5643 TROPIC HO Phone: 52-37-93

Arnold Bueso
FEPROEXAAL - Federacion de Asociaciones de Productores y Exportadores Agropecuarios Agroindustriales de Honduras
8a Calle - 19 Avenida S.O. No. 48
P. O. Box 1442
San Pedro Sula, Honduras
Telex; 5643 TROPIC HO Phone: 52-37-93

JAMAICA, June, 1985

Cowpeas

CARDI had nearly stopped running cowpea trials primarily because of lack of funds and because two of the three researchers (Jean Dixon and Idelle Brown) left CARDI. Adet Thomas, the coordinator of the cowpea research, had just returned from a one year leave of absence in Canada. Adet Thomas also plans to leave CARDI. Mr. Joseph Suah, Head of CARDI Unit in Jamaica, said funds were very limited and he directed Adet Thomas to spend time on the promotion of VITA 3 which was to be released July 4 by CARDI and the Ministry of Agriculture. I am hoping that CARDI directors in the main office in Trinidad will put cowpea research back on the priority list. Adet Thomas, Idelle Brown, and I visited the cowpea seed multiplication plots near Trelawny on the north coast. They had 56 acres of VITA 3 from which they make 3 picks; expected yield was 1500 Kg/Ha. Plots were sprayed 3 times with nurvacrom insecticide and Daconil fungicide. Mr. Parkinson of the Ministry also had a seed multiplication plot of TVX 1872, a red-seeded erect line, which looked very good. Vita Brown was good and Aurea from Venezuela was fair. Results from 1982 to 1984 are included in the appendix.

I think CARDI should identify an early maturing cowpea and I will encourage directors at CARDI headquarters to support this work. CARDI conducted an eating preference test; the local cowpea (Yvon clay) was chosen often over "African Red", TVX 2724-01F, Laura B, and FR-7. I think there may be scope for further testing. Flavor, texture and appearance were important reasons for choice. CARDI's reports on cowpeas 1981-1984 are included in the appendix.

Soybeans

The Jamaican Soya Products Industry (JSPI) has embarked on a program to promote soybean production. US/AID has provided funds for advisors. In 1984 a private consultant was employed and in 1985 INTSOY took over as consultant to the project. Jamaica imports about 80,000 MT of soybeans and products. Most of the soybean is processed by JSPI in the country. In efforts to stimulate local production, JSPI is contracting growers and is providing technical assistance, including contract planting and harvesting. JSPI had only contracted a few hundred hectares in 1985. Variety trials have not been conducted in a systematic way. JSPI has reluctantly taken some responsibility and they identified Duocrop from Georgia as a productive line for early plantings when the days are relatively long. They do not yet have a variety for short day conditions; they want to plant soybeans year round. Jamaica's rainfall is so sporadic that irrigation is necessary even in the "rainy season". Duocrop looked good in the field but the seed sent from Georgia was of questionable quality; seed showed hilum bleeding suggesting SMV and there were offtype plants. UFV-1 from Brazil had performed well in a yield trial but when they planted a large plot they had

problems with uniformity of maturity. I suspect stink bug damage and suggested that they re-test UFV-1. Several IITA lines, carried by Idelle Brown from IITA, were tested and found to be very late. IITA lines may be useful in the short-day plantings. However Jamaica may be wise to choose varieties with commercial seed available. It is not clear if the Ministry of Agriculture will take the initiative to screen varieties of if JSPI will continue. I sent 60 lines from Brazil but they had not been planted out.

At present INTSOY is sending advisors to Jamaica primarily to give guidance on cultural practices. I talked to Harold Kauffman on the phone and he encouraged me to assist, if possible, in solving the varietal identification problem.

Contacts in Jamaica

Mr. Fred Anderson (President)
Jamaica Soya Products Industries
P.O. Box 27
Rhodens Pen., Old Harbour
St. Catherine, Jamaica, West Indies

Mr. Hugh Wright (Director in charge of soy products)
Jamaica Soya Products Industries
P.O. Box 27
Rhodens Pen., Old Harbour
St. Catherine, Jamaica, West Indies

Ms. Idelle Brown (Wright's techical assistant)
Jamaica Soya Products Industries
P.O. Box 27
Rhodens Pen., Old Harbour
St. Catherine, Jamaica, West Indies

Dr. Joseph Suah (Head of Unit, Entomologist/Agronomist)
CARDI
P.O. Box 113
University Campus
Mona, Jamaica
Phones: 92-76531, 92-76661. ext. 472 Cable: "UNIVERS"

Mr. Adet Thomas (Legume specialist-cowpea, just left program)
CARDI
P.O. Box 113
University Campus
Mona, Jamaica
Phones: 92-76531, 92-76661 Cable: "UNIVERS"

Mr. Jocelyn Grant (Agric. Engineer)
CARDI
P.O. Box 113
University Campus
Mona, Jamaica
Phones: 92-76531, 92-76661 Cable: "UNIVERS"

Ms. Jean Dickson (Botany Dept., used to work on cowpeas w/CARDI)
Univ. of West Indies

Dr. Hussain Ahmad (microbiologist)
University of West Indies
Mona
Jamaica

Table III *Mortality (%) of Fiddler Beetle Grubs* on contact with different Soil Types Treated with Pesticides+*

Pesticide	Dursban		Heptachlor		Primicid		Dieldrin		Control
Soil Type	GW	L	GW	L	GW	L	GW	L	GW
Week 1	100	100	100	100	100	[illegible]			3.0
[illegible]			[illegible]	No sample	100	[illegible]		[illegible]	1.0
[illegible]		[illegible]	[illegible]	65.8	100	84.6	100	88.8	1.2
Week 4	100	100	96.4	63.2	96.4	72.0	100	80.0	2.4
Week 5	100		86.3		98.2		98.7		0
Week 6	99.6		84.2		95.8		98.7		0
Week 7	98.6		90.6		95.0		100		0
Week 8	100		85.0		91.4		97.6		1.9
Week 9	100		[illegible]		89.6		100		1.6
Week 10	97.0		80.6		90.7		92.0		2.0
Week 11	97.4		80.0		84.6		94.2		0
Week 12	98.0		75.0		80.2		97.0		0
Week 13	92.6		78.2		80.8		100		2.4
Week 14	94.8		74.6		76.8		95.0		1.3
Week 15	92.6		72.3		71.2		96.4		2.4

* 300 grubs per treatment
\+ 1.0% a.i.

---

1. Pest Complex on Cowpea (Vigna [illegible] L.) in different areas of Jamaica—Survey A

Introduction: Little is known of the pest distribution on cowpeas in Jamaica. While it is thought that the pod borer *Fundella cistipennis* is the main pest of cowpea in Jamaica, preliminary reports and observations indicated other pests, especially aphids, may be potentially important. (Parasram, personal observation).

Objective: This survey was initiated to provide information regarding the distribution in Jamaica of *Fundella* sp. or any other pod borer on cowpea, the relative size of the borer population in different areas and the composition of the insect population present at the time observations are taken.

Materials and Methods: Starting in 1976, visits were made to each area growing cowpea once during the lifetime of the crop. At this time random samples are taken of pods of approximately uniform size and estimates made of the percent borer infestation per 100 pods. Any borer larvae found are reared through for identification. With the aid of the extension services collections are made of all the insects present on the crop. For each area the collections of pods and insects are repeated with each planting. Background information is also gathered on the nature of cultivation practices and irrigation employed, the identity and concentration of any pesticides used, and the variety of cowpea planted. To date, five areas in two parishes have been visited Serge Island, and Coley, St. Thomas. Tryall Cooperative and two farms in Rosend, St. Mary. These visits will continue at least until the end of 1977.

Results and discussions: For a summary of results to date see Table 1. At all sites evidence of pod borer damage was noted. The samples collected in January 77 are being reared through. The almost total absence of insects in the Tryall planting is not surprising because of the nature of the insecticide used.

Table 1. *Distribution of pod borer on cowpea in different areas of Jamaica*

Locality	Date Visited	Variety	Borer Damage	Spp. found	Comments
Serge Island	June, 1976	California Blackeye	37.8	*Fundella*	Overhead irrigation, no chemical control, very poor weed control. Abundance of aphids.
Coley	June, 1976	" "	42.3	"	Overhead irrigation, no chemical control, weed control poor in patches.
Agualta Vale	July, 1976	" "	5.0	"	No chemical control, abundance of *Cerotoma* and *Diabrotica*.
Tryall Co-operative	January 1977	" "	9.0	To be reared	Phosvel used for two (2) sprays. Extensive burning to foliage and pods. Very few insects present.
Rosend I	January 1977!	" "	40.8	"	No chemicals or irrigation.
Rosend II	January, 1977	Yvon Clay	29.5	"	No chemicals or irrigation. Extensive leaf roller damage.

Introduction. The production of cowpea throughout Jamaica is being encouraged but is still fairly recent. Any large scale production only began in early 1972; previously one variety alone, Yvon Clay, was grown on small farmers holdings. At present three varieties are being grown, Yvon Clay, African Red and California Blackeye. The last two varieties have been introduced to farmers as recently as 1974. It has been shown in other areas e.g. Nigeria (Booker 1965, Taylor 1967, Singh 1975), that insect pests, especially a number of pod borers, can greatly reduce the yield of cowpea plantings. However, there is to date little record of the insects found in cowpea in Jamaica. (Fennah, 1947). In cooperation with the Extension Service, a survey was therefore initiated in November 1976 and continued through 1977 with a view to accumulating information regarding the identity and possible importance of insects found on cowpea plantings throughout Jamaica. [illegible] mation collected in the survey should also help to outline the constr[illegible] affecting cowpea production and thus indicate the trend that should be [illegible] by further research effort in pest control of cowpea.

Materials and [illegible]*ods:* Because of the need for restrictions on travelling which curtaile[illegible] frequency of field assessments, initial emphasis was given to collection o[illegible] for assessments of pest damage done and to determine the identity of [illegible] pest causing the damage.

As in 1976, [illegible] was made to each area growing cowpea at least once during the life [illegible] the crop. At that time random samples were taken of pods of appro[illegible]ly uniform size and age and estimates made of borer infestation. A[illegible] rer larvae were reared to the adult stage for identification. Other i[illegible] present in the crop were also noted. For each area the collection of p[illegible] insects was repeated with each planting. Background information wa[illegible] gathered principally with regard to the farming practices being used.

Results and Di[illegible]: For the period July to January, 1978, 10 parishes have been visi[illegible] mples have been collected from 20 plantings. Yvon Clay and Afric[illegible] are planted more frequently than California Blackeye, with farme[illegible] e often using seed from one planting to provide planting material fo[illegible] er crop. This is not the best practice particularly because seed via[illegible] nd performance decrease with successive generations of inbreeding; [illegible] ition seed-borne diseases will increase their reservoir of inoculum w[illegible] h generation. Planting material should therefore be more carefully [illegible].

Producing a c[illegible] cowpeas in many areas is still dependent on the availability of rainfa[illegible] natural irrigation. In areas where rainfall is regular and timely this [illegible] ot affect production. But observations have shown that water is crit[illegible] certain stages of growth e.g. in early plant establishment, at floweri[illegible] od set and development. Excessive water which can occur in times of [illegible] sive rainfall or some areas under flood irrigation may cause waterloggi[illegible] of plants and increase plant susceptibility to root diseases. In many areas t[illegible] re, attention should be paid to regulation of water supply and testi[illegible] possibility of additional irrigation to allow cowpea production out [illegible] rainy season.

Farmers in mo[illegible] s also have little information concerning the methods for producing a g[illegible] rop of cowpea e.g. planting distances vary from 5cm to 1m between [illegible]. Few farmers use control practices and then any chemical is used f[illegible] and disease control. Many are not fully appreciative

of the need for proper weed control. In many farms, the resultant abundant weed growth has caused direct competition with plant growth as well as a buildup in serious pests problems e.g.

(a) Leaf hopper population and damage

(b) Leaf beetle CPMV infection

(c) Pod borer and Bruchid population

The following is a list of the insects collected from cowpea plantings in Jamaica:

	Pest	Common names
i.	*Aphis craccivora,* *Rhophalosiphum sativum*	Aphids
ii.	*Empoasca sp.*	—Leaf hopper
iii.	*Frankliniella sp.*	—Thrip
iv.	*Lamprosema indicata*	—Leaf roller
v.	*Loxostege sticticalis*	—Leaf webber
vi.	*Goniurus proteus*	—Leaf roller
vii.	*Anticarsia gemmatalis*	—Foliage feeding caterpillars
viii.	*Prodenia ornithognalli*	—Foliage feeding caterpillars
ix.	*Cerotoma ruficornis*	—Leaf beetle
x.	*Diabrotica balteata*	—Banded cucumber beetle
xi.	*Homephaeta cyanipennis* *var octomaculata*	— —Leaf beetle
xii.	*Epitragus auralentus*	—Flower feeding beetle
xiii.	*Nezara viridula,* *Acrosternum sp.* *Euchistus sp.*	—Stink bugs
xiv.	*Leptoglossus phyllobus*	—Leaf footed Coreid
xv.	*Fundella cistipennis* *Maruca testulalis* *Heliothis virescens and* *H. zea*	—Pod borers —Pod borers Pod borers
xvi.	*Callosobruchus chinensis* *Acanthoscelides obtectus*	—Bruchid —Bruchid
xvii.	*Chalcodermes sp.*	—Bean curculio
Beneficial Insects		
i.	*Polistes sp.*	—Wasp
ii.	*Zelus longipes*	—Assassin Bug
iii.	*Rodalia sp.*	—Lady beetle
iv.	*Chrysopus sp.*	—Green lacewing
v.	*Unidentified larval parasites*	—Tentatively identified as 1) Icheumon 2) Braconid 3) Eulophid

Pest populations: The pod borer, *Fundella cistipennis* has been found at all holdings visited. Highest levels of damage have been found at (1) Cape Clear, St. Mary (2) Irwin Towers, Trelawny (3) Phillipsfield, St. Thomas and (4) Lucea, Hanover. The lowest incidence of borer damage was found at United Estates in St. Catherine (3.6%) and Bengal Estates, St. Ann (8%) (Table 2). This is as would be expected since attempts were made to maintain

[illegible] very low [illegible] *Maruca testulalis* from one holding in St. Mary and *Heliothis vi*[illegible] from Lawrencefield St. Catherine and one farm in St. James. Of t[illegible] other insects recorded, high populations have been found in some are[illegible] — of Stink bugs in Tollgate and Lawrencefield, Coreids in May Pen an[illegible] Bruchids in May Pen and St. Thomas. (Table 2). The bean curculid *Cha*[illegible]*lcodermes* sp. has also been recovered from yellow mature beans in some area[illegible] especially in the varieties Black Eye and Yvon Clay.

Other factor[illegible] *ecting production:* Table 2 gives a record of other major insects found [illegible] the different sites.

There are [illegible] factors other than pest activity which militate against successful pr[illegible]on of Cowpea but most important are the role of the Cowpea Mosaic [illegible] (CPMV) and the occurance of root fungi particularly in some suga[illegible] plantings. The virus has been observed in a few areas visited. It wa[illegible] dant in Trelawny and to a lesser extent in Mona and St. Catherine (T[illegible]. Both groups of disease, the CPMV and the root fungi, have serious [illegible]ious affect on flower production and pod set. They can therefore cau[illegible] drastic reduction in yield.

It has been di[illegible] to obtain reliable yield data from these areas. This should be useful in [illegible]ing damage versus yield relationships at sites other than experimental [illegible] Plans are to lay down pest and parasite observation and control [illegible]t those sites known to have high relative pest densities or where par[illegible] have been recorded. Possible locations for these observations are (1) [illegible] St. Catherine, (2) T[illegible]gate, Clarendon (3) Philipsfield, St. Thomas a[illegible] Irwin Towers, Trelawny or Cape Clear, St. Mary.

Other areas [illegible] still be monitored periodically to record quantitatively the developm[illegible] pest populations and the effectiveness of control recommendations gi[illegible]

References Cit[illegible]

1. BOOKER, [illegible] 1965. Pests of Cowpe[illegible] and their control in N. Nigeria. Bull. Ent R[illegible]: 663—672

TAYLOR, [illegible]. 1967. The bionomics of Maruca testulalis, a major pest of cow[illegible] Nigeria. J. West Afr. Sci. Assoc. 12: 111—129.

3. SINGH, [illegible] [illegible]975. Handbook of insects pests of cowpea in Nigeria. IITA publi[illegible]

4. FENNAH, [illegible] Insect pests of leguminous crops: 91—129 in Insects pests of fo[illegible]ps in Lesser Antilles. Publications of Departments of Agriculture [illegible]ard and Windward I[illegible]

J. C. Reid, R. Murray

3. Difference i[illegible]ptibility of popular varieties of cowpea *V. unguiculata* to damage [illegible] borer *F. cistipennis* in Jamaica.

Introduction: L[illegible] production in the Caribbean is becoming increasingly important as a [illegible]tively cheap source of protein for human consumption. The emphasis in [illegible]aica has been largely on production of *Phaseolus vulgaris* (red pea) and *C*[illegible] *cajan* (pigeon pea), but increasing attention is being given to the pro[illegible]n of other food legume especially *Vigna* sp. (cowpea).

Attempts hav[illegible]en made to control the pests in red pea and pigeon pea (Pierre 1972; P[illegible]m 1973) but only recently has any attempt been made to evaluate met[illegible]of controlling pests of Cowpea in Jamaica (Reid [illegible]). Efforts to date [illegible]een concentrated on determining chemicals which can control a pod [illegible] (*Fundella cistipennis*), an important pest of cowpeas

[illegible] for more information on timing of spray applications, and the screening of cowpea varieties to elucidate possible differences in susceptibility to borer attack. Continued evaluation of the effectiveness of other insecticides for borer control was also advisable.

Objective: This present study was to determine whether any differences in susceptibility to borer attack existed among the most popular varieties in Jamaica.

Materials and Methods: Modifications in the design of the experiment were implemented in the hope that more information could be obtained about the stage of the plant most susceptible to attack, the extent of the damage and the relationship between borer damage and loss in yield in the different varieties.

Two experiments were carried out in March and July, 1976. In both experiments guard rows of Blackeye No. 25 were established two weeks prior to planting the main plots, each of which consisted of 1.2 x 3m rows spaced 2 apart. There was a 0.9m space between plot and guard rows. Varieties used for comparison of damage and insecticide control were Blackeye no. 25, African Red no. 26, Yvon Clay no. 5. In experiment No. 1 (March 1976) a 3 x 9 randomized block design with varieties planted in separate blocks.

Two insecticides were used. Treatments were applied with a knapsack sprayer between 7.00 —8.00 a.m. to reduce drift. Two applications were made at a 1 week interval beginning at approximately peak flowering.

Sampling: When plants were 4 weeks old sampling for damage estimates was begun. Assessment of stem damage was done weekly on 48 plants until the first spray. Flower damage was assessed once only on 32 plants at peak flowering. Pod damage was assessed on 32 plants weekly from pod set up to harvest. For stem and pod damage records were taken of total number of entrance holes and total number of stem or pods per sample. Total number of flowers damaged out of the total number flowers produced was recorded at peak flowering.

Results and Discussion: In experiment no.1 (March 197[illegible]) it was found that the rate of development differed among varieties with Blackeye maturing first and [illegible] last. This caused problems in timing of treatments to [illegible] pod set in all varieties and made it difficult to compare varieties for differences in overall performance.

Data for analyses of stem damage given in Table 1 a comparison of number of entrance holes and stem damage per sample appeared to give similar results. The data for entrance holes gave slightly more information but the additional information given there may not justify the amount of time spent in its collection.

There was evidence of varietal differences in susceptibility with African Red being most resistant and Blackeye 25 least.

Data for flower damage Table 2 was not as thoroughly analysed because of the apparent difference in rate of flowering of different varieties. Out of ninety six plants checked on the day of sampling. Blackeye had no plants without flowers whereas in African Red there were 34 plants without flowers and Yvon Clay had 64 plants without flowers. The rate of flower damage in all varieties was low (less than 10%). No evidence of a correlation between rate of flower damage and stem damage was detected.

Differences were indicated in rates of pod set for each variety. (Table 3) The pattern of activity of the borer was apparently constant in that some positive correlation existed between number of entrance holes in 48 stems and number of entrance holes in pods (correlation coefficient—0.634) but there

different varieties to borer attack.
interesting : at as yet unexplained is the persistence of increasing damage for Yvon Clay pods even after the first spray, especially since the timing of insecticide application was more suited to Yvon Clay than to other varieties. It may mean that Yvon Clay is most susceptible to borer damage or that the natural increase in the borer population resulted in a similar increase in the extent of damage done.

A consideration of yield is necessary to elucidate effects of spray and general varietal performance. Both treatments — Sumithion and Diazinon proved significantly better than the control (P. 0.01). Two problems confounded further interpretation of results. In the last two weeks of the experiment (1) uncontrollable water stress affected African Red and more severely Yvon Clay since the latter developed more slowly and (2) timing of spray applications to synchronis with peak flowering for all three varieties was not possible. Thus any fina ssessment of yield and the effects of borer damage is invalid
Further consi ration will be given to determine whether damage is a significant factor in determining yield or if high yield is more closely related to heavy pod set and t are indirectly to water supply than to pod borer damage.

There is ne in Jamaica for some basic information about the agronomic aspects cowpea production especially with regard to water requirements of the throughout its development and overall varietal performance. This save much time in achieving useful results in experiments in chemical co of the borer.

In experime here was a change of location from Lawrence Field to
Bushy Park, S ierine, because of security problems. In spite of modifi-
cation in desi accommodate different growth patterns of the more
popular variet e experiment had to be abandoned after seven weeks.
Plants were ba ected with *Sclerotium* which caused extensive flower fall
therefore con he factors for experimental consideration. The variety
Blackeye appe east affected by the fungus and some pod set occured.
Eighty to ninet nt of the flowers abcissed in the varieties 2 and 3 and the
amount of pod is negligible. The question remains whether this is due
entirely to the r susceptibility of these two varieties to the fungus. On
the advice of hologists at C.A.R.D.I. and Ministry of Agriculture.
work at Bushy s not being continued. At present no further trials can
be carried out suitable location is found.

J. C. Reid

Table 1. *Stem L s (Before Spraying)*

Varieties Ranked	Average Number Stems Damage Per 48 Plants		Average Number Entrance holes per 48 Plants	
	21.5.76	27.5.76	21.5.76	27.5.76
V₁	35.78 a+	42 a	87.33 a	129 a
V₃	21.22 b	37 a	42.11 a	86 b
V₂	17.78 b	24 b	32.89 b	48.67 c
Standard of error of Variety means	2.29	3.28	4.53	8.00

+ Varieties t a letter in common are significantly different at the 5% level Duncan's Multiple Range Test.

Variety	Percent Number of flowers damage (Average Per Sample)
V_1	4.70 a
V_2	5.95 a
V_3	3.72 a
Standard error of variety means	0.89

Table 3: *Pod Damage—Number of Entrance Holes Per pod*

Before spraying 27.5.76	After first spraying 3.6.76		After second spraying
V_1 0.414	V_3 0.755 a	T_3 0.578	V_3 0.823 a+
V_2 0.320	V_1 0.325 b	T_2 0.438 ab	V_2 0.332 b
V_3 0.244	V_2 0.287 b	T_1 0.351 b	
Standard error of variety or Treatment means	0.072	0.072	0.089

—Varieties without a letter in common are significantly different at the 1% level using Duncan's Multiple Range Test.

4. Differences in the susceptibility of 3 varieties of Cowpea *(V. unguiculata)* to damage by pod borer *(F. cistipennis =pellucens)*

Summary: A trial was carried out to determine whether different varieties of cowpea vary in their susceptibility to damage by the pod borer *Fundella cistipennis* (= pellucens). Three popular varieties were used in a randomised split—block design. They were Blackeye No. 25, African Red and Yvon Clay. Starting immediately after flowering, all varieties were sprayed twice at a week's interval with two insecticides and a control. The insecticides were Sumithion 50 EC (common name—Fenitrothion) Diazinon 4E (47.5% a.i.)

Initial differences were observed in the varietal susceptibility to pod borer where Blackeye appeared most susceptible and Yvon Clay least (P<0.01 DMRT). Some varietal difference in response was lost as plants developed further.

Flower damage was low in all plots (less than 10%) and no variety appeared susceptible than others to borer damage.

There is no evidence of a correlation between rate of damage to stem and flowers and variations in sample or plot yields.

Damage to pods was generally low for Blackeye and African Red but tended to increase when only Yvon Clay had not been reaped and were available to the borers. In this case, as in 1976 trials, yield in plots treated with either insecticides were significantly better than the control (P<0.01). Here too, some correlation existed between pod damage and yield of sample plots. Further considerations of varietal differences in total plot yields could not be assessed due to praedial larceny. Until further trials, Sumithion and Diazinon can be recommeded for control of Pod Borer (at application rate of 500 g. a.i./ha). Chemicals should be applied at 7—10 days interval 1 at flower and 1 after.

[illegible] of the different varieties but there was some evidence [illegible]etal susceptibility with African Red most resistant and Blackeye is [illegible] ate of flower damage to all varieties was low (less than 10%) A compar[illegible] varietal differences in susceptibility to pod damage could not be ma[illegible]fly because timing of spray applications to synchronise with peak [illegible]g for all 3 varieties was not possible. However, a consideration of [illegible] effects of the 2 insecticides (Sumithion and Diazinon) in controlli[illegible]r damage to pods of Blackeye No. 25 indicated that both insecticide[illegible]ignificantly better than the control (P 0.01%—Duncan's Multiple Ra[illegible]s) in protecting pods and seeds from borer attack. Other important i[illegible]tion was obtained from the failure of Exp. 2—July 1976 at Be[illegible]y Pa[illegible]. Catherine. Here plants of all varieties were attacked by a root fungus [illegible]tium rolfsii which caused extensive flower fall, approximately 60" [illegible]an Red and Yvon Clay, while in Blackeye No. 25, approximately [illegible]f the plants still manage to hold their flowers and produce pods.

Objectives: Ex[illegible]ments in 1977 were planned to continue the investigations into (1) di[illegible]s in the susceptibility of varieties to borer attack with a design mod[illegible]accommodate the different rates of development of varieties (2) the p[illegible]ed by borer damage in reducing yield (3) the effectiveness of different [illegible]gimes and insecticides in preventing borer damage to pods of diff[illegible]wpea varieties.

Materials a[illegible]*ods:* In this experiment guard rows of Blackeye No. 25 were establi[illegible]weeks prior to planting the main plots. The plots were planted in [illegible]77 and consisted of 4 x 3.3 m long rows spaced 60 cm apart. Plants [illegible]rows were thinned to a distance of 10 cm from each other. There was a [illegible] space between plots and guard rows. Varieties used for comparison [illegible]age and insecticide control were Blackeye No. 25 (V1) African Red [illegible] Yvon Clay (V3). A randomized block design was used with var[illegible]planted in separate blocks. After planting the area was treated with [illegible]emergence herbicides Dacthal (11.2 kg ha) D[illegible] (8.96 kg/ha). Two [illegible]cides were used Sumithion 50 Ec and Diazinon 4E (47.5% a.i.). [illegible]ments were applied with a knapsack sprayer between 7.00—8.00 am [illegible] drift from contiguous plots. Two applications were made at [illegible] week interval beginning at approximately peak flowering for each vari[illegible]

Sampling: W[illegible]nts were 4 weeks old sampling for damage estimates was begun. A[illegible]nts of stem damage was done weekly on 48 plants until the first spray. [illegible]r damage was assessed once only on 32 plants at peak flowering. Po[illegible]ge was assessed on 32 plants weekly from pod set up to harvest. For [illegible]nd pod damage records were taken of the total number of entrance hol[illegible] total number of stems or pods per sample. Total number of flowers dama[illegible]t of the total number of flowers produced was recorded at peak floweri[illegible]

Results and Dis[illegible]: Modifications in experimental design to accommodate the different ra[illegible] development of the varieties made it possible to synchronise timing [illegible]tment with pod set in all cases and to compare varieties for differences i[illegible]rall performance.

Stem damage: [illegible] plants were approximately 5 weeks old, the number of damaged stem[illegible] significantly greater for V1 than for V2 (P<0.05) and V3 (P<0.01). T[illegible]erence between V2 and V3 was not significant.

Table 1. *Stem damage—Average number of damaged stems per 48 sample plants.*

20.4.77 (37 days after planting)		14.5.76 (44 days after planting)	
Varieties ranked	DMRT at 5% level	Varieties ranked	DMRT at 5% level
V1 18.22	a	V1 17.78	a
V2 10.89	b	V3 9.56	b
V3 7.67	b	V2 6.89	b
standard error = 1.29		standard error = 1.96	
27.4.77 (44 days after planting) d.a.p.		21.5.76 (51 days after planting) d.a.p.	
Varieties ranked	DMRT at 5% level	Varieties ranked	DMRT at 5% level
V1 23.56	a	V1 35.78	a
V2 20.44	a	V3 21.22	b
V3 19.00	a	V2 17.78	b
Standard error = 2.67		standard error = 2.29	

This agrees with results for 1976 in that the level of damage was similar and V1 California Blackeye again appeared more susceptible to borer attack than either V2 or V3 — at least in the earlier stages of growth. (Table 1). Similar results were obtained from an analysis of number of entrance holes per 48 stems. V1 had significantly more damage than V2 and V3 P<0.01) while the difference between V2 and V3 was not significant.

