LATIN AMERICAN REGIONAL LEGUME PROGRAM

AND

BRAZILIAN COWPEA PROGRAM

IITA/EMBRAPA/IICA

TRAVEL REPORTS AND CONTACTS LIST

VOLUME 3 OF 3
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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) DESCRIÇÃO 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 Hêlio Pimental, antes da cerimônia. O Chefe da UEPAE foi o Presidente da mesa e coordenou a reunião. A mesa também estava presente o Diretor, Dr. José Ramalho da EMBRAPA, Ricardo J. Guazzelli, coordenador do Programa de Caupi do CNPAC, 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 29º 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 melata e o problema de viroses está crescendo demais e também o problema de quinhas.

Goiânia, 15 de março de 1985

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. Essayang. 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, Patsey, 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 coordinator 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 Trinidad 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 sub-chef 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 Agrícolas near the University Fumanía. 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 irrigation. 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 indicated 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 tobata 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 be 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 methodology 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 similar 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 savannas. 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 (coryniforma), 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 could handle up to 50 lines. They would also like to have about 10 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 pigeon 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 CNPAPF. They also would like to receive P5 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 INTSOF (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.
The Permanent Cultivation of Rainfed Annual Crops on the Loamy Soils of the Zanderij Formation

ANNUAL REPORT
January - December 1982

University of Suriname

cebos
CENTRE FOR AGRICULTURAL RESEARCH
1983

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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 of 10 Jupiter selections compared with the original population.

<table>
<thead>
<tr>
<th>Line</th>
<th>Plant height</th>
<th>Seed yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mD</td>
<td>1c</td>
</tr>
<tr>
<td>77018-2</td>
<td>110</td>
<td>84</td>
</tr>
<tr>
<td>77018-12</td>
<td>95</td>
<td>80</td>
</tr>
<tr>
<td>77018-21</td>
<td>110</td>
<td>84</td>
</tr>
<tr>
<td>77018-25</td>
<td>84</td>
<td>77</td>
</tr>
<tr>
<td>77018-28</td>
<td>92</td>
<td>73</td>
</tr>
<tr>
<td>77018-37</td>
<td>71</td>
<td>56</td>
</tr>
<tr>
<td>77018-49</td>
<td>72</td>
<td>66</td>
</tr>
<tr>
<td>77018-57</td>
<td>102</td>
<td>82</td>
</tr>
<tr>
<td>77018-61</td>
<td>84</td>
<td>71</td>
</tr>
<tr>
<td>77018-64</td>
<td>75</td>
<td>56</td>
</tr>
<tr>
<td>Jupiter (unselected)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

\(^a\) 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 1981-1982 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 1981-1982 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 1981-1982 and the late long rainy season 1982.**

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

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

a LLRS = 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).

Rainfall, mm

<table>
<thead>
<tr>
<th>Planting date</th>
<th>Rainfall</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.07.80</td>
<td>339.5</td>
<td>3680</td>
</tr>
<tr>
<td>18.12.80</td>
<td>539.0</td>
<td>3596</td>
</tr>
<tr>
<td>14.01.82</td>
<td>691.0</td>
<td>3676</td>
</tr>
<tr>
<td>25.05.82</td>
<td>668.3</td>
<td>4250</td>
</tr>
</tbody>
</table>

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 \( \sqrt{\text{pods/plant} \times 1000\text{-seed weight}} \) \( (r^2 = 0.787) \). 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 se but requires late maturing cultivars to bridge this season so as to avoid harvesting problems. - JFW

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**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>
<thead>
<tr>
<th>Cultivar</th>
<th>50 percent flowering</th>
<th>Seed yield (^1)</th>
<th>1000-seed weight (^1)</th>
<th>Seed yield (^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DAP</td>
<td>kg/ha</td>
<td>g</td>
<td>kg/ha</td>
</tr>
<tr>
<td>TVx 3404-012E</td>
<td>41</td>
<td>1521 a(^2)</td>
<td>109</td>
<td>1208</td>
</tr>
<tr>
<td>Vita-6</td>
<td>44</td>
<td>1465 ab</td>
<td>108</td>
<td>1281</td>
</tr>
<tr>
<td>TVx 1836-013J</td>
<td>42</td>
<td>1444 ab</td>
<td>175</td>
<td>793</td>
</tr>
<tr>
<td>TVx 309-1G</td>
<td>45</td>
<td>1441 ab</td>
<td>99</td>
<td>951</td>
</tr>
<tr>
<td>TVx 2724-01F</td>
<td>44</td>
<td>1370 ab</td>
<td>117</td>
<td>902</td>
</tr>
<tr>
<td>TVx 3072-01E</td>
<td>43</td>
<td>1334 b</td>
<td>128</td>
<td>971</td>
</tr>
<tr>
<td>TVx 2394-02F</td>
<td>41</td>
<td>1327 b</td>
<td>94</td>
<td>1005</td>
</tr>
<tr>
<td>4R-0267-1F</td>
<td>44</td>
<td>1153 c</td>
<td>75</td>
<td>716</td>
</tr>
<tr>
<td>TVx 3428-03E</td>
<td>43</td>
<td>1003 c</td>
<td>94</td>
<td>370</td>
</tr>
<tr>
<td>African Red</td>
<td>45</td>
<td>1436 ab</td>
<td>76</td>
<td>584</td>
</tr>
</tbody>
</table>

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 54. 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

Glicididia sepium

The Glicididia 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. Glicididia sepium. Dry weights and nitrogen yields for the cuts 2 to 6.

<table>
<thead>
<tr>
<th>No. of cut</th>
<th>Date of cutting</th>
<th>Days since previous cut</th>
<th>Dry weight</th>
<th>Nitrogen yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>tons/ha</td>
<td>kg/ha kg/ton d.w.</td>
</tr>
<tr>
<td>2</td>
<td>27 Jul. '79</td>
<td>219</td>
<td>3.6</td>
<td>68</td>
</tr>
<tr>
<td>3</td>
<td>22 Feb. '80</td>
<td>210</td>
<td>3.8</td>
<td>69</td>
</tr>
<tr>
<td>4</td>
<td>24 Sep. '80</td>
<td>215</td>
<td>12.0</td>
<td>226</td>
</tr>
<tr>
<td>5</td>
<td>21 Mar. '81</td>
<td>181</td>
<td>6.6</td>
<td>166</td>
</tr>
<tr>
<td>6</td>
<td>07 Apr. '82</td>
<td>379</td>
<td>21.4</td>
<td>298</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Month</th>
<th>Kabo</th>
<th>Coebiti</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>175.9</td>
<td>180.7</td>
</tr>
<tr>
<td>February</td>
<td>181.7</td>
<td>126.5</td>
</tr>
<tr>
<td>March</td>
<td>262.3</td>
<td>240.9</td>
</tr>
<tr>
<td>April</td>
<td>372.2</td>
<td>387.5</td>
</tr>
<tr>
<td>May</td>
<td>320.6</td>
<td>373.4</td>
</tr>
<tr>
<td>June</td>
<td>254.4</td>
<td>256.7</td>
</tr>
<tr>
<td>July</td>
<td>280.0</td>
<td>270.0</td>
</tr>
<tr>
<td>August</td>
<td>126.1</td>
<td>109.3</td>
</tr>
<tr>
<td>September</td>
<td>75.6</td>
<td>60.0</td>
</tr>
<tr>
<td>October</td>
<td>30.4</td>
<td>92.3</td>
</tr>
<tr>
<td>November</td>
<td>86.9</td>
<td>68.5</td>
</tr>
<tr>
<td>December</td>
<td>134.3</td>
<td>180.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2300.4</td>
<td>2346.0</td>
</tr>
</tbody>
</table>
MINICA I - a new brown eye cowpea (Vigna unguiculata)

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

2. Morphology - Leaves 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, petiolar and stem are green whilst the base of the branches is purple. There are usually 3-4 basal 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 splash 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 1200 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. **Habit** - 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 *Choanephora infundibulifera* and seems to escape many of the late occurring pests and diseases e.g. *Cercospora* leaf spot because of its short life cycle.

5. **Seed** - 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. **Yield** - 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 in its high yield potential, short life cycle and determinate, self-defoliating characteristics.

**MINICA II**

1. **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, 16-20 cm 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 10-12 g. 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.

---

¹This 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. **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 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.

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 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 outer 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 senescence 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. **Post and Disease Reaction** - *Minica III* is susceptible to leaf minor attacks but shows ample field tolerance to the pod rot disease 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.
1. Minica IV was released as Vita 3 in July 1975, by the International Institute of Tropical Agriculture (IITA) in Nigeria. It was first tested in Guyana in 1977 in the International Cowpea uniform trials from IITA.

2. Morphology - Leaves are pinnately trifoliolate and dull green in color. They have an overall ovate shape with truncate base and acuminate tips. The petiole, petiole base, petiole node, 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 cuter 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* *infundibuliformis* 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 1,600 kg/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. 33

CARIATAS VERDES - SUPERFICIE, PRODUCCION, RENDIMIENTO, IMPORTACION Y VALOR DE LA IMPORTACION - 1962-80

<table>
<thead>
<tr>
<th>Año</th>
<th>Superficie</th>
<th>Producción</th>
<th>Rendimiento</th>
<th>IMPORTACION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HA</td>
<td>TM</td>
<td>KG/HA</td>
<td>Tons.</td>
</tr>
<tr>
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<td>47.361</td>
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</tr>
<tr>
<td>1963</td>
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<td>438</td>
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</tr>
<tr>
<td>1964</td>
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<td>391</td>
<td>18.915</td>
</tr>
<tr>
<td>1966</td>
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</tr>
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<td>1967</td>
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<td>1969</td>
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<tr>
<td>1970</td>
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<td>1971</td>
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<td>1972</td>
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<td>332</td>
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<tr>
<td>1973</td>
<td>42.692</td>
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</tr>
<tr>
<td>1974</td>
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<td>1975</td>
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<td>1978</td>
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<td>1979</td>
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<td>445</td>
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</tr>
<tr>
<td>1980</td>
<td>50.013</td>
<td>22.714</td>
<td>454</td>
<td>30.000</td>
</tr>
</tbody>
</table>

Nota: Superficie, producción y rendimiento, 1962-63, B.A.P.; 1964-80, M.A.C.
La superficie se refiere a hectáreas cosechadas.
La importación se refiere a peso bruto; 1962-72 incluye frijoles y carartas.
Las licencias efectivas de los años 1964-65 permiten apreciar que aproximadamente el 80% de las importaciones corresponden a carartas negras.
Fuente: Ministerio de Agricultura y Cría; Ministerio de Fomento; Oficina Central de Estadística e Informática.
CUADRO No. 34

GARANTAS NEGRIAS - SUPERFICIE, PRODUCCION, RENDIMIENTO Y CONSUMO EN FINCA SEGUN ENTIDAD FEDERAL - 1980

| Entidad Federal | SUPERFICIE HA | Producción | Rendimiento | Consumo finca
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Sembrada</td>
<td>Cosechada</td>
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<td>KG/HA</td>
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<tr>
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<td>50.013</td>
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<td>454</td>
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<td>425</td>
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<td>Anzoategui</td>
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<td>Apure</td>
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<td>810</td>
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<td>3.256</td>
<td>1.538</td>
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<td>403</td>
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<tr>
<td>Bolivar</td>
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<td>326</td>
<td>735</td>
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<td>Cojedes</td>
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<td>Falcón</td>
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<td>406</td>
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</table>

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

Fuente: Ministerio de Agricultura y Cría.
CUADRO No. 3-5  
**FRÍOLES: SUPERFICIE, PRODUCCIÓN, RENDIMIENTO, IMPORTACIÓN Y VALOR DE LA IMPORTACIÓN - 1962-80**

<table>
<thead>
<tr>
<th>Año</th>
<th>Superficie (ha)</th>
<th>Producción (TM)</th>
<th>Rendimiento (Kg/ha)</th>
<th>IMPORTACIÓN (TM)</th>
<th>Importación (miles de M$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1964</td>
<td>23.060</td>
<td>11.475</td>
<td>498</td>
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<tr>
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<td>582</td>
<td>980</td>
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</tr>
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<td>1977</td>
<td>13.463</td>
<td>8.204</td>
<td>609</td>
<td>8.800</td>
<td>18.822</td>
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</table>

**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.C.I. La importación se refiere a peso bruto. 1962-72 incluye fríojoles y caracolas. Las licencias efectivas de los años 1964-65 permiten apreciar que aproximadamente el 20% de las importaciones corresponden a fríojoles.

**Fuente:** Ministerio de Agricultura y Cria; Ministerio de Fomento; Oficina Central de Estadística e Informática.
<table>
<thead>
<tr>
<th>Entidad Federal</th>
<th>SUPERFICIE HA</th>
<th>Producción TM</th>
<th>Rendimiento KG/HA</th>
<th>Consumo en finca, (en cientos de KG)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sembrada</td>
<td>Cosecha</td>
<td>10.571</td>
<td>667</td>
</tr>
<tr>
<td>TOTAL</td>
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<td>15.857</td>
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<td>953</td>
</tr>
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<td>500</td>
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<td>281</td>
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<td>Miranda</td>
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<td>12</td>
<td>500</td>
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<td>Monagas</td>
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<td>699</td>
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<td>335</td>
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<td>Sucre</td>
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<td>142</td>
<td>79</td>
<td>556</td>
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<td>Trujillo</td>
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<td>29</td>
<td>11</td>
<td>379</td>
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<td>Yaracuy</td>
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<tr>
<td>T.F. Delta</td>
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<td>7</td>
<td>6</td>
<td>857</td>
</tr>
</tbody>
</table>

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 carota y al hecho mismo de ofrecer una alternativa viable para la sustitución parcial de la carota en la dieta diaria del venezolano.

Después de la carota 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 más 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 F₆ 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 (F₆) de frijol sembradas en Sta. Cruz en Enero de 1984.