However, within a week, as the African Red and Yvon Clay plants developed further, the amount of damage to their stems increased to a level approximating that of Blackeye. Any apparent differences in susceptibility was therefore reduced with only the difference in damage between Blackeye and the more slowly developing Yvon Clay remaining nearly significant (P<0.05). This is consistent with many pest-plant relationships where the pest is attracted to the crop at a particular stage of development here possibly arrived at more quickly by the fast-growing Blackeye and more slowly by the African Red and Yvon Clay plants in that order.

An important consideration is the fact that for any of the varieties, analysis did not indicate any relationship between stem damage and yield of either sample or total plots. It is useful information, therefore, that cowpea plants of these varieties appear able to tolerate this level of pod borer damage to stems without any deleterious effect on yield.

Flower Production and Damage by Borer: Peak flowering was assessed for Blackeye at 45 days after planting, African Red at 55 days after planting, Yvon Clay at 60 days after planting.

Differences in the number of flowers recorded for each variety at peak flowering showed that (for a sample of 32 plants) both Blackeye and Yvon Clay had produced significantly more flowers than African Red (P<0.01 Table 1). Throughout the trial, however, it was noted that the varieties also differed in the duration of flower production. This was more prolonged in African Red and Yvon Clay than in Blackeye and consequently would affect values of flower production taken at estimated "peak" flowering [illegible] the

[illegible] [illegible] flower production at "peak" were not reflected in any marked [illegible] ences in yield among the varieties.

The rate of [illegible] ge by the borer to all varieties was low (less than 10%) in all plots wh[illegible] rees with results from the 1976 trial (Table 2).

Table 2. *Flow[illegible] damage and abundance of flowers per 32 sample plants at estimated time [illegible] of flowering*

Approx. time at peak flowering	Variety	Avr. rate of flower damage	DMRT at 5% level	Avr. No. of flowers	DMRT at 1% level
27.4.77	V1	4.6%	a	1361.8	a
5.5.77	V2	4.41%	a	617.9	b
10.5.77	V3	3.13%	a	1267.9	b
		St[illegible]d error=0.8%		Standard error=102.37	

There appear[illegible] significant difference in varietal susceptibility to damage. Equally importa[illegible] there is no indication that rate of flower damage showed any correlated [illegible] in sample or plot yields. It seems therefore that, although damage to flow[illegible] would result in the loss of a potential pod; the small size of an individual [illegible] er and pedicel would attract only the very early-instar larvae which it [illegible] n support. Any appreciable loss of yield due to flower damage could h[illegible] result from larvae which move from flower to flower. This does not a[illegible] to be the case in *F. cistipennis.*

Pod Damage an[illegible] Yield: Pod borers begin to penetrate pods of very small size. Earliest pod [illegible] age observed was in pods three days old. Assessment of damage to po[illegible] s therefore begun for each variety as soon as the pods developed. (table[illegible])

There appears [illegible] difference in susceptibility of California Blackeye and African Red po[illegible] od borer damage. In both these varieties the degree of damage was gen[illegible] ow. This [illegible] ay account for the fact that the difference between treatme[illegible] control did not reveal any statistical significance. (Table 3). Howev[illegible] n Yvon Clay pods were rated, pod borer damage here was markedly h[illegible] nd both treatments showed a significantly lower rate of damage than [illegible] ntrol (P<0,01). This compares with results of the 1976 trials.

These results al[illegible] icate the need for more information on the threshold of Pod borer da[illegible] which would make the application of insecticide economically feasi[illegible]

The marked in[illegible] in damage when Yvon Clay pods were assessed must be interprete[illegible] as an indication that this variety is more susceptible to borer attack. Whe[illegible] er this susceptibility is purely a genetic difference remains to be answer[illegible] More likely it may be a result of the fact that, because Yvon Clay plants [illegible] p at a slower rate than the other two varieties, where this variety is plan[illegible] the same time as others, the pods remain available longer to an incre[illegible] borer population.

At this point, Sm[illegible] and Diazinon at 500g a.i./ha can be recommended for control of pod [illegible] in cowpeas when applied at 7—10 day intervals. The number of ap[illegible] ons will depend on the rate of pod set and development of the parti[illegible] variety.

TAYLOR T.A. 1967. The bionomics of Maruca testolalis a major pest of cowpeas in Nigeria. J. West Afric. Sci. Assoc. 12: 111—129.

J. C. Reid

Table 3. *The relationship between pod borer damage in insecticide treatment in different varieties of cowpea. Lawrence field 1977*

Date of Assessment	Variety	Mean % Pod Borer damage	Treatment	Mean % Pod Borer damage
12.5.77	African Red	5.78 a	Control	7.02 a
	California Blackeye	3.50 a÷	Sumithion	3.63 a
			Diazinon	3.12 a+
	Standard error 0.88	Standard error =1.12		
19.5.77	Yvon Clay	10.61 a	Control	10.56 a
	African Red	8.50 a	Sumithion	8.08 a
	California Blackeye	7.22 a+	Diazinon	7.70 a+
	Standard error 1.82		Standard error =0.99	
25.5.77	Yvon Clay		Control	23.05 a+
			Diazinon	14.51 b
			Sumithion	13.48 b
			Standard error =0.92	

+ Values followed by the same letter are not significant to the 5% level, Duncan's Multiple range Test (DMRT)

++ Values not followed by same letter are significant to the 1% level DMRT.

4. Evaluation of insecticides for control of pod borer, *F. cistipennis*, on cowpea *V. unguiculata*, in Jamaica

Introduction: Evaluation of insecticides for control of any important pest should be a continuous effort aimed at providing the farmer with a selection of compounds shown to be most effective in reducing pest damage and in giving best yields. Evaluation of Insecticides is of special significance since there is always the danger of pests developing resistance to pesticides in cases where monoculture is practised and the life cycle of the pests is sufficiently short to allow the occurrence of several generations within the crop growing period.

Trial I.

Materials and Methods: A trial was laid down at the same time as Experiment I in March, 1977 to test the effectiveness of 8 insecticides in the control of *F. cistipennis* damage to cowpea. Only 1 variety was used—Yvon Clay planted in a randomised complete block with the nine treatments (8 insecti-

[illegible] apart. The distance between guard rows and plots [illegible] ined 75cm. The treatments used were:

	Chemicals		*Common Names*
(1)	Dursban 2E	—	Chlorpyrifos
(2)	Azodrin 60 EC	—	Monocrotophos
(3)	Lannate 95% WP	—	Methomyl
(4)	Metasystox R	—	Oxydemeton-methyl
(5)	Surecide 25% EC	—	Cyanofenphos
(6)	Primicid 50 EC	—	Pirimiphos-ethyl
(7)	Ekalux 25 EC	—	Quinalphos
(8)	Volaton 50 EC	—	Phoxim
(9)	Control	—	No insecticides

All ch[illegible]ls were applied at 500g a.i./ha.

Treatme[illegible]ere applied at peak flowering and 1 week after. application being mad[illegible]een 7:00—8:00 a.m. to prevent drift of treatments between contiguou[illegible]. Pods from all plots were reaped as they matured. Yield was assess[illegible] from weight of dried seed per plot.

Results an[illegible] Di[illegible]ussion: The variety used here grows more slowly and pods are prod[illegible]ver a more extended period than California Blackeye. This mean[illegible] the period over which pods mature and reaping occurs is longer thar[illegible] more determinate variety. (Table 1).

Table 1. *R[illegible] growth of two different varieties of cowpea, Lawrencefield and Hope.* 1977.

Variety	Days to first flower	Days to end of Harvest
California [illegible]ye	35	70
Yvon Clay	48	85—100

+ Duratio[illegible]od set increases in earlier cooler months of year.

Plots wer[illegible]pered with and it was not possible to assess the extent of praedial la[illegible] involved s[illegible] that adjustments in yield data could be made. Consequen[illegible]lysis of total plot yields did not show any significant differences betw[illegible]atments. However, plots treated with Azodrin and Primicid gave [illegible]st yield (Table 2) although these did not differ significantly from the co[illegible] (Duncans multiple range test). The trial was repeated using a more de[illegible]ate variety whereby the period of sequential reaping of plots was s[illegible]ed and hence better protection against praedial larceny should be a[illegible]lished. (Table 2).

Table 2. *Th[illegible] of Insecticide Treatment on yield in Cowpea, V. unguiculata, Law[illegible]eld March. 1977*

Treatment		Wt. (g) dried seed
Dursban	2 E	1137
Azodrin	60 EC	1243
Lannate	95 WP	1017
Metasystox R		1153
Surecide	50 EC	1198
Primicid	50 EC	1272
Ekalux	25	1250
Volaton	50 EC	1063
Control		907
S. E. of trea[illegible] means = 134		

Materials and Methods: The insecticide evaluation trial was repeated starting December 1977 with some modifications. California Blackeye was used instead of Yvon Clay.

The treatments were:

	Chemicals		*Common Names*
(1)	Dursban 2 E	—	Chlorpyrifos @ 600g a.i./ha
(2)	Dursban 2 E	—	Chlorpyrifos
(3)	Azodrin 60 EC	—	Monocrotophos
(4)	Lannate 95 WP	—	Methomyl
(5)	Metasystox R	—	Oxydemeton methyl
(6)	Ekalux 25	—	Quinalphos
(7)	Volaton 50 EC	—	Phoxim
(8)	Supona 20 EC	—	Chlorfenvinphos
(9)	Control	—	

Note—treatments 2—8 were applied at the rate of 500g a.i./ha

As in the first trial treatments were applied at peak flowering and one week after: applications being made early in the morning to prevent the drift of treatments between adjacent plots. Yield was assessed from the weight of dried seed (g) per plot.

Results and Discussion:

Table 3. *Effect of different insecticide treatments on yield of Cowpea, V. unguiculata* var. Blackeye, Lawrencefield 1977

Treatment	Average Yield per plot (g) dried seed	Average No. of Plants per plot
Supona	1294.8 a+	118
Dursban (600g/h)	1146.5 ab	121
Azodrin	113[illegible].5 ab	102
Ekalux	10[illegible].5 ab	120
Volaton	1076.3 ab	119
Dursban (500g/h)	1074.5 ab	111
Metasystox R	1013.5 abc	115
Lannate	94[illegible].8 bc	118
Control	753.3 c	112

Standard error of treatment means 90.1

+ Letters indicate results of Duncans Multiple Range Test at the 5% level

Average yields and average plot populations are given in Table 3. The analysis of treatments by Duncan's Multiple Range Test (DMRT) showed that Supona gave the best yields which were better than those given for Lannate (P 0.05 DMRT) and the control (P 0.01 DMRT). All other treatments were better than the control. The pesticide residue levels in the dried grain are being analysed to ascertain whether the chemicals with the most effective performance could be recommended for use in cowpea production. This is of particular relevance here since some are more toxic than those referred to in the first experiment. General recommendations for the use of these chemicals will not be made until the information is received re[illegible]ing t[illegible] resid[illegible]vels[illegible]ried[illegible]h.

[illegible] gave comparatively poor per[illegible] in [illegible] trials wher[illegible] odrin did much better. Ekalux performed somewhat bett[illegible] in the first [illegible]al [illegible]ut no reason for this can be given at this time.

Table 4. *E[illegible] of different Insecticides on yield of cowpea,* V. *unguiculata* , *Lawrencefi[illegible] 1977*

Comparison of Results for 1977 Trials 1 & 2

Treatment	Trial 1-Variety Avr. yield per plot (g)	Yvon Clay Avr. plant population	Trial 2-Variety Avr. yield per plot (g)	Blackeye No. 5 Avr. plant population
Azodrin	1243.3	149	1136.5	102
Lannate	1016.7	162	944.8	118
Metasystox	1153.3	131	1013.8	115
Dursban (6[illegible])			1146.5	121
Dursban (5[illegible])	1136.7	159	1074.5	111
Supona			1294.8	118
Ekalux	1250.0	147	1099.5	120
Volaton	1063.3	152	1076.3	110
Surecide	1198.3	149		
Primicid	1271.7	143		
Control	906.7	163	753.3	112
Standard err[illegible] of treatment [illegible]ans	134.0		90.1	
l.s.d. (5% le[illegible])	284.1		186.0	
coefficient of Variation	20.4%		9.5%	

In additio[illegible]t population numbers as included do not appear to have an effect on [illegible]rences in yield.

Chemicals [illegible]onsiderable promise for recommendation to control pod borer damag[illegible]wpea at present are Azodrin, Supona, Eklux at 500g, a.i./ha and Durst[illegible]00g. a.i./ha — Further recommendations will be made as information c[illegible]ing the cost benefit ratios have been analysed on the role played by the[illegible]nicals in reducing Pod Borer damage and improving the yield in cowp[illegible]ntings. Consideraton in further evaluations will also be given to the e[illegible]ese chemicals have on other potentially important pests in the crop.

Future trial[illegible]t also take into consideration the economic feasibility of chemical cont[illegible] pests of cowpea varieties with extended flowering periods.

J. C. Reid

Assessment of the Susceptibility of a Jamaican Population of the West Indian Fruitfly *Anastrepha mombinpracoptans* (Sein) (Diptera: Tephritidae) to various Insecticides

Abstract: Basic data are provided from an apparently insecticide-susceptible population of fruitflies; such data may be used in future monitoring for the emergence of insecticide-resistant populations of fruitflies. [illegible] that dimethoate, phosphamidon, fenitrothion and diazinon were highly toxic being 778 to 4.057 times as toxic to males and 1,039 to 20.087 times as toxic to females as dicofol. At the same time, trichlorphon, MTMC, chlorpyrifos-methyl, coumaphos, promecarb, primiphos-methyl, lindane, chlorpyrifos, iodofenphos, methomyl, tetrachlorvinphos dichlorvos and propoxur were moderately potent, being 43 to 536 times as toxic to males and 28 to 467 times as toxic to females as dicofol. Female fruitflies were 1.1 to 7.7 times more susceptible than males to 12 of the 18 chemicals, whereas males were only more susceptible than females to four of the insecticides.

Introduction: In Jamaica, the West Indian fruitfly *Anastrepha mombinpraeoptans* (Sein) is the most serious pest of the mango (*Mangifera indica* L.), the hog plum (*Spondias mombin* L.) and the red coat plum (*Spondias purpurea* L.), together with the Caribbean fruitfly, *A. suspensa* (Leow), it also attacks the guava (*Psidium guajava* L.). Van Whervin (1974). As a result, significant losses are experienced in the fruit industry; indeed some varieties of mangoes may suffer up to 90% loss as a result of *A. mombinpracoptans* infestation (Fawcett and Harris, 1901). Despite the high prevalence of *A. mombinpracoptans* infesting mangoes in most Caribbean islands, the Southern U.S.A., Mexico, Central and South America (Sommeijer.) 1974, van Whervin, 1974; Steyskal, 1975), very little information is available on the susceptibility to pesticides of this species or any other *Anastrepha* species.

When insecticide treatments of 0.1% of dimethoate and malathion of dimethoate and fenthion, or of tetrachlorivinphos alone at three-weekly intervals were made to guavas, treatments which contained dimethoate were successful in controlling the fruitflies in Jamaica (Apeji, ,1970). Similarly in Brazil, dimethoate (0.075%), cithion (0.10%), formathion (0.06%) and amidithion (0.075%) reduced the larval population of *A. fraterculus* (Weid), a related species, in guavas to 1.12%, 1.80%, 2.08% and 28.27% respectively, compared to 95.42% in the controls (Sampaio and Orlando, 1971).
Indeed, reports of insecticide trials on *Anastrepha* spp have been limited to the effects of a few chemicals on the larval infestation of fruits, ignoring the comparative toxicity of various insecticides on the adult fruitfly. There is thus a need for a comprehensive study of the relative toxicity of a range of insecticides on the adult fruitfly before successful field trials can be attempted. This present laboratory study of the susceptibility of *A. mombinpracoptans* to insecticides will fill such a need.

Materials and Methods: Bombay mangoes which were each infested b 10—40 final instar larvae of *A. mombinpracoptans* were brought to the laboratory from an orchard where the trees had never been exposed to insecticide treatments. The larvae were allowed to pupate in a moist coconut coir dust medium, where they remained for about 14 days until emergence occurred. The adult flies which were fed with a mixture of brewer's yeast and glucose in water (both at 10% w/v) for two or three days, were maintained at a constant temperature of 24—26°C.

Three replicates each of 10 females and 10 males were selected for treatment with each insecticide concentration. At least five concentrations of each insecticide were prepared by dissolving technical grades of the insecticide in acetone. Droplets of 0.36 μl of each insecticide solution were applied to the thorax of individual flies, using a WHO self-filling capillary applicator (Anon. 1970). Control flies received 0.36 μl of acetone. Individual flies were then maintained in ventilated glass tubes (5 cm x 2 cm diameter) for

Jamaica

CARDI - 1982-83

22. COWPEA

22.1. Introduction of New Cowpea Cultivars

Two trials were conducted under this programme which is in collaboration with the International Institute of Tropical Agriculture (IITA). There were ten cowpea entries in Trial No.1. and 16 entries in Trial No.2. Trial No.1. consisted of varieties having white seeds while Trial No.2. consisted of varieties with different seed colours. Trial No.1. was conducted at Lawrencefield and Trial No.2. was planted in Mona.

Both trials were planted in September and harvested in December. In Trial No.2. major diseases observed were powdery mildew, *Erysiphe* sp. leaf spot, *Cercospora* sp. wilt, *Fusarium* sp. and cow pea mosaic virus (CPMV).. *Empoasca* sp. was the major insect problem.

For Trial No.1. prevalent diseases observed were CPMV and leaf spot *Cercospora* sp. and Fusarium wilt. Both *Diabrotica* sp. and *Empoasca* sp. were often found at Lawrencefield.

Several high-yielding cultivars have been recognised in the trials at both locations. Data on yield performances are listed in Tables 1 and 2.

Results have been forwarded to IITA.

Table 1. Seed Yield, Threshing Percentage and Days to Fifty Percent Flowering (DFF) of Ten Cowpea Cultivars Tested IITA Trial No.1.

Cultivers	Seed Yield Kg/ha	Threshing Percentage	DFF
Vita 3	1313	74.52	47
TVU3629	1243	60.27	46
TVX 3236-01G	1522	63.40	50
TVX 3627-012F	1083	59.60	44
TVX 3671-7C-020	1318	68.28	45
TVX 3671-14C-01D	1110	66.51	49
TVX 4262-014D	743	59.07	47
TVX 4659-03E	1307	76.47	46
Local Check (Laura B)	1155	70.47	44
TVX 4262-09D	1375	76.32	48

Table 2. Seed Yield, Threshing Percentage and Days to Fifty Percent Flowering (DFF) of Sixteen Cowpea Cultivars Tested in IITA Trial No.2.

Cultivars	Seed Yield Kg/ha	Threshing Percentage	DFF
Vita 7	1055	67.92	48
TVU 3629	1032	71.15	49
TVX 1836-013J	940	68.05	47
TVX 1948-02F	1034	63.13	51
TVX 133-16D2	950	61.87	41
TVX 2394-02F	1083	70.75	45
TVX 2724-01F	1208	67.34	46
TVX 3381-02F	882	69.43	47
TVX 3410-02J	908	73.74	43
TVX 3627-02G	1242	[illegible]	44
TVX 4577-02D	1025	66.25	46
TVX 4661-07D	1265	71.60	43
TVX 4667-088E	1117	71.73	47
TVX 4673-03E	1458	71.39	48
Local Check (Yxon Clay)	[illegible]	[illegible]	[illegible]

Status

Promising cultivars will be further evaluated in subsequent trials under Project 22.1 and 72.2, and sent to other CARDI Units.

Constraints and Needs

- i) Inadequate laboratory space and equipment i.e. balances and ovens.
- ii) A lack of functioning meteorological equipment at Mona and no functional meteorological station at Lawrencefield.
- iii) Need for more efficient and rapid means of obtaining results of soil tests.

Cowpea Adaptation Trial

This trial, which was initiated in July 1981, involved monthly plantings of four outstanding cultivars. Final harvest was completed in August 1982. Plantings have been completed and analysis of the data is nearing completion. The major constraint was the unavailability of reliable meteorologican data.

Yield in Kg/ha of Four Cowpea Cultivars for the Period July 1981 - June, 1982

	1981					1982				
Variety	Jul	Aug	Sep	Nov	Dec	Jan	Feb	Apl	May	Jun
Vita 3	181	0	138	76	391	518	331	0.00	0.00	47
Laura B	310	186	145	70	288	98	176	210	829	260
African Red	289	998	198	467	823	100	199	258	526	156
ER-7	361	83	213	163	495	274	162	292	1133	178

Summary of Differences Between Variety Means

Yield and Yield Components for Four Cowpea Varieties Planted Monthly, July, 1981 - June, 1982

Variety	Yield Kg/ha	Seed Yield Per Plot (gm)	Mean No. of Plants Harvested Per Plot	Pods Weight Per Plot	Pods Per Plant	Seeds Per Pod	Threshing Percentage
Vita 3	212	127	40	172	4.28	9.12	53.85
Laura B	257	154	35	245	7.10	7.10	60.05
African Red	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.11	63.04
ER-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	65.71
SE			0.66	10.44	0.30	0.14	0.87

Data collected which related to yield and yield components for the cowpea planted, showed significant differences between time of planting ($P<0.0001$). Lowest value for seed yields and number of plants harvested were in February, 1982 while the highest values were observed in May of the same year.

Significant differences also occurred between varieties ($P<0.0001$). Vita 3 and African Red gave the best results for number of plants harvested. African Red and ER-7 produced significantly higher yields than all other varieties. Interaction was also significant ($P<0.0001$) indicating that different varieties did best when planted at different periods of the year.

Summary of Disease Rating

A summary of the effect of disease infestation on the four cultivars indicates that ER-7 was most susceptible to CPMV. Disease infestation is most severe during the months of November and December. Levels and severity of infection for mildew, CPMV, Cercospora leaf spot (CLS) were greatest in these periods.
Visual Rating follows.

Summary of the Effect of Diseases on the Four Cultivars

Average Disease Rating

Cultivars	Mildew	CPMV	CLS	Wilt
Vita 3	2.50	3.64	1.70	2.00
Laura B	4.10	3.35	4.25	2.00
African Red	3.50	2.71	2.63	1.33
ER-7	2.87	4.71	3.79	2.50

Score	Degree of Occurrence	Severity of Symptoms
1 =	None	None
2 =	Occasional	Mild
3 =	Moderate	Mild
4 =	Moderate	Severe
5 =	Frequent	Very Severe

22.2. Evaluation of Selected Cowpea Cultivars

Promising cultivars of cowpea derived from project 22.1. were further evaluated at Lawrencefield over three different planting seasons and at Dundee, Trelawny in two seasons.

The cultivars in the trials included large and small seeded red types, tan and cream seeded types. Growth habits ranged from erect bush to semi-erect types.

Yields were generally high from the Trelawny trials. However, Vita 3, Vita 9, TVX 1193-7D, TVX 1576-01F were comparatively higher. Incidence of disease and insect pests were not recorded for this location. In spite of the prolonged drought conditions the yields obtained were encouraging.

At the Lawrencefield location, the trial was first planted in July, 1982. Subsequent plantings were made in October, 1982 and May, 1983. All trials were harvested. Data from these are being compiled for analysis. This includes yield, levels of insect and disease infestation and days to 50% flowering.

A summary of data collected, which relates to seed yield, threshing percentage and days to harvest is found in Table 3. Yields from the October, 1982 planting were generally higher than those obtained in July, 1982 and May, 1983. The incidence of disease and insect pests were lower in October than in July. In general, the parameters studied indicated that the fall planting of cowpea in the Lawrencefield area is more favourable to cowpea production.

Results obtained from the Trelawny location and the Lawrencefield location are not directly comparable since planting practices differ for the two areas. Nevertheless, the results obtained are meaningful since reported yields are attainable using local technology. Initial observations at the Trelawny location indicated a compatibility of some varieties with the existing low rainfall - no irrigation system of production in this area. This suggests the possibility of drought tolerance in these varieties (See Table 4).

There was no fertilizer application in any of the trials.

Status

This project is ongoing. It will be continued for three further planting seasons at Lawrencefield. It is hoped to have further plantings in Trelawny, the first of which is being scheduled for June, 1983 and based on the level of cooperation possible at the local Ministry level. These cultivars will be evaluated in other major cowpea growing parishes.

Table 3. Seed Yield, Threshing Percentage and Days to Harvest of Ten Cowpea Cultivars in each of Three Planting Seasons

Location: Lawrencefield

Cultivar	Seed Yield Kg/ha 1	2	3	Threshing Percentage 1	2	3	Days of Harvest 1	2	3
Local Cowpea	545	1053	760	73.5	76.3	70.7	64.5	79.0	68.0
TVX 3811-02F	667	1675	1313	72.5	72.6	75.2	63.8	77.5	65.3
John Coote	658	1068	923	67.8	73.8	71.5	64.5	79.0	68.0
TVX 3629 (Ife Brown)	1163	1873	2073	76.5	81.7	77.5	62.3	79.5	67.5
TVX 2724-01F	1253	1772	1583	69.9	79.7	72.4	60.8	77.5	65.0
African Red	692	1482	917	68.8	75.1	71.7	63.5	72.0	64.0
Vita -3	260	1705	0	47.2	76.3	-	70.0	79.0	-
ER-7	1055	1552	2104	75.0	79.5	73.5	58.3	74.0	63.5
Laura B	1030	1780	1729	70.0	72.7	73.8	56.5	72.0	60.0
Laura R	695	1554	1021	73.3	71.7	67.1	64.3	79.0	68.0

1 - planted 5. 7. 1983
2 - " 26.10. 1983
3 - " 6. 4. 1983

Table 4. Seed Yield from Cowpea Cultivars in Dundee Nursery

Location: Dundee, Trelawny

Cultivar	Seed Yield Kg/ha Trial 1	Trial 2
African Red	1260	0
Laura B	-	278
Local Cowpea	-	253
ER-7	-	203
TVX 4678	-	236
Ife Brown	1008	249
Vita 9	1386	-
Vita 3	1512	0
Vita 6	1008	-
TVX 2724-01F	1386	306
TVX 1843-1G	1009	-
[illegible]	-	238
[illegible]	[illegible]	
TVX 3671-02F	756	157
TVX 1850-01E	1008	-
TVX 1576-01F	1260	-
TVX 1193-7D	1386	-

Multiplication of Selected Cowpea Cultivars

A. Under different Microclimates

A number of selected farmers in Trelawny and St. Mary were provided with seed material of promising cultivars of cowpea for further evaluation under field conditions to compare performance under different microclimates.

B. At Lawrencefield Research Station

The cultivars listed below were multiplied at the Lawrencefield station.

TVX 2724 - 01F
Aruaca
Local Cowpea
Laura B
John Coote

C. At Mona

The cultivars listed below were multiplied on a smaller scale at the Mona Laboratory Garden.

TVX 2724 - 01F
Local Cowpea
Laura B

Materials from B and C were bulked for use in further cowpea trials, sugarcane intercropping trials, and to be sent to other CARDI Units.

During multiplication, cultivars were observed for days to fifty percent flowering and levels of infestation by diseases and pests.

Status

Multiplication of all promising cultivars is ongoing. In June 1983, the cultivar Aruaca was cultivated using CARDI's multitrac with a view to evaluating the recommendations for large scale production of cowpeas. Initially, two acres of the Aruaca were planted. It is hoped that this process will be continued for the other promising cultivars.

Progress of Vita 3 - Production and use in the Parish of Trelawny

The cowpea cultivar Vita 3 was first introduced into the parish of Trelawny in the sugarcane/cowpea intercropping programme. The first trial was conducted in Wakefield on farmers' field. The variety yielded well and was highly acceptable because of its [illegible]

Vita 3 has been promoted by CARDI in association with the Trelawny Land Authority. Mr. Albert Parkinson is the field officer responsible for field operations involving production of this legume. Cooperation of Mr. Underhill and the chief executive officer has been outstanding.

Today, Vita 3 is planted at various locations in and around Trelawny. Farmers are planting the cowpea both as a pure stand crop or intercropped with sugarcane. Planting distance within and between rows vary from 2 to 4 ft. and the average price per quart of dried Vita 3 is J$7.00. Yields on farmers' fields range from 400-800 lbs per acre. Many have ratooned the crop. When ratooned, the first crop yield was in the region of 800 lbs. Six weeks later the second ratoon crop was ready. Yields were usually about 400 lbs per acre. The production of this variety of cowpea appears to be affected by environmental conditions, particularly day length with the legume being more responsive to shorter days in the wet cool periods which exist in fall.

Vita 3 is being utilized by a number of restaurants, hotels and the hospital in Falmouth.

At the close of 1983, approximately 28 acres of Vita 3 was in production in Trelawny with the average acreage of 1½ acre per farmer, 4 acres in St. James and unknown acreages in Hanover and Westmoreland.

.1. Evaluation of the New Bean Cultivars

Two trials received from CIAT's Internation Bean Yield and Adaptation Nursery (IBYAN) were planted in December. 1982.