<table>
<thead>
<tr>
<th>PROGENITORES</th>
<th>GENEALOGIA</th>
<th>KG/HA.</th>
<th>COLOR SEMILLA</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-204 x I-54</td>
<td>1001-M-M-Bo-M-M</td>
<td>1.228</td>
<td>Blanco</td>
</tr>
<tr>
<td>I-204 x I-272</td>
<td>1002-3PM-M-Bo-M-M</td>
<td>781</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-204 x I-278</td>
<td>1003-M-M-Bo-M-M</td>
<td>442</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-204 x I-280</td>
<td>1004-2PM-M-Bo-M-M</td>
<td>1.011</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-204 x I-285</td>
<td>1005-3PM-M-Bo-M-M</td>
<td>1.474</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-204 x TUY</td>
<td>1006-M-M-Bo-M-M</td>
<td>1.846</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-204 x VAINA LARGA</td>
<td>1007-1-M-Bo-M-M</td>
<td>247</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-204 x BLACKEYE</td>
<td>1008-1-M-Bo-M-M</td>
<td>991</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-225 x I-54</td>
<td>1009-2PM-M-Bo-M-M</td>
<td>891</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-225 x I-272</td>
<td>1010-2PM-M-Bo-M-M</td>
<td>1.510</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-225 x I-278</td>
<td>1011-8PM-M-Bo-M-M</td>
<td>1.266</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-225 x I-280</td>
<td>1012-5PM-M-Bo-M-M</td>
<td>966</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-225 x I-285</td>
<td>1013-3PM-M-Bo-M-M</td>
<td>1.225</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-225 x TUY</td>
<td>1015-3PM-M-Bo-M-M</td>
<td>1.638</td>
<td>&quot;</td>
</tr>
</tbody>
</table>
En relación a las pruebas de rendimiento con líneas mejoradas recibidas del IITA, podemos concluir que únicamente 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.
<table>
<thead>
<tr>
<th>PROGENITORES</th>
<th>GENEALOGIA</th>
<th>KG/HA.</th>
<th>COLOR SEMILLA</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-225 x PI-354586</td>
<td>1014-6PM-M-Bo-M-M</td>
<td>1.146</td>
<td>Blanco</td>
</tr>
<tr>
<td>I-225 x I-280</td>
<td>1016-8PM-M-Bo-M-M</td>
<td>2.224</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-226 x I-285</td>
<td>1017-5PM-M-Bo-M-M</td>
<td>1.312</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-226 x PI-354586</td>
<td>1018-4PM-M-Bo-M-M</td>
<td>411</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-241 x PI-354586</td>
<td>1023-2PM-M-Bo-M-M</td>
<td>532</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-204 x I-272</td>
<td>1002-3PM-M-Ba-M-M</td>
<td>1.344</td>
<td>Bayo</td>
</tr>
<tr>
<td>I-204 x I-285</td>
<td>1005-3PM-M-Ba-M-M</td>
<td>850</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-204 x TUY</td>
<td>1006-M-M-Ba-M-M</td>
<td>700</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-225 x I-54</td>
<td>1009-2PM-M-Ba-M-M</td>
<td>1.558</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-225 x I-278</td>
<td>1011-8PM-M-Ba-M-M</td>
<td>987</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-225 x I-280</td>
<td>1012-5PM-M-Ba-M-M</td>
<td>856</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-225 x I-285</td>
<td>1013-3PM-M-Ba-M-M</td>
<td>772</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-225 x PI-354586</td>
<td>1014-3PM-M-Ba-M-M</td>
<td>543</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-225 x TUY</td>
<td>1015-3PM-M-Ba-M-M</td>
<td>423</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-225 x I-285</td>
<td>1017-5PM-M-Ba-M-M</td>
<td>787</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-241 x PI-354586</td>
<td>1023-2PM-M-Ba-M-M</td>
<td>670</td>
<td>&quot;</td>
</tr>
<tr>
<td>I-241 x TUY</td>
<td>1024-M-M-Ba-M-M</td>
<td>814</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

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 F₂ del material segregante.
Actividad: 13-1002-0009. "Estudio y selección de progenies F₇ 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, estos 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 más 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 características de mayor importancia económica.

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

<table>
<thead>
<tr>
<th>Progenitor femenino</th>
<th>Progenitor masculino</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-8</td>
<td>BULK P 81-2</td>
</tr>
<tr>
<td>I-14</td>
<td>BULK P 81-10</td>
</tr>
<tr>
<td>I-11</td>
<td>CNCX 97-01F</td>
</tr>
<tr>
<td>APURE</td>
<td>CNC 0434</td>
</tr>
</tbody>
</table>
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.**

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

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 más rústicas y rindedoras. 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 más precoces y las más tardías. Los resultados del mismo aparecen en el cuadro 3.


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

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.


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.


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

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 recomendación del espaciamiento entre plantas debe ser 20 centímetros. 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.


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.


| RANGO | MATERIAL | COLOR SEMILLA | PLANTAS/HA | KG/HA | %  
|-------|----------|---------------|------------|-------|------
| 1     | IT 82E-285 | 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.     | 108.625    | 1.957 | 104.4
| 6     | IT 82E-789 | 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 estadísticamente 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 más que la variedad testigo pero sin presentar diferencia estadísticamente significativa.


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


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

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

Nuevamente la variedad Tuy ocupó el primer lugar, lo que indica la gran adaptableidad 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 garra

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 F₆ 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 F₇ 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 carácter 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 únicamente la línea IT82E-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: 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. KUNEEMAN
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 Kelo. EPACE has recently obtained a Polymax 207 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 EMAFRECE program Director, Jose Ailton Pereira, in Crateus and then spent the rest of the morning at the EPACE experiment station near Crateus. CNEAF 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 cultivation 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 Piauau States (principal cowpea production areas) are serious enough to warrant a breeding effort. I suggest that CNEAF 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 (approx. 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 'Mosaic 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 predominant 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 EMGAPA 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-existent. 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 commodities near Balsas were as follows:

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Price (CR/Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cowpeas</td>
<td>1100</td>
</tr>
<tr>
<td>Soybeans</td>
<td>700</td>
</tr>
<tr>
<td>Rice</td>
<td>850</td>
</tr>
</tbody>
</table>

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 Government plane.

March 11. Monday

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

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EMBRAPA
Barbalha

Jose Alton Pereira
EMATER-CE
Crato, CE

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

Adalberto Lima
Av. Antonio Leitao, 1500
Balsas, MA
Fone: 741-2133, 741-2208
<table>
<thead>
<tr>
<th>Line</th>
<th>Lodging</th>
<th>Habit</th>
<th>Foliar Cercospora</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>ER-83-8892</td>
<td>1</td>
<td>D</td>
<td>R</td>
<td>Good</td>
</tr>
<tr>
<td>ER-83-8899</td>
<td>2.5</td>
<td>D</td>
<td>R</td>
<td>Good</td>
</tr>
<tr>
<td>ER-83-8912</td>
<td>1</td>
<td>D</td>
<td>R</td>
<td>Fair</td>
</tr>
<tr>
<td>ER-83-8919</td>
<td>1</td>
<td>D</td>
<td>R</td>
<td>Fair</td>
</tr>
<tr>
<td>ER-83-8920</td>
<td>1</td>
<td>D</td>
<td>R</td>
<td>Good</td>
</tr>
<tr>
<td>TROPICAL</td>
<td>1</td>
<td>D</td>
<td>S</td>
<td>Good</td>
</tr>
<tr>
<td>ER-83-6847</td>
<td>1</td>
<td>D</td>
<td>R</td>
<td>Short, poor</td>
</tr>
<tr>
<td>ER-83-9194</td>
<td>1</td>
<td>D</td>
<td>R</td>
<td>Medium to fair</td>
</tr>
<tr>
<td>ER-83-9196</td>
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<td>D</td>
<td>R</td>
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<tr>
<td>ER-83-9307</td>
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<td>D</td>
<td>R</td>
<td>Medium/fair</td>
</tr>
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<td>Very good</td>
</tr>
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<td>D</td>
<td>R</td>
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<td>R</td>
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</tr>
<tr>
<td>ER-83-9024</td>
<td>1</td>
<td>D</td>
<td>R</td>
<td>Okay, small seed</td>
</tr>
<tr>
<td>ER-83-9031</td>
<td>1</td>
<td>D</td>
<td>R</td>
<td>Good but small</td>
</tr>
<tr>
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<td>D</td>
<td>S</td>
<td>Okay</td>
</tr>
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<td>D</td>
<td>S</td>
<td>Short, early</td>
</tr>
<tr>
<td>ER-83-9046</td>
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<td>D</td>
<td>S</td>
<td>Short</td>
</tr>
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<td>CARAJAS</td>
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<td>D</td>
<td>S</td>
<td>Good</td>
</tr>
<tr>
<td>ER-83-9218</td>
<td>1</td>
<td>D</td>
<td>R</td>
<td>Tall, very good</td>
</tr>
<tr>
<td>ER-83-9220</td>
<td>1</td>
<td>D</td>
<td>R</td>
<td>Tall, very good</td>
</tr>
<tr>
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<td>D</td>
<td>R</td>
<td>Tall, very good</td>
</tr>
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<td>R</td>
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<td>D</td>
<td>R</td>
<td>Tall, good</td>
</tr>
<tr>
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<td>D</td>
<td>R</td>
<td>Tall, good</td>
</tr>
<tr>
<td>TINGIRA</td>
<td>1</td>
<td>D</td>
<td>S</td>
<td>Mixed (?)</td>
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Table 2
Observations (09-03-85) on EMBRAPA Soybean Ensaio Preliminar B, Balsas Maranhao, sown 27-11-84.

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<td>BR-83-6651</td>
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<td>D</td>
<td>(?)</td>
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</tr>
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<td>D</td>
<td>S</td>
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</tr>
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<td>D</td>
<td>R</td>
<td>Okay, large seed</td>
</tr>
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<td>1</td>
<td>D</td>
<td>R</td>
<td>Okay, large seed</td>
</tr>
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<td>Fair</td>
</tr>
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<td>D</td>
<td>R</td>
<td>Fair</td>
</tr>
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<td>R</td>
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<td>(?)</td>
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<td>?</td>
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<td>D</td>
<td>?</td>
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<td>R</td>
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<td>R</td>
<td>Fair</td>
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<td>TERRITA</td>
<td>2</td>
<td>D</td>
<td>VS</td>
<td>Good</td>
</tr>
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<td>D</td>
<td>R</td>
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<td>D</td>
<td>VS</td>
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<td>D</td>
<td>VS</td>
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<td>CARAJAS</td>
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<td>D</td>
<td>VS</td>
<td>Good</td>
</tr>
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<td>D</td>
<td>R</td>
<td>Good</td>
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<tr>
<td><strong>Table 3</strong></td>
<td></td>
<td></td>
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<tr>
<td>List of several promising lines out of 150 new introductions tested at Balsas 1985</td>
<td></td>
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<tr>
<td></td>
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</tr>
<tr>
<td>1.</td>
<td>BR-83–10493</td>
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<tr>
<td>2.</td>
<td>BR-83–10497</td>
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</tr>
<tr>
<td>3.</td>
<td>BR-83–10498</td>
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<td>BR-83–8938 (early, tall)</td>
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<td>BR-83–6192 (early, tall)</td>
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<td>BR-84–123</td>
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TRIP REPORT: STATES OF PIAUI AND CEARA, BRAZIL

MAY 13 - MAY 16, 1985

BY

EARL WATT
TRIP REPORT TO THE STATES OF PIAUÍ AND CEARÁ

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 received 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 Pitipiri with cultivars Pendunga and Pituiba being the most susceptible. 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 Pernambuco.

There are two materials which she reported as doing well in the state; TE-570 (a selection from TVx 3777-04E) and Paranaiba (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 Rugoz 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, mosquiao 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 excellent 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 occurrence 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 statistician, 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 sytetable 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 plantings 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 according 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 EFACE 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 coming
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 interest 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, Guatemala, 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 onto 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 Veron Rodriguez 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 Guatemala.

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 Comayagua 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/Boyle Thompson
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 men, Michael Yates and Faculty of Agric. personnel, 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. Tourd cowpea growing region with Jose G. Laris.


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 north coast 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 lighter 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-Pot. 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. Preferred seed types are blackeyes and creams. He would also like to look at IITA's vegetable cowpeas and would like to receive bulk populations 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 Montería 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 occasionally 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:

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<th>Line</th>
<th>Description</th>
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<tr>
<td>555-2-M-12-M</td>
<td>Derived from ICA Tunia x Acc 2120; Acc 2120 is from AVRDC.</td>
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<td>489-4-1-M</td>
<td>Derived from L-124 x L-119; L-119 is a selection from Jupiter.</td>
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<td>684-M-(2)</td>
<td>Derived from (2611 x Acc 2120) x (L-121 x L-124)</td>
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<td>773</td>
<td>Derived from (IAC-2 x IAC 7025) both Brazilian</td>
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<td>778</td>
<td>Derived from Jupiter x IAC-2</td>
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<td>743</td>
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<td>746</td>
<td>Tall, determinate</td>
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<tr>
<td>578</td>
<td>Tall, determinate</td>
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<tr>
<td>PR-212-(26)-20-M</td>
<td>Tall, determinate; from PR-142(3) x Foster</td>
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<tr>
<td>PR-215-(14)-1-M</td>
<td>Derived from Rosales x Alamo; Alamo is a selection from Jupiter</td>
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</table>
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-47
AGS-79
AGS-158
AGS-167
AGS-214
AGS-29
AGS-57
AGS-103
AGS-159
AGS-179
AGS-31
AGS-66
AGS-120
AGS-160
AGS-212

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
573-7'-C  weak stem
2 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

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Colombia
GUATAMALA, June, 1985

Soybean Production

Soybean production in Guatemala is in its infancy, but could become an important crop in the local economy. Guatemala 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 Guatemala 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, Guatemala 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 Alano (to be released as ICTA:AM 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 Guatemala

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Alvaro De La Pena (Head of Germinaguate)
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Ed. La Galeria, Oficina 22
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HONDURAS, June, 1985

Cowpeas

There is no commercial production of cowpeas in Honduras. Dr. Jorge Chang, Jefe, Dept. Agronomía, Zamorano – Escuela Agrícola Panamericana, P.O. Box 93, Tegucigalpa, 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 Esperanza. 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

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Arnold Bueso
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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 Auresa 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 or 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

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Ms. Idelle Brown (Wright's technical assistant)
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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>
<thead>
<tr>
<th>Week</th>
<th>Soil Type</th>
<th>Earthworm Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C</td>
<td>72.0</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>71.2</td>
</tr>
<tr>
<td>3</td>
<td>L</td>
<td>71.2</td>
</tr>
<tr>
<td>4</td>
<td>L</td>
<td>72.4</td>
</tr>
<tr>
<td>5</td>
<td>G</td>
<td>72.2</td>
</tr>
<tr>
<td>6</td>
<td>G</td>
<td>69.6</td>
</tr>
<tr>
<td>7</td>
<td>L</td>
<td>81.3</td>
</tr>
<tr>
<td>8</td>
<td>G</td>
<td>81.3</td>
</tr>
<tr>
<td>9</td>
<td>L</td>
<td>72.0</td>
</tr>
<tr>
<td>10</td>
<td>C</td>
<td>80.8</td>
</tr>
</tbody>
</table>

Table III: Mean soil earthworm density on different soil type treated with Pesticides.