The first of these trials consisted of small, red seeded, determinate types. There were nine entries including two local checks viz. Portland Red and Miss Kelly. The trial was planted at Mona on December 13, 1982, and harvest was completed in early March 1983. Fertilizer (7-14-14) was applied at the rate of 376 Kg per ha. Yields ranged from 1122 to 1496 Kg per ha. The local cultivars Portland Red and Miss Kelly performed satisfactorily, having yields of 1358 and 1371 Kg per ha and were the earliest producers with days to 50% flowering of 32.66 and 31 respectively. Preliminary data appear in Table 5. The major diseases observed were Bean Golden Mosaic Virus (BGMV) and Rust <u>Uromyces phaseoli</u>.

CARDI 1983-84

22. COWPEA

22.1. Introduction of New Cowpea Cultivars

Objectives

To introduce, evaluate and distribute new cultivars from the major international breeding centres, for evaluation in the region for yield, quality and disease and pest resistance.

Details of Work Done

Ten varieties were planted in small plots at Lawrencefield. Some of these were brought directly from IITA by Miss Brown who attended the 1984 Cowpea/Soybean production course.

1. IT82D - 716)
2. IT82E - 60)
3. IT82D - 889) Brought directly from IITA
4. IT81D - 113)
5. Local Cowpea
6. Laura B
7. Aruaca
8. Vita-3
9. TVX 2724 - 01E
10. African Red

The following observations were made:

1. Growth habit
2. Twining tendency
3. Vigor index
4. Determinacy
5. Number of main branches
6. Terminal leaf shape
7. Cowpea mosaic virus (CPMV) rating
8. Yield

Status

Evaluations are continuing.

One trial was conducted under this programme which is in collaboration with the Institute of Tropical Agriculture (IITA). The trial consisted of 19 medium-maturing varieties which had multiple disease resistance and varied seed colour. The local check used was Laura B.

The trial was planted on November 15, 1983 and first harvest commenced 65 days after planting. The major diseases were caused by viruses while the major pests included Empoasca sp. and Diabrotica sp.

Several high-yielding varieties have been selected and multiplied for evaluation in subsequent trials.

A summary of the results which have been forwarded to IITA are presented in Table 1. below.

Performance of 19 cultivars of Vigna species
evaluated at Lawrencefield, Jamaica.

Identification	DFF	*Days to maturity	Mean pod wt.kg/ha	Mean seed wt.kg/ha	** T.%
IT82E - 3	42	59	1141	919	80.5
IT825 - 25	41	58	914	658	72.0
IT82E - 27	39	62	1529	950	62.1
IT82E - 49	40	60	1029	671	65.2
IT82E - 70	40	60	864	598	69.2
IT81D - 1069	51	66	1843	1394	75.6
IT81D - 1151	52	64	1483	1077	72.6
IT81D - 1205-174	45	64	1812	1179	65.1
TVX1836-013J	49	66	1450	927	63.9
TVX1948-012F	49	62	1481	969	65.4
TVX3236-01G	49	-	1602	1135	70.8
TVX3627-012F	45	66	1341	779	58.1
TVX3871-02F	42	65	1381	810	58.7
TVX4654-44E	48	65	1652	1075	65.1
*TVX4659-02E	49	65	1962	1216	62.0
TVX4659-03E	48	-	935	633	67.7
TVX4661-07E	44	64	1562	1010	64.7
TVX4677-88E	40	62	1635	946	57.9
TVX4677-010E	46	65	1918	1213	63.2
LAURA B.	50	66	1560	948	60.8

*Days to physiological maturity

**Threshing percentege

22.2. Evaluation and Multiplication of Selected Cowpea Cultivars.

Objectives

To evaluate new cultivars identified in project 22.1. in the major cowpea growing areas, and multiply for distribution to other CARDI units.

Details of Work Done

Cowpea cultivar Vita-3 was multiplied at Wait-A-Bit in Trelawny, on hillsides. The crop was sprayed frequently to control pests and diseases and was rain-fed. It was observed that more flowering occurred on elevated areas when compared to lower regions of the same field. The plants grew vigorously, and no major disease or pest problems occurred. The seeds were harvested in July.

At the Annual Denbigh Agricultural Show held in August 1983 the opinions of 58 persons as they relate to cultivars of cowpea grown by CARDI in Jamaica were recorded. 81% had eaten cowpea before.

Persons were asked to sample any three of five prepared cowpea varieties and to indicate their first, second and third preference after. A summary of the preferences is presented in the Table below.

Variety	1st Choice	2nd Choice	3rd Choice
Local cowpea	51	32	16
African Red	9	12	19
TVX 2724-01F	12	19	19
Laura B	9	19	12
ER-7	16	9	25
No response	-	6	6

Numerous reasons were advanced to justify the consumers choice of cowpea. The flavour and texture of the cooked grain appeared to be the most frequent.

While rice and peas, stew and soups appeared to be popular dishes in which these varieties may be used, a large number of respondents (29%) were undecided as to alternate recipes for use of the legume. Pamphlets with suggested recipes for [illegible]

The enthuisiasm with which respondents participated was encouraging and while it is early to draw any definite conclusions about consumer preference, it appears that with time the introduced varieties in particular TVX 2724-01F and ER-7 will rival the local cultivars.

Status

This work is continuing.

Cowpea Adaptation Nursery

Location: Dundee, Trelawny.

Ten cultivars of cowpea were evaluated in this rain-fed location over the period May 1984 to harvest in July 1984. In addition to seed yield, which is reported below, the cultivars were assessed for pod set, days to physiological maturity and susceptibility to Choanephora curbitarum and C. infundibulifera the pathogens of Lambs Tail Pod Rot which was observed before in this location. The disease was observed on Laura B in all four plots. The major pest problems were by aphids and pod borers.

The earliest maturing cultivars were Ife Brown, Laura B, TVX 4677-010E and Aruaca. Vita-3 was the latest maturing variety.

As observed before, the performance of African Red in this location was poor. The plants were yellow, appeared stunted in growth with a tendency to trail, produced few flowers and exhibited poor pod set.

Table 3 - Yield of cowpea cultivars in the Dundee, Trelawny location.

Identification	*Yield kg/ha.
IT81D -1069	1890
IT82E -27	756
TVX4677 -01E	2080
LAURA-B	945
VITA-3	-
TVX2724 -01F	1040
AFRICAN RED	756
ARUACA	1230
YVON CLAY	1797
IFE BROWN	1135

*Yield [illegible] on 4 replicates of net [illegible].

In collaboration with the Trelawny Area Land Authority, CARDI initiated investigations of appropriate practices for large-scale production of Vita-3 in the Dundee area of Trelawny. This variety which shows much promise and enjoys high consumer and farmer acceptance in this area was also planted by one farmer as an intercrop of sugarcane.

HAITI, June, 1985

I. Institutions

1.1 Ministry of Agriculture

The Ministry no longer carries out research; research is presently handled by the Faculte d'Agronomie. The Ministry does have principal responsibility for extension and because 'on-farm' research is presently the major activity in Development Projects, the Ministry still participated indirectly in research. It appears that the key persons in the Ministry are a) Frantz Flambert, the Minister and b) Antoine Mathellier, the Director of Food Crop Production.

1.2 Faculte d'Agronomie

The key people appear to be a) Max Millien, head of research (CRDA) within Faculte, he was not at Damien when I visited; b) Dr. Paul Saint-Hilaire, Adjunct director of CRDA and also participates in Agric. Development Projects, expecially the AID-ADS-2 project. Saint-Hilaire is interested in training of Haitian agronomists and would be a good person to invite to IITA; c) Lionel Richard (Haitian Director of AID's big ADS-2 project); d) Jean Fenel Felex, Legume specialist in the Faculte; e) Dr. Jacques Eduardo Alexis, vice-dean; f) Luckner Saint-Dic, Dean.

The Faculte d'Agronomie has responsibility for training agronomists and for research. The research activity is quite limited.

1.3 AID

AID has a substantial program in Haiti and it looks like it will grow. The major program focused on the Cayes region on the southern Peninsula. They are looking at the farming systems both on the hillsides and on the plains. The format is a "systems analysis" followed by on-farm testing and intervention. The most attractive intervention is replacement of varieties. Several IRRI rice varieties are being multiplied as is a black-seeded bean variety from Guatamala introduced by CIAT. A CIMMYT introduced maize line is also being multiplied. Cowpeas, pigeon peas, and sorghums are also important crops in the maize-based system but new lines of these crops have not yet been thoroughly evaluated at the farm level. Root crops are also very important. Some of the key personnel in the AID-ADS-2 project include: a) Dr. Abdul Wahab; b) Richard Swanson (Univ. of Arkansas-contract); c) Gustave Menager (Haitian agronomist working for AID).

AID will soon initiate a Fragil Lands Project for Latin America to look at farming systems to minimize soil erosion from hillsides and minimize soil degredation in high-rainfall ecologies. Haiti will be a key country for implementation.

Dr. Swanson said he had written several letters to IITA to explore training Haitians but has not had any response from IITA.

1.4 CIDA

Cananda is funding CIMMYT's maize-based farming systems program. I was told that CIDA sees Haiti's situation as so serious that they have a 'Haiti Desk' in Ottawa. The people in the CIDA office in Haiti include Jenny Donavon and Francois Gilbert. A list of CIDA's country activities is included in the appendix.

1.5 CIMMYT

CIMMYT has an economist, Dr. Michael Yates, conducting on-farm research with a view to increase corn production in the Cayes water-shed on the southern penisula. Major activites have focused on the economics of N-fertilizer application taking into account varietal response, source of N, and whether the land is owned or share-cropped.

1.6 Institute - Francais - Section Research

I believe this project is funded by IRAT. The project has one agronomist working in a valley on the southern penisula. See section on cowpea research.

1.7 IICA

IICA is coordinating a project to reestablish pigs in Haiti. All swine were killed by swine fever several years ago.

1.8 Cowpea Research

Fenel Felex has tested several IITA cowpea lines at the Damien research station. He has the following materials: IT 82E-9, IT 82E-16, IT82E-18, IT 82E-32, IT 82E-60, IT 82D-789, IT 82D-812, IT 82D-885, and IT 82D-889 from the 1984 extra early trials. He said the best lines yielded as follows: IT 82E-18 gave 603 Kg/Ha, IT 82D-812 gave 739, and the local check gave 677 Kg/Ha. From the medium maturity trial the best lines performed as follows:

IT 82D-709	836 Kg/Ha
IT 82D-766	940 Kg/Ha
IT 82D-975	864 Kg/Ha
TVX 4659-03E	876 Kg/Ha
Local check	663 Kg/Ha

Other lines included in trials were IT 713, 716, 744, 752, and TVX 3236. No results were provided by Felex.

On earlier trials conducted by Felex, California Blackeyes did very well, 1,800 Kg/Ha. He has multiplied a small amount of

CB-5. Felex says he will conduct regional cowpea trials. I suggest IITA Nigeria send 5 sets of both early and medium maturity trials (attention Dr. B.B. Singh). Send seed to Jean Fenel Felex, Faculte d'Agronomie, Damien, Port-au-Prince, Haiti, West Indies.

The agronomist, Liverato Jean Marc, with the French project, is keen to test cowpea lines on farmers fields on the dry region of the southern penisula. He has already received 7 lines from IRAT but could not say what materials. He would like IITA cowpeas to plant in February and March. He would like some spreading types for forage and a few medium and extra early lines. IITA should send 2 reps of each line to plant on 5 farmer's fields (attention Dr. B.B. Singh). He said Golden Mosaic virus was a frequent problem. Send seed to Liverato Jean Marc, Institut Francais, Section de recherche, B.P. 131, Port-au-Prince, Haiti.

IITA should also send one set of cowpea trials to Dr. Abdul H. Wahab, USAID, American Embassy, Port-au-Prince, Haiti.

Contacts in Haiti

Frantz Flambert (Minister)
Ministry of Agriculture
Damien
Port-Au-Prince, Haiti

Antoine Mathellier (Director of Food Crop Production)
Ministry of Agriculture
Damien
Port-Au-Prince, Haiti

Max Millien (Head of research - CRDA)
Faculte d'Agronomie
Damien, Haiti

Dr. Paul Saint-Hilaire (Ing. Agr., Adjunct director CRDA)
Faculte d'Agronomie
Damien, Haiti

Lionel Richard (Director of AID's ADS-2 project)
Faculte d'Agronomie
Damien, Haiti

Jean Fenel Felex (Legume specialist)
Faculte d'Agronomie
Damien, Haiti

Dr. Jacques Eduardo Alexis (Vice-Dean)
Faculte d'Agronomie
Damien, Haiti

Luckner Saint-Dic (Dean)
Faculte d'Agronomie
Damien, Haiti

Dr. Abdul Wahab (AID ADS-2 project)
USAID
American Embassy
Port-Au-Prince, Haiti
Phone: 25500

Richard Swanson (Univ. of Arkansas, contract)
USAID
American Embassy
Port-Au-Prince, Haiti

Jenny Donavon
CIDA office
Canadian Embassy
Nova Scotia Building
Delma Road
Port-Au-Prince, Haiti
Phones: 22358, 24919, 24231

Francois Gilbert
CIDA office
Canadian Embassy
Nova Scotia Building
Delma Road
Port-Au-Prince, Haiti
Phones: 22358, 24919, 24231

Gustave Menager (Agronomist)
27 P. Lumumba
Delmas 19
Port-Au-Prince, Haiti
Phones: 6-1121, 2-1558

Dr. Michael Yates (CIMMYT economist)
C/O MARNDR/CIMMYT
B.P. 9
Les Cayes, Haiti

Liverato Jean March (Agronomist with French project)
Institut Francais
Section de Recherche
B.P. 131
Port-
Au-Prince, Haiti

CIDA's co-operation activities in Haïti began in 1968 in the form of projects directed by Canadian non-governmental organizations and financed in part by CIDA. Canadian religious communities had already been working in Haïti for many years.

Since the beginning of the 1970s, when Jean-Claude Duvalier succeeded his father, François Duvalier, in power, donors have been developing co-operation programs with Haïti, encouraged by the new atmosphère of détente emerging in the country.

Canada signed a General Co-operation Agreement with Haïti in 1973. The bilateral co-operation program at that time was aimed at providing direct support to the country's development plan and enabling the people themselves to raise their standard of living and levels of employment, agricultural production and use of resources. The sectors selected for bilateral activities (agriculture, energy and education) corresponded to the sectoral priorities of Haïti's five-year development plan (1976-1981).

In 1977-78, the orientation of the co-operation program with Haïti was reviewed, but no significant changes were made. It was, however, expressed more clearly and the following objectives were stressed: improvement of the lot of the poorest people and of their ability to take their own development in hand; enhancement and protection of the resource base; concentration of agricultural and rural development activities in a specific region, the southwest peninsula of Haïti; improvement of the planning and management abilities of the public sector. Emphasis was placed on rural and agricultural development (50% of available funds), on the one hand, and on energy and non-renewable resources (25%), education (16%) and institutional support (9%), on the other.

Experience in recent years has, however, revealed the following weak points in the implementation of the program:

(a) deficiencies in the general management of the bilateral program (as a result, among other things, of an overly vague definition of the respective responsibilities of the two governments in the planning, implementation and evaluation of the program) leading to misunderstandings;

(b) the limited administrative and financial absorption capacity of the Haïtian government.

Since 1979, measures to remedy this situation have been taken in order to improve the management of the aid program. Despite this corrective action, the Agency had to suspend its participation in DRIPP, its major program in Haïti.

A review of the co-operation program in Haïti was carried out in 1982 and made it possible to prepare a multi-year program for Canadian activities, taking into account the need to concentrate Canadian aid in certain key sectors and to update our transfer mechanisms and project planning and control procedures.

CIDA has selected three areas of concentration for its 1983-86 co-operation program in Haïti.

- The first is concerned with reinforcing the capacity for self-development among a number of rural and urban target groups. There are three aspects to the intervention: to help meet essential needs, to help increase revenue by creating jobs and increasing farm production and to help develop natural resources by improving arboricultural techniques.

  Reinforcement of this capacity will rely on local and community organizations in a grass-roots approach to intervention, encouraging the participation of the groups affected.

- The second area deals with the institutional reforms necessary to Haïtian development. There are two aspects of this intervention: to help improve educational institutions by providing support to three institutions - the Faculté d'agronomie et de médecine vétérinaire, the Institut national d'administration, de gestion et des hautes études internationales (national institute of administration, management and international studies) and the Centre de formation professionelle (professional training centre) - and to help improve the management of government agencies.

- The third area of concentration was selected in order to help meet Haïti's energy requirements by optimizing the use of existing production capacity and increasing the production capacity in rural areas.

CIDA will give priority to developing the human resources of each of the projects to which it contributes (the fourth area, which is horizontal) with a view to turning the project over to Haïtian counterparts. Finally, the fifth area (which is also horizontal) deals with program development, and focusses primarily on strengthening management procedures (project identification, planning, follow-up and evaluation) through the creation of a Task Force on Development in early 1985 which will work in Haïti.

All Canadian bilateral co-operation projects in Haïti are financed through grants.

CIDA has also been involved in Haïti through its special programs and emergency programs.

The Special Programs Branch, in particular the Non-Governmental Organizations Division, has been working in Haïti on a continuous basis since 1968. Table 1 in section 3.1 presents CIDA's contributions to NGOs since 1968; table 2, a profile of the sectors in which NGOs were involved in Haïti in 1983-84; and table 3, a list of NGOs working in Haïti in 1983-84.

A second component of the Special Programs Branch, the Industrial Co-operation Division, has financed a number of projects since 1974, primarily in the area of exploratory and viability studies, as shown in section 3.2.

Emergency programs were implemented in 1975, 1977, 1978, 1980 and 1981 to deal with natural disasters, in particular hurricanes, floods and drought. Section 3.3 presents a table of the emergency relief provided by CIDA since 1975.

The attached table gives a summary of CIDA disbursements in Haïti for all its programs since 1968.

A - ONGOING BILATERAL PROJECTS LISTED ACCORDING TO THE AREAS OF ACTIVITY OF THE NEW PROGRAM

a) Underprivileged populations

444/10262 ASSISTANCE TO THE APPLIED RESEARCH PROGRAM OF CIMMYT (INTERNATIONAL CENTRE FOR THE IMPROVEMENT OF MAIZE AND WHEAT)

Objective

To increase maize yields by identifying improved technologies through testing at the small farmer level.

Description

Financial assistance to CIMMYT to cover the costs of an applied research specialist and the training of Haitian technicians in applied research.

Duration: 1983 to 1984

Cost to CIDA: $245,000 (grant)

b) Institutional reforms

444/10260 ASSISTANCE TO THE NATIONAL INSTITUTE OF ADMINISTRATION, MANAGEMENT AND HIGHER INTERNATIONAL STUDIES (INAGHEI) - PHASE III

Objective

To provide Haiti's public and private sectors with senior officials competent in the use of modern management techniques.

Description

The project comprises seven components:

1) assistance to the teaching program by: supplying technical assistance to supplement the scarcity of Haitian teachers in certain specialized fields; introducing computer courses; preparing teaching materials; managing school files by computer; and co-ordinating accounting courses;

2) organization of seminars to improve the management skills of officials in the private and public sectors;

AID - Washington

The purpose of my visit to AID-Washington was first to determine if AID would be willing and able to assist IITA's Latin American training activities by providing scholarships to key persons that would benefit from group and individual training. I also wanted to inform relevant AID personnel of IITA's Regional Legume Program such that IITA might give technical support to AID projects that include cowpeas and soybeans. Dr. Loren Schultz, AID's soybean/peanut officer, was extremely helpful in organizing meetings with AID staff.

Within the CRISP program there does not appear to be, at present, funds for scholarships to attend IITA's courses according to Harvey Hortik, but he showed a desire to be flexible. I believe he will assist IITA if and when possible. AID-CRISP might be able to fund an entire course, for example a course in English to be held in Jamaica. The CRISP funds must be focused on solving "GLOBAL PROBLEMS"; proposed CRISP activities must be presented in such terms.

Within each country mission, AID has funds for training which could be used to sponsor candidates to IITA regional training courses. The government in each country will need to request that AID sponsor individuals. When we hold a training course we should notify Hortik, Schultz, Bertram, and Dalrymple. They can send an announcement to all country missions describing the course and noting their support for the activity. This apparently can facilitate matters at the country level. We should also feel free to write directly to the country missions, especially when we have identified specific individuals for training; a list of mission officers is attached.

According to Bob Walter AID is initiating a 10 year project, "Fragil Lands Initiative" for Latin America with emphasis on managing soils on steep slopes and tropical lowlands. They anticipate participation of 10 misssions. This year they are in the planning stage and have a group working on "Development Strategies for Fragil Lands" (DESFIL). DESFIL will help missions design projects related to the Fragil Lands Initiative. Universities and Institutions can bid on projects; I believe both design and implementation. Because of IITA's experience in soil management, we may wish to explore participation

Contacts in US-AID

Loren Schultz
Agency for International Development (AID)
Bureau for Science and Technology
Washington, D.C. 20523

Bob Walter
Agency for International Development (AID)
Bureau for Science and Technology
Washington, D.C. 20523
Phone: (703) 235-8860

Harvey J. Hortik
Agency for International Development
Bureau for Science and Technology
AID/S & T/AGR/AP
Room 411D, SA-18
Washington, D.C. 20523
Phone: (703) 235-1497

Robert Bertram
Agency for International Development
Office of Agriculture
Bureau for Science and Technology
Washington, D.C. 20523
Phone: (703) 235-8894

Agricultural Development Officers

Barbados
Mr. William Baucom
RDO/Bridgetown
Agency for International Development
Washington, D. C. 20523 (809/42-75811)

USAID
FPO Miami 34054

Bolivia
~~Mr. Robert V. Thurston~~ David Johnston
USAID/La Paz
Agency for International Development
Washington, D. C. 20523 (011-591-2-350120)

USAID
APO Miami 34032

Costa Rica
Mr. Rafael Rosario
USAID/San Jose
Agency for International Development
Washington, D.C. 20523 (011-506-331155; 235608)
(ROCAP/011-/506-235608)

USAID
APO Miami 34020

Dominican Republic
Mr. Marion Ford
USAID/Santo Domingo
Agency for International Development
Washington, D.C. 20523 (809-682-2171)

USAID
APO Miami 34041

Ecuador
Mr. Joseph Goodwin
USAID/Quito
Agency for International Development
Washington, D.C. 20523 (011-593-2-521100)

USAID

APO Miami 34039

El Salvador
~~Mr. Tom King (Acting)~~ Ken Ellis
USAID/San Salvador
Agency for International Development
Washington, D.C. 20523 (011-503-239515/236164)

USAID
APO Miami 34023

Guatemala
Mr. Harry Wing
USAID/Guatemala City
Agency for International Development
Washington, D.C. 20523 (011-502-2-311541/361641)

USAID
APO Miami 34024

Guyana
(Vacant)
USAID/Georgetown
Agency for International Development
Washington, D.C. 20523 (011-520-02-63206)

Georgetown (ID)
Department of State
Wash. D.C., 20520

Haiti
Dr. Vincent Cusumano
USAID/Port-au-Prince
Agency for International Development
Washington, D.C. 20523 (011-509-1-20558/24812)

Port au Prince (ID)
Department of State
Wash. D.C. 20520

Honduras
Mr. Stephen Wingert
USAID/Tegucigalpa
Agency for International Development
Washington, D.C. 20523 (011-504-328853/326514/324458)

USAID
APO Miami 34022

Jamaica
Mr. William McCluskey
USAID/Kingston
Agency for International Development
Washington, D.C. 20523 (809-929-4850; 926-8619; 929-4962)

Kingston (ID)
Department of State
Wash. D.C. 20520

Panama
Dr. Gale Rozell
USAID/Panama City
Agency for International Development
Washington, D.C. 20523 (011-507-644011)

USAID
APO Miami 34002

Peru
Mr. David Bathrick
USAID/Lima
Agency for International Development
Washington, D.C. 20523 (51-14-286200)

Lima (ID)
APO 34031

Paraguay
Mr. Paul Fritz
USAID/Asuncion
Agency for International Development
Washington, D.C. 20523 (595-21-25801)

USAID
APO Miami 34036

ROCAP/Costa Rica
Mr. David Joslyn
ROCAP/San Jose
Agency for International Development
Washington, D.C. 20523 (502-2-64739/66378/66309)

ROCAP
APO Miami 34024

Belize City
Mr. Charles Jenkins
USAID/Belize
Agency for International
Development
Washington, D.C. 20523

WANG#4264C:11/84

Development Strategies for Fragile Lands
(DESFIL)

Latin America's steep slopes and humid tropical lowlands are coming under increasing population pressure which results in their misuse and in the rapid decline/degradation of the rural resource base. The depletion of soil and water resources and the rapid and accelerating deforestation under expanding agriculture threaten the ability of Latin American and Caribbean (LAC) countries to feed their people. A working group consisting of representatives from AID's LAC and Science and Technology (S&T) Bureaus is developing a program that will address this problem of deterioration on LAC's "fragile lands."

In a recent LAC Agriculture and Rural Development Officers (ARDO) conference held at CIMMYT in Mexico, the LAC/S&T Fragile Lands Working Group (FLWG) presented and refined a draft proposal for a joint LAC/S&T program on fragile lands. The proposed initiative is the result of common concern among the LAC Bureau, LAC missions, and the Rural Development (RD), Agriculture (AG), and Forestry and Natural Resources (FNR) Offices of the S&T Bureau about the problem of fragile lands development.

The program concentrates on five priority areas:

a) National/Donor Awareness and Policy Support. Develop public and donor awareness of the fragile lands problem. Focus also on understanding the context in which policy is developed, policies that influence fragile lands, and the constraints to policy change.

b) Need for a Strategic Approach within Countries. Identify the magnitude and nature of the fragile land problem in the country to select those areas most strategic for intervention. Concentrate on those lands where it still is possible to induce stabilization or improvement.

c) Appropriate Institutional Arrangement. Identify appropriate mixes of public and private sector involvement for program/project implementation.

d) Farmer Incentive Requirements. Gain an understanding of the incentive systems that govern farmer behavior and how to use this understanding in the design of the fragile lands programs/projects.

e) Technology Adoption and Spread. Identify and adapt available technology for use on fragile lands management and farming. Develop programs and a basic strategy for technology spread. Identify and research technology gaps.

The program will be a long-term effort (more than 10 years), with the following immediate, short, medium and long-term objectives:

A. Immediate (1-2 years)

- Assist participating AID field missions with development of a strategic approach to the Fragile Lands problem within their own countries, using existing Environmental Profiles as a point of departure through a rapid assessment methodology. Interested donors might be invited to contribute technicians to TA teams as appropriate and at the discretion of missions concerned.

- Include in these rapid assessments a projection/estimation of consequences of current trends in fragile lands degradation and off site impacts in order to develop a strong case for high level fragile lands policy/strategy.

- Develop an analytical assessment of successful and unsuccessful approaches, technologies, and policies in the fragile lands area for countries of the region.

- Share these analytical assessments after synthesis and consolidation.

- This information will be pulled together in a format that can be shared with other donors. It can serve as a basis for discussions with these donors to establish priorities for addressing the LAC Fragile Lands problem.

- Initiate discussions with other donor agencies at the technical level.

B. Short-Term (3 years):

  - Continuation of the joint LAC-S&T Fragile Lands Working Group [FLWG] based on collaborating units and projects to provide and develop a mechanism and institutional base for brokering and otherwise supporting a long term program of research, policy dialogue, technical assistance and international collaboration on fragile lands, for evaluating results and progress, and for continuity.

  - Strategic framework for participating missions to guide their programming and policy dialogue in the fragile lands area.

  - An assessment [regional or sub-regional] of current trends and their costs if left unabated, based on specific country analyses. Baselines for evaluation of future gains or losses are established.

  - A synthesis of approaches, technologies, and policies that work and those that don't in the context of fragile lands sustained development.

  - A major case for long term international collaboration in addressing the fragile lands problem.

  - The basis for a set of information sharing research and technical assistance networks in the region.

- Preparations for a series of workshops and conferences involving interested donors, missions, and host country representatives.

C. Medium Term (3-5 years):

- Series of technical and policy level meetings with donors to establish priorities.

- Regular meetings among donors to review progress and problems.

- National and donor awareness raised at policy level as a result of "homework" done and series of regional and sub-regional meetings -- some highly visible.

- Research and collaboration networks established and work begun on problems with regional or sub-regional dimensions.

- Mission programs sharpened as a result of improved policy dialogue, better information and technical support, strategic framework for programming, increased donor coordination and agreement on priorities, "do's" and "dont's", and feedback from continuous evaluation and monitoring.

D. Long Term (5-15 years):

- Substantial agreement on national and international approaches to fragile lands development and stabilization. Major resources being dedicated to work on the problem.

- National and regional institutions, [e.g., those involved in networks] respond and dedicate core budget and personnel to continuous research and development in fragile lands area.

- Significant improvements in slowing or reversing negative trends. Productivity on fragile lands increases.

- Sound approaches to settlement, development, and protection of fragile lands. Institutionalization of these.

At least eight projects from S&T/RD, AGR, and FNR which address aspects of the five priority areas outlined on pages 1 and 2 would be used to help meet the research and technical assistance needs of the LAC Bureau and missions in addressing the fragile lands problem. A new project would be created to perform the brokering function, provide information dissemination, conduct some research, and provide some technical assistance. It would be called Development Strategies for Fragile Lands (DESFIL).