- Soil Type: C (Control), L (Lindane), G (Guthion)
- Earthworm Density: measured in numbers per square meter.
- Data collected from multiple weeks (Week 1 to Week 10).

**Observation:**
- The soil earthworm density varies across different soil types and pesticide treatments.
- Lindane (L) and Guthion (G) treatments show higher earthworm densities compared to the control (C).
- Week 9 shows the highest earthworm density for the control group.
- Week 8 shows the highest earthworm density for Lindane and Guthion treated groups.

**Conclusion:**
- Further studies are needed to determine the long-term effects of pesticide treatments on soil earthworm populations.

### Table 2: Pod Damage - Number of Drums Holes Per Pod

<table>
<thead>
<tr>
<th>Variety Name</th>
<th>Standard Error of Estimate</th>
<th>Variance</th>
<th>Average Number of Holes Damaged</th>
<th>Average Number of Holes Damaged Per Pod</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.08</td>
<td>A</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td>B</td>
<td>0.08</td>
<td>A</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td>C</td>
<td>0.08</td>
<td>A</td>
<td>0.07</td>
<td>0.07</td>
</tr>
</tbody>
</table>

### Table 3: Pod Damage - Number of Drums Holes Per Pod

<table>
<thead>
<tr>
<th>Variety Name</th>
<th>Standard Error of Estimate</th>
<th>Variance</th>
<th>Average Number of Holes Damaged</th>
<th>Average Number of Holes Damaged Per Pod</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.08</td>
<td>A</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td>B</td>
<td>0.08</td>
<td>A</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td>C</td>
<td>0.08</td>
<td>A</td>
<td>0.07</td>
<td>0.07</td>
</tr>
</tbody>
</table>

### Table 4: Pod Damage - Number of Drums Holes Per Pod

<table>
<thead>
<tr>
<th>Variety Name</th>
<th>Standard Error of Estimate</th>
<th>Variance</th>
<th>Average Number of Holes Damaged</th>
<th>Average Number of Holes Damaged Per Pod</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.08</td>
<td>A</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td>B</td>
<td>0.08</td>
<td>A</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td>C</td>
<td>0.08</td>
<td>A</td>
<td>0.07</td>
<td>0.07</td>
</tr>
</tbody>
</table>
### Table

<table>
<thead>
<tr>
<th></th>
<th>( q )</th>
<th>( \sigma )</th>
<th>( \bar{q} )</th>
<th>( \bar{\sigma} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( q' )</td>
<td>0.67</td>
<td>0.95</td>
<td>0.67</td>
<td>0.95</td>
</tr>
<tr>
<td>( q'' )</td>
<td>0.72</td>
<td>0.96</td>
<td>0.72</td>
<td>0.96</td>
</tr>
<tr>
<td>( q''' )</td>
<td>0.73</td>
<td>0.97</td>
<td>0.73</td>
<td>0.97</td>
</tr>
<tr>
<td>( q'''' )</td>
<td>0.74</td>
<td>0.98</td>
<td>0.74</td>
<td>0.98</td>
</tr>
</tbody>
</table>

### Calculation

\[ \sigma = \frac{\sum q}{n} \]

\[ \bar{\sigma} = \frac{\sigma}{n} \]

\[ \bar{q} = \frac{\sum q'}{n} \]

\[ \bar{\bar{q}} = \frac{\bar{q}}{n} \]

### Formula

\[ \text{Percentage Error} = \frac{|\text{True Value} - \text{Calculated Value}|}{\text{True Value}} \times 100\% \]
4. Elevation of miscible injectors for control of pod contents is effective in the 1% level.

Table 1: Results of Treatment

| Pod  | Standard Error | Yield % | Variety | Test of Assumptions | 1% Pod
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>125.7</td>
<td>0.88 Standard Error</td>
<td>12.1</td>
<td>latin red</td>
<td>=1.1</td>
<td>12.1</td>
</tr>
<tr>
<td>125.7</td>
<td>0.88 Standard Error</td>
<td>12.1</td>
<td>latin red</td>
<td>=1.1</td>
<td>12.1</td>
</tr>
<tr>
<td>125.7</td>
<td>0.88 Standard Error</td>
<td>12.1</td>
<td>latin red</td>
<td>=1.1</td>
<td>12.1</td>
</tr>
<tr>
<td>125.7</td>
<td>0.88 Standard Error</td>
<td>12.1</td>
<td>latin red</td>
<td>=1.1</td>
<td>12.1</td>
</tr>
</tbody>
</table>

The number of miscellaneous treatments was dependent on the size of pod and depth. The number of treatments in pods at 1 to 10 feet intervals was reduced due to the presence of pods that were not considered.

The pods were harvested at 12 months after planting and the results were recorded in the chart above. The data was analyzed using analysis of variance and the results were presented in the table below.

Table 2: Analysis of Variance

<table>
<thead>
<tr>
<th>Pod</th>
<th>Standard Error</th>
<th>1% Pod</th>
</tr>
</thead>
<tbody>
<tr>
<td>125.7</td>
<td>0.88 Standard Error</td>
<td>12.1</td>
</tr>
<tr>
<td>125.7</td>
<td>0.88 Standard Error</td>
<td>12.1</td>
</tr>
<tr>
<td>125.7</td>
<td>0.88 Standard Error</td>
<td>12.1</td>
</tr>
<tr>
<td>125.7</td>
<td>0.88 Standard Error</td>
<td>12.1</td>
</tr>
</tbody>
</table>

The results show a significant difference in the yield of pods at different depths. Further investigations are needed to determine the optimal depth for pod growth. The analysis also indicated a significant difference in the variety of pods at different depths. Further research is needed to identify the factors that contribute to this variation.
Table 1. Effects of different inoculums on seedling emergence. A. nigrum.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Av. No. of plants</th>
<th>Treated field plot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>112</td>
<td></td>
</tr>
<tr>
<td>Treatment A</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>Treatment B</td>
<td>106</td>
<td></td>
</tr>
<tr>
<td>Treatment C</td>
<td>102</td>
<td></td>
</tr>
<tr>
<td>Treatment D</td>
<td>98</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Effect of inoculums on yield in a controlled experiment.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>50</td>
</tr>
<tr>
<td>Treatment A</td>
<td>55</td>
</tr>
<tr>
<td>Treatment B</td>
<td>60</td>
</tr>
<tr>
<td>Treatment C</td>
<td>65</td>
</tr>
<tr>
<td>Treatment D</td>
<td>70</td>
</tr>
</tbody>
</table>

Note: Inoculums were applied at 500 g/ha.
<table>
<thead>
<tr>
<th>Percentage</th>
<th>1980</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.5%</td>
<td>1.6%</td>
<td>1.4%</td>
</tr>
<tr>
<td>20.5%</td>
<td>2.0%</td>
<td>1.8%</td>
</tr>
</tbody>
</table>

Table 1: Economic Profile of Roosevelt Island

<table>
<thead>
<tr>
<th>Industry</th>
<th>1980</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>16%</td>
<td>14%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>18%</td>
<td>16%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>8%</td>
<td>6%</td>
</tr>
<tr>
<td>Transportation</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>3%</td>
<td>2%</td>
</tr>
</tbody>
</table>

*Note: The population numbers in this table are estimates based on the 1990 Census.*
22. COUPEA

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 Kona.

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). Empoaasca sp. was the major insect problem.

For Trial No.1. prevalent diseases observed were CMV and leaf spot Cercospora sp. and Fusarium wilt. Both Diabrotica sp. and Empoaasca 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 in IITA Trial No.1.

<table>
<thead>
<tr>
<th>Cultivars</th>
<th>Seed Yield Kg/ha</th>
<th>Threshing Percentage</th>
<th>DFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vita 3</td>
<td>1313</td>
<td>74.52</td>
<td>47</td>
</tr>
<tr>
<td>TVU3629</td>
<td>1243</td>
<td>60.27</td>
<td>46</td>
</tr>
<tr>
<td>TVX 3236-010</td>
<td>1522</td>
<td>63.40</td>
<td>50</td>
</tr>
<tr>
<td>TVX 3627-012F</td>
<td>1083</td>
<td>59.60</td>
<td>44</td>
</tr>
<tr>
<td>TVX 3671-7C-020</td>
<td>1318</td>
<td>68.28</td>
<td>45</td>
</tr>
<tr>
<td>TVX 3671-14C-01D</td>
<td>1110</td>
<td>66.51</td>
<td>49</td>
</tr>
<tr>
<td>TVX 4262-014D</td>
<td>743</td>
<td>59.07</td>
<td>47</td>
</tr>
<tr>
<td>TVX 4659-03E</td>
<td>1307</td>
<td>76.47</td>
<td>46</td>
</tr>
<tr>
<td>Local Check (Laura B)</td>
<td>1155</td>
<td>70.47</td>
<td>44</td>
</tr>
<tr>
<td>TVX 4262-09D</td>
<td>1375</td>
<td>76.32</td>
<td>48</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Cultivars</th>
<th>Seed Yield Kg/ha</th>
<th>Threshing Percentage</th>
<th>DFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vita 7</td>
<td>1055</td>
<td>67.92</td>
<td>48</td>
</tr>
<tr>
<td>TVU 3629</td>
<td>1032</td>
<td>71.15</td>
<td>49</td>
</tr>
<tr>
<td>TVX 1836-013J</td>
<td>940</td>
<td>68.05</td>
<td>47</td>
</tr>
<tr>
<td>TVX 1948-03F</td>
<td>1034</td>
<td>63.13</td>
<td>51</td>
</tr>
<tr>
<td>TVX 133-16C2</td>
<td>950</td>
<td>61.87</td>
<td>41</td>
</tr>
<tr>
<td>TVX 2394-02F</td>
<td>1083</td>
<td>70.75</td>
<td>45</td>
</tr>
<tr>
<td>TVX 2724-01F</td>
<td>1208</td>
<td>67.34</td>
<td>46</td>
</tr>
<tr>
<td>TVX 3381-02F</td>
<td>882</td>
<td>69.43</td>
<td>47</td>
</tr>
<tr>
<td>TVX 3410-02J</td>
<td>968</td>
<td>73.74</td>
<td>43</td>
</tr>
<tr>
<td>TVX 3607-02B</td>
<td>1292</td>
<td>74.37</td>
<td>44</td>
</tr>
<tr>
<td>TVX 4577-02D</td>
<td>1025</td>
<td>66.25</td>
<td>46</td>
</tr>
<tr>
<td>TVX 4661-07D</td>
<td>1265</td>
<td>71.60</td>
<td>43</td>
</tr>
<tr>
<td>TVX 4667-08E</td>
<td>1217</td>
<td>71.73</td>
<td>47</td>
</tr>
<tr>
<td>TVX 4673-03E</td>
<td>1458</td>
<td>71.39</td>
<td>48</td>
</tr>
<tr>
<td>Local Check (Yuma Check)</td>
<td>1200</td>
<td>64.77</td>
<td></td>
</tr>
</tbody>
</table>
Status

Promising cultivars will be further evaluated in subsequent trials under Project 22.1 and 72.2, and sent to other CANFI 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 meteorologic data.

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

<table>
<thead>
<tr>
<th>Variety</th>
<th>1981</th>
<th>1982</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jul</td>
<td>Aug</td>
</tr>
<tr>
<td>Vita 3</td>
<td>181</td>
<td>138</td>
</tr>
<tr>
<td>Laura B</td>
<td>310</td>
<td>145</td>
</tr>
<tr>
<td>African Red</td>
<td>269</td>
<td>196</td>
</tr>
<tr>
<td>ER-7</td>
<td>361</td>
<td>213</td>
</tr>
</tbody>
</table>

Summary of Differences Between Variety Means


<table>
<thead>
<tr>
<th>Variety</th>
<th>Yield</th>
<th>Mean No. Pods</th>
<th>Per Plant, Weight</th>
<th>Harvested Per Pct</th>
<th>Per Pct</th>
<th>Threshing Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kg/ha</td>
<td>(gm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vita 3</td>
<td>212</td>
<td>127</td>
<td>40</td>
<td>172</td>
<td>4.26</td>
<td>9.12</td>
</tr>
<tr>
<td>Laura B</td>
<td>257</td>
<td>154</td>
<td>35</td>
<td>245</td>
<td>7.10</td>
<td>7.10</td>
</tr>
<tr>
<td>African Red</td>
<td>297</td>
<td>117</td>
<td>20</td>
<td>417</td>
<td></td>
<td>9.11</td>
</tr>
<tr>
<td>ER-7</td>
<td></td>
<td></td>
<td>8</td>
<td></td>
<td>7.07</td>
<td>7.07</td>
</tr>
<tr>
<td>SE</td>
<td>0.66</td>
<td>10.44</td>
<td>0.30</td>
<td>0.14</td>
<td>0.07</td>
<td></td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Cultivars</th>
<th>Mildew</th>
<th>CPMV</th>
<th>CLS</th>
<th>Wilt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vita 3</td>
<td>2.50</td>
<td>3.64</td>
<td>1.70</td>
<td>2.00</td>
</tr>
<tr>
<td>Laura B</td>
<td>4.10</td>
<td>3.35</td>
<td>4.25</td>
<td>2.00</td>
</tr>
<tr>
<td>African Red</td>
<td>3.50</td>
<td>2.71</td>
<td>2.53</td>
<td>1.33</td>
</tr>
<tr>
<td>ER-7</td>
<td>2.87</td>
<td>4.71</td>
<td>3.79</td>
<td>2.50</td>
</tr>
</tbody>
</table>

Score Degree of Severity of
Occurrence 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 (Sec 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 i.e. 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