In addition, a central component of the program is a short/medium term objective to develop an international strategy/policy among major donors for addressing fragile lands problems in Latin America. Strategy development

would be launched through a high level conference (or series of conferences) on this subject and would be monitored through regular meetings of donor representatives (AID, IBRD, BID, OAS, World Bank, UN, etc.,).

Based on information received from missions, FLWG plans to develop a draft Project Identification Document (PID) for DESFIL for distribution to missions for comment in February. PID approval will be followed by ST - LAC field visits to participating missions to develop further details for collaboration. This will feed into a PP which we propose to have ready for approval by April/May. The intention is to start the project in FY 1985.

For further information, contact ST/RD/RRD: Bob J. Walter (235-8860) or LAC/DR/RD: Bob Mowbray (632-8126).

SNichols:da:12/12/84:W1293n
Revised:12/28/84
Revised:1/28/85

University of Florida, Gainesville, 1985

Dr. Hinson is continuing to incorporate the hard seed coat genes into various lines with the view to produce lines resistant to seed deterioration. His sources of hardseed are derived from Glycine sojina, D-65-8232, D-81-9788, and D-81-9765. Dr. Hinson has not determined if the hardseed gene would cause lack of uniformity at maturation due to delayed emergence of hard seed. Preliminary studies by Dr. Alberto Costa in Brazil inicated that some hard seed emerge up to 3 weeks afer planting and that uniformity of maturation could be a problem. Dr. Hinson is also crossing lines resistant to Phomopsis (pod and stem blight). Phomopsis is the principal fungal organism responsible for field weathering of seed. Hinson is using PI-80837 (MAT. GROUP II) as a source of resistance. This line was identified by Wilcox of Purdue. Other sources of pod and stem blight resistance are F81-1351, F82-3651, and F81-6184. John Ross from North Carolina believes one can have seed resistance to Phomopsis without having stem and pod resistance. If GLIP gets a pathologist, this would be a good area of research.

Dr. Hinson has also crossed IITA germplasm line TGM 739 (yellow seeded line from Indonesia) with Braxton. He subjected F2 and F3 populations to delayed harvest. Single plants were selected in the F4 and advanced in F5 progeny rows. He is planting F6 lines in 1985.

Dr. Hinson believes the best way to generate high-yielding lines for the tropics is to incorporate the juvenile gene for delayed flowering into good varieties adapted to sub-tropics and temperate ecologies. He is currently incorporating the juvenile gene into Foster and Forest. Many of the improved tropically adapted varieties developed in Brazil were generated using this method. While I agree that this is a useful procedure when breeding for yield per se, this alone does not solve problems such as resistance to seed deterioration or resistance to foliar cercospora (frog eye) which are serious problems in the tropics in Latin America.

I was also surprised at the amount of SMV in Dr. Hinson's nurseries. He agreed that SMV is a serious "cosmetic" problem and will be putting more screening pressure against SMV.

I asked Hinson about the origen of 'Alamo' that will be released in Guatamala. Alamo is derived from Jupiter x D492491. Jupiter came from D492491 x PI 240664. D492491 is similar to Lee.

Dr. Shirley West (seed physiologist) provided some exciting information about a new seed treatment he identified. Seeds soaked briefly in Polyvinyldene Chloride do not absorb moisture during storage, even under very humid conditions. However this chemical is very water soluble and seeds planted in moist soil

apparently germinate very well. Dr. West said that the W.R. Gracen Co. of Dallas Texas which specializes in seed treatment has picked up on the idea and will market a product (I beleive it will be called "DURAN 220") using this compound in combination with a fungicide. I have requested a sample of the compound from Dr. West. This will not likely solve the problem of seed deterioration for small farmers but there are situations where it could make storage of seed much less problematic.

MEXICO, August, 1985

Soybeans

I met with Dr. Jorge Nieto and Ing. Nicolas Maldonado in Tampico. Due to excessive rains plantings were delayed. Consequently, we did not go to the field. Dr. Nieto would like to send Maldonado to Brazil for 4 months to 1 year for training. Need to identify funding. We should also explore the possibility of Maldonado doing his Ph.D in Brazil. He has no family.

The varieties under commercial production near Tampico included: Jupiter, Santa Rosa, UFV-1 and F76-7233-1. In the south near Tapachula the varieties are Jupiter and UFV-1.

The soybean lines sent from Brazil to Rafael Reza in Tapachula had just arrived and were being planted. IITA's 1984 medium maturity trial was just sown in Tampico. Lines included: 252-71C, 297-35C, 330-04E, 342-356C, 442-02C, 533-65C, 533-100C-Y, 536-02D, 711-01D, 715-09D, and 744-01E.

Cowpeas

In Merida Yucatan I met with Dr. Jesus Martinez (INIA Regional Director) and Ing. Jose Laris Delgado (Legume Agronomist who attended IITA/EMBRAPA training course, 1985). Laris and I drove to central Yucatan state where cowpeas are grown. We were both surprised at how much cowpea we saw. Laris had previously estimated that the state had about 1000 Ha of cowpea. I would guess that it is substantially more. Farmers who have irrigation plant cowpeas all year. I saw some damage due to Cercospora and stem blight. Pod damage due primarily to Calcodermis to a lesser degree by pod bugs was quite severe. Some farmers spray with insecticide. We saw cowpea in monoculture (plots of 0.2 to 1 Ha) and intercropped with corn and with watermelon.

Cowpeas are consumed mainly as immature pod and immature seed. Black seed is the most common but cream was also seen. In the village market of Oxkutzcab many vendors were selling cowpea pod and green seed. While it is evident that many rural people in Yucatan State consume cowpea frequently, cowpeas are not the common legume in the urban areas; Phaseolus is subsidized by the Government. The urban population do eat cowpeas on Halloween (Dia de los Muertos). The reason and significance of consuming cowpeas on this date escapes me, but farmers grow extra amounts for this date as the price goes sky-high.

Laris had just planted the following IITA and EMBRAPA germplasm.

TVX 3428-03E
TVX 3516-09F
TVX 3627-012F
TVX 2394-02F
TVX 1836-013J

IT 81D-1228
IT 82D-18
IT 82D-60
IT 82D-716
IT 82D-789

TVX 1948-01F
TVX 3408-02J
TVX 4262-014D
TVX 4272-05D
TVX 3236
VITA 7

IT 82D-889
IT 82D-9
CNCX 252-1E
CNCX 187-22D-1
CNCX 171-021E
CNCX BR-1 POTY
CNCX 0434
CNCX 177-02C

He had also sown F6 bulk populations (derived from single seed descent), CNCX 251, 252, 257, 279. He plans to make single seed selections from these populations.

Laris said he requested throught INIA the 1985 IITA trials but Dr. Cardenas delayed his request to request additional trials for the states of Campeche and Quintana-Roo.

Contacts in Mexico

Dr. Jorge Nieto (Soybean Coordinator for Southern Region)
INIA
Centro de Investigaciones Agricolas del Golfo Norte
Campo Agricola Experimental "Las Huastecas"
Carr. Tampico-Mante Km. 55
Apartado Postal C-1
Sucursal Aeropuerto
Tampico, Tamaulipas
Mexico
Phone: 3-63-74, 3-66-72 (Country code 52, city code 121)

Ing. Nicolas Maldonado Moreno (Soy Program)
INIA
Centro de Investigaciones Agricolas del Golfo Norte
Campo Agricola Experimental "Las Huastecas"
Carr. Tampico-Mante Km. 55
Apartado Postal C-1
Sucursal Aerepuerto
Tampico, Tamaulipas
Mexico
Phones: 3-64-74, 3-66-72 (Country code 52, city code 121)

Ing. Rafael Reza Aleman (Soybean Agronomist)
INIA-Chiapas
Campo Agricola Experimental Rosario Izapa
Apartado Postal 96
30700 Tapachula, Chiapas
Mexico
Phone: (962) 6-13-44   Telex: 77711

Dr. Jesus Martinez (INIA Regional Director)
CIAPY-INIA
Apartado Postal No. 50 Suc. "D"
Merida, Yucatan
Mexico

Jose Laris Delgado
CIAPY-INIA
Apartado Postal No. 50 Suc. "D"
Merida, Yucatan
Mexico

Dr. Cardenas (in charge of germplasm acquisition)
INIA
Insurgentes Sur No. 694, Piso 9
Mexico City, D.F. Mexico
Phones: 6-87-74-24, 6-87-74-94

TRAVEL REPORT TO PERU AND ECUADOR

SEPTEMBER 11 - 28, 1985

BY

EARL WATT

Travel Report to Peru and Ecuador

September 11 - 28, 1985

By Earl Watt

Program:

Wednesday Sept. 11
Flew from Goiania to Lima. Stayed at Grande Hotel Miraflores.

Thursday Sept. 12
Lima. Met at INIPA Dr. Dale Bandy and Dr. Walter Couto, Director and Associate Director, respectively, of the Mission of the University of the State of North Carolina in Peru. Met in CIP Dr. Peter Gregory, present Director of Research; K.V. Ramon, entomologist (ex-IITA). Met with Guillermo Hernandez-Bravo, Colider Programa Nacional Leguminosas de Grano - CIAT, who was to accompany me on the trip.

Friday Sept. 13
Flew early to Iquitos. Recommended hotel: Acosta. Persons met: Italo Cardama, Cowpea Coordinator (note home phone: 232273); Eng. Agr. Roger Torres, Director; Carlos Quiroz, Extension; and Oioniel Mendoza, Director of Experiment Station San Roque (Great interest in soybeans).

Sunday Sept. 15
Flew to Yurimaguas. Discussed previous years results with Guillermo.

Monday Sept. 16
Met Miguel Villavicencio-Fernandez, Director of the Experiment Station; Jose Benitez, Coordinator of the North Carolina team at Yurimaguas; and Wilfredo Guillen, Cowpea and Soybean Program Director.

Tuesday Sept. 17
Visited Yurimaguas market. Flew to Tarapoto. Recommended hotel: San Jose. Met Chief Washington Lopez, ex-researcher in pasture and extension. Dario Maldonado is the bean coordinator but is acting station director soon to become permanent director and replaced as coordinator. Also met were Beder Diaz, an agronomist and Wilma, a Hollandaise student working on cowpea and soybean spacing and yield trials.

Wednesday Sept. 18
Flew to Lima p.m.

Thursday Sept. 19
Lima. Went to INIAP. The new president is Benjamin Quijandria. I met with Wilfredo Caballiera, Economist and present Director of Research and again with Dale Bandy and Walter Couto.

Friday Sept. 20
Continued meetings at INIAP and met CIP personnel to change money.

Saturday Sept. 21
Lima, free.

Sunday Sept. 22
A.M. Flew to Ecuador, not met at airport due to error in my letter.

Monday Sept. 23
Guayaquil, Ecuador. Visited Boliche station. Met Saul Mustanya, Experiment station Chief; Hector Buestan, Cowpea breeder; Fernando Armigos, pathologist; Ing. Agr. Carlos Becilla, Soybean Coordinator and participant of the IITA-EMBRAPA training course in Brazil.

Tuesday Sept. 24
Drove to Pichilingue in the early morning. Met Gorky Dias, Jefe Programa Oleoginosas Ciclo Curto, and Saustobirto Ramiro Villalva, Agronomist. Carmensa Suares who was the Director of the station is now the director of that particular region of Ecuador and research for the lowland tropics.

Wednesday Sept. 25
Drove to Portoviejo at 4 a.m. Met Ing. Agr. Marat Rodriguez, M.Sc., Experiment Station Director; Wes Kline, country coordinator bean cowpea CRISP; plus Linin Linzan Macias, Agronomist. Late evening flew to Quito.

Thursday Sept. 26
Quito. Met Francisco Munoz, Sub-director de Pesquisa; Raul Escobar, Sub-director General; Judith Hall, seed pathology from Cornell, Master degree student.

Friday Sept. 27
Flew to Miami, London, Lagos, to attend World Soybean Production Workshop.

Soybeans in Peru

Iquitos

Little soybean is presently planted in Iquitos. Apparently there was an oil factory there some ten years ago according to hearsay but it ceased to function with the change in government, when the military government took over. There is quite a bit of interest in producing soybean, extracting oil and using the cake in the large chicken industry around the city. I did not see the chickens. Requested information in using soybean and cowpea as a feed.

Yurimaguas

In Yurimaguas there was an observation nursery including 12 lines from IITA, two replications with extremely poor germination plus 180 soybean lines from Brazil. No fertilizer had been applied. They expected to reduce these to about 20 lines for future trials. Storage continued to be a problem. The IITA lines had been planted on the 12th and thus were about 34 days old when visited. Germination estimated at 30%. Check lines such as Jupiter and Tropical had no germination at all.

Tarapoto

Will be planting soybean and cowpea in September and again in the main season in January. Cristolina is presently the most widely grown cultivar in the region, most of the seed being used for local consumption in milk production and in local food preparations. There is a cotton factory that does buy soybean. They are paying about production costs for the seed. They have the capacity of 43 tons per day. In 1979 to 1980 there were 800 hectares of soybean in the valley with 8000 hectares in the higher areas around it. At present there are probably about 15 to 20 hectares in the valley, 2000 hectares in the higher zone, showing a lack of price and marketing for the soybeans. They had planted a trial from CIAT last Janurary including check lines (Timbira, Numbaira, Tropical), and 16 lines with TGX's. This looks like the longevity or promiscuity trials, data included in table. In summary, the goverment prices at present depress production. Problems of seed longevity do not allow them to maintain adequate seed stocks. However, they plan to plant soybeans at 2 locations, the above mentioned 20 lines from CIAT "IITA" and 60 germplasm lines including some lines noted for acid tolerance soils.

They requested information on promiscuity as well as the oil and protein content of the seed longevity lines. Mr. Washington Lopez is very interested in producing more soybeans in the region. He will be writing a project proposal and will be gathering data on present production, production constraints, and the economics of producing soybeans in this particular region. A copy to be sent to me in Brazil. Also during final talks in Lima

I learned that new government support will be placed on soybeans. In the re-structuring of INIPA, the Director of research, Dr. Benjamin Quijandira, is promising a high priority for soybeans in the coming years.

Soybean in Ecuador

Boliche

Present trials include F4s using INIAP 302 as one parent crossed primarily with Davis, UFV 1, CS 94, and INIAP SOYA. The first five plants in each row had been inoculated with virus as virus appears to be the most severe problem on soybean at this location.

Trial 2, F3s for yield and Cercospora. Virus also present. Jupiter, the check, was looking quite good. This trial had also been inoculated with virus and selection will be made on virus and general sanity.

Trial 3, regional yield trial, medium maturity, plant type erect. Four reps with 15 lines, mostly from a cross, CS 35 from a Davis by Jupiter cross.

Trial 4, introduction medium height from Florida, 4 reps, 14 lines, extremely bad lodging from within the trial, maturity very late.

Trial 5, prelim trial for yield, a triple lattice rectangular 3 x 4 with each sub-block bordered by Jupiter. Material tended to be quite tall and branchy.

Trial 6, another prelim trial, also triple lattice, but late maturing. Extreme virus in this particular set of materials.

Trial 7, medium maturity, semi-late, again prelim yield trial.

Trial 8, 30 lines introduced from Puerto Rico. This INTSOY trial was extremely variable due to drought and the station at present had no money for supplemental irrigation. Yet, a good bit of work was being done. Soybean in Guayaquil has more virus problems, much less Cercospora problems than Pichilingue and much better seed quality. The oil factory for soybean is located in Guayaquil yet the majority of soybean is produced elsewhere and transported to Guayaquil.

Pichilingue

Many of the experiments had already been harvested. Gorky Dias was using a sand germination test for some materials that had been stored and others in which he had tried rapid aging. He also had a crossing block where many of the materials, particularly TGX 324-356D with medium height, 536-01D with short height, 709-01E of medium height, were planted in plastic pots along with several other lines. Remaining seeds were to be used

for germination tests. Cercospora and seed quality are the major constraints of the region. He did have an introduction nursery from Brazil as well as F2s from some earlier crosses particularly CS 39 crosses. Many of his experiments had been hurt by drought. It was suggested that neighboring irrigated corn fields could be used for one split of a water deficiency trial to supplement his present research.

Of note, he was using a thrashing box as described and suggested by Dr. Kueneman. He had found it very useful and had been giving it great use. One trial had suffered from Empoasca damage. Some of the most susceptible lines were CS92-0-18-2-5, INIAP 301 and AGS-66. One of the better lines was ICA Tunia.

Several farmers fields were visited as well as seed multiplication fields. Maturity was extremely dis-uniform with the majority of plants being ready for harvest and a few plants being very green, very late. I did not notice any virus in these fields. It was attributed to variability in germination as well as just seed mixtures. So, a reselection had been conducted to eliminate the disuniformity in maturation.

Cowpea in Peru

Iquitos

There are two flights per week from Manaus to Iquitos. Cowpea in Iquitos is called Chiclayo. Present price of cowpea in the market is around 6000 soles per kilo with the exchange rate of 17,000 per dollar. In the state, there is approximately 5000 hectares to cowpea. About 10% are eaten green, and 90% eaten as dry seed. I believe this number to be low for green. Of the plantings, 20% are upland or "Ratinga" and 80% are "playa bajo". However, most all of the work is presently being done in Ratinga. Farmers reportedly use asodrin often for control of spodoptera and small rats.

There are presently two new lines for release, La Molina No.1 and Provenir 1. These materials have been tested for 5 years and seed has been sent to Tarapoto for multiplication.

Material presently in the field included Regional Trial 3 from Brazil in the podding stage. Two lines CNC 0434 and CNCX 176-03G had been badly damaged by bruchids and therefore had low stands. (Regional trial 4 had been sent to the coastal region along the Pacific which is white seeded growing area. Of note, this material has all of the cowpea severe mosaic virus resistance and it was requested that this material be multiplied and then planted in the Amazon Valley). In the field were also some lines from Tony Hall, which were adapted to high temperature, as well as a Prelim trial with 3 reps including materials from local collections and IITA past trials. All of this was located on the Ratinga at a location called Muyuy. From there we went to UNAP, "Universidad National de Amazonas Peruviana", for the playa plantings on the sandy soils. There was one observation nursery of 92 lines which was also called their germplasm renovation collection, and a prelim trial which included 15 lines with 2 replications. All material had been badly damamged because of a drought after planting as well as being severly delayed such that the river probably will rise before the material will be harvested. At the same field several farmers had planted cowpea on the sandier soils and rice on the heavier soils which is the common way of planting at this location. The farmer we spoke to was a woman with several children living up on the high bank. She had planted one small area of cowpea on the playa and a very, very complex intercropping up on the higher Ratinga. Her materials were full of insects and diseases particularly virus, Cercospora and Septoria. She had planted both seed cowpea and sesquipedalus. On the sand the material was relatively free of viruses although some Cercospora was present. Material is reportedly eaten mostly green. She prefers prostrate plant type and material that she can have up to 4 or 5 pickings because cowpea is the staple, something that is always available to eat.

Another area was visited a half an hour up-stream from the university area. Along this area several plantings of cowpea were looked at. One farmer had about 1 hectare planted, bad damage with virus and Cercospora. He also reported using insecticides for control of spodoptera and rats.

In general, experiments visited were well kept although time of planting was often badly delayed because of lack of transportation. There are no roads in the area and all traffic is done by river boat.

Yurimaguas

The results from the 1984 IITA cowpea trials were well summarized. Notes on yields were with and without calcium, and the minus calcium over plus calcium ratio calculated. However, the trial of vegetable cowpea was harvested as a dry seed trial and FARV 13 had not been staked. Therefore it was not a proper test of the genetic potential even though most of the vegetable cowpea in this region is staked. The bruchid resistance trial was very good but means had not yet been calculated. Medium maturity cowpea showed a few lines which did better under high calcium which was very rare. Of particular interest would be IT 82D-713 which gave only 80% of the yield without calcium as with calcium. In the early erect trial all materials yielded higher without calcium. In looking through past data it is very consistant that the low calcium trial treatments yield better than the split plot treatments where calcium has been applied. A very strong consistent result is VITA 7 where it typically yields at least twice with low calcium as it does with high calcium. Many of the newer lines from IITA yielded about the same on high calcium and low calcium and most all of them under low calcium yielded less than VITA 7. Four lines in the bruchid trial, IT 81D-1064, 1137, 1151, and 716 yielded better than the VITA 7. In the medium maturity trial and in the vegetable cowpea, nothing out-yielded VITA 7, while in the early erect trial only the line IT 82D-889 out-yielded VITA 7.

Typical soils have a ph of 4.2 to 4.6. Liming implies going to 1.5 kilograms of lime per mili-equivalent of aluminium. Mostly this is about 2 tons per hectare and is applied broadcast. Much of their work has been down on upland soils and very little on the varzea or the Ratinga.

The local agronomist, Wilfredo Guillen, prepares 2 or 4 trials per year and sends them out to 6 locations. The support and enthusiasm is largely from the North Carolina State program. Most of their present interest is in the future potential of cowpea in the region. At present they estimated 300 hectares of cowpea in the area with a potential yield of 600 to 800 kilograms per hectare. In this region no green seed or pod was reported eaten. Usually the cowpea was eaten as brown seed and dry seed. However people eat all seed colors, red, white, blackeyes, browneyes, manteiguinha type but the dark cream or brown is the preferred. VITA 7 is a very acceptable seed size and seed color.

Cowpea in Yurimaguas was selling for 4,000 soles per kilogram as opposed to the 6,000 to 8,000 per kilogram in Iquitos.

Seeds from EMBRAPA had been increased in an observation nursery which had been harvested the previous week. No data was available. The only thing that was observed was about 6/10ths of a hectare of VITA 7, very clean, very beautiful seed multiplication. Three lines are being looked at carefully, IT 82E-32 and IT 82D-1205-174 and, of course, VITA 7, with a possible release date in December or January.

Other experiments reported were spacing, intercropping, particularly with leucena on the high Ratinga, and herbicides. In the herbicides trial, the obvious advantage was Dual although they also reported using Bladex.

Tarapoto

Planting dates are three times per year. The present one was planted in September for harvest in December. The main planting and most important planting is December-January which are the coolest months and also the most important for soybeans and dry beans. The third planting is in April. Best improved varieties are VITA 7 and Seda-improved. Seda-improved looks much more resistant to virus although I did see some golden mosaic in it. The station is about 20 meters above sea level.

A student from Holland named Wilma was doing her thesis work at the station. She will be spending one year studing spacing agronomy and physiology, looking at plant growth habit, seed yield, leaf area, number of leaves, and number of pods on cowpea and soybean in two locations and 4 spacings.

Area had been prepared for the multiplication of the Iquitos lines as well as VITA 7. The soil there is quite black and at a particular location it was undulating. The soil tends to be neutral to akaline.

Three experiments were seen in the field. The IITA medium maturity trial and the IITA early maturing trial were both podding, about ready for the first harvest. In the medium maturing lines, two lines IT 82E-27 and TVX 4659-02E both looked good. In the early maturing, the higher yielding ones will most probably be IT 82E-32, 41, and 77.

The third trial was Advanced Trial 3 without the Brazilian checks, 3 reps, 17 lines including the check lines VITA 7 and Seda-improved. This trial had just barely germinated.

Cowpeas in Ecuador

Boliche

The Boliche station is at sea level and quite flat. Land would be easily flood irrigated although they were using sprinkler irrigation on the cowpea, mung bean and dry beans.

Most of the material had been very recently planted and only germination notes had been taken. There were 6 experiments in the field including seed multiplication of collections from Portoviejo. The three new materials he would like to release were each planted at two spacings - one meter and 50 centimeters. The lines included "INIAP Tumbe" which is "Zipper Cream", "Tumbe colorado" which was VITA 3, and "Trancuedo" which was TVX 1836-013J. The IITA lines being multiplied were IT 82D-25, IT 81D-1205-174, TVX 4677-010E, and IT 81D-994 but this had a seed mixture in it and half of them were blackeyed and half browneyed. He had separated the two colors and they appered to be breeding true. He called them "Oyo negro" and "Oyo bayo". He is multiplying and using that name on them as he multiples them.

The third experiment is a Regional Trial with 4 reps and 13 lines. Also there are 31 lines that were selected from his earlier crossings, segregation from 5 or 6 crosses. The fifth experiment was 35 lines from EMBRAPA including the lines from Regional Trial 3, Regional Trial 4, and Advanced Trial 3, i.e. the erect trials. Six, the four F5 populations that we had sent.

Fields in general were well laid out, land well prepared but irrigation seemed to be erratic causing dis-uniformity in germination.

Portoviejo

Portoviejo is also at sea level. They only work on cowpeas and lima beans as consumer consumption crops. The experiments had been recently planted or were in the process of being planted, or were soon to be planted so I did not even note the types of experiments there. Cowpea runs about 80 sucres in the markets as a dry seed. Lima bean was about 60 sucres. Exchange rate is about 118 sucres per dollar.

I visited one region where they were using a field as a FAO training course with classes every 15 days. They had various spacings, both lima and cowpea, both were planted at improved recommendations with spraying and planted at farmers specifications without spraying as the farmers often do not spray except when intercropped with other more economical crops. Fields were furro-irrigated and there was a technician on site which was taking care of the materials. Very clean. They had installed benches under one of the bigger trees for the people that visit the fields and for the classes. There was an empty

building nearby which was set up to look somewhat like an acceptable classroom. The farmers there were quite excited about the zipper cream type of seed.

Another farmer visited was planting an extremely complicated intercropping and was reportedly the most common intercropping in the region. Many crops are grown on trellises including yard long beans, in between that was grown the bush cowpea as well as many other crops. A quite closed canopy gave a very nice greenhouse effect as the principal problems were mildew, spider mites, Cercospora, and probably both viruses. Weed control was extensive. Insecticides were used but yields will probably be low and the harvest season short because of mildew and spider mites. In the markets green cowpea as well as the vegetable type cowpeas were extremely common and the vegetable cowpea was probably second in demand after lima bean. After that was the phaseolus and fourth was reportedly being dry seeded cowpea of the zipper cream type although smaller and darker seeds were also readily available.

IITA Cowpea lines, Bruchid resistant - Yurimaguas Peru

Planted Aug. 07, 1984
Dry Seed Yield
Split plot: 2 reps +2 tons lime, 2 reps no lime

Yield	+ Ca	-Ca	-Ca/+Ca
IT 81D-985	1060	1364	1.29
IT 81D-1007	1195	1313	1.10
IT 81D-10	1259	1424	1.13
IT 81D-1064	1559	2125	1.36
IT 81D-1137	1342	1803	1.34
IT 81D-1151	778	1792	2.30
IT 82D-703	628	922	1.47
IT 82D-716	977	1681	1.72
IT 82D-6005	744	1021	1.37
VITA 7	607	1276	2.10

IITA Vegetable Cowpeas - Yurimaguas Peru

Dry Seed Yield
Planted Aug. 07, 1984
Split plot: 2 reps +2 tons lime, 2 reps no lime

Yield	+ Ca	-Ca	-Ca/+Ca
IT 81D-1228-10	666	639	0.98
IT 81D-1228-13	848	767	0.90
IT 81D-1228-14	612	733	1.20
IT 81D-1228-16	733	698	0.95
IT 81D-380-5	800	927	1.16
FARV 13	427	411	0.96
TVu 21	846	706	0.83
TVx 3442-027E	824	709	0.86
TVx 5881-016e	625	909	1.45
VITA 7	461	1228	2.79

IITA Early, Erect - Yurimaguas, Peru

Dry Seed Yield
Planted Aug. 07, 1985
Split plot: 2 reps +2 tons lime, 2 reps no lime

Yield	+Ca	-Ca	-Ca/+Ca	Days to Flowering	Days to Maturity
IT 82E-9	926	1162	1.26	48	77
IT 82E-16	557	1004	1.80	48	77
IT 82E-18	950	1209	1.27	49	80
IT 82E-32	1006	1165	1.16	47	76
IT 82E-60	1177	1226	1.04	47	72
IT 82D-789	824	834	1.01	47	74
IT 82D-812	723	1187	1.64	48	78
IT 82D-885	1224	1232	1.01	46	70
IT 82D-889	1226	1417	1.16	46	70
VITA 7	669	1376	2.06	55	81

IITA Medium Maturity - Yurimaguas, Peru

Planted Aug. 07, 1984
Dry Seed Yield
Split plot: 2 reps +2 tons lime, 2 reps no lime

Yield	+ Ca	-Ca	-Ca/+Ca	Days to Flowering	Days to Maturity
IT 82D-709	570	1117	1.96	49	79
IT 82D-713	1220	993	0.81	50	79
IT 82D-716	787	976	1.24	50	79
IT 82D-744	242	591	2.44	48	77
IT 82D-752	1239	1169	0.95	50	80
IT 82D-786	699	867	1.24	48	78
IT 82D-975	605	960	1.59	50	78
TVx 3236-01G	776	1017	1.31	49	81
TVx 4659-03E	668	642	0.96	49	79
VITA 7	659	1457	2.21	55	80

IITA Soybean Trial, received via CIAT
Planted Jan. 08, 1985
Tarapoto, Peru

o.	Line	Days to Maturity	Height (cm)	Kg/ha
1.	Timbira	123	49	1256
2.	Numbaira	114	35	566
03.	Tropical	118	68	1142
04.	TGx 726-01F	111	70	1431
5.	TGx 744-01F	111	52	1983
06.	TGx 744-02F	111	47	1586
07.	TGx 775-01E	118	82	766
8.	TGx 775-03F	118	71	623
9.	TGx 775-06E	118	61	782
10.	TGx 786-02E	115	58	1143
1.	TGx 709-05G	116	33	653
2.	TGx 709-05E	117	50	1268
13.	TGx 709-01F	114	44	1718
14.	TGx 533-79D	111	60	1628
5.	TGx 536-03E	111	40	1304
16.	TGx 573-01E	111	67	1475
17.	TGx 573-03E	114	48	1495
8.	TGx 573-06D	118	45	1214
9.	TGx 753-128D	111	44	1053
20.	TGx 604-027D	123	83	1194

TRAVEL TO HONDURAS

OCTOBER 1985

E.A. KUENEMAN

Itinerary

Wednesday 16/10

Flew at 1:00 AM from Belem to Miami and caught 10:30 flight to San Pedro Sula, Honduras. I met at noon with Pablo Soto, Julio Romero and Mario Contreras at the Fundacion Hondurena para Investigacion Agricola (FHIA) located in La Lima about 10 km from San Pedro Sula. FHIA is initiating a small soybean project and Julio Romero had just joined FHIA as project leader. The project will function primarily to assist sugar cane growers, and to some extent cotton growers, to become familiar with soybean as an alternative crop.