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Seed Yield Kg/ha</th>
<th>Threshing Percentage</th>
<th>Days of Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Local Cowpea</td>
<td>545</td>
<td>1053</td>
<td>760</td>
</tr>
<tr>
<td>TVX 3811-02F</td>
<td>667</td>
<td>1675</td>
<td>1313</td>
</tr>
<tr>
<td>John Coote</td>
<td>658</td>
<td>1068</td>
<td>923</td>
</tr>
<tr>
<td>TVX 3629 (Ife Brown)</td>
<td>1163</td>
<td>1873</td>
<td>2073</td>
</tr>
<tr>
<td>TVX 2724-01F</td>
<td>1253</td>
<td>1772</td>
<td>1583</td>
</tr>
<tr>
<td>African Red</td>
<td>692</td>
<td>1482</td>
<td>917</td>
</tr>
<tr>
<td>Vita -3</td>
<td>260</td>
<td>1705</td>
<td>0</td>
</tr>
<tr>
<td>ER-7</td>
<td>1055</td>
<td>1552</td>
<td>2104</td>
</tr>
<tr>
<td>Laura B</td>
<td>1030</td>
<td>1780</td>
<td>1729</td>
</tr>
<tr>
<td>Laura R</td>
<td>695</td>
<td>1554</td>
<td>1021</td>
</tr>
</tbody>
</table>

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

### Table 4. Seed Yield from Cowpea Cultivars in Dundee Nursery

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Seed Yield Kg/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trial 1</td>
</tr>
<tr>
<td>African Red</td>
<td>1260</td>
</tr>
<tr>
<td>Laura B</td>
<td>-</td>
</tr>
<tr>
<td>Local Cowpea</td>
<td>-</td>
</tr>
<tr>
<td>ER-7</td>
<td>-</td>
</tr>
<tr>
<td>TVX 4678</td>
<td>-</td>
</tr>
<tr>
<td>Ife Brown</td>
<td>1008</td>
</tr>
<tr>
<td>Vita 9</td>
<td>1386</td>
</tr>
<tr>
<td>Vita 3</td>
<td>1512</td>
</tr>
<tr>
<td>Vita 6</td>
<td>1008</td>
</tr>
<tr>
<td>TVX 2724-01F</td>
<td>1386</td>
</tr>
<tr>
<td>TVX 1843-10</td>
<td>1009</td>
</tr>
<tr>
<td>Aurora</td>
<td>-</td>
</tr>
<tr>
<td>TVX 3671-02F</td>
<td>756</td>
</tr>
<tr>
<td>TVX 1050-01E</td>
<td>1008</td>
</tr>
<tr>
<td>TVX 1576-01F</td>
<td>1260</td>
</tr>
<tr>
<td>TVX 1193-7D</td>
<td>1386</td>
</tr>
</tbody>
</table>
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.

O 10
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 multitrace 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 Walerfield on farmers' field. The variety yielded well and was highly acceptable because of its...
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 ratocned the crop. When ratocned, the first crop yield was in the region of 800 lbs. Six weeks later the second ratocn 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 20 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.

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 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 Uromyces phaseoli.
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. Aruzina
8. Vita-3
9. TVX Z72 - 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 *Empesca* 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.

<table>
<thead>
<tr>
<th>Identification</th>
<th>DFF</th>
<th>Maturity</th>
<th>Mean pod wt. kg/ha</th>
<th>Mean seed wt. kg/ha</th>
<th><strong>T%</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>IT82E - 3</td>
<td>42</td>
<td>59</td>
<td>1141</td>
<td>919</td>
<td>80.5</td>
</tr>
<tr>
<td>IT82S - 25</td>
<td>41</td>
<td>58</td>
<td>914</td>
<td>650</td>
<td>72.0</td>
</tr>
<tr>
<td>IT82E - 27</td>
<td>39</td>
<td>62</td>
<td>1529</td>
<td>950</td>
<td>62.1</td>
</tr>
<tr>
<td>IT82E - 49</td>
<td>40</td>
<td>60</td>
<td>1029</td>
<td>671</td>
<td>65.2</td>
</tr>
<tr>
<td>IT82E - 70</td>
<td>40</td>
<td>60</td>
<td>864</td>
<td>558</td>
<td>69.2</td>
</tr>
<tr>
<td>IT81D - 1069</td>
<td>51</td>
<td>66</td>
<td>1843</td>
<td>1394</td>
<td>75.6</td>
</tr>
<tr>
<td>IT81D - 1151</td>
<td>52</td>
<td>64</td>
<td>1483</td>
<td>1077</td>
<td>72.6</td>
</tr>
<tr>
<td>IT81D - 1205-174</td>
<td>45</td>
<td>64</td>
<td>1812</td>
<td>1179</td>
<td>65.1</td>
</tr>
<tr>
<td>TVX1836-013F</td>
<td>49</td>
<td>66</td>
<td>1450</td>
<td>927</td>
<td>63.9</td>
</tr>
<tr>
<td>TVX1848-012F</td>
<td>49</td>
<td>62</td>
<td>1461</td>
<td>969</td>
<td>65.4</td>
</tr>
<tr>
<td>TVX2326-01G</td>
<td>49</td>
<td>-</td>
<td>1602</td>
<td>1135</td>
<td>70.8</td>
</tr>
<tr>
<td>TVX3627-012F</td>
<td>45</td>
<td>66</td>
<td>1341</td>
<td>779</td>
<td>58.1</td>
</tr>
<tr>
<td>TVX3871-02F</td>
<td>42</td>
<td>65</td>
<td>1381</td>
<td>810</td>
<td>58.7</td>
</tr>
<tr>
<td>TVX4651-1456</td>
<td>48</td>
<td>65</td>
<td>1652</td>
<td>1075</td>
<td>65.1</td>
</tr>
<tr>
<td>TVX4659-02E</td>
<td>49</td>
<td>65</td>
<td>1962</td>
<td>1216</td>
<td>62.0</td>
</tr>
<tr>
<td>TVX4652-03E</td>
<td>48</td>
<td>-</td>
<td>935</td>
<td>633</td>
<td>67.7</td>
</tr>
<tr>
<td>TVX4661-07E</td>
<td>44</td>
<td>64</td>
<td>1562</td>
<td>1010</td>
<td>64.7</td>
</tr>
<tr>
<td>TVX4677-85E</td>
<td>40</td>
<td>62</td>
<td>1635</td>
<td>946</td>
<td>57.9</td>
</tr>
<tr>
<td>TVX4610-010E</td>
<td>46</td>
<td>65</td>
<td>1918</td>
<td>1213</td>
<td>63.2</td>
</tr>
<tr>
<td>LAURA B.</td>
<td>50</td>
<td>66</td>
<td>1560</td>
<td>948</td>
<td>60.8</td>
</tr>
</tbody>
</table>

*Days to physiological maturity

**Threshing percentage
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.

<table>
<thead>
<tr>
<th>Variety</th>
<th>1st Choice</th>
<th>2nd Choice</th>
<th>3rd Choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local cowpea</td>
<td>51</td>
<td>32</td>
<td>16</td>
</tr>
<tr>
<td>African Red</td>
<td>9</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td>TVX 2724-017</td>
<td>12</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Laura 3</td>
<td>9</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td>ER-7</td>
<td>16</td>
<td>9</td>
<td>25</td>
</tr>
<tr>
<td>No response</td>
<td>-</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

Numerous reasons were advanced to justify the consumer's 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 (25%) were undecided as to alternate recipes for use of the legume. Pamphlets with suggested recipes are to be issued.
The enthusiasm 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 Chaetomphora cupulifera and C. infundibuliformis the pathogens of Links 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 4677-01E 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 trailing, produced few flowers and exhibited poor pod set.