During the aftenoon Julio Romero and I met with Ing. Victor Manuel Leva (Director Regional Recursos Naturales, No.3 Region Norte, San Pedro Sula) and with Sergio Castro (extension agronomist with MAG). We discussed their plans to introduce soybeans to sugar cane growers. They were having difficulties locating planters and combines for large scale on-farm trials.

Thursday 17/10

I met with Ing. Leonardo Miller of Federacion de Asociaciones de Productores y Exportadores Agropecuarios Agroindustriales de Honduras (FEPROXAL). We discussed a proposed visit of 6 or 7 Hondurenos to Brasil for two weeks in March to see various aspects of soybean production. Late afternoon I met briefly with Pablo Soto. Dr. Soto expressed keen interest in joining IITA on some Latin American Project, apparently Dr. George Wilson had mentioned some possibility with Farming Systems. Dr. Soto is a very creative scientist and as before when he worked with IITA-CIP, Soto would be a valuable asset to IITA.

Friday 18/10

Flew early morning from San Pedro Sula to Tegucigalpa and met with Roger Guerrero and Ing. Francis Mo Hsu of the Banco Centroamericano de Integracion Economica. We discussed their plans to initiate soybean production (pilot project) in 5 Central American countries. They requested that IITA evaluate their project proposal in December and if implemented they will look to IITA/EMBRAPA for assistance.

I spent most of Friday afternoon in a small room courtesy of Honduran amebic dysentery.

Monday 21/10

Was Honduran National Holiday but I met with Ing. Francis Mo Hsu of Central American bank to discuss soybean project documents.

Tuesday 22/10

Drove early morning to Danli with Gerardo Reyes (Jefe Nacional de Investigacion Agricola) to attend FAO workshop. We listened to country reports during the day.

Wednesday 23/10

In the morning I presented a seminar on IITA with emphasis on GLIP and our new project in Latin America. Late afternoon, I drove back to Tegucigalpa.

Thursday 24/10

Flew to Miami.

Friday 25/10

Purchased camera for regional project in the morning. Took evening flight to Brazil.

TRIP REPORT - E.A. KUENEMAN

Honduras: October 1985

1. Comments on National Soybean Program

The Fundacion Hondurena para Investigacion Agricola (AID funded) has as its mandate to develop export crops for Honduras. They have decided to initiate a small soybean project and employed Julio Romero as leader. Romero will conduct applied research and work closely with the MAG to assist farmers in soybean production. The target farmers are principally sugar cane growers and cotton growers who no longer have markets. Romero has requested soybean seed from IITA/Brazil which I will send. The current price for locally grown soybeans is very good, about 16 cents US per lb,, so I think there is a good chance that Honduras may become a modest producer of soybeans for internal consumption (oil and meal).

The Federation of Producers and Exporters are keen to send a fact-finding team of 6 or 7 individuals to Brazil in early March. It appears that most costs for their trip can be paid by the Federation.

2. Comments on Soybean Project of Banco Centroamericano de Integracion Economica.

The bank conducted a thorough study of the vegetable oil situation for 5 countries (Honduras, Costa Rica, Guatamala, El Salavador, Nicaragua) in Central America. The vegetable oil deficit is growing rapidly because of the decline in cotton seed production. The study recommended that efforts be made to stimulate soybean production to minimize importation in the next 10 years; they estimate a need of about 300,000 Ha of soybeans in 10 years. They also recommended increase in oil palm production which would be an important vegetable oil source in 10 to 15 years. The Bank employed Ing. Francis Mo Hsu, a Costa Rican originally from Taiwan, to prepare a proposal for a pilot production study in five countries. IITA will be asked to evaluate the proposal. If the project is accepted by the bank officials and the participating countries, they hope to begin activities in 1986. IITA/EMBRAPA will be asked to assist with technical assistance and training.

3. Comments on FAO round table food legume workshop for Central America.

The concept of FAO is to stimulate exchange of genetic materials and tecnology between countries in the region. The meetings take place every two years to report on activities and to develop plans for the future. Most country representatives

were scientists working on <u>Phaseolus</u> and they provided little information on other legumes. FAO would like countries to nominate research administrators instead of technicians so that decisions can be taken and commitments by countries can be made. FAO would like to serve as a catalyst for exchange and would like countries to host visits of scientists from other countries. Country representatives did not understand the FAO philosophy and expected FAO to provide all resources for activities and to provide financial assistance to strengthen national programs. There was considerable acrimony between the country representatives and the FAO official (Benvenuti). The FAO roundtable meetings do provide a good forum for IITA and CIAT to meet with scientists; Dr. Guillermo Galvez of CIAT attended also. In addition I learned that for Central American and Caribbean countries the PCCMCA meetings held annually are being used by CIAT and CIMMYT for coordinating regional activities. CIAT and CIMMYT pay travel and per-diems for key people to attend the meetings. I believe IITA should do the same thing to bring cowpea and soybean scientists together. In 1986 the PCCMCA meeting will be held March 17-21 in El Salvador.

4. Other comments:

4.1 Benvenuti (FAO) said he is interested in paying for a trainee (cowpea) from Argentina to participate in the next course if held in Brazil.

4.2 Nicaragua plans to plant 20,000 Ha of soybeans in 1986.

4.3 According to Bernardo Patino, some cowpea, primarily as immature seed, is consumed in El Salvador. He believes the country had about 2000 Ha. The cowpea contact in El Salvador is Ing. Alejandro Salazar, Apartado Postal 885, Centro de Tecnologia Agricola, San Salvador, El Salvador. Telephone: 28-20-66.

4.4 CIAT has a rather large team of bean scientists working in Central America including a coordinator, economist, biometrician, pathologist (post doc) and a breeder. CIAT is giving in-country courses on on-farm evaluation of varieties. They also give bean production courses and last year gave a course on the use of microcomputers for agricultural research data analysis.

Since 1978 CIAT has received financial assistance from the Swiss Government for activities in Central America. The Swiss SDC has an office in Honduras.

4.5 Send promiscuous soybeans to Rodrigo Alfaro, Subdirector de Investigacion Agricola, MAG, Apartado Postal 10094, San Jose, Costa Rica. Materials will be sent by IITA Brazil. Also send cowpea trials. Attention B.B. Singh - please send early, medium, and vegetable trials.

4.6 There was considerable interest by country representatives at FAO workshop in IITA's rolling jab planter. I suggested that persons write directly to Charley Garman. I still believe that the international institutes with programs in farm machinery for small farmers should organize a workshop (demonstration) some place or several places in Latin America. Good sites might be at CIAT or CATIE (Costa Rica). Within Honduras I learned that Ing. Gerber Yanes, Unidad de Desarrollo y Adaptacion, Comayagua, Comayagua, Honduras and Ing. Juan Jose Alan, Escuela Agricola Panamericana, Apartado 93, Tegucigalpa, Honduras, would be individuals interested in testing the planters. I was told that at Piracicaba, Brazil there is an institute with interest in equipment for small farmers. I will try to make contact.

TRAVEL REPORT TO MANAUS, PERU AND ECUADOR

NOVEMBER 17 - 30, 1985

BY

EARL WATT

Travel Report to Manaus, Peru and Ecuador

November 17 - 30, 1985

By Earl Watt

Schedule:

Sunday November 17
Flew to Manaus.

Monday November 18
Met early morning with Jot. Smith who works with soil fertility and intercropping on the North Carolina project. Later met with Miguel Diaz; Edson Camera Italiano, the sub-chefe tecnico; and Erci D. Morais, chefe. The chefe is new, previously from Roraima. He was extremely helpful.

Tuesday November 19
Visited Calderao and evaluated TVx 4376-01D for release in 1986.

Wednesday November 20
Flew to Iquitos. I was met by Italo Cardama, Cowpea Coordinator; and Julio Correa de Aguila, Acting Director (CIPA XVI) who works with pasture and forrages.

Thursday November 21
Met with Italo in the morning. Flew to Tarapoto in the evening. Met at airport by Luz Chung (Public Relations).

Friday November 22
Met Washington Lopez, the new director (CIPA X). Went to the research station in Tarapoto where I met Dario Maldonado; Beder Diaz, Agronomist; and Wilma, the student from Holland.

Saturday November 23
Flew to Lima. Relaxed and recorded last trip report.

Monday November 25
Guillermo Hernandez-Bravo picked me up at the hotel. We went to INIAP and met personnel including Dale Bandy and Walter Couto, from the North Carolina team.

Tuesday November 26
Early morning flew to Guayaquil, Ecuador. Met by Hector Buestan, Saul Mestanza, Director of the Boliche Research Station. Afterwards visited cowpea fields until 6 p.m.

Wednesday November 27
Missed connection with driver. Therefore, stayed in hotel until the afternoon. At 2:30 took a taxi to Boliche research station. Made arrangements to go to Portoviejo the following day.

Thursday November 28
A driver took me to Portoviejo and returned to Guayaquil. Met with Ing. Linin Linzan Macias, agronomist and leader of the cowpea and haba or lima bean program; Ing. Jose Heriberto Mendoza, cowpea and lima bean breeder; Ing. Jimmy Ricardo Limongi, works with almacenamiento (cowpea storage) and working on his Masters thesis; Ing. Romulo Carrillo Alvaredo, works with production, basically economist; Ing. Francisco Hinostroza Garcia, with production systems; and Economist Napoleon Chavez, Cowpea use and Production specialist; and Osvaldo Zambranen, pathologist plus one other Osvaldo who was the entymologist.

Friday November 29
Wes Kline, Agronomist with the Cornell Title 12 Project, flew in from Quito to spend the day with me.

Saturday November 30
Recorded trip report and flew to Guayaquil. Made connections to Rio de Janerio.

Sunday December 1
Arrived in Goiania.

MANAUS

Discussions with Jot Smith. He has found from drawing yield response curves of maize at various levels of nitrogen, then planting cowpea, harvesting the pods, incorporating the rest and then calculating the yield of the following maize crop, that cowpea residue is indicated to be worth about 40 kg/H Nitrogen on upland soils of the amazon.

Jot has been doing quite a bit of work with Miguel and the PDIR project which is funded by Banco Mundial and BIRD, somewhat like Polo Norte where money is being provided to put cowpeas and other crops into farmers fields for testing. The new variety, Calderao, as well as other materials, have been put into farmers fields with this money.

In analyzing his five years of research it can be shown that the response of cowpea to various levels for phosphorous vary with the amount applied, the timing of the aplication (i.e. all at one time or a quarter of the total at the planting time of each of the four crops planted during the time of the experiment) and the residual effect. He is finding that if one adds 200 kilos of phosphorous that this is approximately equal to adding 50 kilos of phosphorous for each of four crops planted consecutively. This is not true at applications of less than 200 Kg/h and is not economical at higher applications. However, the easiest method for the farmer is the 50 to 60 kilos P205 per hectare per planting. Potassium and Nitrogen when added to a previous maize crop give sufficient residuals for the following cowpea crop. However, cowpea does respond to higher levels of phosphorous than maize. That is, it has a higher need for phosphorous than maize.

He has been working with the soybean cv.Tropical but is in need of a more erect, early maturing material as they only have about 150 days on the varzea where this would be planted such that the crop can be removed before the water becomes too high. Local researchers are trying to promote oil palm (dende) and are putting priority on dende over soybeans saying that it has a much better production of oil for that region.

For the release of Calderao, Miguel has requested information on the registration number in BAG, parent lines and the history of TVX 4678-01D.

UEPAE Manaus has worked on a manually driven pod thrasher. They have written up a Pesquisa en Andamento and are presently producing a Circular Tecnico. The Circular Tecnico should come out with complete diagrams and specifications for the pod thrasher. They requested a copy of the paper by Fery on the genetics of cowpea as well as Ciruclar Tecnico 18 as he had not received a copy. Material seen in field included the variety

called Calderao under multiplication for release. The material looks quite good in the field. Seed is of better quality than Manaus with yield equal or better than IPEAN V69. I have recommended its release as an alternate to MANAUS.

The Ensaio Estadual had already been harvested. Growth had been extremely poor. Reasons are unknown. Possibilities are: soil compaction as the varzea has not been flooded since 1982 and has been worked extensively; or possibily, an imbalance between magnesium and calcium. In the yield results the best material was IPEAN V69 with the new variety Calderao (TVX 4678-01D) coming in second with a difference of less than 5 kilos per hectare.

Notes were taken on Regional Trial 4, Treatment 7 CNCX 171-01E was the only line badly affected by rust. It was infected in all four replications. There was some rust-looking spots on older leaves of MANAUS in one plot only.

PERU

IQUITOS

Met at the airport by Italo Cardama. Went to the office and visited Julio Correa de Aguila. Looked at reports of previous years experiments.

Some notes:

1) Population/spacing study found that for the erect line La Molina No. 1, best population is 166 thousand plants per hectare.

2) Cost of production - the point of constriction is harvesting. Farmers have requested material which can only be harvested once as they often need to hire labor for harvests and multiple harvests are more expensive.

3) In a sixteen line yield trial, the best materials were VITA 5 and VITA 7. Other notable lines were TVx 1948-01F, TVx 4262-09-1D, TVx 1952-01F, IFE Brown, and CNCx 177-024E.

4) Important pests presence on cowpea were: gusanos de tierra (spodoptera, agrotus), grillas (grasshoppers), Diabrotica, chichas (podsuckers), ratos (rats), and camaleones (lizards).

5) Playa yield trial, 16 lines, best IFE Brown. Other notable lines were CNCx 136-026E, CNCx 171-03E, CNCx 171-012E, TVx 4262-9D, TVx 4072-1-C1-D.

6) Time of planting, cowpea-maize intercrop. All results indicate that the best planting combination is to plant both cowpea and maize at the same time. Spacing commonly used and recommended was 60cm x 40cm with 3 plants per hill.

Other notes:

There was much more cowpea in the market on this trip than on the previous trip in September, particularly in green pod eaten as green seed. Yard long was not seen. They requested that I send the 2 lines from Acre - BR 5 and BR 4 as well as Calderao from Manaus. Planting times are July-August for the Ratingas or the high varzeas and June-July for the playa or the sandy low varzea. Seed type preferred is basically a darker smooth brown colored. They would accept most all Brazilian material but need erect, early maturing to get the pods out before insect and fungal attack.

TARAPOTO

The planting of VITA 7 looked poor. The soil pH was neutral. Soil tests showed 1 ppm phosphorous, 229 ppm potasium, 21.5 mili-equivalent calcium and magnesium with organic matter at 2.6%. No phosporous had been added. Plants were showing extreme phosphorous deficiency plus aphids had been extremely bad such that there were almost no pods. Material had been sprayed 3 days before my visit and from the size of the dead weeds, had probably been weeded a week before my visit.

Below VITA 7 was a 1/2 Ha planting of La Molina 1 for seed multiplications for Iquitos. Material had been planted in wet soil, followed by 30 days of dry weather. The soil was heavy so most of the seed germinated. After 30 days of drought it rained 7 days straight. So, there was very bad dis-uniformity of germination.

There were two other experiments in the same field. One was Wilma's population using Seda-improved, a local selection, and VITA 7. Row spacing used was 50 x 25, 60 x 25, and 70 x 25. IITA early erect trial 1 had been planted. Germination was extremely uneven. (The IITA medium maturity trial will be planted in January which is the normal growing season in Tarapoto.) These experiments also showed severe phosphorous deficiency.

The 4 lines from California, UCR 193, UCR 194, UCR 204, and UCR 206A had already been harvested. However, they were not very aware of the objective of the lines they were testing even though vegetable cowpeas are important in Tarapoto. Seventeen lines from the EMBRAPA/IITA Advanced Trial 3 were planted using local checks but not the virus differentials. Two particular lines CNCx 164-9F and CNCx 161-5E looked like they might be suitable for their environment. This is the time of year for higest virus damage but lack of the differential lines prevented identification of the virus. The cultivar Seda-improved had significantly less virus damage and considerably more Cercospora damage. The field had a pH of 6.7, organic matter of 2.8%, calcium and magneseum 8.8 mili-equivalents, potassium 108 ppm, phosphorous 6 ppm. There was no phosphorous deficiency symptoms in this field as this is quite near the critical level for

cowpea. They requested material with aphid resistance as aphids were obviously a bad problem.

I saw two farmers fields where Seda-Improved had been planted. One was a sandy field which had proved inadequate for rice and the farmer was trying cowpea as an alternative. Seda, Vita 7, and a local variety were each planted at their respective optimum densities but it was too early to tell diferences. At the other field, only Seda-Improved had been planted. It looked good and was well cared for; small amounts of virus were observed. At the third field we went to, it turned out the farmer had not yet planted the Seda but had planted a blackeye which he said was the preferred seed type, irrespective of the local researcher reporting a small dark brown seed as being the preferred seed type.

Soybeans in Tarapoto

Several soybean experiments were observed. One trial had been sent in January and received in Tarapoto on October 23. Of the 61 lines from Brazil, only 12 germinated. Of note: EMGOPA 303 and GO81 numbers 11075, 460-31, 18774 had the best stands. It would be interesting to check seed storability on these particular lines. One hundred lines from Puerto Rico via INTSOY-CIAT had been recevied. Results are included in the annex. The best 18 lines were put in a 4 rep trial, 4 row, 4 meter plots, spacing 60 cm with 25 cm between hills, 4 seeds per hill. These 18 lines are now in yield trials in 3 locations. However, because of their particular rainy season they do not want material with more than 110 days. Tropical is running 110 to 118 days. They thought that the TGx lines were much too bushy for their particular desires. They have lost seed of Improved Pelican and request that seed be sent. It seems to have the best quality seed color. A farmers field was visited. He had planted Cristalina, probably about 1/2 hectare, basically to be eaten as milk or as a vegetable.

Tarapoto Market

In the market the highest frequency was pigeon pea, called Puspo, eaten green by most people in the region. After that, were lima bean and cowpea as a green seed. Also seen were many lentils, chickpea, Great Northerns, Navys, etc. Price ran 3000 soles (with the exchange rate of 17,000 soles = US $1) per 1/2 kilo on the browns or beiges; 2000 soles for 1/2 kilo on the red-seeded such as VITA 3; 1000 soles for a hand of green cowpea for eating shelled seed. Soja was sold for 5000 soles per 1/2 kilo.

Of note is that Dario says he will not be remaining as Station Director, he is only Acting Director. Washington says they will be looking for a different person to become the Legume Coordinator. They requested methodology for insuring that we would visit twice a year and wanted to make a formal paper of it.

In Lima I discussed training with Dale Bandy and Guillermo Hernandez Bravo. Dale Bandy has money to send two, or possibly three, people to CNPAF for a one month work-training. They need to have one person, such as Guillermo, put in the request, giving names of people, and a telex from EMBRAPA-IITA program giving acceptance of them and a time for their training.

ECUADOR

GUAYAQUIL

I was met at the airport by Hector Buestan. We proceeded to visit one of their fields. They have a collection from Portoviejo, material is totally prostrate and viney. Seed was extremely light colored but not extremely large. Seed multiplications of VITA 3, INIAP Tumbe which is Zipper Cream, and Tranquero, (TVx 1836-013J -note bad virus). All three lines being tested at two spacings, ready for farmer field day to show the new material. A yield trial of the best lines from their previous years including 13 lines, 4 reps. Most of the material had virus and bad mildew. Vita 3 was probably the best looking material but most people do not readily accept red seed color. Zipper Cream looked very good although it had medium to late maturity. The EMBRAPA/IITA introduction nursery was very well kept. Notes had been taken on mildew and maturation. CNC 0434 had bad virus and BR1-Poty was totally clean. Probable virus was Poty. In the EMBRAPA/IITA second experiment, CNCx 252-1E (known to have resistance to both CSMV and Poty), medium early maturing, semi-prostrate, looked very nice, completely clean of virus. Again BR1-Poty was prostrate and late but clean. CNCx 171-021E and CNCx 177-02G were both badly attacked by virus and mildew and also quite late. F6 populations looked good, ready for single plant selections soon. Populations of seed multiplication of IT 81D-1205-174, IT 82D-25 (NB. quite early), TVx 4677-010E and 2 populations of IT 81D-944 (one, browneyed and one, blackeyed) were also seen.

Thirty-one lines from 5 crosses were planted out. A great deal of variability was noted in maturation and plant type. However, almost all lines were attacked by virus. Vita 3 had been one of the parental lines and the material had been single plant selected in the F6 generation.

Question: All farmer materials were prostate and late. Most all farmers produced very small areas or vegetable cowpeas. What justification is there for needing early maturing? Prospect for machine harvesting or for larger scale production is minimal. Note: lines sent from IITA via Eduardo Calero had not been planted nor placed in storage.

PORTOVIEJO

Many of the team had extensive questions about cowpea. In the field the EMBRAPA/IITA trial was 30 lines plus the IITA early

maturing trial. Notes on virus included in the appendix. BR 1-Poty had 2 to 3 plants with virus, obviously severo symptoms. CNC 0434 was completely infected by virus, obvious Poty virus symptoms. Most all other lines were infected by some virus but especially the cultivar Manaus which was totally infected. Mildew and virus are the important dry season diseases and both were obvious. Material had been planted in 2 reps, 1 rep with insecticide and 1 rep without insecticide. The rep with insecticide was obviously less affected by viruses.

In another field they had IITA lines which Eduardo Calero had carried from IITA, including vegetable cowpea, aphid resistant, bruchid resistant, early maturing, and medium maturing; most all were affected with virus. Each plot 2 rows, they suggested picking one row for green seed and one row for dry seed. I suggested this would be a waste of time as only 1 rep of each treatment would not give significant results. More advisable would be to multiply seed and do a replicated trial in the normal planting season in January. In their material of local collections there were a few lines which showed no virus symptoms even though both viruses were obviously in the field. I requested some seed of these lines to be sent to Brazil so we can test their virus resistances.

The agronomist had planted the 4 best lines from the yield trial in a population study with spacing at 1 meter by 1 meter with 1, 2, and 3 plants per hill. Most farmers plant 1 meter by 1 meter with 4 plants per hill and the ground is completely covered by the plants after flowering.

They have no lines from California of the varieties for eating pods. I suggested contacting Tony Hall. They requested any assistance possible that we can give with training. I would suggest Linin Linzan as the best candidate because he is general cowpea program coordinator as well as an agronomist. He was very concerned with bruchid species as his species looks different than that pictured in books. They have very little literature. The book on insects and pests of diseases of cowpea from IITA was extremely well received as well as EMBRAPA Circular Tecnico 18. They requested any other literature that we might be able to send; they can read Portuguese easier than English. Discused release procedures and seed multiplicaton to some extent with Wes Kline. Also discussed computers.

Cowpea Introduction (Portoviejo - Ecuador) Sown Oct. 15, 1985

Entry	Line	Virus Score*	Plants Attacked
01.	BR 1- Poty	3	6P
02.	CNC 0434	4	TOT
03.	40 DIAS	2	TOT
04.	CNCX 105-22E	3	TOT
05.	CNCX 112-01-F	3	TOT
06.	CNCX 105-8-F	4	TOT
07.	CNCX 177-02-G	3	TOT
08.	INIAP CAUPI (ZIPPER CREAM)	2	TOT
09.	CNCX 176-03G	3	TOT
10.	CNCX 159-03G	4	TOT
11.	CNCX 149-01G	2	TOT
12.	CNCX 171-07E	4	TOT
13.	CNCX 171-09E	3	TOT
14.	CNCX 171-12E	3	TOT
15.	CNCX 171-03E	3	TOT
16.	INIAP CAUPI (ZIPPER CREAM)	1	
17.	CNCX 172-01E	2	TOT
18.	CNCX 161-01E	2	TOT
19.	MANAUS	5	TOT
20.	CNCX 167-50F	3	TOT
21.	CNCX 167-25E	3	TOT
22.	CNCX 167-10F	3	TOT
23.	CNCX 167-12F	2	TOT
24.	INIAP CAUPI (ZIPPER CREAM)	1	
25.	CNCX 167-48F	4	TOT
26.	CNCX 167-11F	3	TOT
27.	CNCX 167-9E	2	TOT
28.	CNCX 167-83E	2	TOT
29.	CNCX 180-3	2	TOT
30.	CNCX 163-18F	2	TOT
31.	CNCX 167-28F	4	TOT
32.	INIAP CAUPI (ZIPPER CREAM)	1	
33.	CNCX 168-2F	1	
34.	CNCX 164-7F	1	
35.	CNCX 161-5E	3	TOT
36.	CNCX 167-7E	3	TOT
37.	CNCX 164-2F	3	TOT
38.	CNCX 164-9F	1	
39.	CNCX 167-52F	2	TOT
40.	INIAP CAUPI (ZIPPER CREAM)	1	
41.	CNCX 163-25E	2	4P
42.	CNCX 167-18F	2	3P
43.	IT 82E-64 (AFRICANO)	1	
44.	IT 82E-44 (AFRICANO)	1	

*Virus score: 1 = No virus, 4 = Serious virus

Entry	Line	Virus Score	Plants Attacked
45.	IT 82E-54 (AFRICANO)	1	
46.	IT 82E-42 (AFRICANO)	2	3P
47.	IT 82E-61 (AFRICANO)	1	
48.	IT 82E-76 (AFRICANO)	2	1P

Tipo de Planta
Peso 100 Sem.

21/11/85
Tarapoto Peru.

DATOS AGRONOMICOS DEL ENSAYO INTERNACIONAL DE CAUPI IRL
EN LA ESTACION EXPERIMENTAL "EL PORVENIR" TARAPOTO-PERU.

?

CLAVE	VARIEDAD	COLOR FLOR	DIAS FLORACION	DIAS MADURACION	PLANTAS COSECHADAS	ALTURA PLANTA	VAINAS x PLANTA	Kg/Ha	GRADO ATAQUE Mosaico 1 a 4
1	IT 82 E - 3	Lila	45	73	25	133	27	1421	3
2	IT 82 E - 25	Lila	47	73	15	84	37	1040	2
3	IT 82 E - 27	Lila	45	73	34	103	21	1611	2
4	IT 82 E - 49	Blan y Amr.	47	73	1	123	42	140	1
5	IT 82 E - 70	" "	45	73	8	153	27	399	4
6	IT 81 D - 1069	Lila	51	74	5	58	34	364	2
7	IT 81 D - 1151	Lila	51	76	31	73	17	825	1
8	IT 81 D - 1205-174	Lila	48	73	19	104	29	1266	3
9	TVX 1836 - 013 F	Lila	51	74	8	118	24	340	1
10	TVX 1948 - 012 F	Lila	52	73	34	137	20	1036	4
11	3 TVX 32016 - 01 G	-	-	-	-	-	-	-	-
12	TVX 3627 - 012 F	Blan y Amr.	50	75	12	84	22	519	1
13	TVX 3871 - 02 F	Lila	47	74	31	131	20	1152	2
14	TVX 4654 - 44 E	Lila	49	74	12	118	20	1002	3
15	TVX 4659 - 02 B	Lila	50	74	39	69	11	1449	1
16	TVX 4659 - 03 E	Blan y Amr.	51	75	23	111	8	272	3
17	TVX 4661 - 07 E	Lila	48	74	31	63	18	1269	2
18	TVX 4677 - 08 E	Lila	46	73	30	82	21	1249	2
19	TVX 4677 - 010 E	Lila	49	74	32	69	13	1343	2
20	VITA - 7	Lila	51	74	28	58	12	730	2
21	S E D A Mejorada	Lila	52	75	42	116	17	1674	2

DATOS AGRONOMICOS DEL ENSAYO INTERNACIONAL DE CAUPI Nº 2 EN LA ESTACION EXPERIMENTAL "EL PORVENIR" JUAN GUERRA TARAPOTO - PERU.

CLAVE	VARIEDAD	COLOR FLOR	DIAS FLORACION	DIAS MADURACION	PLANTAS COSECHADAS	ALTURA PLANTA	VAINAS x PLANTA	Kg/HA	GRADO ATAQUE MOSAICO
1	VITA - 7	Lila	43	73	40	126	22	1734	3
2	IT 82 E - 13	Lila	45	73	20	141	12	610	2
3	IT 82 E - 16	Lila	45	74	31	130	17	705	2
4	IT 82 E - 18	Lila	46	74	25	144	18	859	3
5	IT 82 E - 32	Lila	45	73	22	132	20	1068	2
6	IT 82 E - 41	Lila	43	78	39	140	21	1948	3
7	IT 82 E - 56	Blan y Amr.	43	73	5	46	26	264	1
8	IT 82 E - 60	" "	45	73	3	50	29	105	2
9	IT 82 E - 77	Lila	44	73	25	121	25	1515	3
10	S E D A Mejorada	Lila	51	76	43	126	19	1879	3

S O Y A

LINEAS AVANZADAS F6 (ENVIADOS POR EL DR. CAMACHO) IT. INV. P.S. 07-01-83.

ORDEN	No ENTRADA CIAT	PEDI-GREE.	PADRES	COLOR FLOR	FLORA-CION	MADURA-CION	F CHA COSE-CHA	PLANTAS COSECHA-DAS	ALTURA PLANTA	ALTURA 1ra. VAINA	DEHI SCENc.	DEFO LIA-CION	TUM BA-DA.	VAINAS x PLANTA	SEMIL. x VAINA	CO-LOR GRANO	CO-LOR HILUM	PESO 100 SEMIL.	Kg/HA
1	004	BR 144-4	DAVIS x VI	L	40	112	120	55	42	9	1	1	1	65	2	Cr.	Negro	17	3400
2	012	BR 144-11	DAVIS x VI	L	47	112	120	54	36	4	1	1	1	87	2	Cr.	Mr.	21	3550
3	018	BR 145-2	DAVIS x IMPALA	L	41	103	107	58	56	6	1	1	1	40	3	Cr.	Mr.	19	3229
4	023	BR 145-6	DAVIS x IMPALA	D	41	103	107	59	60	6	1	2	1	57	2	Cr.	Cr.	22	4538
5	031	BR 145-14	" " "	D	41	103	107	49	68	5	1	1	1	44	3	Cr.	Cr.	24	3213
6	035	BR 145-17	" " "	B	41	102	107	69	69	5	1	1	1	53	3	Cr.	Mr.	18	4133
7	037	BR 145-19	" " "	B	41	102	107	53	52	6	1	1	1	55	3	Cr.	Cr.	25	3750
8	042	BR 147-2	" " "	B	41	102	107	49	47	5	1	1	1	35	2	Cr.	Cr.	26	2145
9	054	BR 147-13	DAVIS x TUNIA	L	41	102	107	74	56	8	1	2	1	28	3	Cr.	Cr.	24	2370
10	069	BR 148-2	" " "	D	41	104	107	33	33	5	2	1	1	45	3	Cr.	Mr.	22	1925
11	079	BR 148-11	DAVIS x Eg.48-2	D	44	105	107	50	50	9	1	2	1	45	2	Cr.	Mr.	22	3615
12	085	BR 148-17	" " "	D	42	105	107	53	45	7	1	1	1	41	2	Cr.	Mr.	21	2004
13	090	BR 148-21	" " "	D	43	104	107	58	41	8	3	1	1	32	3	Cr.	Negro	19	2050
14	091	BR 148-22	" " "	D	41	102	107	63	48	7	4	1	1	33	2	Cr.	Negro	21	1521
15	095	BR 148-24	" " "	D	47	104	107	56	47	8	1	1	1	31	3	Cr.	Mr.	23	2542
16	100	BR 148-30	" " "	D	41	102	107	56	34	8	2	1	1	31	2	Cr.	Mr.	18	2106
17	101	BR 149-1	DAVIS x SIAMSA 1204A	B	43	104	107	47	81	9	1	2	1	28	2	Cr.	Mr.	25	3142
18	103	BR 149-3	" " "	L	43	104	107	55	46	8	1	1	1	38	3	Cr.	Negro	21	2975
19	104	BR 149-4	" " "	L	45	105	107	46	61	9	1	3	1	73	3	Vr.	Negro	20	3167
20	106	BR 149-6	" " "	B	42	104	107	42	76	9	1	1	1	58	2	Cr.	Mr.	20	2746
21	107	BR 149-7	" " "	L	43	106	107	46	80	7	1	2	1	47	3	Cr.	Mr.	23	2896
22	108	BR 149-8	" " "	D	41	102	107	58	69	8	2	1	1	49	2	Cr.	Mr.	22	3133
23	112	BR 149-11	" " "	L	41	102	107	22	60	7	1	1	1	51	2	Cr.	Mr.	19	954
24	120	BR 149-19	" " "	L	43	105	107	27	102	13	1	2	1	55	3	Cr.	Negro	22	2146
25	123	BR 149-21	" " "	D	23	105	107	42	48	9	1	1	1	87	2	Vr.	Mr.	19	2500
26	125	BR 149-23	" " "	L	43	104	107	36	69	9	1	1	1	53	3	Cr.	Mr.	22	1496
27	129	BR 149-27	" " "	D	41	102	107	42	50	9	1	1	1	53	2	Cr.	Mr.	23	2093
28	178	BR 151-3	PI 171-443 x IMPALA	L	44	102	107	49	54	5	1	1	1	43	2	Cr.	Mr.	21	2775
29	183	BR 152-1	PI 171-443 x TUNIA	L	45	104	107	48	84	11	1	2	1	63	2	Cr.	Mr.	21	2670
30	184	BR 152-2	" "	L	45	105	107	59	80	10	1	2	1	55	2	Cr.	Mr.	22	3579

ORDEN	No ENTRADA CIAT	PEDI-GREE.	PADRES	COLOR FLOR	FECHA FLORA CION	FECHA MADURA CION	FECHA COSE-CHA	PLANTAS COSECHA DAS	ALTURA PLANTA	ALTURA 1ra. VAINA	HABIT CREC.	DEFO LIA-CION	TUM BA-DA.	VAINAS x PLANTA	SEMIL. x VAIN.	CO-LOR GRANO	CO-LOR HILIO.	PESO 100 SEMIL.	Kg/Ha
31	106	IR 152- 4	PI 171-443 x TUNIA	L	45	110	120	59	79	15	1	1	1	58	3	Vr.	Mr.	19	2263
32	190	IR 152- 7	" "	L	44	104	107	70	71	11	1	1	1	64	3	Vr.	Mr.	18	3104
33	191	IR 152- 8	" "	L	43	104	107	54	43	7	1	1	1	40	2	Cr.	Mr.	18	2491
34	195	IR 152-10	" "	L	43	104	107	50	76	8	1	1	1	39	2	Cr.	Mr.	17	2358
35	199	IR 152-12	" "	L	45	104	107	61	64	7	1	2	1	51	2	Vr.	Mr.	20	3212
36	202	IR 152-13	" "	L	43	114	120	59	74	8	1	1	1	5,	3	Cr.	Mr.	21	3196
37	244	IR 155-38	VIRGINIA 1204 x	L	45	104	107	59	46	7	1	1	1	72	3	Cr.	Mr.	15	2063
38	256	IR 154- 4	VIxJUPITER	L	49	114	120	38	63	8	2	1	1	100	2	Cr.	Mr.	30	3608
39	260	IR 154- 8	" "	L	49	114	107	51	54	9	1	2	1	52	3	Cr.	Mr.	20	3308
40	262	IR 154-10	" "	L	49	112	120	62	61	17	1	1	1	43	2	Cr.	Mr.	18	3338
41	263	FR 154-11	" "	L	47	104	107	61	44	8	1	2	1	24	3	Vr.	Mr.	18	2371
42	266	IR 154-13	" "	L	48	112	119	51	44	8	1	1	1	85	2	Vr.	Mr.	18	2913
43	267	IR 154-14	" "	L	48	114	107	56	56	9	1	1	1	98	3	Cr.	Mr.	17	3367
44	269	IR 154-16	VI x JUPITER	L	47	115	120	61	54	13	2	1	1	84	2	Cr.	Mr.	19	4008
45	270	IR 154-17	" "	L	47	114	120	62	57	11	1	1	1	85	3	Cr.	Mr.	20	3354
46	274	IR 154-21	" "	L	49	112	120	57	66	15	1	1	1	63	2	Cr.	Mr.	20	3633
47	276	IR 154-22	" "	L	49	114	120	53	59	19	1	2	1	59	3	Cr.	Mr.	22	4400
48	279	IR 154-29	" "	L	48	104	107	47	47	10	2	1	1	35	2	Cr.	Mr.	20	2206
49	281	IR 154-36	" "	L	46	105	107	59	56	17	1	2	1	47	3	Vr.	Mr.	20	2346
50	282	IR 154-37	" "	L	48	112	120	56	53	15	1	1	1	92	3	Cr.	Mr.	23	3342
51	296	IR 154-41	" "	L	46	104	107	71	48	9	1	2	1	55	3	Cr.	Mo.	19	1908
52	303	IR 154-47	" "	L	47	112	120	58	49	13	1	1	1	35	3	Cr.	Mr.	13	3342
53	306	IR 156-50	" "	L	45	114	120	66	53	17	1	1	1	49	3	Cr.	Mr.	22	4050
54	311	IR 156- 2	IMPALA x VI	L	41	102	107	51	58	6	1	1	1	48	2	Cr.	Mr.	19	2100
55	314	IR 156- 5	" "	L	41	102	107	45	49	5	1	1	1	62	2	Cr.	Mr.	17	1929
56	325	IR 156- 6	" "	L	40	104	107	57	68	7	1	1	1	78	2	Cr.	Mr.	22	3542
57	318	IR 156- 9	" "	L	41	104	107	36	60	4	1	1	1	91	2	Cr.	Mo.	20	2129
58	321	IR 156-11	" "	L	41	103	107	41	66	5	1	2	1	76	3	Cr.	Mr.	18	2054
59	323	IR 156-13	" "	L	40	110	121	49	73	6	1	1	1	87	2	Cr.	Mr.	19	4330
60	325	IR 156-15	" "	L	40	104	107	36	56	7	1	1	1	45	3	Cr.	Cr.	16	2563
61	333	IR 156-22	" "	L	41	104	107	41	67	7	1	1	1	75	2	Cr.	Mr.	18	3404
62	344	IR 156-32	" "	L	41	112	120	25	69	6	1	1	1	87	3	Cr.	Mr.	29	2133
63	357	IR 157-10	IMPALAx71-38	L	42	104	107	45	61	5	1	2	1	50	3	Cr.	Mr.	21	2463

ORDEN	No. ENTRADA CIAT	PEDI-GREE.	PADRES	COLOR FLOR	FECHA FLORA CION	FECHA MADURA CION	FECHA COSE CHA	PLANTAS COSECHA DAS	ALTURA PLANTA	ALTURA 1ra. VAINA	HABI CRE.	DEFO LIA-CION	TUM BA-DA.	VAINAS x PLANTA	SEMIL. x VAINA.	CO-LOR GRA.	CO-LOR HILI.	PESO 100 SEMIL.	Kg/Ha
64	366	PR 150- 1	TUNIA x SIATSA 1204A.	L	41	114	120	46	65	7	2	2	1	68	3	Vr.	Mr.	24	3075
65	373	PR 150- 8	" "	L	43	104	107	31	57	6	1	3	1	52	3	Vr.	Ma.	23	1725
66	385	PR 150-17	" "	L	42	104	107	46	67	8	1	2	1	49	3	Cr.	Mr.	21	3933
67	388	PR 150-21	" "	L	44	104	107	52	67	9	1	2	1	68	2	Vr.	Ma.	20	2970
68	420	PR 160- 6	TUNIA x VI	L	45	104	107	58	64	9	1	2	1	35	2	Cr.	Mr.	21	2054
69	445	PR 161- 4	Eggey 83-2x 71-38	B	43	103	107	77	42	7	1	1	1	30	3	Cr.	Cr.	16	3358
70	443	PR 161- 7	" "	L	46	104	107	44	39	6	2	1	1	71	3	Cr.	Mr.	17	2704
71	457	PR 161-15	" "	L	48	104	107	78	42	6	1	2	1	55	3	Cr.	Mr.	13	1046
72	475	PR 161-31	" "	B	48	104	107	47	37	5	1	2	1	42	3	Cr.	Mr.	17	2067
73	483	PR 162- 1	Eggey 83-2x SIATSA 1204A	L	42	104	107	52	46	9	1	1	1	34	2	Vr.	Mr.	17	1903
74	493	PR 162- 6	" "	L	43	112	120	48	62	11	2	1	1	45	2	Cr.	Mr.	22	2383
75	499	PR 162-11	" "	L	45	105	107	44	56	11	1	2	1	51	3	Cr.	Mr.	20	2904
76	503	PR 162-17	" "	L	46	104	107	41	40	9	1	1	1	36	2	Cr.	Mr.	21	2604
77	507	PR 162-18	" "	B	46	104	107	31	96	8	1	1	1	62	3	Cr.	Mr.	22	3358
78	533	PR 164-22	Eggey 83-2x JUPITER	L	46	112	120	45	74	9	1	1	1	71	3	Cr.	Mr.	22	5579
79	538	PR 164-27	" "	L	42	104	107	35	40	6	1	1	1	69	2	Cr.	Mr.	22	1621
80	544	PR 165- 3	Eggey 83-2xVI	B	46	104	107	60	56	17	2	1	1	33	3	Cr.	Mr.	18	1042
81	547	PR 165- 6	" "	L	45	104	107	67	56	9	1	1	1	43	2	Cr.	Mr.	16	3913
82	557	PR 165- 7	" "	LB	49	106	107	62	57	10	1	2	1	49	3	Cr.	Mr.	17	3763
83	562	PR 165-19	" "	L	48	103	107	61	60	13	1	1	1	31	3	Cr.	Mr.	16	3575
84	575	PR 165-31	" "	L	44	104	107	60	53	8	1	1	1	37	2	Cr.	Cr.	15	3958
85	593	PR 165-43	PR 165-43	L	43	104	107	53	51	9	1		1	51	3	Cr.	Mr.	17	2242
86	596	PR 165-50	PR 165-50	B	43	104	107	58	54	9	1		1	57	3	Cr.	Mr.	17	4217
87	598	PR 165-52	Eggey 83-2xVI	L	41	104	107	71	46	8	1	1	1	40	3	Cr.	Mr.	17	2042
88	601	PR 165-55	" "	L	42	104	107	65	53	7	1	1	1	51	2	Cr.	Mr.	19	4196
89	610	PR 166- 8	Eggey 83-2x IMPALA	B	41	104	107	63	41	10	2	1	1	24	3	Cr.	Mr.	22	2217
90	618	PR 166-15	" "	B	41	104	107	31	60	5	2	1	1	86	2	Cr.	Mr.	24	2138

ORDEN	No. ENTRADA CIAT	PEDI-GREE.	PADRES	COLOR FLOR	FECHA FLORA-CION	FECHA MADURA-CION	FECHA COSE-CHA	PLANTAS COSECHA-DAS	ALTURA PLANTA	ALTURA 1ra. VAINA	DEHI SCEN.	DAÑO LIMA-CION	TUM BA-DA.	VAINAS x PLANTA	SEMIL. x VAIN.	CO-LOR GRAN.	CO-LOR HILI.	PESO 100 SEMI.	Kg/Ha
91	659	PR 166-34	Eggrey 80-2x LIPALA	L	42	104	107	62	53	17	1	1	1	30	2	Cr.	Mr.	22	3271
92	687	PR 157-55	SH 1274xEggrey 80-2	B	43	104	107	50	58	11	1	2	1	57	2	Cr.	Cr.	19	3200
93	706	PR 160- 9	SH 1274x71-58	L	43	104	107	60	65	10	1	1	1	59	2	Cr.	Mr.	19	4213
94	782	PR 169-24	SH 1274xSIATSA 1204A	L	44	103	107	53	61	19	1	3	1	75	3	Cr.	Mr.	23	1258
95	726	PR 139-27	SH 1274xSIATSA 1204A	L	44	104	107	42	66	10	1	2	1	84	2	Cr.	Mo.	24	2038
96	731	PR 169-32	" "	L	42	104	107	44	67	7	1	3	1	59	2	Ve.	Mr.	21	3142
97	741	PR 170- 2	SH 1274 x JUPITER	B	42	104	107	37	53	8	1	2	1	86	2	Ve.	Ve.	21	3296
98	837	PR 173-18	SH 1274 x VI	L	42	105	107	36	63	9	1	1	1	32	3	Cr.	Mr.		2158
99	848	PR 173-28	" " "	L	42	105	107	57	50	7	1	2	1	45	2	Cr.	Mr.	21	2008
100	849	PR 173-29	" " "	L	42	103	107	57	50	5	1	1	1	43	3	Cr.	Mr.	17	3121

SOYA EL PORVENIR

F.S. 08-01-85

ORDEN	VARIEDAD	COLOR DE FLOR	FECHA FLORACION.	FECHA MADURACION.	FECHA COSECHA.	PLANTAS COSECHADAS.	ALTURA [illegible] PLANTA	ALTURA 1ra. VAINA	DEHISCE.	DEFO LIO.	TUMBADA	VAINAS x PLANTA	SEMILLAS x VAINA	COLOR GRANO	COLOR HILIUM	PESO 100 SEMI.	Kg/Há
1	TIMBIRA	L	57	123	125	46	49	8	1	1	1	53	03	Cr.	Negro	17	1,256
2	MOMBAIRA	L	51	114	120	14	35	5	1	2	1	105	02	Cr.	Mr.	21	566
3	TROPICAL	L	59	118	120	15	68	8	1	2	1	175	03	Cr.	Negro	20	1,142
4	TGX 726-01F	B	48	111	120	51	70	8	4	1	1	97	03	Cr.	Mr.	16	1,431
5	TGX 744-01F	L	47	111	120	53	52	7	1	2	1	93	02	Cr.	Mr.	16	1,983
6	TGX 744-02F	L	48	111	120	42	47	6	1	2	1	75	02	Cr.	Mr.	19	1,586
7	TGX 775-01E	L	56	118	120	17	82	7	1	2	1	120	02	Cr.	Mr.	19	766
8	TGX 775-03F	L	57	118	120	14	71	12	1	1	1	77	02	Cr.	Mr.	17	623
9	TGX 775-06G	L	57	118	120	26	61	8	1	1	1	75	02	Cr.	Mr.	16	782
10	TGX 706-02B	L	51	115	120	31	58	8	2	1	1	172	02	Cr.	Mr.	13	1,143
11	TGX 709-05G	L	53	116	121	18	53	5	1	2	1	102	02	Cr.	Mr.	18	653
12	TGX 709-053	L	55	117	120	40	50	8	1	2	1	134	02	Cr.	Mr.	18	1,268
13	TGX 709-01F	L	51	114	120	33	44	9	1	1	1	101	02	Cr.	Mr.	14	1,718
14	TGX 533-79D	L	48	111	120	46	60	6	2	1	1	76	02	Cr.	Negro	20	1,626
15	TGX 536-03B	L	47	111	120	44	40	7	2	1	1	98	02	Cr.	Negro	19	1,304
16	TGX 573-01B	L	48	111	120	48	67	7	2	2	1	78	02	Cr.	Mr.	21	1,475
17	TGX 573-05E	L	51	114	120	50	48	10	1	1	1	58	02	Cr.	Negro	18	1,495
18	TGX 573-06D	L	56	118	120	36	45	9	2	1	1	110	02	Cr.	Mr.	13	1,214
19	TGX 753-120D	L	47	111	120	43	44	8	2	1	1	74	02	Cr.	Negro	20	1,053
20	TGX 604-027D	L	56	123	125	36	83	7	1	1	1	49	02	Cr.	Negro	16	1,194

TRAVEL REPORT: BAHIA, RIO GRANDE DO NORTE, CEARA

NOV. 25 - DEC. 03, 1985

BY

E.A. KUENEMAN

TRAVEL REPORT: BAHIA, RIO GRANDE DO NORTE, CEARA

NOV. 25 - DEC. 03, 1985

BY E.A. KUENEMAN

ITINERARY

Monday 25/11
Flew to Salvador.

Tuesday 26/11
Went to EPABA office and met with Oswaldo Chaves Batista Filho, Chefe do Departamento de Pesquisa Vegetal; with Maria Clarice Ferral, Assessora do Departamento de Pesquisa Vegetal and Caupi Coordinator; with Joao da Costa Pinto, Assessor do Departmento de Pesquisa Vegetal. Took night flight to Natal.

Wednesday 27/11
Met in the morning with Lucas Antonio de Souza Leite, Director Tecnico of EMPARN, Rio Grande do Norte. In the afternoon met with Caupi Coordinator, Auri Alaecio Simplicio.

Thursday 28/11
Rented a car and drove to Acu to see cowpea seed multiplication on David Knoll's farms.

Friday 29/11
Visited fields of irrigated cowpeas.

Sunday 01/12
Flew to Fortaleza, Ceara State.

Monday 02/12
Spent early morning with EPACE President, Edgard Matus Cavalcante and his assesoria, Paulo Frota. Drove to Barbalha in southern Ceara during the afternoon.

Tuesday 03/12
Spent the morning with caupi breeder, Paulo Diogenes Barreto, looking at trials and seed multiplication plots. Returned to Fortaleza Tuesday night.

Wednesday 04/12
Returned to Goiania.

Salvador, Bahia (EPABA)

They were concerned about not receiving the 1985 ADVANCED TRIAL 4. Oswaldo Chaves Batista Filho expressed interest in receiving one or two bulk populations (F_5) of cowpea for selection in Bahia. Oswaldo also agreed to plant the IITA/EMBRAPA soybean seed longevity experiment. I gave him location #15 to plant in the coastal region (Paraguacu). He would like another set to plant at UEP Sao Francisco. Oswaldo suggested the last week of February as the time to visit soybean trials. Oswaldo beleives that Bahia could become an important seed producing state because of available irrigation and low relative humidity.

Rio Grande do Norte

Discussions with EMPARN staff:

Cowpea root rot still is seen as a major problem and Auri is not convinced that a thorough study has been made to identify causal agents. The major region of root rot is Agreste. Auri suggested that Dr. Gerson visit in April to make a survey. As indicated in my 1984 travel report, flower thrips (different from those seen in West Africa) are problematic in Region Serido. Auri expressed interest in planting in February IITA lines with moderate levels of thrips resistance to see how they hold up. He said he would be interested in receiving F_5 bulk populations with poty virus resistance. Auri also re-emphasized damage caused by leaf hoppers in some regions. He is willing to plant out CNPAF selections to assess leaf hopper resistance. I think this is a very good idea especially due to the low pest pressure at Goiania 1984 and 1985.

EMPARN staff said cowpea prices were low but David Knoll said the price is still quite good (4500 Cr/Kg grain price) and has no trouble in marketing green or dry seed. In fact, the state government just requested pruchase of 100 tons of seed from Knoll.

Lucas agreed to plant a soybean seed longevity trial in February or March. I gave him location #14.

David Knoll has several farms near Acu and plants irrigated cowpeas in the dry season. He sells both green seed and dry grain. He is a certified seed grower and is currently producing substantial amounts of cowpea seed. This year he had approximately 100 Ha of CNCX 77-1E (cream), 30 Ha of BR 1-Poty, 5 Ha of CNC 0434, and 60 Ha of two white-seeded materials for the fresh seed market. He calls these lines CARIRI-1 and CARIRI-2; they differ in maturity. Knoll used to grow VITA 7 but this has been mostly phased out due to Poty virus susceptibility.

Knoll has just received seed sample of CNCX 252-1E, CNCX 187-22D-1, CNCX 24-015E, IT 82D-885, and CNCX 166-08G. He will plant immediately and suggested a late January visit. Knoll

would like to try bush vegetable cowpeas and IITA sweet corn. He would also like information on herbicides for cowpeas; he is presently using DUAL and has a rolling cultivar that he uses once or twice in the first 40 days. In-row weeding is done by hand.

Seed production in susceptible varieties is a problem. BR 1-Poty looked good with little rogueing required.

Barbalha, Ceara

Near Barbalha cowpea sells for about 7000 Cr/Kg and Phaseolus for 6000 Cr/Kg. Paulo Diogenes had 3 replicated preliminary trials in the field at Missao Velha; entries were from selections he made from CNPAF populations. The entries look quite good in the early podding stage. Paulo was multiplying seed of two varieties. He had 7 Ha of Vita 7 which was already harvested and 14.5 Ha of BR 1-Poty. Vita 7 had a rather high incidence of virus. BR 1-Poty was quite clean.

Paulo and I discussed support needed to accomplish his objectives. This information was given to CNPAF Administrators in the form of a memo from Watt and Kueneman.

TRIP TO VENEZUELA, PANAMA, EL SALVADOR, BELICE

JANUARY 1986

BY

E.A. KUENEMAN

ITINERARY - E.A. KUENEMAN

TRIP TO VENEZUELA, PANAMA, EL SALVADOR, BELICE

JANUARY 1986

Friday Jan. 03/86

Arrived early morning in Caracas and met with Eddy Ramirez of FUSAGRI, then drove to Cagua where I met Dario Boscan and John Galan to look at cowpea trials. Later in the afternoon I met with Juan Pedro and Raul Nino to discuss the soybean program at POLAR, presently based at the FUSAGRI experiment station. At 5:30 Dario Boscan and I visited AGROMACA in Maracay. Agromaca is producing IITA's rolling jab planter.

Saturday Jan. 04

I met with Dr. Miranda, seed scientist of FONAIAP. We discussed the lack of cooperation between POLAR and FONAIAP in relation to breeding soybeans with better seed longevity and the new seed laws that Venezuela is planning to initiate. In 1986 Venezuela should have a varietal protection act which will make it very attractive for private seed companies to work on self-pollinated crops, especially soybeans. In the afternoon I drove back to Caracas.

Monday Jan. 06

I flew on an early morning flight to Panama City and was met by Omar Alfaro (previous trainee and agronomist of IDIAP). We met with Dr. Gaspar Silvera and went to a meeting with Dra. Susana J. Icaza (Despacho de la Primera Dama - program of the President's wife). Also present were Dr. Roberto Cuevas from INCAP-Guatamala and Isaias Camacho from the University. We discussed plans to produce a cereal drink based on rice and cowpea flour to be used in schools and nutrition centers.

Tuesday Jan. 07

Dr. Silvera, Ing. Alfaro and I drove 2 1/2 hours to Rio Hato Experiment Station which is located on the central Pacific coast. They had both IITA cowpea trials plus 200 soybean lines I had sent from Brazil. Both crops were at harvest stage. We went through the trials and returned to Panama City late afternoon.

Wednesday Jan. 08

Dr. Silvera and I took the 7:30 a.m. flight to David where we were met by IDIAP agronomist, Ruben de Gracia. We drove to Chiriqui and to Alanja, a principal cowpea growing region. We looked at cowpea trials and production fields of local farmers. We met with Fritz Kocker of CIMMYT to discuss IITA's rolling jab planter. We took the 9:00 p.m. flight back to Panama City.

Thursday Jan. 09

National holiday in Panama. I read reports and wrote up travel notes.

Friday Jan. 10

I took 6:30 a.m. flight to El Salvador and was met by Carlos Mario-Garcia, bean breeder of CENTA. We drove to the CENTA station and met with Alejandro Salazar (cowpea project leader) and Nelson Vasquez (soybean project leader). We met with Roberto Rodriguez, Jefe, Division de Investigacion. We discussed CENTA training needs and the PCCMCA meetings to be held in El Salvador in March. I also decribed IITA's program. They showed considerable interest for help on both crops, but especially on soybeans. CENTA has funds from BID for training and I met with BID representatives, Lic. Daniel Americo Figueroa, Joaquin Laris Canas, and Ing. Rigoberto Arevalo (in charge of BID training). BID was trying to contact EMBRAPA to see if they could send people to Brazil for training for 1 to 6 months. They agreed to send people to the group course in Mexico and send trainees to Brazil for individual training. I then met briefly with Dra. Bellosa, Director of CENTA. After lunch I met with Napoleon Puenta Marquez, head of the Division Tecnologia de Semillas y Plantas. We went through the seed processing plant built by AID (designed by Mississippi State) and discussed handling of soybean seed. Nelson Vasquez and I then went to the Ministry of Agriculture and Ganaderia and met with Lic. Maximiliano Cruz-Carcamo, Jefe de Division de Projectos, Oficina Sectorial de Planificacion Agropecuaria (OSPA). We discussed the country's plans to initiate soybean production. Nelson and I then went to a soybean meeting being held by Bayer Chemical Company. Bayer is promoting soybean production to replace cotton. Principal contacts were Fernando Lopez-Granillo (agronomist) and Agr. Manuel Mauricio Martinez, Gerente de Vendas, Dept. Fito-Agricola. Our meeting lasted until 7:30 and Nelson and I went back to the hotel for dinner and discussions.

Saturday Jan. 11

Carlos Mario, Nelson Vasquez, Alejandro Salazar, and I met at 8:00 at the hotel for discussions and then Carlos took me to Taca and Varig airway offices to make travel arrangements. At 11:00, Nelson, Alejandro, and I went to Consorcio Avicola Popular (association of farmers and people from the poultry industry). This group is forming a new company to promote soybean production called Pro-soya. We met with the head of Pro-soya, Geraldo Cioneros, and discussed their activities (demonstration plots) and the need for soybean production in the country. At 1:00 we had a meeting with Max Guillermo Nova, Gerente General for Quality Foods de C.A., S.A. Quality Foods is contracting farmers along the coast to produce cowpeas for export to the USA as frozen green seed. We returned to the hotel and had a late afternoon lunch and summarized our plans for future interaction.