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

<table>
<thead>
<tr>
<th>Identification</th>
<th>&quot;Yield kg/ha.&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT81D -1069</td>
<td>1890</td>
</tr>
<tr>
<td>IT82E -27</td>
<td>756</td>
</tr>
<tr>
<td>TVX4677 -01E</td>
<td>2080</td>
</tr>
<tr>
<td>LAURA-B</td>
<td>945</td>
</tr>
<tr>
<td>VITA-3</td>
<td>-</td>
</tr>
<tr>
<td>TVX2724 -01F</td>
<td>1040</td>
</tr>
<tr>
<td>AFRICAN RED</td>
<td>756</td>
</tr>
<tr>
<td>ARUACA</td>
<td>1230</td>
</tr>
<tr>
<td>YUC-CLAY</td>
<td>1797</td>
</tr>
<tr>
<td>IFE-ERGIE</td>
<td>1135</td>
</tr>
</tbody>
</table>

Note: *Yield kg/ha.*
In collaboration with the Trelawny Area Land Authority, CARDI initiated investigations of appropriate practices for large-scale production of Vita-3 in the Dundoe 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, especially 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 Guatemala 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 degradation 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

Canada 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 peninsula. Major activities 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 peninsula. 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:

<table>
<thead>
<tr>
<th>Line</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT 82D-709</td>
<td>836 Kg/ Ha</td>
</tr>
<tr>
<td>IT 82D-766</td>
<td>940 Kg/ Ha</td>
</tr>
<tr>
<td>IT 82D-975</td>
<td>864 Kg/ Ha</td>
</tr>
<tr>
<td>TVX 4659-03E</td>
<td>876 Kg/ Ha</td>
</tr>
<tr>
<td>Local check</td>
<td>663 Kg/ Ha</td>
</tr>
</tbody>
</table>

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 peninsula. 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.
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Dr. Paul Saint-Hilaire (Ing. Agr., Adjunct director CRDA)
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B.P. 131
Port-
Au-Prince, Haiti
CIDA's co-operation activities in Haiti 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 Haiti 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 Haiti, encouraged by the new atmosphere of détente emerging in the country.

Canada signed a General Co-operation Agreement with Haiti 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 Haiti's five-year development plan (1976-1981).

In 1977-78, the orientation of the co-operation program with Haiti 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 Haiti; 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) Inefficiencies 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 Haitian 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 CRIPP, its major program in Haiti.
A review of the co-operation program in Haiti 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 Haiti.

- 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 Haitian 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 professionnelle (professional training centre) - and to help improve the management of government agencies.

- The third area of concentration was selected in order to help meet Haiti'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 Haitian 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 Haiti.

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

CIDA has also been involved in Haiti through its special programs and emergency programs.
The Special Programs Branch, in particular the Non-Governmental Organizations Division, has been working in Haiti 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 Haiti in 1983-84; and table 3, a list of NGOs working in Haiti 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 Haiti 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;
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 missions. 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
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WAN#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 ALB'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 CDI/NT 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 "don't'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 IAC 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, IERD, 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 PF 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).
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 soja*, 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 indicated that some hard seed emerge up to 3 weeks after 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 (NAT. 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 origin of 'Alamo' that will be released in Guatemala. 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 Polyvinylidene 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 believe 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 cowpeas. 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 Oxxutzcab many vendors were selling cowpea pod and green seed. While it is evident that many rural people in Yucatan State consume cowpeas 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 | IT 81D-1228 |
| TVX 3516-09F | IT 82D-18 |
| TVX 3627-012F | IT 82D-60 |
| TVX 2394-02F | IT 82D-716 |
| TVX 1836-013J | IT 82D-789 |
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 through 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

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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 INIAPA 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-IIITA). 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 Oleaginosas 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 January 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 governent 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 INIPE, the Director of research, Dr. Benjamin Quijandira, is promising a high priority for soybeans in the coming years.

**Soybean in Ecuador**

**Bolíche**

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 damaged because of a drought after planting as well as being severely 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 sandy 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 sesquipedalpus. 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 apodoptera 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 consistent 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 cowpeas, 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, manteiguninha 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 studying 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 alkaline.

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 black-eyed and half brown-eyed. He had separated the two colors and they appeared 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 sucre in the markets as a dry seed. Lima bean was about 60 sucre. Exchange rate is about 118 sucre 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.
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<td>TVx 5881-016e</td>
<td>625</td>
<td>909</td>
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<tr>
<td>VITA 7</td>
<td>461</td>
<td>1228</td>
<td>2.79</td>
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IITA Early, Erect - Yurimaguas, Peru

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

<table>
<thead>
<tr>
<th>Yield</th>
<th>+Ca</th>
<th>-Ca</th>
<th>-Ca/+Ca</th>
<th>Days to Flowering</th>
<th>Days to Maturity</th>
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<td>VITA 7</td>
<td>669</td>
<td>1376</td>
<td>2.06</td>
<td>55</td>
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### IITA Medium Maturity - Yurimaguas, Peru

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

<table>
<thead>
<tr>
<th>Yield</th>
<th>+ Ca</th>
<th>-Ca</th>
<th>-Ca/+Ca</th>
<th>Days to Flowering</th>
<th>Days to Maturity</th>
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IITA Soybean Trial, received via CIAT  
Planted Jan. 08, 1985  
Tarapoto, Peru

<table>
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<th>Line</th>
<th>Days to Maturity</th>
<th>Height (cm)</th>
<th>Kg/ha</th>
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<td>49</td>
<td>1256</td>
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<tr>
<td>2. Numbaira</td>
<td>114</td>
<td>35</td>
<td>566</td>
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<tr>
<td>03. Tropical</td>
<td>118</td>
<td>68</td>
<td>1142</td>
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<tr>
<td>04. TGx 726-01F</td>
<td>111</td>
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<td>20. TGx 604-027D</td>
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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 afternoon 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 (PEPROXAL). We discussed a proposed visit of 6 or 7 Hondureños to Brazil 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.
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, Guatemala, El Salvador, 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 technology 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 *Phaseolus* 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, biometrcian, 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 Agrícola 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 forages.

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 Buesatan, 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 of phosphorous
vary with the amount applied, the timing of the application (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 P2O5 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 Ciuclar 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 possibly, 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 were some rust-looking spots on older leaves of MANAUS in one plot only.

PERU

ΙQUITOS

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 harvest, 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 Ragingas 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 potassium, 21.5 mili-equivalent calcium and magnesium with organic matter at 2.6%. No phosphorus 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 highest 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 magnesium 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 differences. 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: ENGOPA 303 and G081 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 INTOSOY-CIAT had been received. 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 Northern, 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 177-026 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 cowpeas. 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 severe 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 Linlin 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. Discussed release procedures and seed multiplication to some extent with Wes Kline. Also discussed computers.
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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 Departamento 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 assessoria, 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 believes 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, Ceará

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-Guatemala 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-García, 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 Rodríguez, Jefe, División de Investigacion. We discussed CENTA training needs and the PCCMCA meetings to be held in El Salvador in March. I also described 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 Ventas, 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 Avícola 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 Claassen 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.
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<th>Fecha Devolución</th>
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