Sunday Jan. 12

Worked on travel reports and met in the afternoon with Nelson Vasquez and with Julio Romero, who came to El Salvador to buy soybean seed for Honduras.

Monday Jan. 13

Took early flight to Belice City and was met by CARDI agronomist, Mr. Sinha. We drove to Belmopan and spent the day looking at cowpea and soybean trials.

Tuesday Jan. 14

Drove back to Belice City and took flight to Miami. Took night flight from Miami to Rio de Janeiro.

Wednesday Jan. 15

Was robbed at Varig counter in Rio de Janeiro of all documents and travelers checks. Spent day making claims with local police. Took late afternoon flight to Goiania.

VENEZUELA

Soybeans in Venezuela

In the 1985 main season the Polar project only planted 65 Ha of Jupiter with a mean yield of 1700 kg/ha. There still appears to be a lack of organization and confidence. Raul Nino, responsible for the varietal testing, still has not begun evaluating for seed longevity even though he agrees that it is a critical factor in Venezuela. Although the dry-season nurseries were still in the pre-flowering stage they were already full of SMV. I had told them about this problem on several previous visits and that SMV resistant materials were available upon request. Now he is interested and Dr. Dashiell should send lines and populations that are resistant. The guaranteed price for soybeans has gone up (now 5 Bolivars/kg, about 30 cents) and is adequate to stimulate production; maize price is 3 Bolivars/kg.

In 1985 Nino tested 20 IITA lines among a series of introductions (results included in the appendix). TGm 1891-2 was the most productive line from IITA; TGx 843-42D also did well. Unfortunately, Nino has not tested the entries for seed longevity so IITA lines did not stand out as being different from those from Florida. A number of lines from Hinson's program in Florida were very high yielding. Like the previous germplasm sent from IITA, Hinson's lines are generally susceptible to SMV.

A very significant policy will be implemented in 1986. Venezuela will introduce a varietal protection act and we can expect that big seed companies such as Pioneer and Asgrow, who are selling corn and sorghum seed, will probably begin working on soybean seed in Venezuela. This will be a major breakthrough because the government programs are having difficulties getting organized. There are well trained people in Venezuela. However, they lack a breeder with experience and better organization.

NEW IITA LINES PROVIDED

BRAZILIAN SOYBEAN VARIETIES AND IITA LINES

FOR DR. KUENEMAN

01. SANTA ROSA
02. DOKO
03. CRISTALINA
04. IAC 7
05. EMGOPA 301
06. IAC 6
07. IAC 8
08. PARANAGOIANA
09. BOSSIER
10. EMGOPA 303
11. TROPICAL
12. TGx 306-036C
13. TGx 311-62F
14. TGx 803-99E
15. TGx 813-34D
16. TGx 825-15D
17. TGx 849-8D
18. TGx 856-66E

Cowpea Production in El Salvador

There is some potential for increasing cowpea production in El Salvador, but the main limitation in market. People prefer Phaseolus (red and black seeded). In the mid-1970's there was a national campaign to promote cowpea production. Apparently about 1000 Ha of Vita 3 were sown and the production stayed in the warehouse because there was no market. As a consequence, CENTA has only a modest interest in cowpeas. They recently started a small cowpeas program with Alejandro Salazar as leader. He appears to be a good man but has very little experience in cowpeas. There is money from BID for training and if EMBRAPA agrees, I will invite Salazar to spend the month of March with us in Goiania.

Quality Foods Co. contracted about 80 Ha of cowpea production in 1985 for export to the US as frozen immature seed. They have a modern food processing plant about 15 km from San Salvador and a special line of equipment for processing cowpeas. The pods are hand-picked just before the pod begins to dry-down. Pods are transported in refrigerated trucks to the plant where they have a high capacity dehuller. The seeds are washed, sorted and frozen in plastic bags and labeled as Bel-Air or Safeway products. The company plans to double the production (1400 Ha) in 1986. They apparently have a market advantage over US grown cowpeas because the crop is hand-harvested resulting in better quality. The director claimed there is an enormous market for high quality green cowpea. The variety they are using is Early Purple Hull. They are interested in testing germplasm from IITA; they require white-seeded lines with blackeye.

Alejandro Salazar received 4 trials from IITA/Nigeria. The vegetable cowpea trial was a failure because of poor germination and they were very unhappy that this trial arrived full of Bruchids, especially Farv 13. CENTA may make a formal protest to IITA, because the species of Bruchid does not yet exist in El Salvador. Anyway, plant stands were poor and Salazar used the trial to multiply seed for later testing. The extra-early trial was planted but because of a labor strike in CENTA it was not possible to harvest the trials properly. Salazar says he still had seed and will replant the trials under irrigation in January. He had not planted the medium maturity trial or the Bruchid trial but says he will do so now. I plan to be in El Salvador for the regional PCCMCA meeting in late March. If he plants I can look at the trials during that visit.

BELICE

Soybeans in Belice

CARDI and the Ministry of Agriculture are very keen to expand soybean production in Belice. In the last 2 years they have tested over 250 introductions, mostly from INTSOY, AVRDC, and a few from IITA.

All trials were run on the experiment station at Belmopan where plant growth is very vigorous. The twenty most promising lines were being multiplied; TGx 536-02D and TGx 814-23D were among the entries. They looked fair agronomically. IAC-8 from Brazil was the best line agronomically but it is known to have poor seed longevity characteristics. CARDI scientists were fond of AGS-59 from AVRDC. This variety is determinate and of medium stature. About 20 Ha of AGS-59 were sown at CARICOM farms near Belmopan. The variety was very short and stunted, probably from water logging and soil compaction; nodulation was also poor. I explained to Dr. Rai the merit of selecting a late-maturing, tall determinate variety for stress situations. I also stressed the importance of testing soybeans in different sites. Dr. Rai was keenly interested in evaluating introduction for seed longevity. Belice is very humid and seed deterioration is rapid. He ordered thermostats for accelerated aging chambers while I was in Belice.

Most soils in Belice are heavy clay and frequently shallow with a limestone subsoil which is rather impervious to water. Consequently, water-logging is a problem. Planting needs to be done no-till but it must be combined with some sort of subsoil ripping to prevent water accumulation. Another possibility is to plant on raised beds that allow lateral drainage. I suggested that Dr. Rai contact Dr. Hartwig of Mississippi and Stan Claasen of IITA for further suggestions.

Dr. Rai requested information on threshers for soybeans. I sent him addresses of Brazilian companies.

Cowpeas in Belice

The population of Belice is only 150,000. Unlike other Caribbean countries, Belice has land resource for large scale agriculture and they are interested in producing food crops for other Caribbean countries. Cowpeas are only consumed in small amounts. Red kidney beans are the preferred food legume. There is some interest in producing blackeyed cowpea for the export market. CARDI has been conducting IITA trials. The crop was only 30 days old during my visit and there was no evidence of any disease or insect problem. From previous research it is apparent that CSMV is present in Belice; only 'Laura B' a CSMV resistant variety was disease-free while all entries from IITA-Nigeria were infected.

CONTACTS LIST

LATIN AMERICAN REGIONAL LEGUME PROGRAM

CONTACTS IN BELICE

Dr. Rai
CARDI
P.O. Box 2
Ministry of Agriculture
Belmopan
Belice, C.A.

T. Carlyle Reeser
General Manager
Continuous Crop Improvement Co. Ltd.
P.O. Box 503
Belize City
Belize, C.A.
Phone (farm): 44018 Phone (town): 7288 Cable: CCIC BELIZE

CONTACTS IN BOLIVIA

Ing. Cesar Samur
CIAT
Av. Ejercito 131
Casilla 247
Santa Cruz De La Sierra
Bolivia

Home Address:
Calle Tne. Aponte 180, Casilla No. 3785
Santa Cruz De La Sierra, Bolivia
Phone: 47432

Ing. Agr. Hebert Zurita
Gerente Tecnico
VIGOROSA
Libertad 767
Casilla 2465
Santa Cruz de la Sierra
Bolivia
Phones: 2-3566, 3-6229 Telex: 4372 ADEPA BV

Fernando Vargas
Centro de Investigacion Agricola Tropical
CIAT
Av. Ejercito 131
Casilla 247
Santa Cruz de la Sierra
Bolivia

Contacts in Brazil

Decio Luiz Gazzoni
Chefe
CNP-SOJA
Rodovia Celso Garcia Cid, Km. 375
Caixa Postal 1061
86.100 Londrina, Parana
Phones: 23-9719, 23-9850 Telex: (0432) 2208

EMPRESA BRASILEIRA DE PESQUISA AGROPECUARIA - EMBRAPA
(Sede) Supercenter Venancio 2000 - Q. 08, Bloco "B", No. 50
6/9 andares e 2 subsolo - Setor Comercial Sul - SCS
70.333 Brasilia, D.F.
Caixa Postal: 04.0315
Phone: (061) 225-3870 Telex: 016.1620, 061.1524 EBPA
Presidente: Luiz Carlos Pinheiro Machado
Diretors: Ali Aldersi Saab, Derly Chaves Machado da Silva, Severino de Melo Araujo

Dr. Romeu Kiihl
CNP-SOJA
Rodovia Celso Garcia Cid, Km. 375
Caixa Postal 1061
86.100 Londrina, Parana
Phones: 23-9719, 23-985 Telex: (0432) 2208

Dr. Hermino Maia Rocha
CENARGEN
S.A.I.N. Parque Rural
Caixa Postal 10.2372
70.770 Brasilia, D.F.
Phone: (061) 273-0100 Telex: (061) 1622

Dr. Silvio De Magalhaes Carvalho
Acting Head
Assessoria De Cooperacao Internacional
EMBRAPA
Ed. Super Center Venancio 2000 - 9 Andar
Caixa Postal 040315
70.812 Brasilia, D.F.
Phones: 225-8087, 225-3870 Telex: 061-1620

Dr. Jose Crisco Ascenso
Chefe da Assessoria de Cooperacao Internacional
EMBRAPA
Ed. Super Center Venancio 2000 - 9 Andar
Caixa Postal 040315
70.812 Brasila, D.F.
Phones: 225-8087, 225-3870 Ext. 231 Telex: 061-1620

Warney Mauro da Costa Val
Coordenador Projecto Soja
CNP-SOJA/EMBRAPA
Rodovia Celso Garcia Cid, Km. 375
Caixa Postal 1061
86.100 Londrina, Parana
Phones: 23-9719, 23-9850 Telex: (0432) 2208

Dr. Daniel Gustafson
IICA Brazil
SHIS QI-05 Block D Conj. 9
Caixa Postal 09 1070
71.600 Brasilia, D.F.
Phone: (061) 248-5358, 248-5477 office; 243-6481 home

UEPAE DE TERESINA
Av. Duque de Caxias, 5.650
Bairro Buenos Aires
Caixa Postal 01
64.000 Teresina, PI
Phones: (086) 225-1611, 225-1141 Telex: 086.2337
Projeto Soja: Gilson Jesus de Azevedo Campelo

INPA - Instituto Nacional de Pesquisa da Amazonia
Estrada do Aleixo 1756
Caixa Postal 478
69.000 Manaus, AM
Phones: 236-5610, 236-5710, 236-5700
Projeto Soja: Kaoru Yuyama

EMPA - Empresa de Pesquisa Agropecuaria de Mato Grosso
Edificio Sede da Secr. da Agricultura do Estado de Mato Grosso
Centro Politico-Administrativo
Av. Getulio Vargas, 1.160 - 2/3 Andares
Caixa Postal 241
78.000 Cuiaba, MT
Phones: 322-2187, 322-2196 Telex: 0652190 SIAG BR
Programa Soja: Norival T. Cabral and S.C. Guimaraes

UEPAE PORTO VELHO
Br 364 - Km. 5.5
Caixa Postal 406
78.900 Porto Velho, RO
Phones: (069) 222-2891, 222-2279 Telex: 0692258
Programa Soja: Shizuo Maeda and Maria Alice Santos Oliveira

EMAPA/UEPAR BACABAL
Br 316 - Km. 376
Caixa Postal 12
65.700 Bacabal, MA
Phone: (098) 621-1863
Programa Soja: Edilson Ribeiro Gomes

EMEPA - Empresa Estadual de Pesquisa Agropecuaria da Paraiba S.A.
Av. Epitacio Pessoa 1883
Bairro Tambauzinho
Caixa Postal 275
58.000 Joao Pessoa, PB
Phones: (083) 224-2004, 224-2188 Telex: 832308
Programa Soja: Joao Bosco

UEPAE de Rio Branco
Rua Sergipe 216 - Centro
Caixa Postal 392
69.900 Rio Branco, AC
Phone: (068) 224-4035 Telex: 692589
Programa Soja: Jorge W. De Souza

UEPAT MACAPA
Av. General Gurjao s/no. esq. com Rua Independencia
68.900 Macapa, Amapa
Phones: 222-3471, 222-3551, 222-3492 Telex: 091.2461
Programa Soja: Oscar Lameira Nogueira

UEPAE DE ALTAMIRA
Rua lo (Primeiro) de Janeiro 1586
Caixa Postal 0061
68.370 Altamira, PA
Phones: (091) 515-1085, 515-1035
Programa Soja: Raimundo P. Oliveira

EMGOPA - EMPRESA GOIANA DE PESQUISA AGROPECUARIA
Caixa Postal 49
74.000 Goiania, GO
Programa Soja: Renato Rolim and Alberto Costa

EMPAER - EMPRESA DE PESQUISA ASISTENCIA
Tecnica e Extensao Rural de Mato Grosso de Sul
Rua 26 de Agosto, 113 - Centro
Caixa Postal 472
79.100 Campo Grande, MS
Phones: 383-2251, 383-2351 Telex: 0672416
Programa Soja: Nilson Zuffo and Jacinto Antunes de Souza

Thomas Francis Shaxson
Representante Interino de FAO no Brasil
Organizacao de Alimentacao e Agriculturas Das Nacoes Unidas
SRTS (Setor de Radio - Televisao Sul)
Edificio Planalto 4 Andar
Quadra 701, Bloco "I" No. 14
Caixa Postal 07-1058
70.330 Brasilia, D.F.
Phone: 226-5366

Dr. Elmar Wagner
IICA
Caixa Postal 09-1070
SHIS QI-05, Bloco D, Conjunto 9, Comercial Local
71.600 Brasilia, D.F.
Phone: (061) 248-5358, 248-5477

Dr. Francisco Helio Machado
Director Tecnico
EPACE
Av. Rui Barbosa 1246
Bairro Aldeota
60.000 Fortaleza, CE
Phone: (085) 244-4166

Paulo Diogenes
EMBRAPA
Brabalha

Jose Ailton Pereira
EMATER - CE
Crateus, CE

Leonaidas Philpsen
Caixa Postal 11
65.800 Balsas, MA
Phone: (098) 741-2446

Adalberto Lima
Av. Antonio Leitao, 1500
Balsas, MA
Phones: (098) 741-2133, 741-2208

Ray Smith
ICI Brasil S.A.
Av. Eusebio Matoso, 891, 2 Andar
05423 Sao Paulo, SP
Phone; (011) 212-1955, Ext. 338   Telex: (11) 24.225/23.806

Jose Francisco De Assis
CPATU
Caixa Postal 48
66.000 Belem, PA

Solange Felicidade F. Aquino
FCAP
Caixa Postal 197
66.000 Belem. PA

Luis Rodrigues De Oliveira
IPA
Fazenda Saco
56.900 Serra Talhada, PE

Jose Luciano De Almeida
UEPAT - EMBRAPA
Av. Capitao Julio Bezerra, 353
Centro
69.300 Boa Vista, Roraima

Joao Bosco
EMEPA - PB
Av. Fpitacio Pessoa, 1883
Tambauzinho
Caixa Postal 275
58.000 Joao Pessoa, PB
Phone: (083) 224-2004

Flavio Moscardi
CNP-SOJA/EMBRAPA
Rodovia Celso Garcia Cid, Km. 375
Caixa Postal 1061
86.100 Londrina, Parana
Phones: 23-9719, 23-9850 Telex: (0432) 2208

Jose T. Yorinori
CNP-SOJA/EMBRAPA
Rodovia Celso Garcia Cid, Km. 375
Caixa Postal 1061
86.100 Londrina, Parana
Phones: 23-9719, 23-9850 Telex: (0432) 2208

Stefan Druzinec (Plastic labels)
Rua Capote Valente, 448
Sao Paulo, SP
Phone: (011) 282-9459

Antonio Ricardo Danizzi (Entomologia)
CNP-SOJA/EMBRAPA
Rodovia Celso Garcia Cid, Km. 375
Caixa Postal 1061
86.100 Londrina, Parana
Phones: 23-9719, 23-9850 Telex: (0432) 2208

Alair Martins da Silva (Eng. Agr.)
COMIGO - Cooperativa Mista Dos Produtores Rurais Do Sudoeste Goiano Ltda.
Avenida Presidente Vargas, 386
Rio Verde, GO
Phones: (062) 621-0921, 621-0927, 621-2233

Home: Rua Joaquim Vaz do Nascimento, 271
Rio Verde, Go
Phone: 621-2036

Jose Garcia
Univ. Federal de Goias
Depto. de Agricultura
Faculdade de Agronomia
Phone: 224-8187

Home: Rua 231, Q. 19, L. 55
Setor Coimbra
Goiania, GO
Phone: 233-5394

Miranice G. Sales (cowpea cooking quality)
Federal University of Ceara
Av. Barao de Studart, 1966
Bl. B Art. 802
Aldeota 60000
Fortaleza
Phone: 224-8847

Milton Castor
Centro Nacional de Pesquisa de Soja - CNPSo
Rodovia Celso Garcia Cid, Km. 375
Caixa Postal 1061
86.100 Londrina, PR
Phone: (0432) 23-1830 Telex: 043.2208

Amelio Dall'Agnol (Chefe Tecnico)
Centro Nacional de Pesquisa de Soja - CNPSo
Rodovia Celso Garcia Cid, Km. 375
Caixa Postal 1061
86.100 Londrina, PR
Phone: (0432) 23-1830 Telex: 043.2208

Rubens Jose Campo (Chefe de Apoio)
Centro Nacional de Pesquisa de Soja - CNPSo
Rodovia Celso Garcia Cid, Km. 375
Caixa Postal 1061
86.100 Londrina, PR
Phone: (0432) 23-1830 Telex: 043.2208

Joao Luiz Gilioli
F.T. Sementes
C.P. 070663
Brasilia, D.F.

Dr. Maurice Lukefahr
EMBRAPA/CNPAF
C.P. 174
58.100 Campine Grande, Paraiba

Kazuo Jorge Baba
Cooperativa Agricola de Cotia
Rod. MG 235 Km 01, Pavilhao 01
38.800 Sao Gotardo, MG

Bento Manoel Ferreira
Coopacel
Caixa Postal 144
78.500 Rondonopolis, MT

Norival Tiago Cabral
EMPA/MT
Caixa Postal 941
78.000 Cuiaba, MT

Marcelino Hoppe
EPABA
Caixa Postal 24
47.800 Barreiras, BA

Tochio Hirooka
Itamarati Norte S/A Agropecuaria
Caixa Postal 15
78.830 Tangara da Serra, MT

Edson Camara Italiano, Eng. Agr. M. Sc.
Subchefe
EMBRAPA - UEPAE de Manaus
Caixa Postal 455
Manaus, Amazonas
Phones: 233-5315 e 233-5568 Telex: (0922) 440

Home address: Conj. Campos Eliseos, Quadra 24, Casa 25
Manaus, Amazonas Phone: 238-4457

Erci de Moraes, Zootecnista, M.Sc.
Chefe
EMBRAPA - UEPAE de Manaus
Caixa Postal 455
Rodovia AM-010 Km. 30
Manaus, Amazonas
Phone: 233-5315 e 233-5568 Telex: (0922) 440

Home address: Jardim Haydea III, Casa No. 16, Bairro da Chapada
Manaus, Amazonas Phone: 236-1304

Universidade de Sao Paulo
Escola Superior de Agricultura "Luiz de Queiroz"
Caixa Postal 83
13.400 Piracicaba, Sao Paulo

David Knoll
Agro Knoll Ltda.
Praca Getulio Vargas 160
59.650 Acu, Rio Grande do Norte

Lucas Antonio De Souza Leite
EMPARN
Av. Prudente de Morais, 836
Tirol-Natal, Rio Grande do Norte

Fao Brasil
Sr. Bonne Maison
Phone: 226-5369
Cable: FOODAGRI BRASILIA
Telex: 612205 Brasilia

Embaixada Americana
Av. das Nacoes, Lote 3
70.403 Brasilia, D.F.

Oswaldo Chaves Batista Filho
Av. Ademir de Barros, 967
Ondina
Caixa Postal 1222
40.000 Salvador, Bahia

CONTACTS IN CHILI

Giancarlo Benvenuti
Regional Plant Production Officer for Latin America and the Caribbean (Oficial Regional de Produccion Vegetal para America Latina y el Caribe)
Oficina Regional de FAO
Av. Santa Maria 6700
Casilla 10095
Santiago, Chili
Phone: 228-8056 Telex: 340279 FAOCHI CK Cable: FOODAGRI, SANTIAGO

Dr. Mario E. Jalil
Subdirector General
Representante Regional de la FAO
Oficina Regional de FAO
Av. Santa Maria 6700
Casilla 10095
Santiago, Chili
Phone: 228-8056 Telex: 340279 FAOCHI CK Cable: FOODAGRI, SANTIAGO

Contacts in Colombia

Dr. Luis Camacho
INTSOY - CIAT
Apartado Aereo 6713
Cali, Colombia
Phone: 680111 Cable: CINATROP Telex: 05769 CIAT CO

Dr. Schoohoven (CIAT Bean Program Leader)
CIAT
Apartado Aereo 6713
Cali, Colombia
Phone: 680111 Cable: CINATROP Telex: 05769 CIAT CO

Gilberto Bastidas Ramos (Ing. Agronomo)
ICA
Apartado Aereo 233
Palmira, Valle
Colombia
Phones: 28162 - 66
Home Address: Calle 33 No. 25-65

Carlos Arturo Varon Rodriguez
ICA
C.R.I. Nataima
Apartado Aereo 40 Espinal
Tolima, Colombia

Douglas R. Laing
Deputy Director General
CIAT
Apartado Aereo 6713
Cali, Colombia
Phone: 680111 Cable: CINATROP Telex: 05769 CIAT CO

Miguel Angel Munoz
Centro Nacional Investigaciones Turipana
Apartado Aereo 206
Monteria
Cordoba
Colombia

Ed Pulver
Rice Program
CIAT
Apartado Postal 67-13
Cali, Colombia

CONTACTS IN COSTA RICA

Guillermo Grajales V., IICA
Director de Finanamento Externo
Apartado 55
2200 Coronado
San Jose, Costa Rica
Phone: 29-02-22 Telex: 2144 IICA Cable: IICA SANJOSE

Carlos Enrique Fernandez, IICA
Director del Area Central y de la oficina del IICA en Costa Rica
Apartado 55
2200 Coronado
Phone: 29-02-22 Telex: 2144 IICA Cable: IICA SANJOSE

Enrique Blair-Fabris, IICA
Associate Deputy Director General for External Affairs
Apartado 55
2200 Coronado
San Jose, Costa Rica
Phone: 29-02-22 Telex: 2144 IICA Cable: IICA SANJOSE

Dr. Jorge Soria, IICA
Head of Agricultural projects, administrates many external interactions for IICA, assists with IITA projects.
Apartado 55
2200 Coronado
San Jose, Costa Rica
Phone: 29-02-22 Telex: 2144 IICA Cable: IICA SANJOSE

Dr. Tarte, CATIE Director
Turrialba, Costa Rica
Phones: 56-01-22, 56-01-69 Telex: 8005 CATIE CR

Dr. Raul Moreno, CATIE
Agron./Path.
Turrialba, Costa Rica
Phones: 56-01-22, 56-01-69 Telex: 8005 CATIE CR
Home Phone: 56-07-20

Dr. Richard Hawkins, CATIE
Physiologist working on cowpeas in Honduras and Nicaragua
Turrialba, Costa Rica
Phones: 56-01-22, 56-01-69 Telex: 8005 CATIE CR

Dr. Carlos Burgos, CATIE
Head of Crops Research
Turrialba, Costa Rica
Phones: 56-01-22, 56-01-69 Telex: 8005 CATIE CR

Dr. Rodrigo Gamez, CATIE
Experienced virologist
Turrialba, Costa Rica
Phones: 56-01-22, 56-01-69 Telex: 8005 CATIE CR

Gustavo Enriques, CATIE
Breeder
Turrialba, Costa Rica
Phones: 56-01-22, 56-01-69 Telex: 8005 CATIE CR

Donald Kass, CATIE
Title ?
Turrialba, Costa Rica
Phones: 56-01-22, 56-01-69 Telex: 8005 CATIE CR

Ing. Rodrigo Alfaro Monge
Sub-director de Investigaciones Agricolas
Ministerio de Agricultura y Ganaderia
Apartado Postal 10094
San Jose
Costa Rica

CONTACTS IN DOMINICAN REPUBLIC

Jesus Clemente Mercedes
Centro Sur de Desarrollo Agropecuaria
CESDA
Apartado Postal 24
San Cristobal
Republica Dominicana

Luis Grullon M.
CESDA
Apartado Postal 24
San Cristobal
Republica Dominicana

Luis Crouch
Instituto Superior de Agricultura
Apartado Postal 166
Santiago de los Caballeros
Republica Dominicana

CONTACTS IN ECUADOR

Ing. Gonzalo Carrion
Depto. Agropecuario
Centro Nstle de Investigacn y Desarrollo para America Latina
LATINRECO S.A.
Casilla 6053-CC1
Quito - Cumbaya
Via Interoceanica
Km. 12.5 Phone: 355-240
Dra. Carmen Suarez
Directora, Estacion Experimental "Pichilingue"
INIAP
5 Km. Carretera a Guayaquil, al Sur de Quevedo
Casilla Postal 24
Quevedo, Ecuador
Phones: 750-966 y 750-967

Samuel Van Rutte
Ing Agronomo ETS, Jefe Dept. Agropeuario
CENTRO NESTLE LATINRECO S.A.
Casilla 6053-CC1
Quito - Cumbaya
Via Interocnica Km. 12.5
Phones: 355-240, 886, 887

Dr. Francisco Munoz A.
Director, Estacion Experimental "Santa Catalina"
INIAP
Km. 18, Panamericana Sur
Apartado 340
Quito, Ecuador
Phones: 317-035, 115

an additional handwritten address (home?)
Dr. Francisco Munoz A.
Rocafuerte 2290
Quito, Ecuador
Phone: 320-317 (Country code 593, city code 2)

Ing. Eduardo Calero H., M.Sc. (Subdirector General)
INIAP
Calle Las Lomas 417 y Quinta Esquina
Ciudadela Urdesa Central
Casilla Postal 7069
Guayaquil, Ecuador
Phones: 387-510, 383-782, 383-922

Dr. Wes Kline, Agronomia
INIAP
Casilla 2600
Eloy Alfaro y Amazonas, Edificio del MAG (4to Piso)
Quito, Ecuador
Telex: 2532 Quito Ecuador Phones: 230-354, 355 Home: 52-78-70

Programa Colaborative de Investigacion Frijol/Caupi
402 Bradfield Hall
Cornell University
Ithaca, N.Y. 14853
USA

Ing. Èduardo Maldonado (Asst. to Ing. Calero in Guayaquil)

Ing. Hector Buestan (Cowpea Agronomist)
INIAP
Prog. Leguminosas
Estacion Experimental Boliche
Box 7069
Guayaquil, Ecuador

Ing. Gorky Dias (Soybean breeder)
Estacion Experimental Pichilingue
Casilla Postal 24
Quevedo, Ecuador
Phone: 750966

Address in Portoviejo:
Los Bosques
Manz. A-7, Villa 7
Portoviejo, Ecuador
Phone: 650131

Darrell L. McIntyre
AID
Av. Colombia y Queseras Del Medio
Edificio Computec, 2 Piso
Quito, Ecuador
Phone: 521-100 Ext. 225, 235

Ing. Agr. Marat Rodriguez
Director Estacion Exp. "Portoviejo"
INIAP
Km 12, carretera a Santa Ana
Casilla Postal 100
Portoviejo, Ecuador
Phone: 652-600, 652-317

Ing. Agr. Cristobal Villasis
Jefe, Programa de Leguminosas
INIA
Estacion Experimental "Sta. Cataline"
Apartado 340
Km. 18, Panamericana Sur
Quito, Ecuador

Vicente Bolanos
INIAP
Programa Leguminosas
Estacion Experimental Boliche
Box 7069
Guayaquil, Ecuador
Ing. Agr. Carlos Becilla
INIAP
Programa de Oleaginosas
Estacion Experimental Boliche
Km 26, Via Duran-Tambo
Apartado 7069
Guayaquil, Ecuador

Ing. Agr. Raul Escobar Padilla, M.Sc.
INIAP
Subdirector General
Casilla 2600
Quito, Ecuaodr
Phone: 230-354 Telex: 2532

Ing. Agr. Saul Mestanza, M.Sc.
INIAP
Director
Estacion Experimental "Boliche"
Km. 26, carretera Duran-Tambo
Casilla Postal 7069
Guayaquil, Ecuador
Phone: 710-967

Ing. Agr. Oswaldo Zambrano M., M.Sc.
Jefe del Depto. de Fitopatologia
INIAP
Estacion Experimental "Portoviejo"
Casilla 100
Portoviejo, Ecuador
Phones: 652-317, 652-600

Ing. Agr. Romulo Carillo A.
Jefe del Programa de Investigacion en Produccion
Estacion Experimental "Portoviejo"
Casilla 100
Portoviejo, Ecuador
Phones: 652-317, 652-600

CONTACTS IN EL SALVADOR

Ing. Alejandro Salazar (cowpea)
Depto. Granos Basicos
Tecnico Subproyecto Vignas, CENTA
M.A.G. Apto. Postal No. 885
San Salvador, El Salvador
Phone: 28-20-66

Ing. Bernardo Patino Menjivar, Coordinador
Centro de Tecnologia Agricola
Aptdo. Postal 885
San Salvador, El Salvador
Phone: 28-20-66

Dra. Berta De Bellosa, Director
CENTA
M.A.G. Apto. Postal No. 885
San Salvador, El Salvador
Phone: 28-20-66

Carlos Mario-Garcia (Bean breeder)
CENTA
M.A.G. Apto. Postal No. 885
San Salvador, El Salvador
Phone: 28-20-66

Nelson Vasquez (Soybean project leader)
CENTA
M.A.G. Apto. Postal No. 885
San Salvador, El Salvador
Phone: 28-20-66

Roberto Rodriguez (Jefe, Division de Investigacion)
CENTA
M.A.G. Apto. Postal No. 885
San Salvador, El Salvador
Phone: 28-20-66

BID Representatives:
Lic. Daniel Americo Figueroa
Joaquin Laris Canas
Ing. Rigoberto Arevalo (in charge of BID training)

Napoleon Puenta Marquez (Head of Division Tecnologia de Semillas y Plantas)
CENTA
M.A.G. Apto. Postal No. 885
San Salvador, El Salvador
Phone: 28-20-66

Lic. Maximiliano Cruz-Carcamo
Jefe de Division de Proyectos, Oficina Sectorial de Planificacion Agropecuaria (OSPA)

Bayer Chemical Company
Fernando Lopez-Granillo (Agronomist)
Agr. Manuel Mauricio Martinez (Gerente de Vendas, Dept. Fito-Agricola)

Geraldo Cioneros (Head of Pro-soya)

Max Guillermo Nova (Gerente General for Quality Foods de C.A., S.A.)

Contacts in Guatamala

Astulo Fumagalli (ICTA Director)
ICTA
Av. Reforma Zona 9 8-60 3er Nivel
Edificio Galeron
Guatamala City, Guatamala

Danilo Augustin Gonzalez Arauz (Soybean Project Leader)
ICTA
Av. Reforma Zona 9 8-60 3er Nivel
Edificio Galeron
Guatamala City, Guatamala

Eduardo Menendez Bolanos (Principal Researcher)
ICTA
Av. Reforma Zona 9 8-60 3er Nivel
Edificio Galeron
Guatamala City, Guatamala
Home address: 4 Av. "A" 12-11, Zone 13, Pamplona
Phone: 65874

Alvaro De La Pena (Head of Germinaguate)
Germinaguate)
7A Avenida 14-44 Zone 9
Ed. La Galeria, Oficina 22
Telex: 6215 ANAVI GU
Phones: 314239, 314470, 314489 Ext. 152, Director: 314704

Dr. Porfirio Masaya S., Coord.
Programa de Frijol
Instituto de Ciencia y Tecnologia Agricola (ICTA)
Ave. Reforma 8-60 Zona 9
Galerias Reforma 3er Nivel
Guatemala, Guatemala
Phones: 31-74-64, 31-83-71, 31-88-09, 31-88-19

M.C. Jose Manuel Diaz
Programa de Frijol
Instituto de Ciencia y Tecnologia Agricola (ICTA)
Ave. Reforma 8-60 Zona 9
Galerias Reforma 3er Nivel
Guatamala, Guatemala
Phones: 31-74-64, 31-83-71, 31-88-09, 31-88-19

CONTACTS IN GUYANA

Michael A. Granger (Director NARI)
Ministry of Agriculture
Central Agricultural Station
Mon Repos, E.C.D.
Guyana
Phones: 020-2881/3, 020-2249, 020-2842

Neville C. McAndrew
Seed technology
Central Agric. Station
Mon Repos, E.C.D.
Guyana
Phone: 020-2881/3

Dr. P.L. McKenzie
Chief Agricultural Officer
Ministry of Agriculture
Regent & Vlissengen Roads
P.O. Box 1001
Georgetown, Guyana
Phones: 62384, 53851, ext. 28 Cable: MINIFLAM

Gordon J. Muller (Friend of Gene Terry & Joe Fazamisen)
Head of Unit
CARDI
232 Porshaw St.
Queenstown
Georgetown, Guyana
Phone: 02-67826 Cable: CARDI GUY

Contacts in Haiti

Frantz Flambert (Minister)
Ministry of Agriculture
Damien
Port-Au-Prince, Haiti
West Indies

Antoine Mathellier (Director of Food Crop Production)
Ministry of Agriculture
Damien
Port-Au-Prince, Haiti
West Indies

Max Millien (Head of Research - CRDA)
Faculte d'Agronomie
Damien
Port-Au-Prince, Haiti
West Indies

Dr. Paul Saint-Hilaire (Ing. Agr., Adjunct Director CRDA)
Faculte d'Agronomie
Damien
Port-Au-Prince, Haiti
West Indies

Lionel Richard (Director of AID's ADS-2 project)
Faculte d'Agronomie
Damien
Port-Au-Prince, Haiti
West Indies

Jean Fenel Felex (Legume Specialist)
Faculte d'Agronomie
Damien
Port-Au-Prince, Haiti
West Indies

Dr. Jacques Eduardo Alexis (Vice-Dean)
Faculte d'Agronomie
Damien
Port-Au-Prince, Haiti
West Indies

Luckner Saint-Dic (Dean)
Faculte d'Agronomie
Damien
Port-Au-Prince, Haiti
West Indies

Dr. Abdul Wahab (AID ADS-2 project)
USAID
American Embassy
Port-Au-Prince, Haiti
West Indies
Phone: 25500

Richard Swanson (Univ. of Arkansas, contract)
USAID
American Embassy
Port-Au-Prince, Haiti
West Indies
Phone: 25500

Jenny Donavon
CIDA office
Canadian embassy
Nova Scotia Building
Delma Road
Port-Au-Prince, Haiti
West Indies
Phones: 22358, 24919, 24231

Francois Gilbert
CIDA office
Canadian Embassy
Nova Scotia Building
Delma Building
Port-Au-Prince, Haiti
West Indies
Phones: 22358, 24919, 24231

Gustave Menager (Agronomist)
27 P. Lumumba
Delmas 19
Port-Au-Prince, Haiti
West Indies
Phones: 6-1121, 2-1558

Dr. Michael Yates (CIMMYT economist)
C/O MARNDR/CIMMYT
B.P. 9
Les Cayes, Haiti
West Indies

Liverato Jean March (Agronomist with French project)
Institut Francais
Section de Recherche
B.P. 131
Port-Au-Prince, Haiti
West Indies

Dr. Robert L. Cheaney
Chief of Party
CER Crops Specialist
DARNDR/FAMV, Damien
Port-Au-Prince, Haiti
West Indies

Franckel Cadet, Agr. M.A.
Direction De L'Economie Rural et des Statistiques Agricoles
Departement De L'Agriculture
Damien
Port-Au-Prince, Haiti
West Indies

Contacts in Honduras

Zamorano - Escuela Agricola Panamericana
P.O. Box 93
Tegulcigalpa, Honduras
Phones: 33-3173, 33-2717 Zamorano; 32-8543, 32-4317 Tegulcigalpa

Julio Romero (Principal Soybean Researcher in Country)
FHIA - Fundacion Hondurena de Investigacion Agricola
Apartado Postal 2067
San Pedro Sula, Honduras
Phones: 56-2244, 56-2470, 56-2078 Telex: 8303 FHIA HO

Jose Ramon Ramirez
Estacion Experimental Agricola (MAG)
Comayagua
Phone: 72-00-93

Dr. Mario Contreras (Director of Research FHIA)
FHIA - Fundacion Hondurena de Investigacion Agricola
Apartado Postal 2067
San Pedro Sula, Honduras
Phones: 56-2244, 56-2470, 56-2078 Telex: 8303 FHIA HO

Dr. Pablo Soto (Principal Entymologist FHIA)
FHIA - Fundacion Hondurena de Investigacion Agricola
Apartado Postal 2067
San Pedro Sula, Honduras
Phones: 56-2244, 56-2470, 56-2078 Telex: 8303 FHIA HO

Enrique Borjas
FEPROEXAAL - Federacion de Asociaciones de Productores y Exportadores Agropecuarios Agroindustriales de Honduras
8a Calle - 19 Avenida S.O. No. 48
P.O. Box 1442
San Pedro Sula, Honduras
Phone: 52-37-93 Telex: 5643 TROPIC HO

Ing. Leonard Miller (Assesor de Productividad)
FEPROEXAAL - Federacion de Asociaciones de Productores y Exportadores Agropecuarios Agroindustriales de Honduras
8a Calle - 19 Avenida S.O. No. 48
P.O. Box 1442
San Pedro Sula, Honduras
Phone: 52-37-93 Telex: 5643 TROPIC HO

Arnold Bueso
FEPROEXAAL - Federacion de Asociaciones de Productores y Exportadores Agropecuarios Agroindustriales de Honduras
8a Calle - 19 Avenida S.O. No. 48
P.O. Box 1442
San Pedro Sula, Honduras
Phones: 52-37-93 Telex: 5643 TROPIC HO

Roger Guerrero Jiron (Area de Promocion y Estudios de los Sectores Porductivos)
Banco Centroamericano de Integracion Economica
Edificio Las Cumbres (nest to Hotel Prados)
Apartado Postal 772
Tegucigalpa, D.C., Honduras
Phones: 222230/39 y 221184/88 Telex: BANCADIE 1103
Home phone: 32-5343 Tegulcigalpa

Gerardo A. Reyes - Jefe Nacional de Investigacion Agricola

Carlos Andres Zelaya - Assistente de Programas de la Representacion de la FAO en Honduras
P.O. Box 1808
Tegulcigalpa, Honduras
Telex: 1271 FOODAGRI TEG

Ing. Roldan Echeverria
Coordinador Programa Frijol
Danli, El Paraiso
Honduras
Phones: 93-21-12, 93-21-28

Contacts in Jamaica

Mr. Fred Anderson (President)
Jamaica Soya Products Industries
P.O. Box 27
Rhodens Pen., Old Harbour
St. Catherine, Jamaica
West Indies
Phone: 983-2217/983-2244
Telex: 2318 JANUHOLD
Cable: JAMSOY OLD HARBOUR

Mr. Hugh Wright (Director in charge of soy products)
Jamaica Soya Products Industries
P.O. Box 27
Rhodens Pen., Old Harbour
St. Catherine, Jamaica
West Indies

Ms. Idelle Brown (Wright's technical assistant)
Jamaica Soya Products Industries
P.O. Box 27
Rhodens Pen., Old Harbour
St. Catherine, Jamaica
West Indies

Dr. Joseph Suah (Head of Unit, Entomologist/Agronomist)
CARDI
P.O. Box 113
University Campus
Mona, Jamaica
West Indies
Phones: 92-76531, 92-76661 ext. 472 Cable: "UNIVERS"

Mr. Adet Thomas (Legume specialist-cowpea, just left program)
CARDI
P.O. Box 113
University Campus
Mona, Jamaica
West Indies
Phones: 92-76531, 92-76661 Cable: "UNIVERS"

Mr. Jocelyn Grant (Agric. Engineer)
CARDI
P.O. Box 113
University Campus
Mona, Jamaica
West Indies
Phones: 92-76531, 92-76661 Cable: "UNIVERS"

Ms. Jean Dickson (Botany Dept., used to work on cowpeas w/CARDI)
Univ. of West Indies
Mona, Jamaica
West Indies

Dr. Hussain Ahmad (microbiologist)
University of West Indies
Mona, Jamaica
West Indies

Contacts in Mexico

Dr. Jorge Nieto (Soybean Coordinator for Southern Region)
INIA
Centro de Investigaciones Agricolas del Golfo Norte
Campo Agricola Experimental "Las Huastecas"
Carr. Tampico-Mante Km. 55
Apartado Postal C-1
Sucursal Aeropuerto
Tampico, Tamaulipas
Mexico
Phone: 3-63-74, 3-66-72 (Country code 52, city code 121)
Home phone: 346-14
Telex: Do not have their own tlx, can use telex of CIMMYT, 1772023 CIMTME and ask to forward to Nieto

Ing. Nicolas Maldonado Moreno (Soy Program)
INIA
Centro de Investigaciones Agricolas del Golfo Norte
Campo Agricola Experimental "Las Huastecas"
Carr. Tampico-Mante Km. 55
Apartado Postal C-1
Sucursal Aeropuerto
Tampico, Tamaulipas
Mexico
Phone: 3-63-74, 3-66-72 (Country code 52, city code 121)

Ing. Rafael Reza Aleman (Soybean Agronomist)
INIA-Chiapas
Campo Agricola Experimental Rosario Izapa
Apartado Postal 96
30700 Tapachula, Chiapas
Mexico
Phone: (962) 6-13-44 Telex: 77711

Dr. Jesus Martinez (INIA Regional Director)
CIAPY-INIA
Apartado Postal No. 50 Suc. "D"
Merida, Yucatan
Mexico

Ing. Jose Gabriel Laris Delgado
CIAPY-INIA
Apartado Postal No. 50 Suc. "D"
Merida, Yucatan
Mexico

Dr. Ramon Rodriguez Rivera
(Coord. Prog. Plagas de Granos Alamacendos Zona Sur,cowpea contact)
CIAPY-INIA
Apartado Postal No. 50 Suc. "D"
Merida, Yucatan

Dr. Eduardo Alvarez Luna (Director for Agricultural R & D)
Alimentos del Fuerte, S.A. de C.V.
Apartado Postal 810
81200 Los Mochis, Sin.
Mexico
Phone: (52) (681) 2-14-10, 2-14-48
Telex: 53221 AFMC ME, 53105 PDFU ME, 1771177 AFSA ME

Home: Amado Nervo 143
Col. Jardines del Valle
81200 Los Mochis, Sinaloa   Phone: (681) 2-6321

Dr. Crispin (was legume scientist now head of training)
INIA
Insurgentes Sur No. 694, Piso 9
Mexico City, D.F.
Mexico
Phone: 6-87-74-24, 6-87-74-94

Evangelina Sevilla Paniague (Invest. del Lab. Central de Oleaginosas)
INIA
Centro de Investigaciones Agricolas de la Mesa Central
Apartado Postal No. 10
Chapingo, Mexico
Phone: 585-45-55 ext. 5290

Rocio R. Archundia Romero (Programa Apoyo Entomologia Soya/Maiz)
Apartado Postal 96
Tapachula
Central Oriente No. 1
Cacahoatan, Chiapas
Mexico

M.C. Fernando Taruandaz R. (?) (Soybean breeder)
Campo Agricola Experimental Valle de Culican
INIA-CIAPAN-CAEUACO
Apartado Postal 356
Culican, Sinaloa
Mexico
Phones: 4-40-00, 4-40-01, 4-40-02

Ing. Salvador Cortes Acosta (Coord. Tecnico Regional del CAEVACU)
INIA
Centro de Investigaciones Agricolas del Pacifico Norte
Carretera Culican - El Dorado - Km. 16
Apartado Postal 356
Culican, Sinaloa
Mexico
Phones: 4-40-00, 4-40-01, 4-40-02

M.C. Guillermo Fraire V. (Coordinacion Regional)
INIA-CHIAPAS
Campo Agricola Experimental Rosario Izapa
7A Calle Oriente No. 27
Apartado Postal No. 96
Tapachula, Chiapas
Phone: 6-13-44

ROSARIO IZAPA
Mpio, de Tuxtla Chico
Cacahoatan, Chiapas
Mexico
Phone: No. 18

Dr. Juan Manuel Ramirez Diaz (Director of CIAPAN)
INIA
Centro de Investigaciones Agricolas del Pacifico Nore
Apartado Postal 356
Culiacan, Sinaloa
Mexico
Phones: 4-40-00, 4-40-01, 4-40-02

Ing. Sergio R. Marquez Berber (Professor Investigador de Tiempo Completo, Seccion de Fisiologia Vegetal, Dept. de Fitotecnica)
Universidad Autonoma Chapingo
Chapingo, Mexico
Phones: 585-45-55 ext. 5735, home: (5) 873-46-20 Mexico City

Ing. Juan Diaz Maldonado (Subdirector de CIAPAN)
INIA
Centro de Investigaciones Agricolas del Pacifico Norte
Cerretera Culiacan - El Dorado Km. 16
Apartado Postal 356
Culiacan, Sinaloa
Mexico
Phones: 4-40-00, 4-40-01, 4-40-02

Dr. Cardenas
INIA
Insurgentes Sur No. 694, Piso 9
Mexico City, D.F.
Mexico
Phones: 6-87-74-24, 6-87-74-94

Dr. Rogelio Lepiz I., Coordinador
Manuel Esparza No. 96
Colonia de los Maestros
C.P. 45150
Aptdo. Postal #77 Suc. "A"
C.P. 45000
Zapopan, Jal.
Mexico
Phones: 33-05-08, 33-07-38

CIMMYT
Sede - El Batan, Tezcoco, Estado de Mexico Km. 25, Carretera Mexico
Correo: Londres 40, Apartado Postal 6-641, Col. Juarez, Deleg. Cuauhtemic, 06600, Mexico D.F.
Telex: 1772023 CIMTME
Phone: 585-4355 Mexico D.F.; 421-00 Tezcoco
Cable: CENCIMMYT

CONTACTS IN NICARAGUA

Aurelio Llanos
D.G.A.
Ministerio de Desarrollo Agropecuaria y Reforma Agraria
INRA
Managua
Nicaragua

Ing. Humberto Tapia B., Coordinador
Direccion General de Semillas
DGTA
Apartado Postal 2680
Managua
Nicaragua
Phones: 31-340, 31-109 Ext. 240

H. Tapia
Programa Nacional de Frijol
Ministerio de Desarrollo Agropecuaria y Reforma Agraria
Apartado Postal 2680
Managua
Nicaragua
Phones: 31-340, 31-109

CONTACTS IN PANAMA

Dr. Gaspar Silvera, Sub-director
IDIAP
Apartado 6-4391
Estafeta
El Dorado
Panama 6A
Panama, R.P.
Phone: 63-7711 Telex: 3677 IDIAP PG
Home Phone: 61-4818

Omar Alfaro
IDIAP
Apartado 6-4391
Estafeta
El Dorado
Panama 6A
Panama, R.P.
Phone: 69-5002 Telex: 3677 IDIAP PG

Ing. Miguel A. Acosta, Coordinador
IDIAP
Aptdo. # 958
David-Chiriqui
Panama
Phones: 75-3186, 75-0293 Oficina, 75-5364 Casa

Dra. Susana J. Icaza (Despacho de la Primera Dama - Program of President's wife)

Ruben de Gracia (Agronomist)
IDIAP
Aptdo. # 958
David - Chiriqui
Panama
Phones: 75-3186, 75-0293

CONTACTS IN PARAGUAY

Luis Alberto Alvarez
Director, DIEAF
Ministerio de Agricultura
Asuncion, Paraguay
Phones: 47-304, 49-305

Carlos Federico Schultz
Campo Experimental Agricola Chore
Ministerio de Agricultura y Ganaderia - DIEAF
Calle Pte. Franco Casi 14 de Mayo
Asuncion, Paraguay

Contacts in Peru

Dr. Dale Bandy
INIPA
Coordinator of North Carolina Soils Project
Apartado 248, Guzman Blanco 309
Lima 100, Peru
Phone: 32-05-10, 32-6930, 32-0973 Telex: 25194 PE

Ing. Dario Maldonado Busquez
INIPA
Apartado 9
Tarapoto, CIPA X, Peru

Dr. Guillermo Hernandez-Bravo (Co-lider Programa Nacional Leguminosas de Grano) CIAT
INIPA
CIPA VI
Apartado 115
Chincha, Peru
Phone: 24-80
and
Apartado 248
Lima, Peru
Phone: 32-05-10 Telex: 25194 PE

(On back of Bravo's card: Guzman Blanco 309
Mision Carolina del Norte
INIPA

To send seed to Bravo:
CIP
Atencion: Dr. Guillermo Hernandez
Apartado 5969
Lima, Peru

Dr. Manuel Villavicencio Fernandez
Director, Estacion Experimental de Yurimaguas
INIPA
CIPA XVI
Km. 6 Carretera
Mariscal Castilla 411
Yurimaguas, Tarapoto
Phone: 2210 Telex: 93736 PE-EEY-NC

Sergio A. Guerra
Ingeniero Agricolo Assesor y Consejero Tecnico
ACDI, Agencia Canadiense para el Desarrollo Internacional
Proyecto Instituto Superior Tecnologico
Lims, Jr. Libertad 130
Miraflores
Casilla 1212 Phone: 463-890
Fundo Ist, Tarapoto
Residencial Canadiense
Casilla 151
Phone: 23-39

Antonio M. Pinchinat
IICA
P.O. Box 11185
Lima 14
Peru
Phones: 22-8336, 22-1921, 22-9623, 22-2833

Ronal Echeveria Trujillo
INIPA
(CIPA XI Tingo Maria)
Apartado Postal 248
Lima, Peru

Wilfredo Guillen
INIPA
(CIPA XVI-Yurimaguas)
Apartado Postal 248
Lima, Peru

Italo Cardama
INIPA
(CIPA XVI-Iquitos)
Apartado Postal 248)
Lima, Peru

Peter Gregory
Centro Internacional de la Papa (CIP)
Director de Investigacion
Apartado 5969
Lima, Peru
Phones: 366920 (oficina); 358731 (casa) Telex: 25672 PE

Walter Couto
INIPA
Director Asociado Investigacion
Mision Carolina del Norte
Apartado 248
Lima 100, Peru
Phones: 32-0973, 32-6930, 32-0510 Telex: 25194 NC

CONTACTS IN SURINAM

Ing. R.R. Husiwoud
Director Extension
Agriculture Experiment Station
Keizerstraat 214
P.O. Box 1545
Paramaribo, Suriname
Phone: 71765

Guillermo Villanueva
Director IICA Office in Suriname
P.O. Box 1895
Paramaribo, Suriname
Phone: 72710 Home: 98411 Telex: 167-Surtorn-SN

Ronald E. Sweeb
Director CELOS
Center for Agricultural Research in Suriname
Leysweg
P.O. Box 1914
Paramaribo, Suriname
Phone: 60244 Cable: CELOS

CONTACTS IN TRINIDAD

J.A. Bergasse, CARDI Executive Director
University Campus
St. Augustine, Trinidad, W.I.
Rep. of T'dad and T'bgo
Phone: 809-663-31364 Cable: CARDINST

Dr. St. Clair Forde, CARDI
Director Finance and Administration
University Campus
St. Augustine, Trinidad, W.I.
Rep. of T'dad and T'bgo
Phone: 809-663-31364 ext. 337 Cable: CARDINST

Dr. Ralph Phelps, CARDI
Plant pathologist, Head of Trinidad and Tobago project
University Campus
St. Augustine, Trinidad, W.I.
Rep. of T'dad and T'bgo
Phone: 662-5511 ext. 347, home phone: 662-5319

Dr. Haque, CARDI virologist
University Campus
St. Augustine, Trinidad, W.I.
Rep. of T'dad and T'bgo
Phone: 809-663-31364 Cable: CARDINST

Garth Rajnauth
Ministry of Agriculture, student of Dr. Haque
University Campus
St. Augustine, Trinidad, W.I.
Rep. of T'dad and T'bgo
Phone: 809-663-31364

USA CONTACTS

Dr. Kuel Hinson
Agronomy Dept.
304 Newell Hall
Univ. of Florida
Gainesville, Florida
U.S.A.

Dr. Ranga Rao
Battelle
C.F. Kettering Research Laboratory
150 E. South College St.
P.O. Box 268
Yellowsprings, Ohio 45387
U.S.A.
Phone: (513) 767-7271
Telex: 24-5454

US AID:

Loren Schultz
Agency for Intl. Development (AID)
Bureau for Science and Technology
Washington, D.C. 20523

Bob Walters
Agency for Intl. Development (AID)
Bureau for Science and Technology

Harvey J. Hortik
Agency for Intl. Development (AID)
Bureau for Science and Technology
AID/S & T/AGR/AP
Room 411D, SA-18
Washington, D.C. 20523
Phone: (703) 235-8894

Robert Bertram
Agency for Intl. Development (AID)
Office for Agriculture
Bureau for Science and Technology
Washington, D.C. 20523
Phone: (703) 235-8894

Standard Charter Bank
160 Water St.
New York, NY

INTSOY
Dr. H. Kauffman
College of Agriculture
Univ. of Illinois at Urbana-Champaign
113 Mumford Hall
1301 W. Gregory Dr.
Urbana, Illinois 61801
Phone: (217) 333-6422
Telex: 206957
Cable: INTSOY

I.I.E. (Inst. Intl. Education)
809 United Nations Plaza
New York, NY 10017
Phone: (212) 883-8243, 8200
Telex: 422207 INTERED (Atn: Kathy O'Conner)

Boyce Thompson Institute for Plant Research at Cornell Univ.
Tower Road
Ithaca, NY 14853
Phone: (607) 257-2030

CONTACTS IN VENEZUELA

Dr. Luis Marcano, FUSAGRI president
Apartado Postal 2224
Caracas, Venezuela
Phones: 284-3089, 284-5521, 284-8709
Telex: (Do not have their own telex, use 27876 public booth ?,
include phone number in tlx).

John Galan, FUSAGRI
Apartado Postal 2224
Caracas, Venezuela
Phones: 284-3089, 284-5521, 284-8709

Mr. Freddy Ramirez, FUSAGRI (Asst. to Marcano)
Apartado Postal 2224
Caracas, Venezuela
Phones: 284-3089, 284-5521, 284-8709

Dr. Dario Rafael Boscan, FUSAGRI (New cowpea project leader)
Apartado Postal 2224
Caracas, Venezuela
Phones: 284-3089, 284-5521, 284-8709

Mr. Raul Nino, FUSAGRI (Soybean breeder/agronomist)
Apartado 162
Cagua, Edo. Aragua
Venezulea
Phones: (044) 79184, 79234

Dr. Francisco Llaurado Duran, FUSAGRI
Director Centro de Adiestramiento
Apartado 162
Cagua, Edo. Aragua
Venezuela
Phones: (044) 79184, 79234

Ing. Agr. Carlos Agudelo L., Fundacion Polar
Programa Mejoramiento de Maiz
Estacion Experimental de FUSAGRI
Cagua, Edo. Aragua
Venezuela
Phones: (044) 79184, 79234

Dr. Fausto Miranda, FONAIAP
Ing. Agr. M.S. Ph.D Ciencia y Tecnologia de Semilla
Apartado Postal 4653
Maracay 2101, Edo. Aragua
Venezuela
Phones: (043) 22475, 24169 Telex: 43402 SIRCA VC

Ing. Camero Carlos
Ministerio de Agricultura y Cria
Direccion General Sectorial de Desarrollo Agricola
Torre Norte Piso 13 Coutro Simon Bolivar
Caracas, Venezuela   Phones: 02-363954, 046-72127

Douglas Torres, FONAIAP
Fondo Nacional de Investigaciones Agropecuarias
Apartado Postal 212
Estacion Experimental
Guanipa
El Tigre, Edo. Anzoategui
Venezuela

Carlos Velazquez, FONAIAP
5 Transversal # 89 (home, can send mail to this address)
Urbanizacion Bermudez
Maracay, Edo. Aragua
Venezuela
Phone: (043) 333907

Ramon Lastra Rodriguez, IVIC
Inst. Venezolano de Investigaciones Cientificas
Apartado 1827
Caracas, Venezuela
Phones: 69.14.41-51 ext. 242 Telex: 21338 Telegram: IVIC SAS CARACAS

Dr. Orangel Borges
Universidad Central de Venezuela
Faculdad de Agronomia
Instituto de Genetica Agricola
Maracay, Edo. Aragua
Venezuela

Dr. Jose E. Martinez Guarda, FUSAGRI
Ingeniero Agronomo Dr., Director
Apartado 162
Cagua, Edo. Aragua
Venezuela
Phones: (044) 79184, 79234

Ing. Pedro Solorzano
UNELLEZ
Ant. Conv. de San Francisco
Guanare, Edo. Portuguesa
Venezuela

Simon A. Ortega-Ibarra
FONAIAP-CENIAP
Apartado 4653
Maracay, Edo. Aragua
Venezuela
Phones: (043) 22475, 22485

Alfredo Barrios Gonzales
FONAIAP-CENIAP
Apartado 4653
Maracay, Edo. Aragua
Venezuela
Phones: (043) 22475, 22485

6